

# High**PROTEC**

Manual | Motor Protection



## **MRM4**

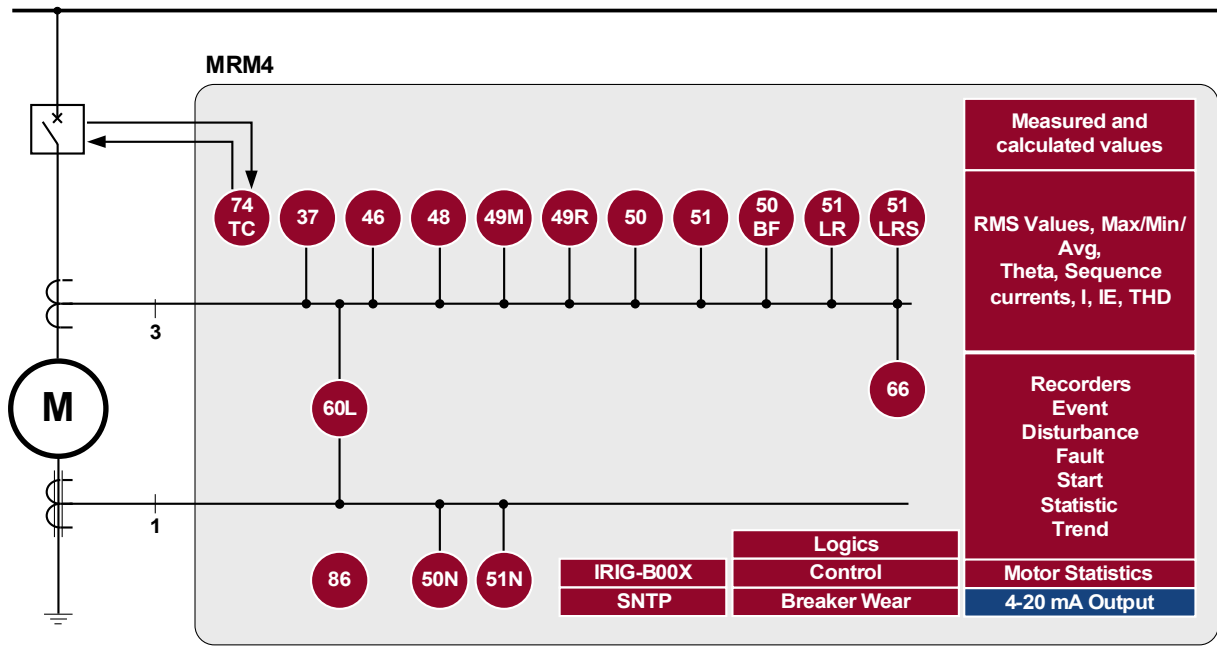
Software-Version: 3.0.b

DOK-HB-MRM4-2E

Revision: B

English

# MRM4 Functional Overview



● — Device type: MRM4Bxxx    
 ● — Standard

## Order Code

<b>Motor Protection</b> (Version 2 with USB, enhanced communication options and new front plate)					<b>MRM4</b>	<b>-2</b>				
<b>Digital Inputs</b>	<b>Binary output relays</b>	<b>Analog Inputs/Outputs</b>	<b>Housing</b>	<b>Large display</b>						
8	6	0/0	B1	-					<b>A</b>	
4	4	0/1	B1	-					<b>B</b>	
<b>Hardware variant 2</b>										
Phase Current 5A/1A, Ground Current 5 A/1 A										<b>0</b>
Phase Current 5A/1A, Sensitive Ground Current 5 A/1 A										<b>1</b>
<b>Housing and mounting</b>										
Door mounting										<b>A</b>
Door mounting 19" (flush mounting)										<b>B</b>
<b>Communication protocol</b>										
Without protocol										<b>A</b>
Modbus RTU, IEC60870-5-103, DNP3.0 RTU   <i>RS485/terminals</i>										<b>B*</b>
Modbus TCP, DNP3.0 TCP/UDP   <i>Ethernet 100 MB/RJ45</i>										<b>C*</b>
Profibus-DP   <i>optic fiber/ST-connector</i>										<b>D*</b>
Profibus-DP   <i>RS485/D-SUB</i>										<b>E*</b>
Modbus RTU, IEC60870-5-103, DNP3.0 RTU   <i>optic fiber/ST-connector</i>										<b>F*</b>
Modbus RTU, IEC60870-5-103, DNP3.0 RTU   <i>RS485/D-SUB</i>										<b>G*</b>
IEC61850, Modbus TCP, DNP3.0 TCP/UDP   <i>Ethernet 100MB/RJ45</i>										<b>H*</b>
IEC60870-5-103, Modbus RTU, DNP3.0 RTU   <i>RS485/terminals</i>										<b>I*</b>
Modbus TCP, DNP3.0 TCP/UDP   <i>Ethernet 100 MB/RJ45</i>										
IEC61850, Modbus TCP, DNP3.0 TCP/UDP   <i>Optical Ethernet 100MB/LC duplex connector</i>										<b>K*</b>
Modbus TCP, DNP3.0 TCP/UDP   <i>Optical Ethernet 100MB/LC duplex connector</i>										<b>L*</b>
<b>Harsh Environment Option</b>										
None										<b>A</b>
Conformal Coating										<b>B</b>
<b>Available menu languages</b>										
Standard English/German/Spanish/Russian/Polish/Portuguese/French										

\* Within every communication option only one communication protocol is usable.  
Smart view can be used in parallel via the Ethernet interface (RJ45).

The parameterizing- and disturbance analyzing software Smart view is included in the delivery of HighPROTEC devices.

## Order Code

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All devices are equipped with an IRIG-B interface for Time Synchronization.

ANSI: 46, 49M, 49R, 49S, 50J, 37, 50, 51, 50N, 51N, 60L, 86, 50BF, 74TC

With control function for 1 switchgear and logic up to 80 equations.

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This manual applies to devices (version):

Version 3.0.b

Build: 27779

## Comments on the Manual

This manual explains in general the tasks of device planning, parameter setting, installation, commissioning, operation and maintenance of the HighPROTEC devices.

The manual serves as working basis for:

- Engineers in the protection field,
- commissioning engineers,
- people dealing with setting, testing and maintenance of protection and control devices,
- as well as trained personnel for electrical installations and power stations.

All functions concerning the type code will be defined. Should there be a description of any functions, parameters or inputs/outputs which do not apply to the device in use, please ignore that information.

All details and references are explained to the best of our knowledge and are based on our experience and observations.

This manual describes the (optionally) full featured versions of the devices.

All technical information and data included in this manual reflect their state at the time this document was issued. We reserve the right to carry out technical modifications in line with further development without changing this manual and without previous notice. Hence no claim can be brought based on the information and descriptions this manual includes.

Text, graphic and formulae do not always apply to the actual delivery scope. The drawings and graphics are not true to scale. We do not accept any liability for damage and operational failures caused by operating errors or disregarding the directions of this manual.

No part of this manual is allowed to be reproduced or passed on to others in any form, unless *Woodward Kempen GmbH* have approved in writing.

This user manual is part of the delivery scope when purchasing the device. In case the device is passed on (sold) to a third party, the manual has to be handed over as well.

Any repair work carried out on the device requires skilled and competent personnel who need to be well aware especially of the local safety regulations and have the necessary experience for working on electronic protection devices and power installations (provided by evidence).

## Information Concerning Liability and Warranty

*Woodward* does not accept any liability for damage resulting from conversions or changes carried out on the device or planning (projecting) work, parameter setting or adjustment changes done by the customer.

The warranty expires after a device has been opened by others than *Woodward* specialists.

Warranty and liability conditions stated in *Woodward* General Terms and Conditions are not supplemented by the above mentioned explanations.

## IMPORTANT DEFINITIONS

The signal definitions shown below serve the safety of life and limb as well as for the appropriate operating life of the device.



**DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.



**WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.



**CAUTION**, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



**NOTICE** is used to address practices not related to personal injury.



**CAUTION**, without the safety alert symbol, is used to address practices not related to personal injury.

**⚠ WARNING**

**FOLLOW INSTRUCTIONS**

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment. Practice all plant and safety instructions and precautions. Failure to follow instructions can cause personal injury and/or property damage.

**⚠ WARNING**

**PROPER USE**

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (1) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (2) invalidate product certifications or listings.

The programmable devices subject to this manual are designed for protection and also control of power installations and operational devices that are fed by voltage sources with a fixed frequency, i.e. fixed at 50 or 60 Hertz. They are not intended for use with Variable Frequency Drives. The devices are further designed for installation in low-voltage (LV) compartments of medium voltage (MV) switchgear panels or in decentralized protection panels. The programming and parameterization has to meet all requirements of the protection concept (of the equipment that is to be protected). You must ensure that the device will properly recognize and manage (e.g. switch off the circuit breaker) on the basis of your programming and parameterization all operational conditions (failures). The proper use requires a backup protection by an additional protective device. Before starting any operation and after any modification of the programming (parameterization) test make a documentary proof that your programming and parameterization meets the requirements of your protection concept.

The self-supervision contact has to be wired with the master communication system (SCADA) in order to supervise and monitor the state of health of the programmable protective device.

Typical applications for this product family/device line are for instance:

- Feeder protection
- Mains protection
- Machine protection
- Transformer Differential Protection

Any usage beyond these applications the devices are not designed for. This applies also to the use as a partly completed machinery. The manufacturer cannot be held liable for any resulting damage, the user alone bears the risk for this. As to the appropriate use of the device: The technical data and tolerances specified by *Woodward* have to be met.



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**CAUTION**

**Electrostatic Discharge Awareness**

All electronic equipment is electro static-sensitive, some components more than others. To protect these components from electro static damage, you must take special precautions to minimize or eliminate electrostatic discharges.

Follow these precautions when working with or near the control.

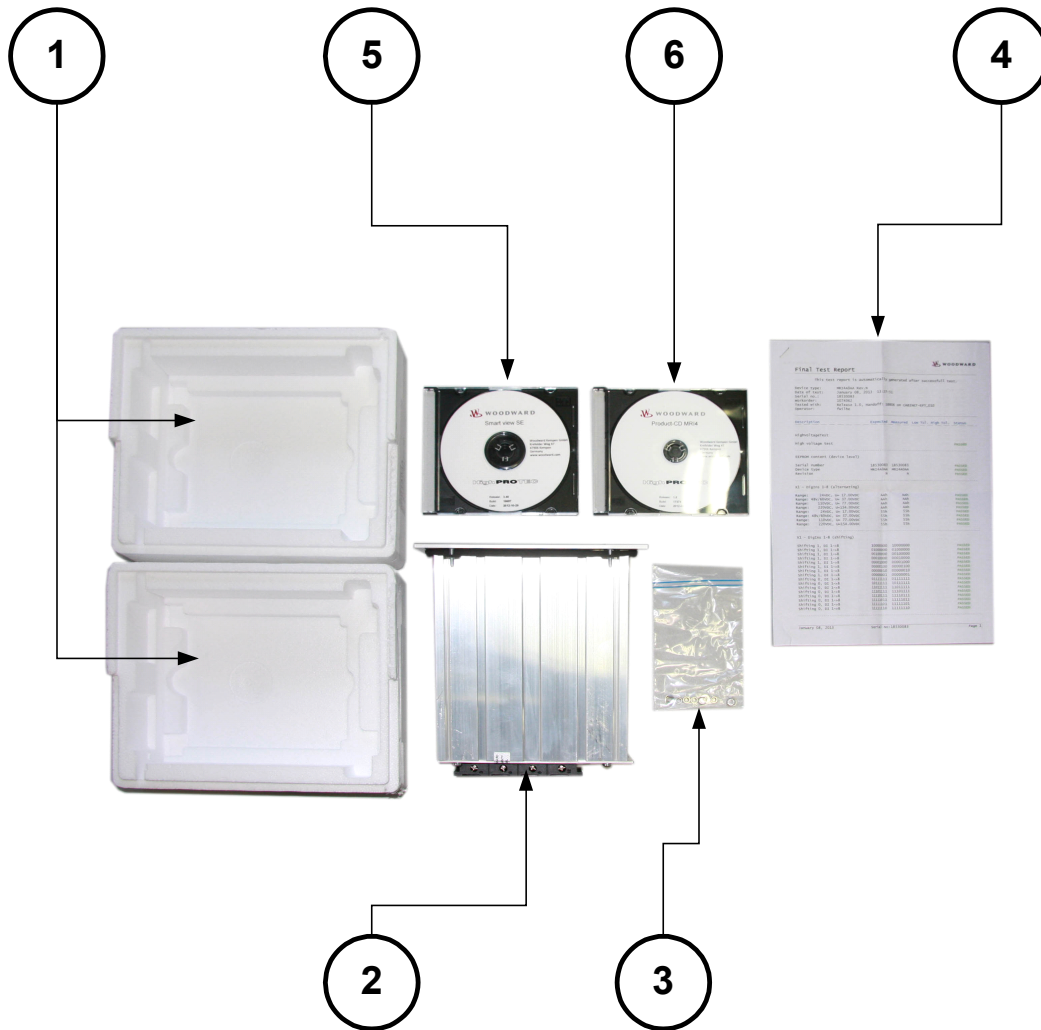
1. Before doing maintenance on the electronic control, discharge the static electricity on your body to ground by touching and holding a grounded metal object (pipes, cabinets, equipment, etc.).
2. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.
3. Keep plastic, vinyl, and Styrofoam materials (such as plastic or Styrofoam cups, cup holders, cigarette packages, cellophane wrappers, vinyl books or folders, plastic bottles, and plastic ash trays) away from the control, the modules, and the work area as much as possible.
4. Do not remove any printed circuit board (PCB) from the control cabinet unless absolutely necessary. If you must remove the PCB from the control cabinet, follow these precautions:
  - Verify the safe isolation from supply. All connectors have to be unplugged.
  - Do not touch any part of the PCB except the edges.
  - Do not touch the electrical conductors, the connectors, or the components with conductive devices or with your hands.
  - When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control cabinet, place it in the antistatic protective bag.

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual 82715, Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules.

Woodward reserves the right to update any portion of this publication at any time. Information provided by Woodward is believed to be correct and reliable. However, no responsibility is assumed by Woodward unless otherwise expressly undertaken.

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Scope of Delivery



The delivery scope includes:

<p>1</p>	<p>The transportation box</p>
<p>2</p>	<p>The protective device</p>
<p>3</p>	<p>The mounting nuts</p>
<p>4</p>	<p>The test report</p>
<p>5</p>	<p>The product CD that includes the manuals</p>
<p>6</p>	<p>The parameter and evaluation software Smart view</p>

Please check the consignment for completeness on arrival (delivery note).

Please ascertain whether the type plate, connection diagram, type code and description of the device tally. If you have any doubts please contact our Service Department (contact address to be found on the reverse of the manual).

### Storage

The devices must not be stored outdoors. The storing facilities have to be sufficiently ventilated and must be dry (see Technical Data).

### Important Information



**In line with the customer's requirement the devices are combined in a modular way (in compliance with the order code). The terminal assignment of the device can be found on the top of the device (wiring diagram).**



# Symbols

**Setting value:**

**Device planning:**

**Signal:**

**Measured Values:**

**Functional description:** If the setting value "E Dir n poss-> Nondir.Trip" is set to "inactive" the output 1 is active and output 2 is inactive. If the setting value "E Dir n poss-> Nondir.Trip" is set to "active" the output 2 is active and the output 1 is inactive.

**Option/features to be realised in the future**

**Adaptive Parameter**

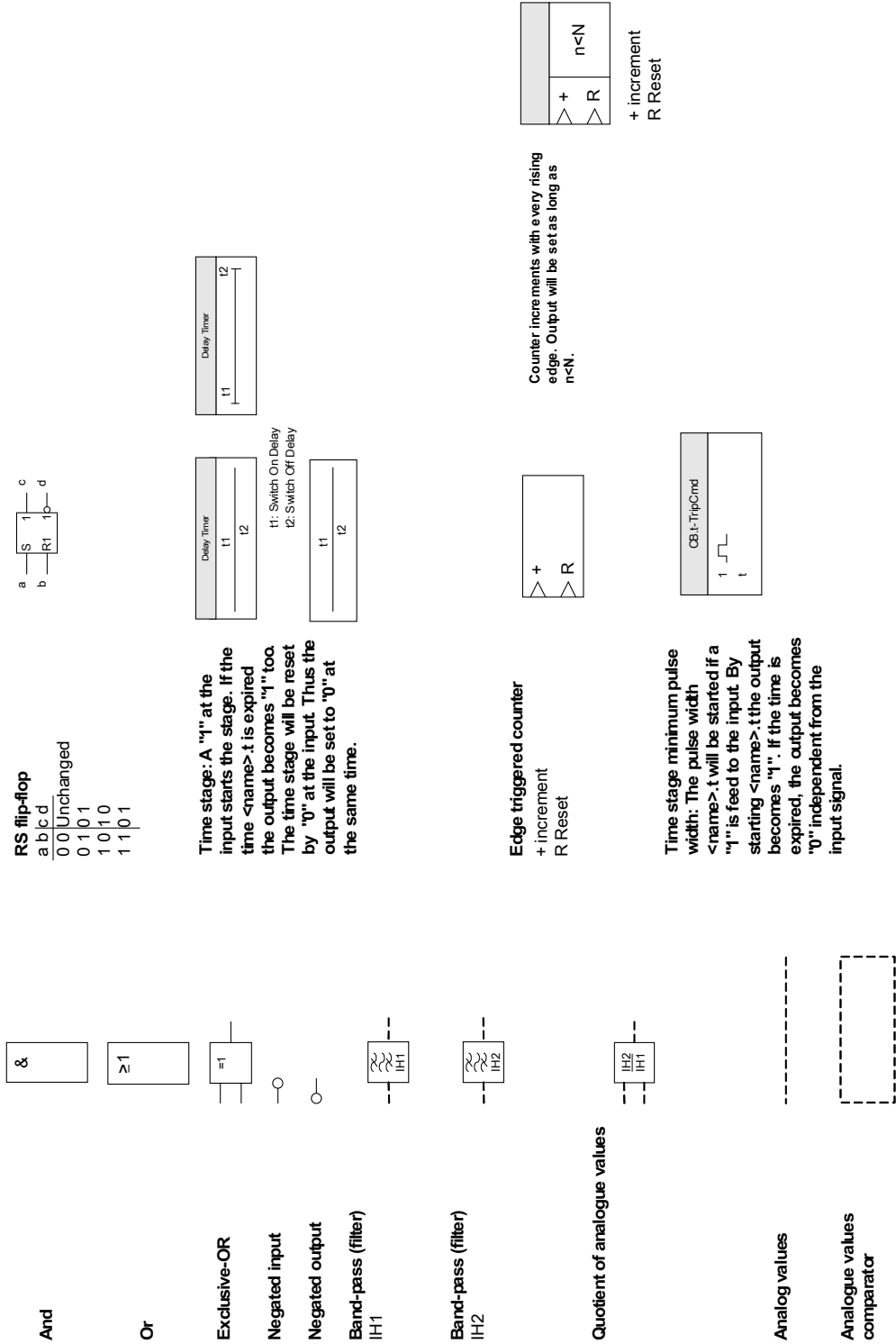
**Direct Command**

**Parameter of a Module-Input with a SelectionList/Down.** An (1..n) signal/output from the list or a pre-defined value can be selected.

**Parameter of a Module-Input (with special values):** An (1..n) output from the list will be assigned to the input "`<zname>-identifier`". If the parameter is set to "ItemNull", an "inactive"-signal will be given out.

**Limit value monitoring with three analogue input values.** Compares 3 analogue values with the set limit; output values are three different binary values as a result of the comparison. If the analogue signal exceeds the limit I/in the corresponding output signal becomes "1".

**Limit value monitoring (Compared to a fixed value).** Compares a value with the fixed set limit; output value is binary as a result of the comparison. If the signal exceeds the limit the corresponding output signal becomes "1".



## General Conventions

»Parameters are indicated by right and left double arrow heads and written in *italic* .«

»SIGNALS are indicated by right and left double arrow heads and small caps .«

[Paths are indicated by brackets.]

*Software and Device names are written in italic.*

*Module and Instance (Element) names are displayed italic and underlined.*

»Pushbuttons, Modes and Menu entries are indicated by right and left double arrow heads .«



Image References (Squares)

Output Signal

Input Signal

- 1 Prot. available Please Refer To Diagram: Prt
- 2 name.active Please Refer To Diagram: Blockings
- 3 name.Blo\_TripCmd Please Refer To Diagram: Trip blockings
- 4 name.active Please Refer To Diagram: Blockings\*\*
- 5 IH2.Bb L1 Please Refer To Diagram: IH2
- 6 IH2.Bb L2 Please Refer To Diagram: IH2
- 7 IH2.Bb L3 Please Refer To Diagram: IH2
- 8 IH2.Blo IG Please Refer To Diagram: IH2
- 9 name.Fault in projected direction Please Refer To Diagram: direction decision phase overcurent
- 10 name.Fault in projected direction Please Refer To Diagram: direction decision Earth fault
- 11 CB.Trip CB Please Refer To Diagram: CB
- 12a VTS.Alarm Please Refer To Diagram: VTS
- 12b VTS.VTS.Ex.FF.VT Please Refer To Diagram: VTS
- 12c VTS.VTS.Ex.FF.EVT Please Refer To Diagram: VTS  
Each alarm of a module (except from supervision modules but including CBE) will lead to a general alarm. (collective alarm).
- 14 name.Alarm
- 15 name.Trip Each trip of an active, trip authorized protection module will lead to a general trip.

- 15a name.TripCmd Each trip of an active, trip authorized protection module will lead to a general trip.
- 16 name.Trip L1 Each trip of an active, trip authorized protection module will lead to a general trip.
- 16a name.Trip L1 Each trip of an active, trip authorized protection module will lead to a general trip.
- 16b name.Trip L1 Each trip of an active, trip authorized protection module will lead to a general trip.
- 17 name.Trip L2 Each trip of an active, trip authorized protection module will lead to a general trip.
- 17a name.Trip L2 Each trip of an active, trip authorized protection module will lead to a general trip.
- 17b name.Trip L2 Each trip of an active, trip authorized protection module will lead to a general trip.
- 18 name.Trip L3 Each trip of an active, trip authorized protection module will lead to a general trip.
- 18a name.Trip L3 Each trip of an active, trip authorized protection module will lead to a general trip.
- 18b name.Trip L3 Each trip of an active, trip authorized protection module will lead to a general trip.
- 19 name.TripCmd Each trip of an active, trip authorized protection module will lead to a general trip.
- 19a name.TripCmd Each trip of an active, trip authorized protection module will lead to a general trip.
- 19b name.TripCmd Each trip of an active, trip authorized protection module will lead to a general trip.
- 19c name.TripCmd Each trip of an active, trip authorized protection module will lead to a general trip.
- 19d name.TripCmd Each trip of an active, trip authorized protection module will lead to a general trip.

## IMPORTANT DEFINITIONS

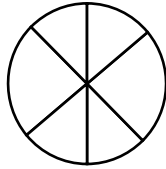
- Each trip of an active, trip authorized protection module will lead to a general trip.
- 20** name.Trip L1
- Each trip of an active, trip authorized protection module will lead to a general trip.
- 21** name.Trip L2
- Each trip of an active, trip authorized protection module will lead to a general trip.
- 22** name.Trip L3
- Each trip of an active, trip authorized protection module will lead to a general trip.
- 23** name.Trip
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 24** name.Alarm L1
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 24a** name.Alarm L1
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 24b** name.Alarm L1
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 25** name.Alarm L2
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 25a** name.Alarm L2
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 25b** name.Alarm L2
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 26** name.Alarm L3
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 26a** name.Alarm L3
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 26b** name.Alarm L3
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 27** name.Alarm
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 27a** name.Alarm
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 27b** name.Alarm
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 27c** name.Alarm
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 27d** name.Alarm
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 28** name.Alarm L1
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 29** name.Alarm L2
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 30** name.Alarm L3
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 31** name.Alarm
- Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).
- 32** Prot.Blo TripCmd
- CB.Pos
- Please Refer To Diagram: CB.CB Manager
- 33** CB.Pos
- Please Refer To Diagram: CB.CB Manager
- 34** CB.Pos ON
- Please Refer To Diagram: CB.CB Manager
- 35** CB.Pos OFF
- Please Refer To Diagram: CB.CB Manager
- 36** CB.Pos Indeterm
- Please Refer To Diagram: CB.CB Manager
- 37** CB.Pos Disturb
- Please Refer To Diagram: CB.CB Manager
- 38a** LOP.LOP Blo
- Please Refer To Diagram: LOP.LOP Blo
- 38b** LOP.Ex FF VT
- Please Refer To Diagram: LOP.Ex FF VT
- 38c** LOP.Ex FF EVT
- Please Refer To Diagram: LOP.Ex FF EVT

- 39 Q->&V<-Decoupling Distributed Generator  
Please Refer To Diagram: Q->&V<-Decoupling Distributed Generator
- 40 CTS.Alarm  
Please Refer To Diagram: CTS.Alarm
- 41  
Please Refer To Diagram: SG.Prot ON
- 42 SG.ON Cmd  
Please Refer To Diagram: SG.ON Cmd
- 43 AnIn[1].Value  
Please Refer To Diagram: Analog values
- 44 AnIn[2].Value  
Please Refer To Diagram: Analog values
- 45 AnIn[n].Value  
Please Refer To Diagram: Analog values
- 46 Trip Incomplete (Motor) Start Sequence

**Access Level**

*(Please refer to chapter [Parameter\Access Level])*

Read Only-Lv0



Parameters can only be read within this level.

Prot-Lv1



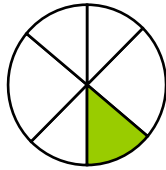
This level enables execution of Resets and Acknowledgements

Prot-Lv2



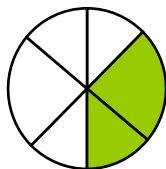
This level enables modification of protection settings

Control-Lv1



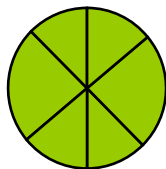
This level enables control functions

Control-Lv2



This level enables modification of switchgear settings

Supervisor-Lv3



This level provides full access (not limited) to all settings

## **Load Reference Arrow System**

Within the HighPROTEC the “Load Reference Arrow System” is used in principal. Generator protection relays are working based on the “Generator Reference System”.



## Device

MRM4

### Device Planning

Planning of a device means to reduce the functional range to a degree that suits the protection task to be fulfilled, i.e. the device shows only those functions you really need. If you, for example, deactivate the voltage protection function, all parameter branches related to this function do not appear in the parameter tree any more. All corresponding events, signals etc. will be deactivated too. By this the parameter trees become very transparent. Planning also involves adjustment of all basic system data (frequency etc.).



**WARNING**

**But it has to be taken into account that by deactivating, for instance, protective functions, you also change the functionality of the device. If you cancel the directional feature of the overcurrent protections then the device no longer trips in a directional way but merely in a non-directional way.**

**The manufacturer does not accept liability for any personal or material damage as a result of wrong planning.**

**A planning service is also offered by *Woodward Kempen GmbH*.**






**WARNING**



**Beware of inadvertent deactivating protective functions/modules**

**If you are deactivating modules within the device planning all parameters of those modules will be set on default.**

**If you are activating one of these modules again all parameters of those reactivated modules will be set on default.**

## Device Planning Parameters of the Device

<i>Parameter</i>	<i>Description</i>	<i>Options</i>	<i>Default</i>	<i>Menu path</i>
Hardware Variant 1 	Optional Hardware Extension	»A« 8 digital inputs   6 binary output relays   IRIG-B, »B« 4 DI, 2 NO, 2 Changeover, 1 AnOut, IRIG, URTD	8 digital inputs   6 binary output relays   IRIG-B	[MRM4]
Hardware Variant 2 	Optional Hardware Extension	»0« Phase Current 5A/1A, Ground Current 5A/1A, »1« Phase Current 5A/1A, Sensitive Ground Current 5A/1A	Phase Current 5A/1A, Ground Current 5A/1A	[MRM4]
Housing 	Mounting form	»A« Flush mounting, »B« 19 inch mounting (semi-flush), »H« Customized Version 1, »K« Customized Version 2	Flush mounting	[MRM4]

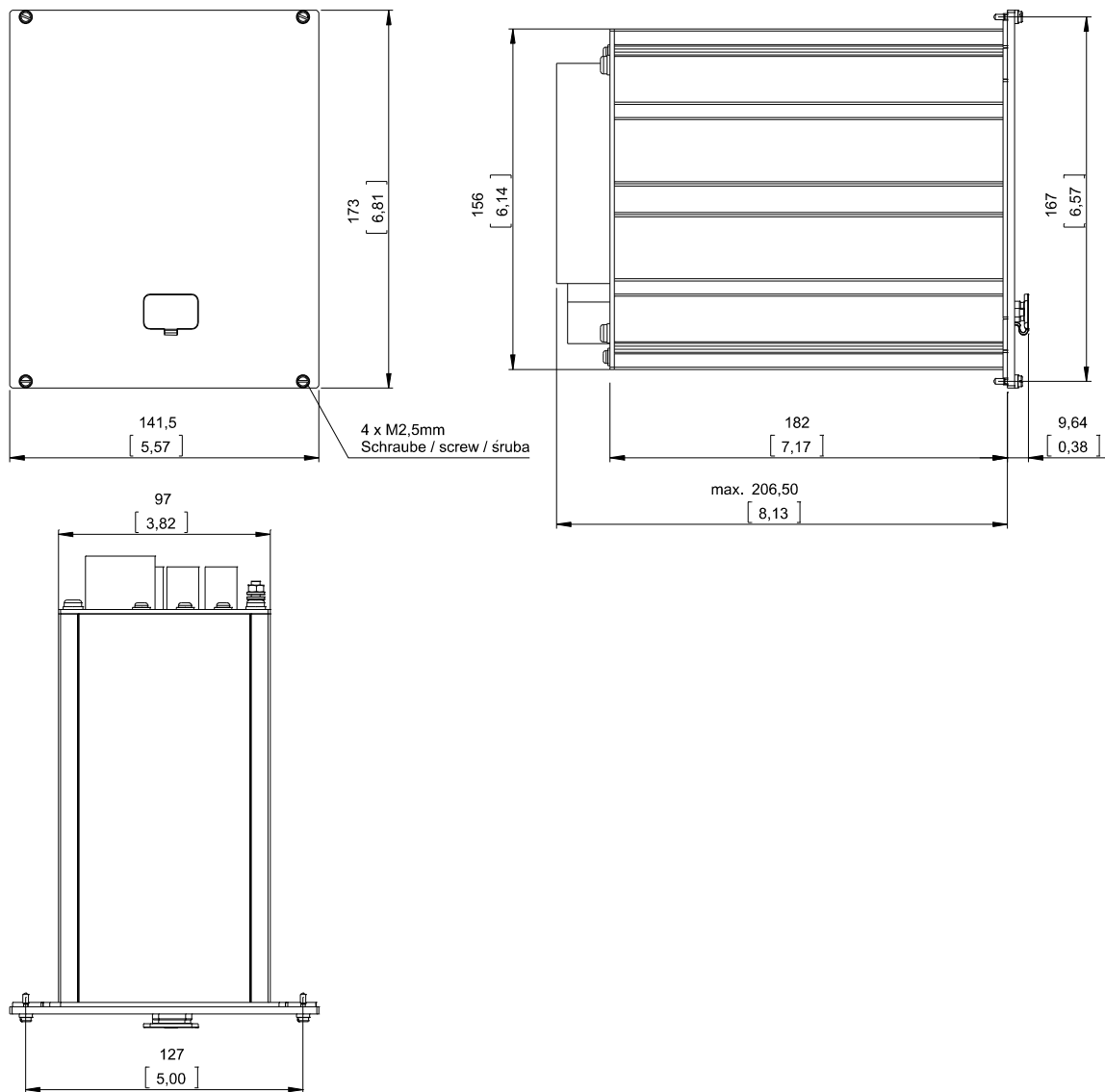
Parameter	Description	Options	Default	Menu path
Communication 	Communication	»A« Without, »B« RS 485: Modbus RTU   IEC 60870-5-103   DNP RTU, »C« Ethernet: Modbus TCP   DNP UDP, TCP, »D« Fiber Optics: Profibus-DP, »E« D-SUB: Profibus-DP, »F« Fiber Optics: Modbus RTU   IEC 60870-5-103   DNP RTU, »G« RS 485/D-SUB: Modbus RTU   IEC 60870-5-103   DNP RTU, »H« Ethernet: IEC61850   Modbus TCP   DNP UDP, TCP, »I« RS 485 and Ethernet: Modbus TCP, RTU   DNP UDP, TCP, RTU, »K« Ethernet/Fiber Optics: IEC61850   Modbus TCP   DNP UDP, TCP, »L« Ethernet/Fiber Optics: Modbus TCP   DNP UDP, TCP, »T« RS 485 and Ethernet: Communication Test	»A« Without	[MRM4]
Printed Circuit Board 	Printed Circuit Board	»A« Standard, »B« conformal coating	»A« Standard	[MRM4]

# Installation and Connection

## Three-Side-View - 19"

**NOTICE** Dependent on the connection method of the SCADA system used the needed space (depth) differs. If, for instance, a D-Sub-Plug is used, it has to be added to the depth dimension.

**NOTICE** The three-side-view shown in this section is exclusively valid for 19" devices.



3-Side-View B1 Housing (19" Devices)

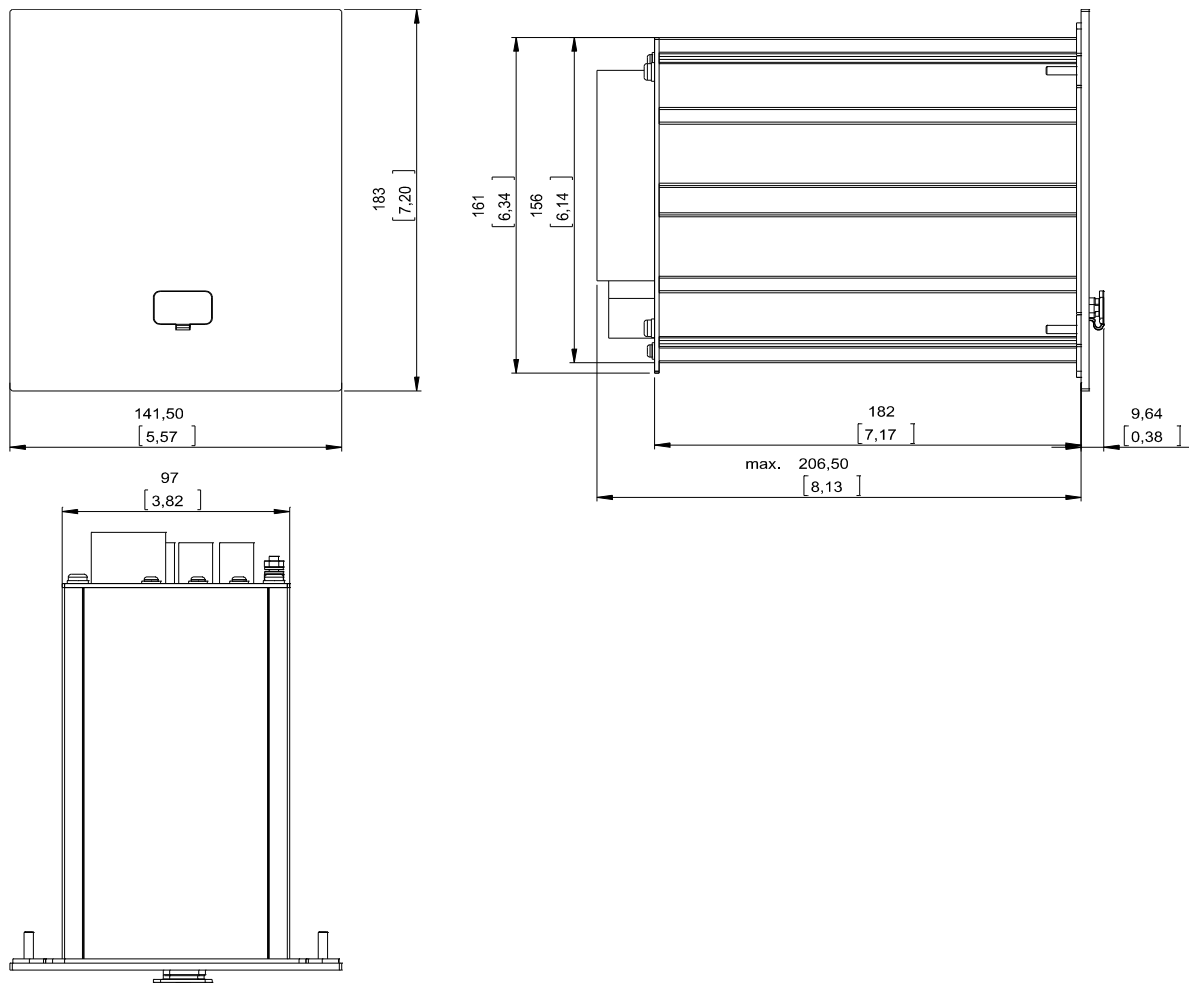
**WARNING** The housing must be carefully grounded. Connect a ground cable (4 to 6 mm<sup>2</sup> / AWG 12-10) / 1,7 Nm [15 lb-in]) to the housing, using the screw, which is marked with the ground symbol (at the rear side of the device).

The power supply card needs a separate ground connection (2.5 mm<sup>2</sup> (AWG 14) at terminal X1 (0.56-0.79 Nm [5-7 lb-in])).

### Three-Side-View - 8-Pushbutton Version

**NOTICE** Dependent on the connection method of the SCADA system used the needed space (depth) differs. If, for instance, a D-Sub-Plug is used, it has to be added to the depth dimension.

**NOTICE** The installation diagram shown in this section is exclusively valid for devices with 8 pushbuttons at the front side of the HMI.  
(INFO-, C-, OK-, CTRL-Pushbutton and 4 Softkeys (Pushbuttons)).



3-Side-View B1 Housing (Devices with 8 Softkeys)

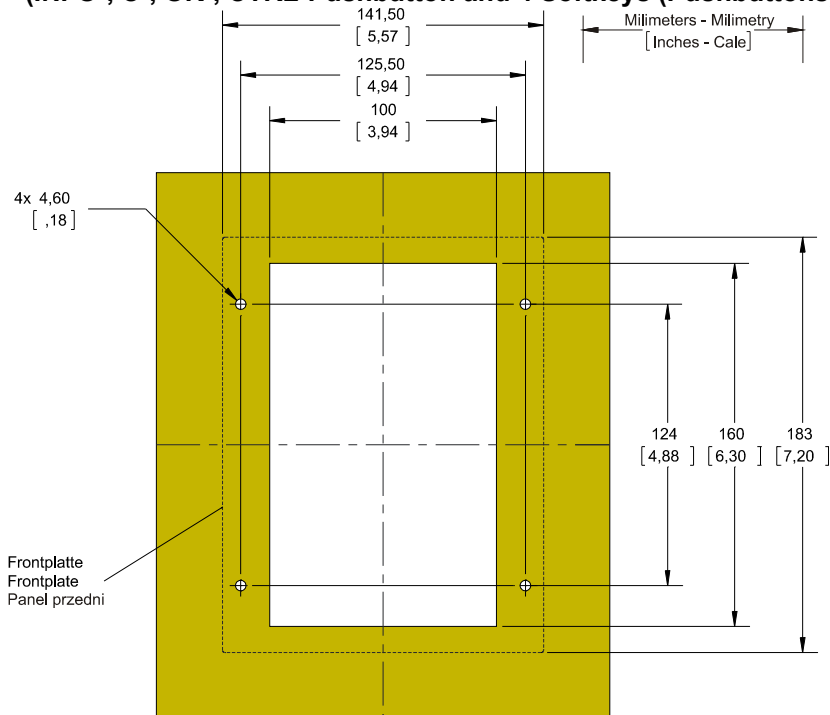
**WARNING** The housing must be carefully grounded. Connect a ground cable (4 to 6 mm<sup>2</sup> / AWG 12-10) / 1,7 Nm [15 lb-in]) to the housing, using the screw, which is marked with the ground symbol (at the rear side of the device).

The power supply card needs a separate ground connection (2.5 mm<sup>2</sup> (AWG 14) at terminal X1 (0.56-0.79 Nm [5-7 lb-in])).

## Installation Diagram 8-Pushbutton Version

**WARNING** Even when the auxiliary voltage is switched-off, unsafe voltages might remain at the device connections.

**NOTICE** The installation diagram shown in this section is exclusively valid for devices with 8 pushbuttons at the front side of the HMI.  
 (INFO-, C-, OK-, CTRL-Pushbutton and 4 Softkeys (Pushbuttons)).



B1 Housing Door Cut-out (8-Pushbutton Version)

**WARNING** The housing must be carefully earthed. Connect a ground cable (4 to 6 mm<sup>2</sup> / AWG 12-10) / 1,7 Nm [15 lb·in]) to the housing, using the screw, which is marked with the ground symbol (at the rear side of the device).

The power supply card needs a separate ground connection (2.5 mm<sup>2</sup> (AWG 14) at terminal X1 (0.56-0.79 Nm [5-7 lb·in])).

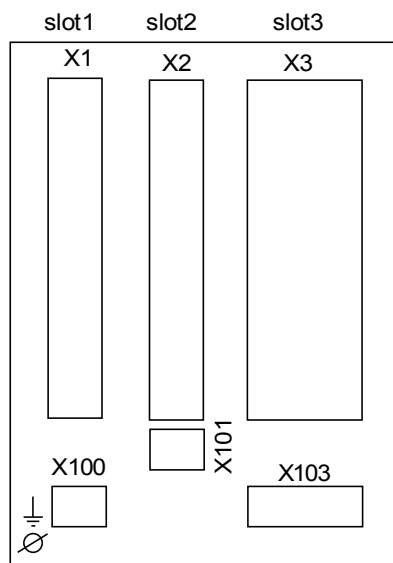
**CAUTION** Be careful. Do not overtighten the mountings nuts of the relay (M4 metric 4 mm). Check the torque by means of a torque wrench (1,7 Nm [15 lb·in]). Overtightening the mounting nuts could due to personal injury or damage the relay.

## Assembly Groups

### **⚠ WARNING**

In line with the customer's requirement the devices are combined in a modular way (in compliance with the order code). In each of the slots an assembly-group may be integrated. In the following the terminal assignment of the individual assembly-groups are shown. The exact installation place of the individual modules can be learned from the connection diagram fixed at the top of your device.

### Housing B1



B1 housing – schematic diagram

## Grounding

### **⚠ WARNING**

The housing must be carefully grounded. Connect a ground cable (4 to 6 mm<sup>2</sup> / AWG 12-10) / 1,7 Nm [15 lb·in]) to the housing, using the screw, which is marked with the ground symbol (at the rear side of the device).

The power supply card needs a separate ground connection (2.5 mm<sup>2</sup> (AWG 14) at terminal X1 (0.56-0.79 Nm [5-7 lb·in])).

### **CAUTION**

The devices are very sensitive to electro-static discharges.

## Legend for Wiring Diagrams

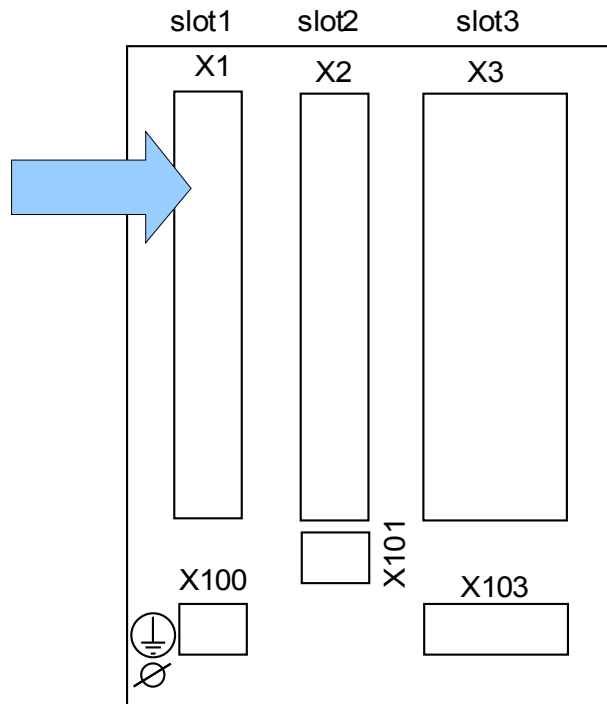
In this legend designations of various device types are listed, e. g. transformer protection, motor protection, generator protection, etc. Therefore it can occur that you will not find each designation on the wiring diagram of your device.

Designation	Meaning
FE	Connection of functional earth
Power Supply	Connection for auxiliary power supply
I L1	Phase current input L1
I L2	Phase current input L2
I L3	Phase current input L3
IG	Earth current input IG
I L1 W1	Phase current input L1, winding side 1
I L2 W1	Phase current input L2, winding side 1
I L3 W1	Phase current input L3, winding side 1
I G W1	Earth current input IG, winding side 1
I L1 W2	Phase current input L1, winding side 2
I L2 W2	Phase current input L2, winding side 2
I L3 W2	Phase current input L3, winding side 2
I G W2	Earth current input IG, winding side 2
V L1	Phase voltage L1
V L2	Phase voltage L2
V L3	Phase voltage L3
V 12	Phase to phase voltage V 12
V 23	Phase to phase voltage V 23
V 31	Phase to phase voltage V 31
V X	Fourth voltage measuring input for measuring residual voltage or for Synchro-check
BO	Contact output, change over contact
NO	Contact output, normally open
DI	Digital input
COM	Common connection of digital inputs
Out+	Analog output + (0/4...20 mA or 0...10 V)
IN-	Analog input + (0/4...20 mA or 0...10 V)
N.C.	Not connected
DO NOT USE	Do not use
SC	Self supervision contact
GND	Ground



<b>Designation</b>	<b>Meaning</b>
HF SHIELD	Connection cable shield
Fibre Connection	Fibre optic connection
Only for use with external galvanic decoupled CTs. See chapter Current Transformers of the manual.	Only for use with external galvanic decoupled CTs. See chapter Current Transformers of the manual.
Caution Sensitive Current Inputs	Caution Sensitive Current Inputs
Connection Diagram see specification	Connection Diagram see specification

### Slot X1: Power Supply Card with Digital Inputs



Rear side of the device (Slots)

The type of power supply card and the number of digital inputs on it used in this slot is dependent on the ordered device type. The different variants have a different scope of functions.

*Available assembly groups in this slot:*

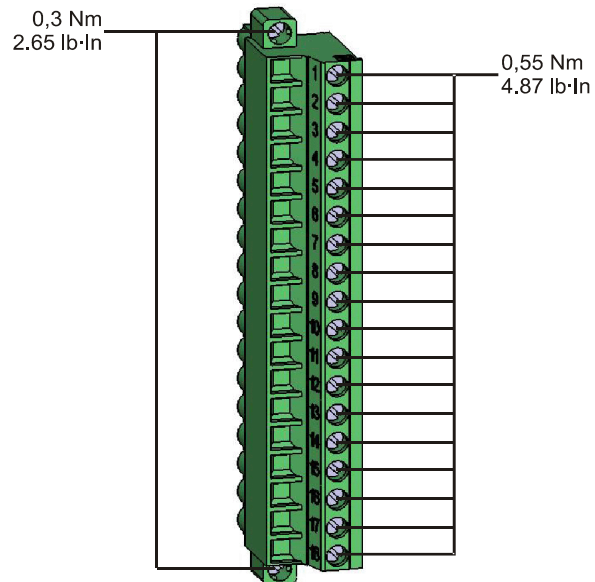
- **(DI8-X1):** This assembly group comprises a wide-range power supply unit; and two non-grouped digital inputs and six (6) digital inputs (grouped).

### NOTICE

The available combinations can be gathered from the ordering code.

## DI8-X Power Supply and Digital Inputs

**⚠ WARNING** Ensure the correct tightening torques.



This assembly group comprises:

- a wide-range power supply unit
- 6 digital inputs, grouped
- 2 digital inputs, non-grouped

### *Auxiliary voltage supply*

- The aux. voltage inputs (wide-range power supply unit) are non-polarized. The device could be provided with AC or DC voltage.

### *Digital inputs*

#### **CAUTION**

**For each digital input group the related voltage input range has to be parameterized. Wrong switching thresholds can result in malfunctions/wrong signal transfer times.**

The digital inputs are provided with different switching thresholds (can be parameterized) (two AC and five DC input ranges). For the six grouped (connected to common potential) inputs and the two non-grouped inputs the following switching levels can be defined:

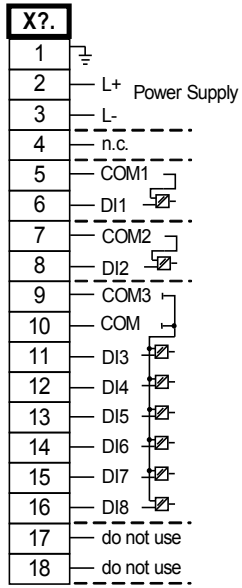
- 24V DC
- 48V DC / 60V DC
- 110 V AC/DC
- 230 V AC/DC

If a voltage >80% of the set switching threshold is applied at the digital input, the state change is recognized (physically "1"). If the voltage is below 40% of the set switching threshold, the device detects physically "0".

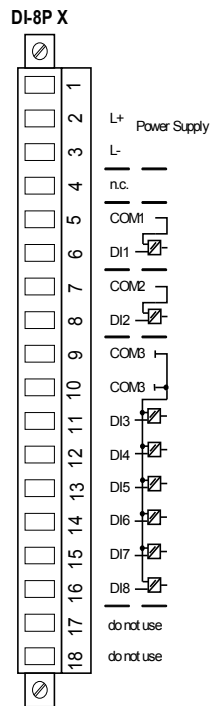
#### **CAUTION**

**When using DC supply, the negative potential has to be connected to the common terminal (COM1, COM2, COM3 - please see the terminal marking).**

**Terminals**



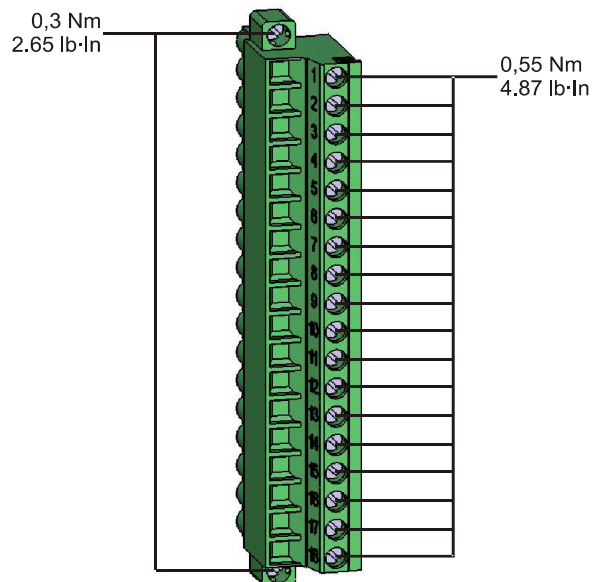
*Electro-mechanical assignment*



## DI-4 X - Power Supply and Digital Inputs



**WARNING** Ensure the correct tightening torques.



This assembly group comprises:

- a wide-range power supply unit
- 4 digital inputs, grouped

### *Auxiliary voltage supply*

- The aux. voltage inputs (wide-range power supply unit) are non-polarized. The device could be provided with AC or DC voltage.

### *Digital inputs*

#### **CAUTION**

**For each digital input group the related voltage input range has to be parameterized. Wrong switching thresholds can result in malfunctions/wrong signal transfer times.**

The digital inputs are provided with different switching thresholds (can be parameterized) (two AC and five DC input ranges). For the six grouped (connected to common potential) inputs and the two non-grouped inputs the following switching levels can be defined:

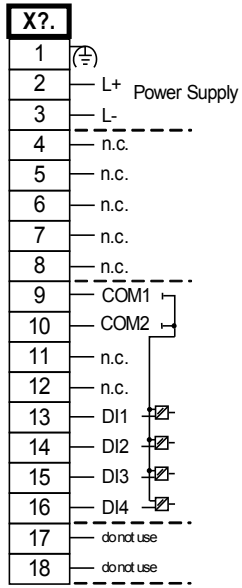
- 24V DC
- 48V DC / 60V DC
- 110 V AC/DC
- 230 V AC/DC

If a voltage >80% of the set switching threshold is applied at the digital input, the state change is recognized (physically "1"). If the voltage is below 40% of the set switching threshold, the device detects physically "0".

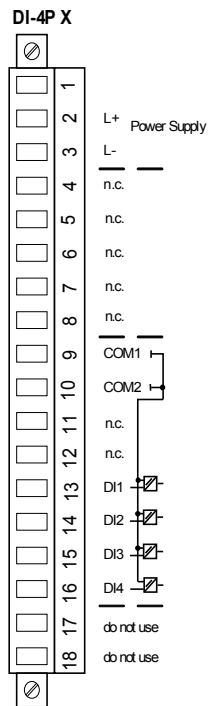
#### **CAUTION**

**When using DC supply, the negative potential has to be connected to the common terminal (COM1, COM2, COM3 - please see the terminal marking).**

**Terminals**

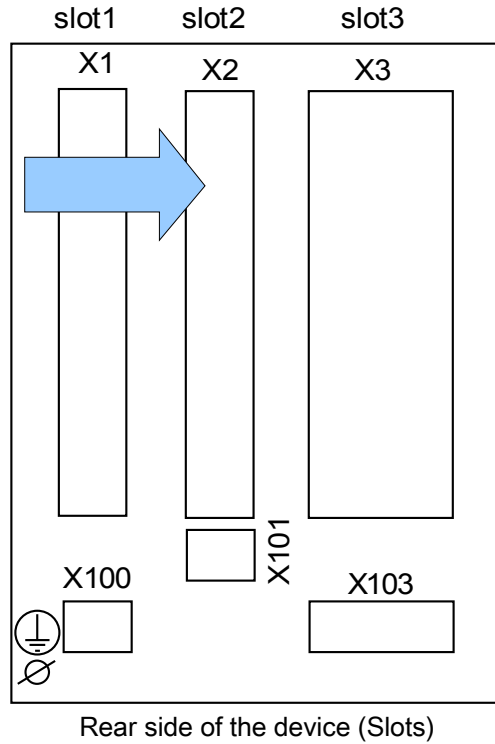


*Electro-mechanical assignment*





## Slot X2: Relay Output Card



The type of card in this slot is dependent on the ordered device type. The different variants have a different scope of functions.

*Available assembly groups in this slot:*

- **(OR-5 X2):** Assembly Group with 5 Changeover (CO), Supervision Contact (SC)
- **(OR-3AI X2):** Assembly Group with 2 Normally Open (Form A), 1 Changeover (Form C), SC , Analog Output IRIG-B

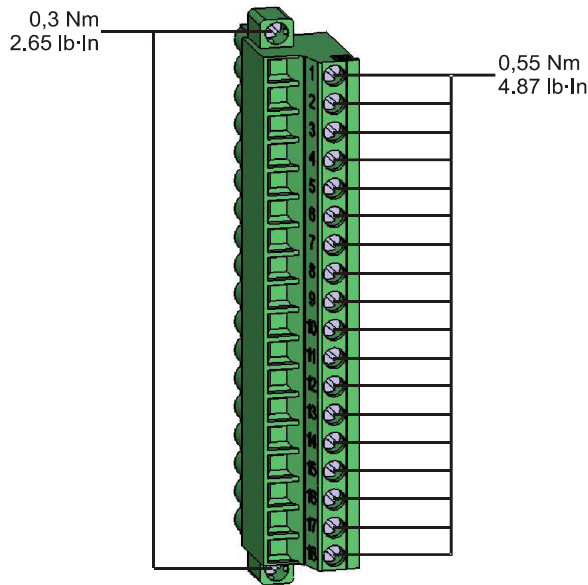
### NOTICE

The available combinations can be gathered from the ordering code.

## Binary Output Relays and System Contact

The number of the binary output relay contacts is related to the type of the device or type code. The binary output relays are potential-free change-over contacts. In chapter [Assignment/binary outputs] the assignment of the binary output relays is specified. The changeable signals are listed in the »assignment list« which can be found in the appendix.

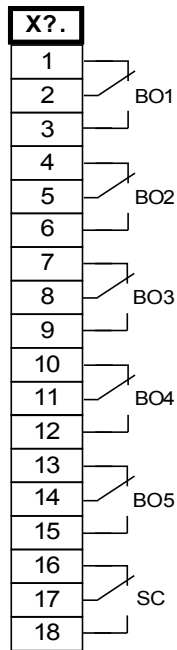
**WARNING** Ensure the correct tightening torques.



**CAUTION** Please duly consider the current carrying capacity of the binary output relays. Please refer to the Technical Data.

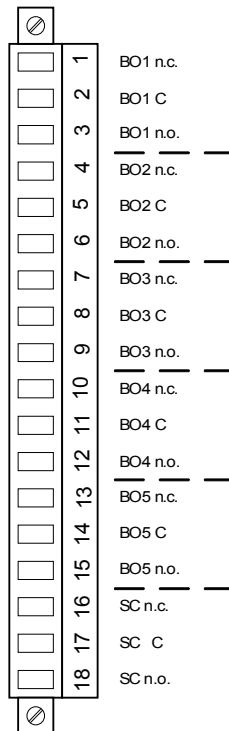
The *System-OK contact (SC relay)* cannot be configured. The system contact is a changeover contact that picks up when the device is free from internal faults. While the device is booting up, the *System OK relay (SC)* remains dropped-off (unenergized). As soon as the system is properly started (and protection is active), the System Contact picks up and the assigned LED is activated accordingly (please refer to the Self Supervision chapter).

**Terminals**



*Electro-mechanical assignment*

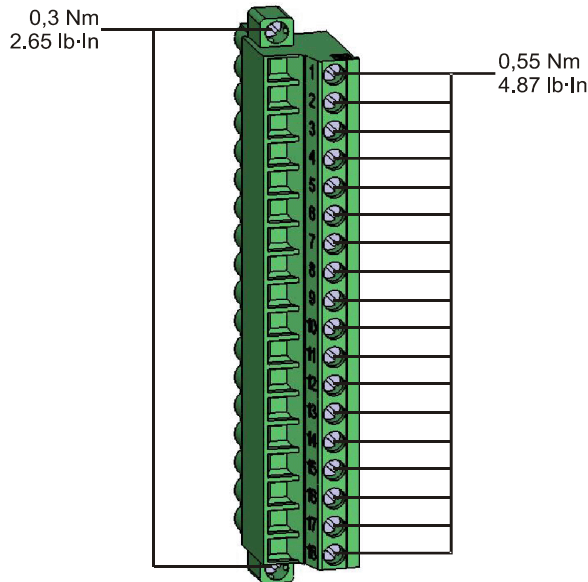
**BO-5 X**



## OR - 3AI X - Output Relays and System Contact

The number of the binary output relay contacts is related to the type of the device or type code. The binary output relays are potential-free contacts. In chapter [Assignment/binary outputs] the assignment of the binary output relays is specified. The changeable signals are listed in the »assignment list« which can be found in the appendix.

**WARNING** Ensure the correct tightening torques.

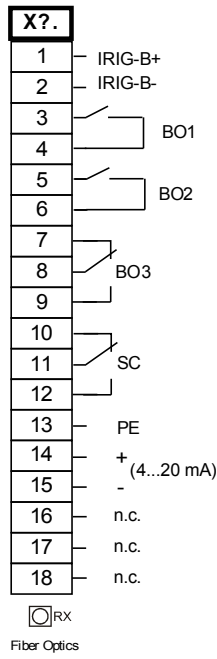


**CAUTION** Please duly consider the current carrying capacity of the binary output relays. Please refer to the Technical Data.

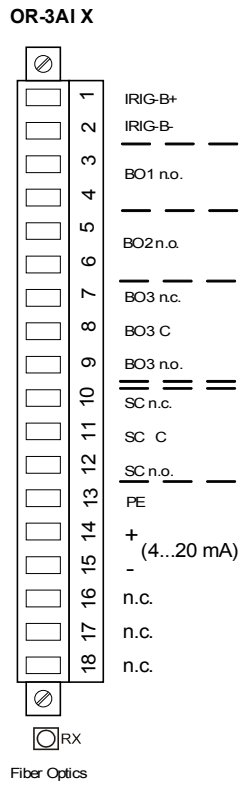
The *System-OK contact (SC relay)* cannot be configured. The system contact is a changeover contact that picks up when the device is free from internal faults. While the device is booting up, the *System OK relay (SC)* remains dropped-off (unenergized). As soon as the system is properly started (and protection is active), the System Contact picks up and the assigned LED is activated accordingly (please refer to the Self Supervision chapter).

For details on the Analoge Output please refer to the Technical Data.

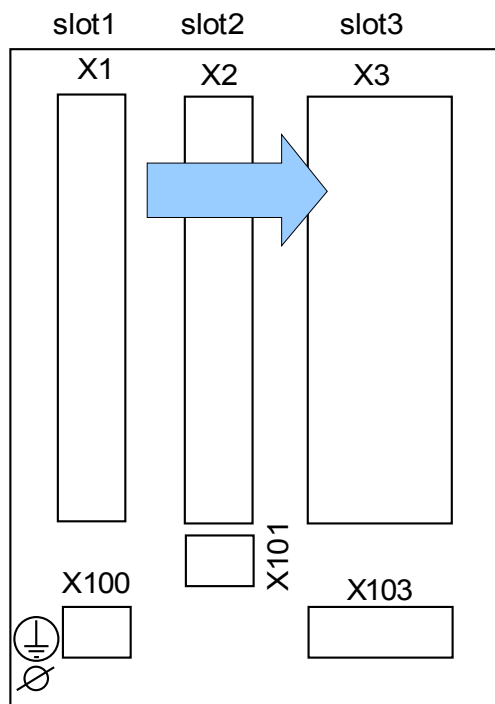
**Terminals**



*Electro-mechanical assignment*



### Slot X3: Current Transformer Measuring Inputs



Rear side of the device (Slots)

This slot contains the current transformer measuring inputs.

## TI X- Standard Phase and Ground Current Measuring Input Card

This measuring card is provided with 4 current measuring inputs: three for measuring the phase currents and one for measuring of the earth current. Each of the current measuring inputs has a measuring input for 1 A and 5 A.

The input for earth current measuring either can be connected to a cable-type current transformer or alternatively it is possible to connect the summation current path of the phase current transformer to this input (Holmgreen connection).



**Current transformers have to be earthed on their secondary side.**



**Interrupting the secondary circuits of current transformers causes hazardous voltages.**

**The secondary side of the current transformers have to be short circuited before the current circuit to the device is opened.**



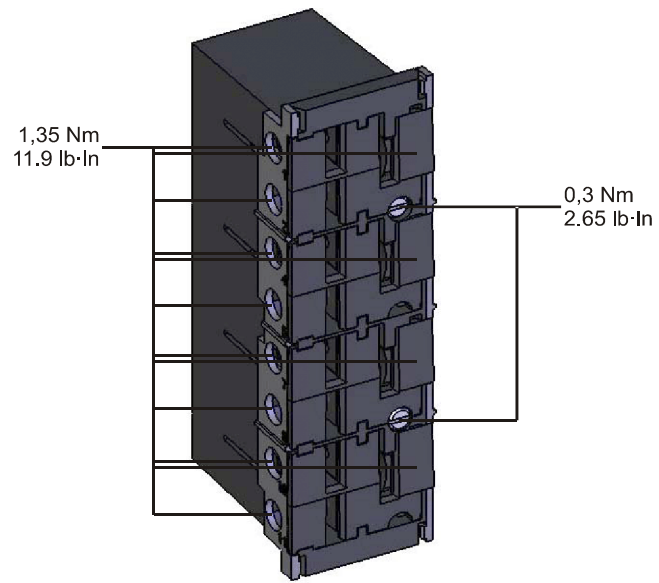
**The current measuring inputs may exclusively be connected to current measuring transformers (with galvanic separation).**



- **Do not interchange the inputs (1 A/5 A)**
- **Make sure the transformation ratios and the power of the CTs are correctly rated. If the rating of the CTs is not right (overrated), then the normal operational conditions may not be recognized. The pickup value of the measuring unit amounts approx. 3% of the rated current of the device. Also the CTs need a current greater than approx 3% of the rated current to ensure sufficient accuracy. Example: For a 600 A CT (primary current) any currents below 18 A cannot be detected any more.**
- **Overloading can result in destruction of the measuring inputs or faulty signals. Overloading means that in case of a short-circuit the current-carrying capacity of the measuring inputs could be exceeded.**

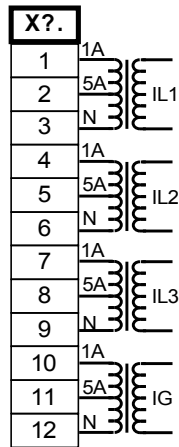


**Ensure the correct tightening torques.**

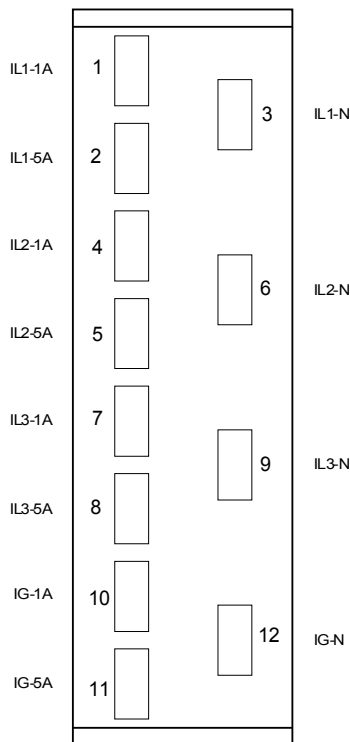




**Terminals**



*Electro-mechanical assignment*



## TIS X – Phase and Sensitive Ground Current Measuring Card

The measuring card is provided with 4 current measuring inputs: three for measuring the phase currents and one for measuring of the earth current. The sensitive Ground current Input has different technical data. Please refer to chapter Technical Data.

The input for earth current measuring either can be connected to a cable-type current transformer or alternatively it is possible to connect the summation current path of the phase current transformer to this input (Holmgreen connection).

**⚠ DANGER** Current transformers have to be earthed on their secondary side.

**⚠ DANGER** Interrupting the secondary circuits of current transformers causes hazardous voltages.

The secondary side of the current transformers have to be short circuited before the current circuit to the device is opened.

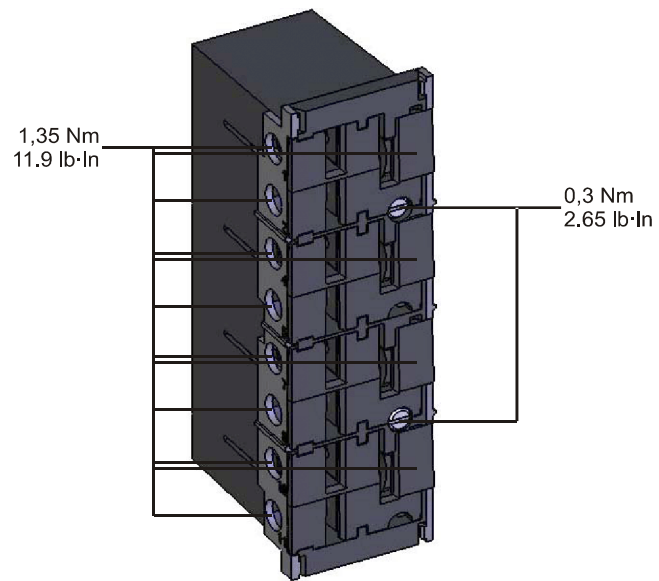
**⚠ DANGER** The current measuring inputs may exclusively be connected to current measuring transformers (with galvanic separation).

**⚠ WARNING**

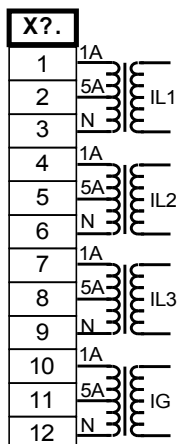
- Do not interchange the inputs (1 A/5 A)
- Make sure the transformation ratios and the power of the CTs are correctly rated. If the rating of the CTs is not right (overrated), then the normal operational conditions may not be recognized. The pickup value of the measuring unit amounts approx. 3% of the rated current of the device. Also the CTs need a current greater than approx 3% of the rated current to ensure sufficient accuracy. Example: For a 600 A CT (primary current) any currents below 18 A cannot be detected any more.
- Overloading can result in destruction of the measuring inputs or faulty signals. Overloading means that in case of a short-circuit the current-carrying capacity of the measuring inputs could be exceeded.



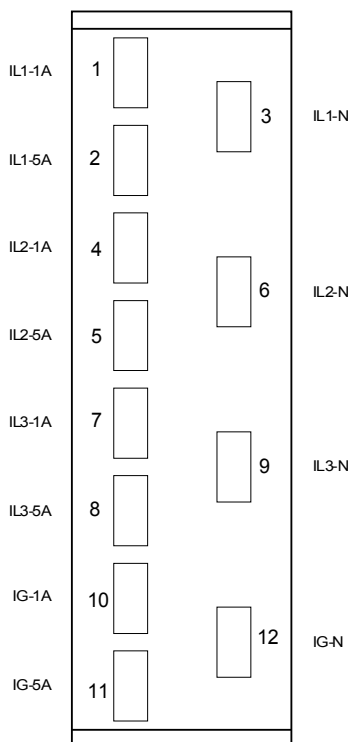
**WARNING** Ensure the correct tightening torques.



**Terminals**



*Electro-mechanical assignment*



## Current Transformers (CT)

Check the installation direction.



It is imperative that the secondary sides of measuring transformers be grounded.



The current measuring inputs may exclusively be connected to current measuring transformers (with galvanic separation).



CT secondary circuits must always to be low burdened or short-circuited during operation.

### NOTICE

For current and voltage sensing function external wired and appropriate current and voltage transformer shall be used, based on the required input measurement ratings. Those devices provide the necessary insulation functionality.

All current measuring inputs can be provided with 1 A or 5 A nominal. Make sure that the wiring is correct.

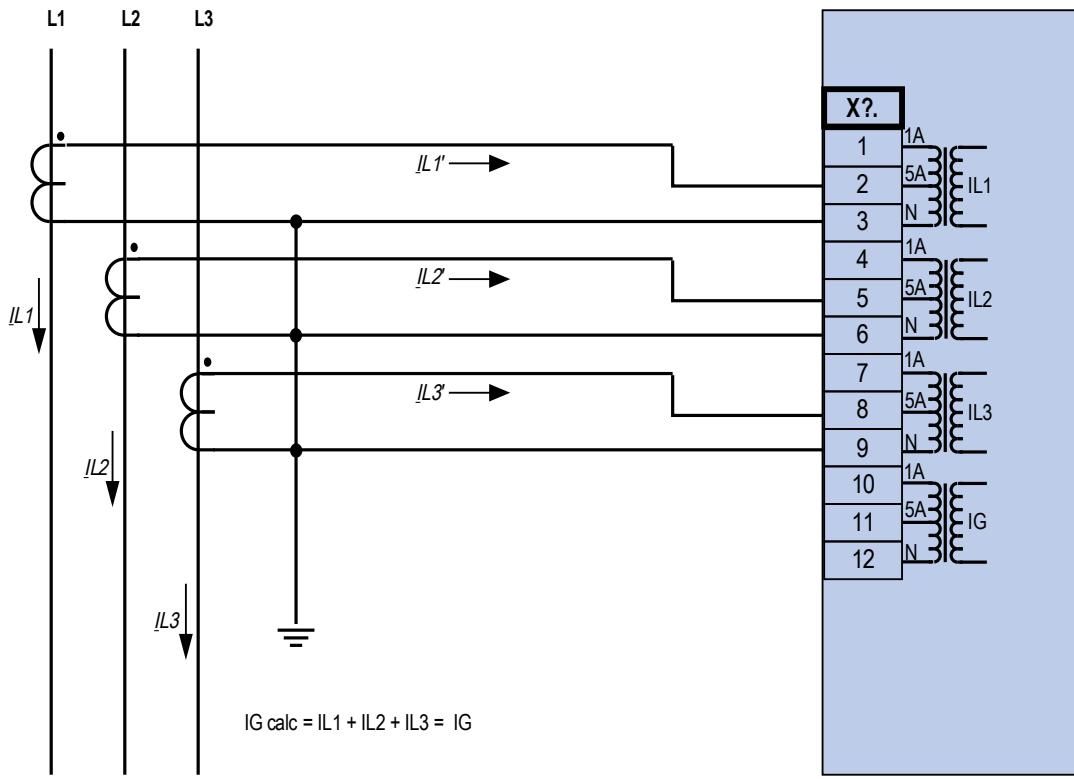
## Sensitive Ground Current Measurement

The proper use of sensitive current measuring inputs is the measurement of small currents like they could occur in isolated and high resistance grounded networks.

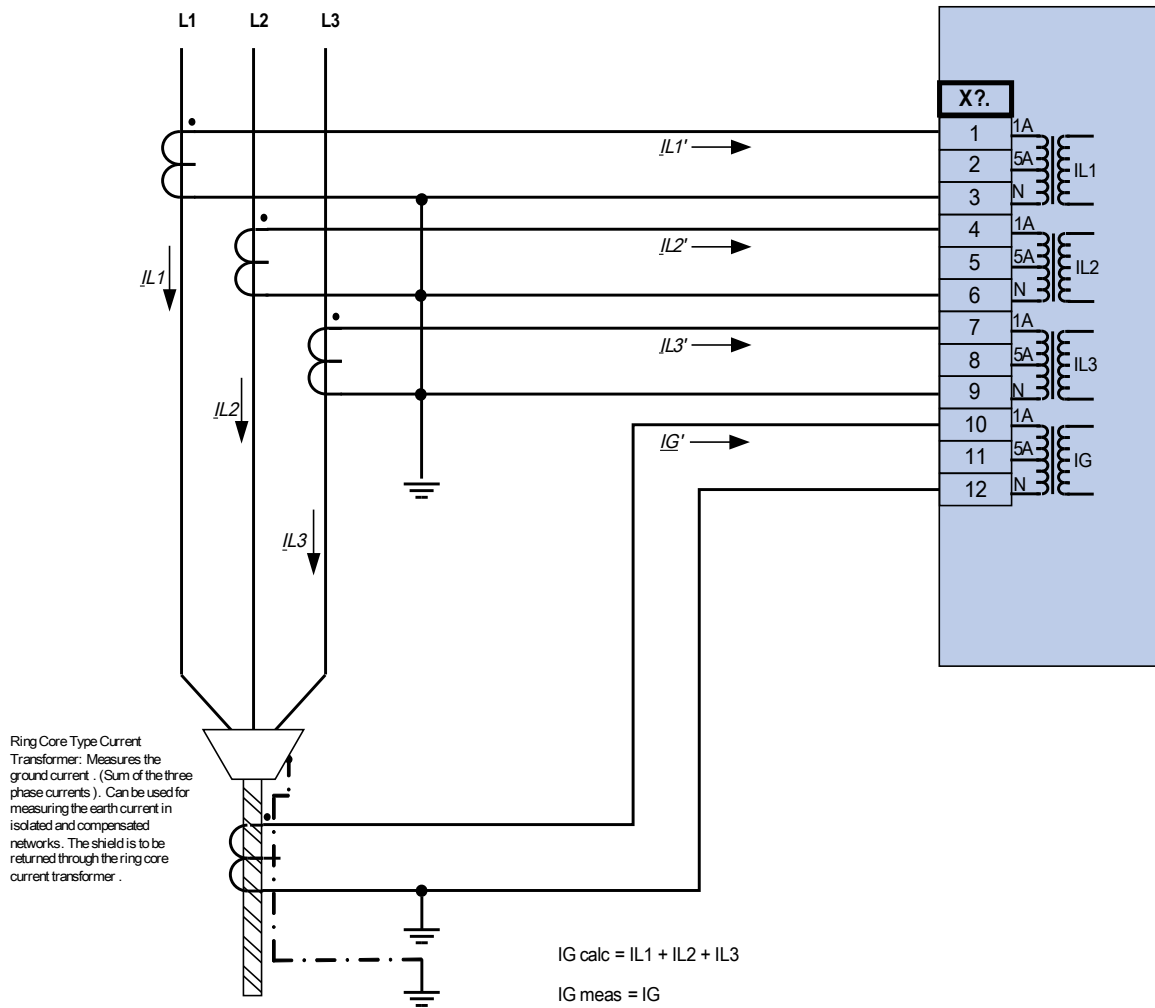
Due to the sensitiveness of these measuring inputs don't use them for the measurement of ground short circuit currents like they occur in solidly earthed networks.

If a sensitive measuring input should be used for the measurement of ground short circuit currents, it has to be ensured, that the measuring currents are transformed by a matching transformer according to the technical data of the protective device.

### Current Transformer Connection Examples



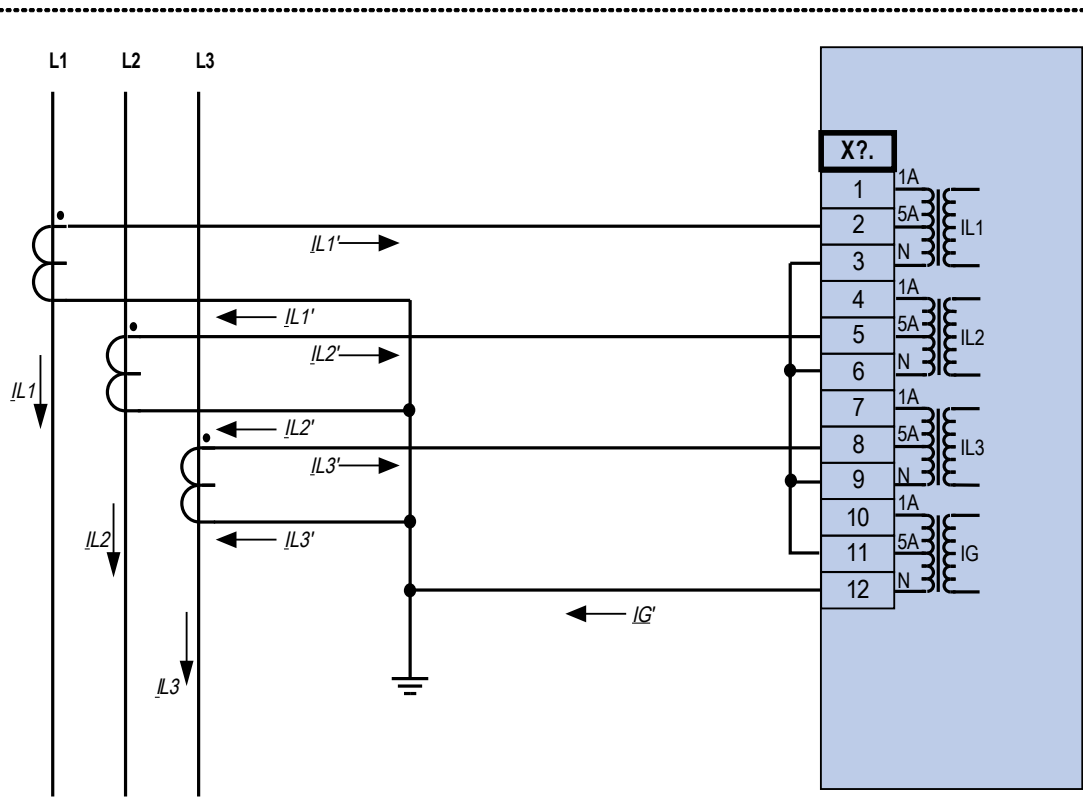
Three phase current measurement; In secondary = 5 A.



Three phase current measurement ; In secondary = 1 A.  
 Earth-current measuring via cable-type current transformer ; IGnom secondary = 1 A.

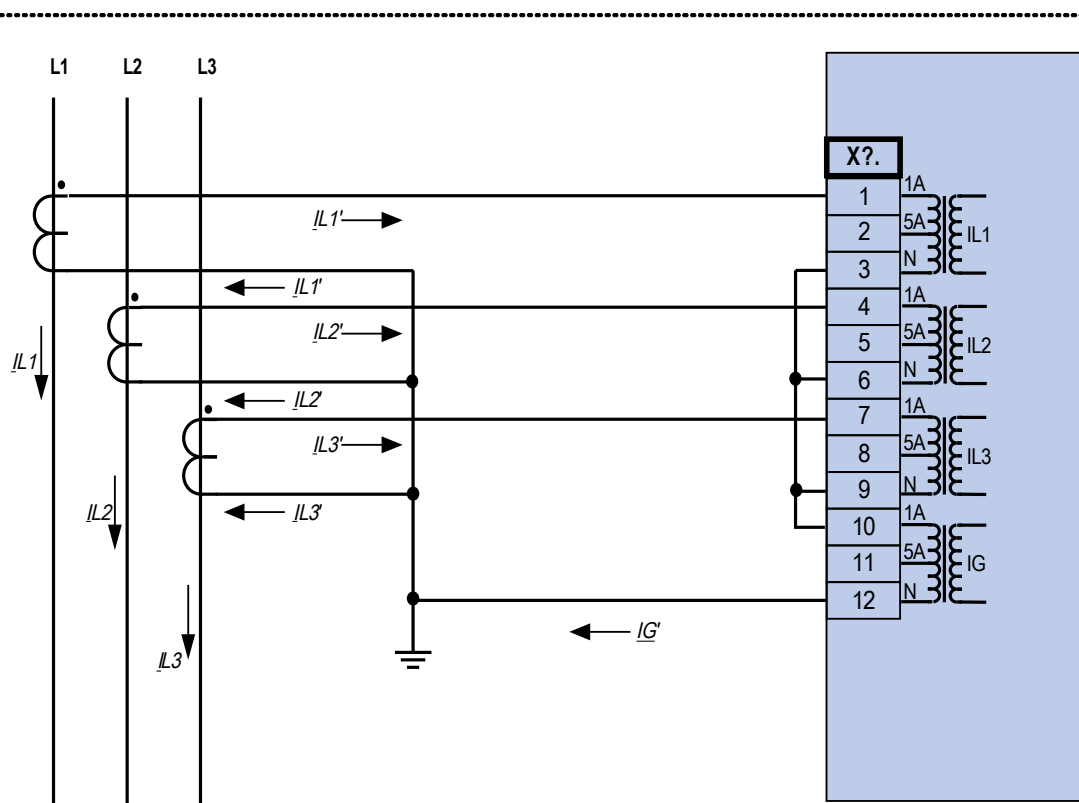


**Warning!**  
 The shielding at the dismantled end of the line has to be put through the cable -type current transformer and has to be grounded at the cable side .



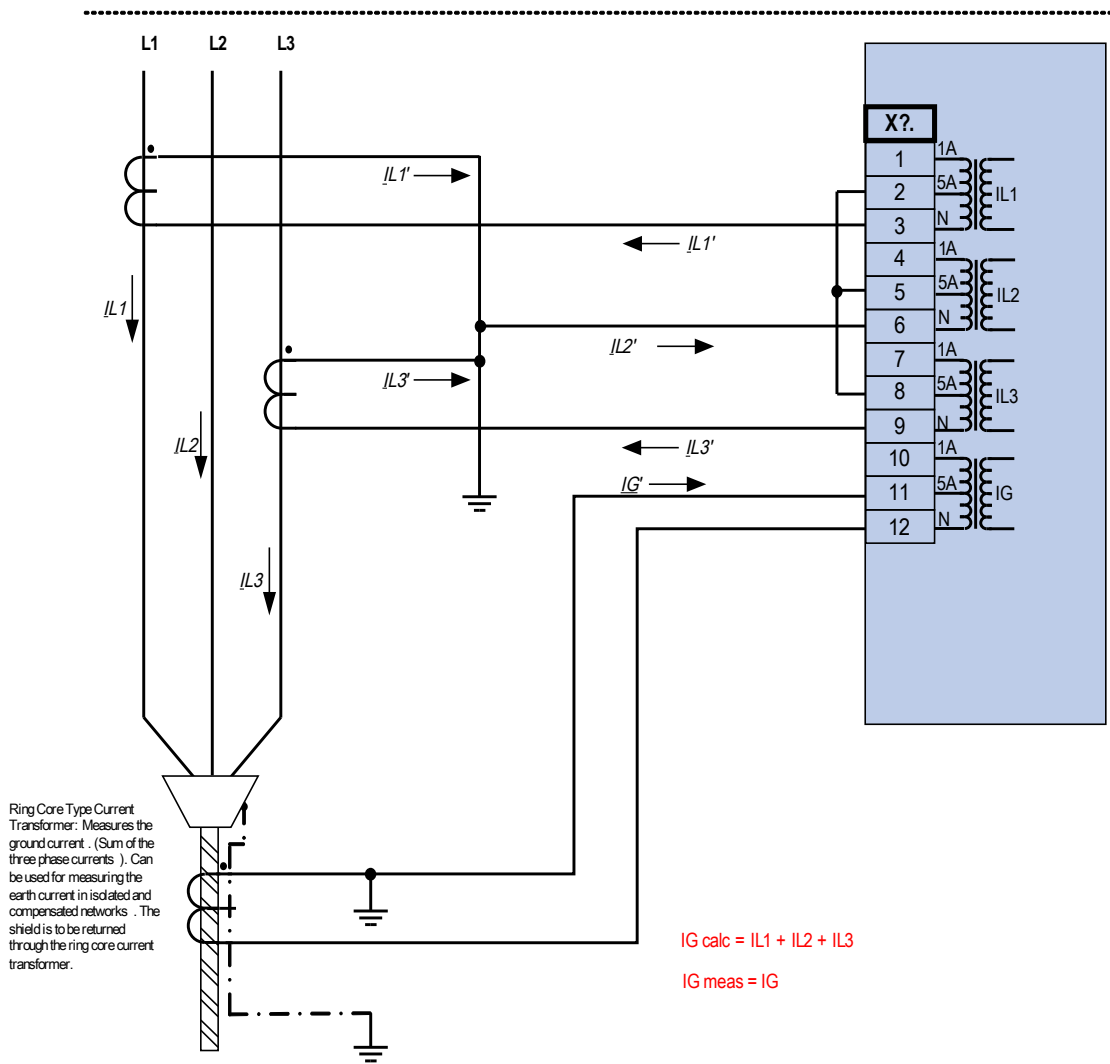
Three phase current measurement;  $I_n$  secondary = 5 A.  
 Earth-current measuring via Holmgreen-connection;  $I_{Gnom}$  secondary = 5 A.





Three phase current measurement;  $I_n$  secondary = 1 A.

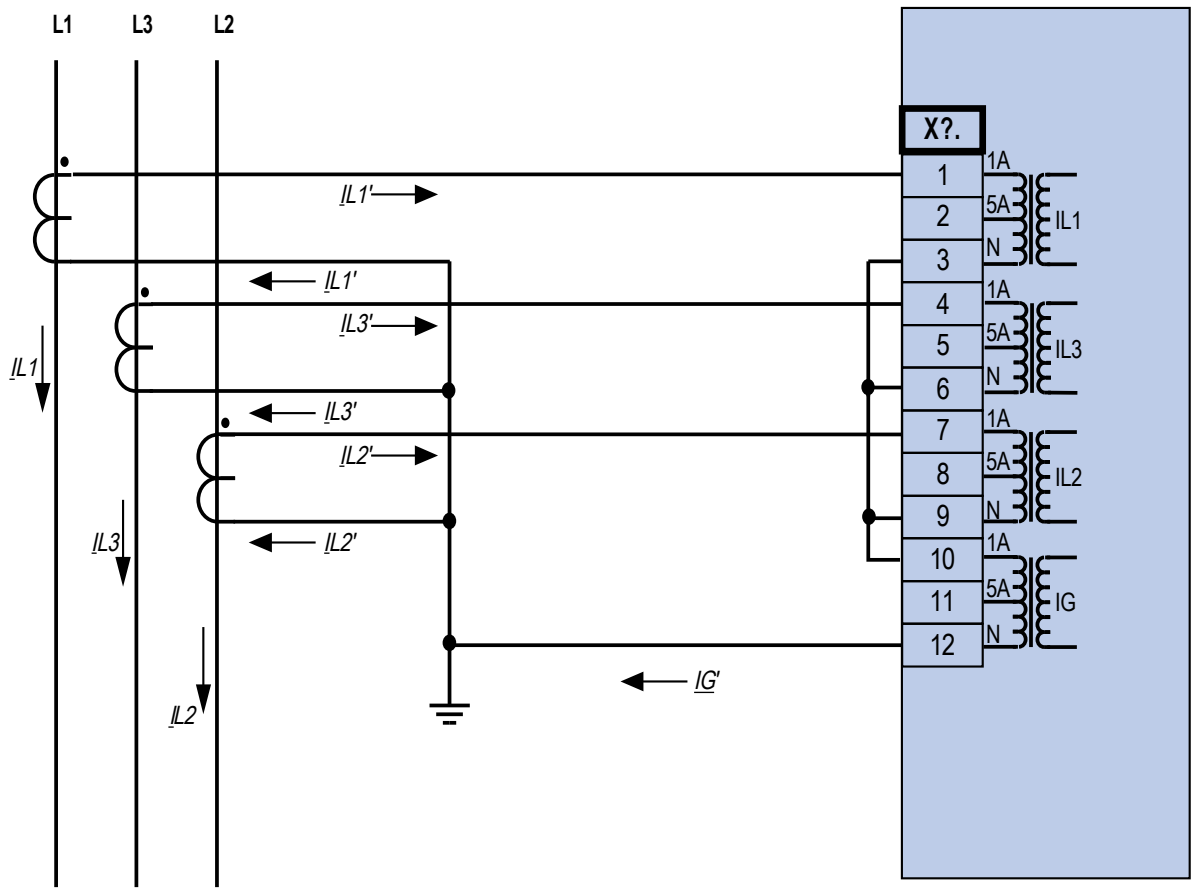
Earth-current measuring via Holmgren-connection;  $I_{Gnom}$  secondary = 1 A.



Two phase current measurement (Open Delta); In secondary = 5 A.  
 Earth-current measuring via cable-type current transformer ; IGnom secondary = 5 A.



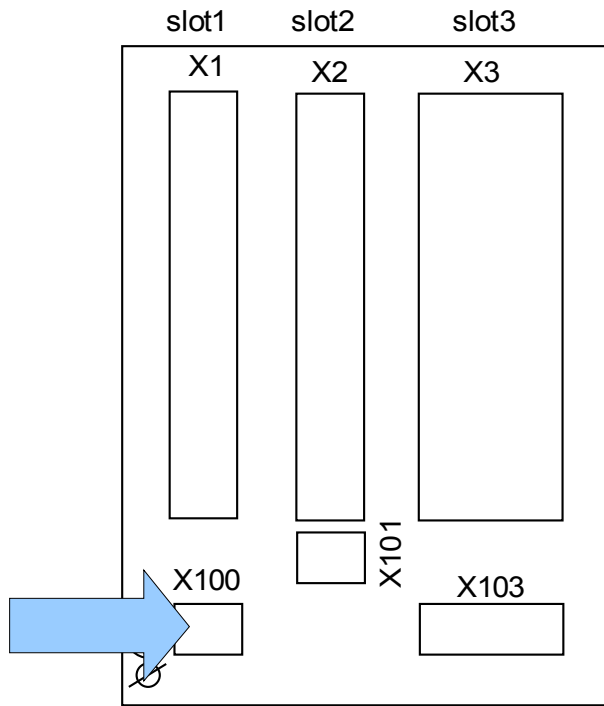
**Warning!**  
 The shielding at the dismantled end of the line has to be put through the cable -type current transformer and has to be grounded at the cable side .



Three phase current measurement;  $I_n$  secondary = 1 A.

Earth-current measuring via Holmgreen-connection;  $I_{Gnom}$  secondary = 1 A.

### Slot X100: Ethernet Interface



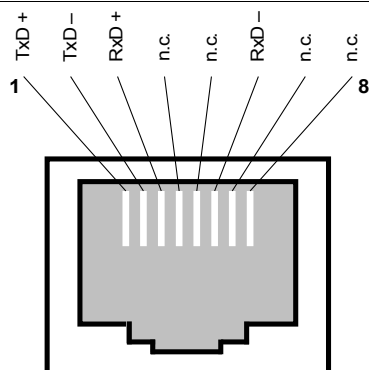
Rear side of the device (Slots)

An Ethernet interface may be available depending on the device type ordered.

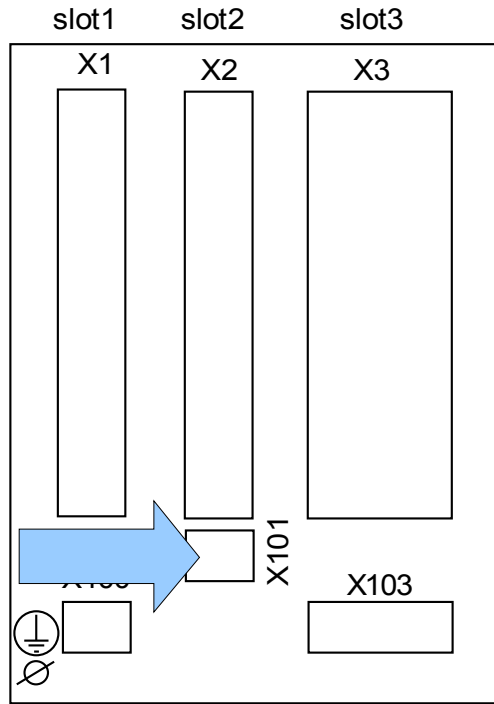
**NOTICE** The available combinations can be gathered from the ordering code.

## Ethernet - RJ45

### Terminals



### Slot X101: IRIG-B00X



Rear side of the device (Slots)

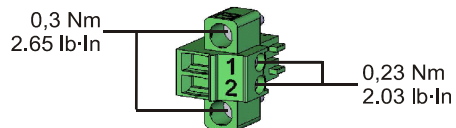
If the device is equipped with an IRIG-B00X interface is dependent on the ordered device type.

**NOTICE** The available combinations can be gathered from the ordering code.

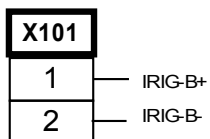
## IRIG-B00X



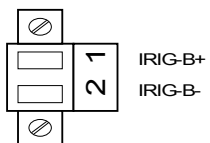
Ensure the correct tightening torques.



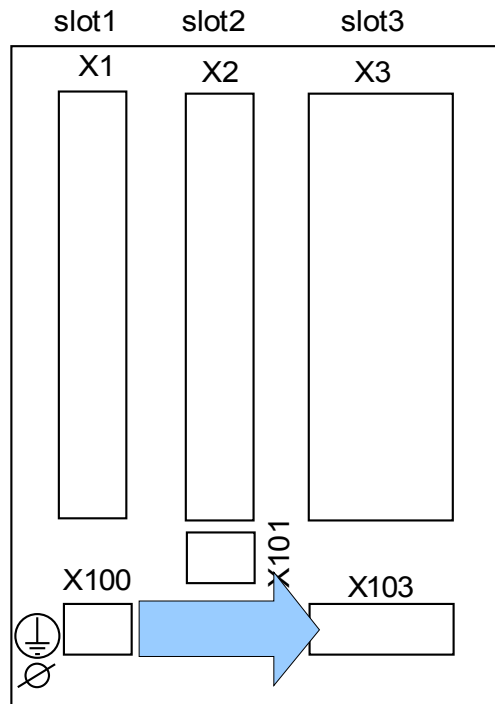
### Terminal Markings



### Electromechanical Assignment



## Slot X103: Data Communication



Rear side of the device (Slots)

The data communication interface in the **X103** slot is dependent on the ordered device type. The scope of functions is dependent on the type of data communication interface.

*Available assembly groups in this slot:*

- RS485 Terminals for Modbus and IEC
- LWL Interface for Modbus, IEC and Profibus
- D-SUB Interface for Modbus and IEC
- D-SUB Interface for Profibus
- Fiber Optics Interface for Ethernet\*

\*=ask for availability

**NOTICE**

The available combinations can be gathered from the ordering code.



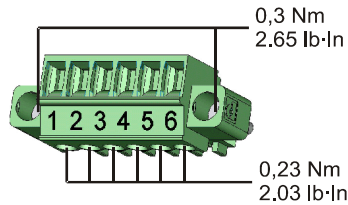
## Modbus® RTU / IEC 60870-5-103 via RS485



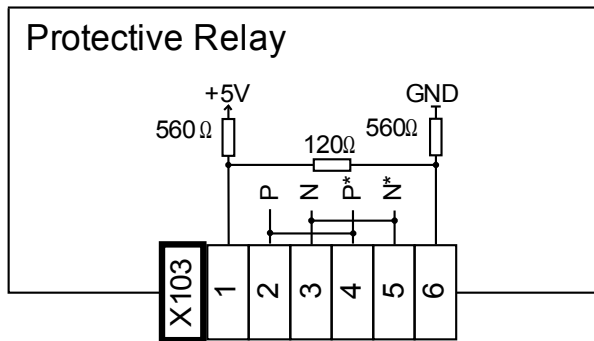
**WARNING** There are two different versions of the RS485 interface. By means of the wiring diagram on the top of your device, you have to find out which version is built in your device (Type1 or Type2).



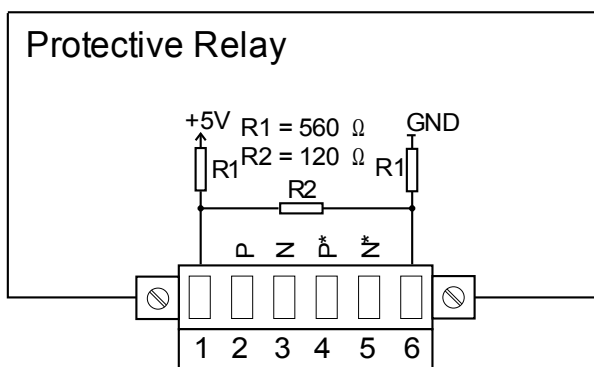
**WARNING** Ensure the correct tightening torques.



### RS485 – Type 1 (see wiring diagram)



### Electro-mechanical assignment Type 1 (see wiring diagram)

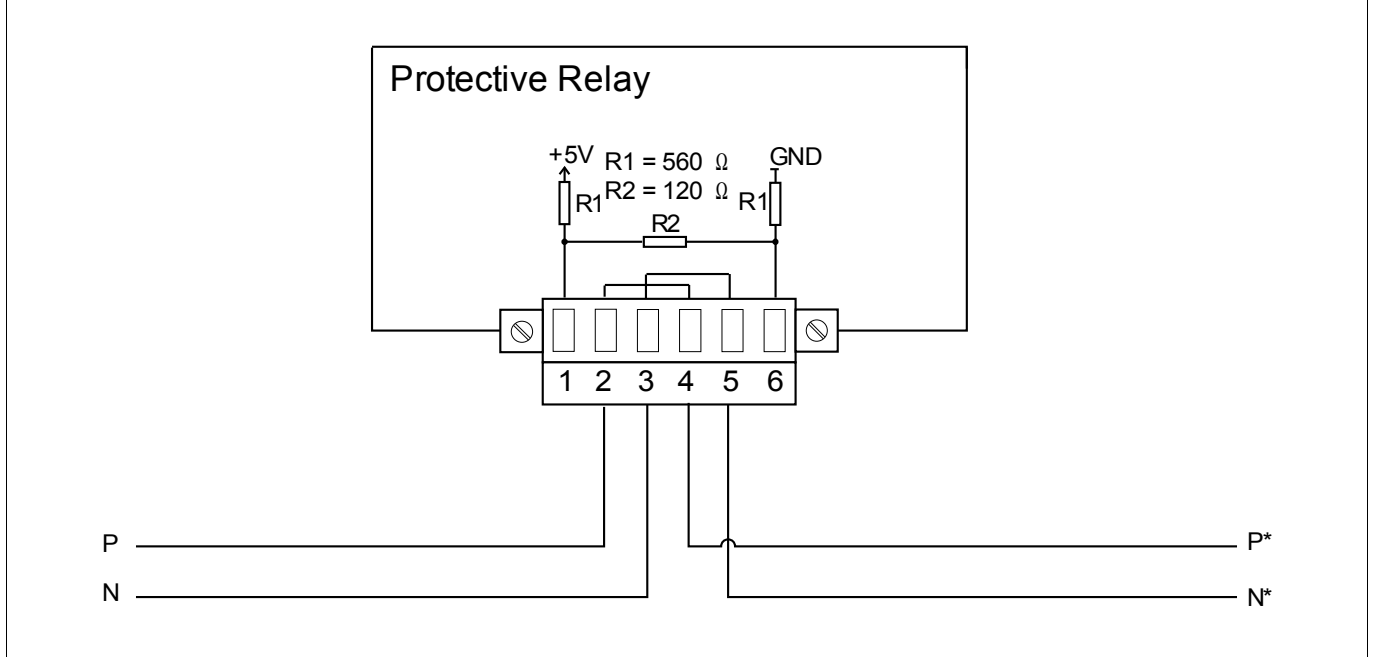


## NOTICE

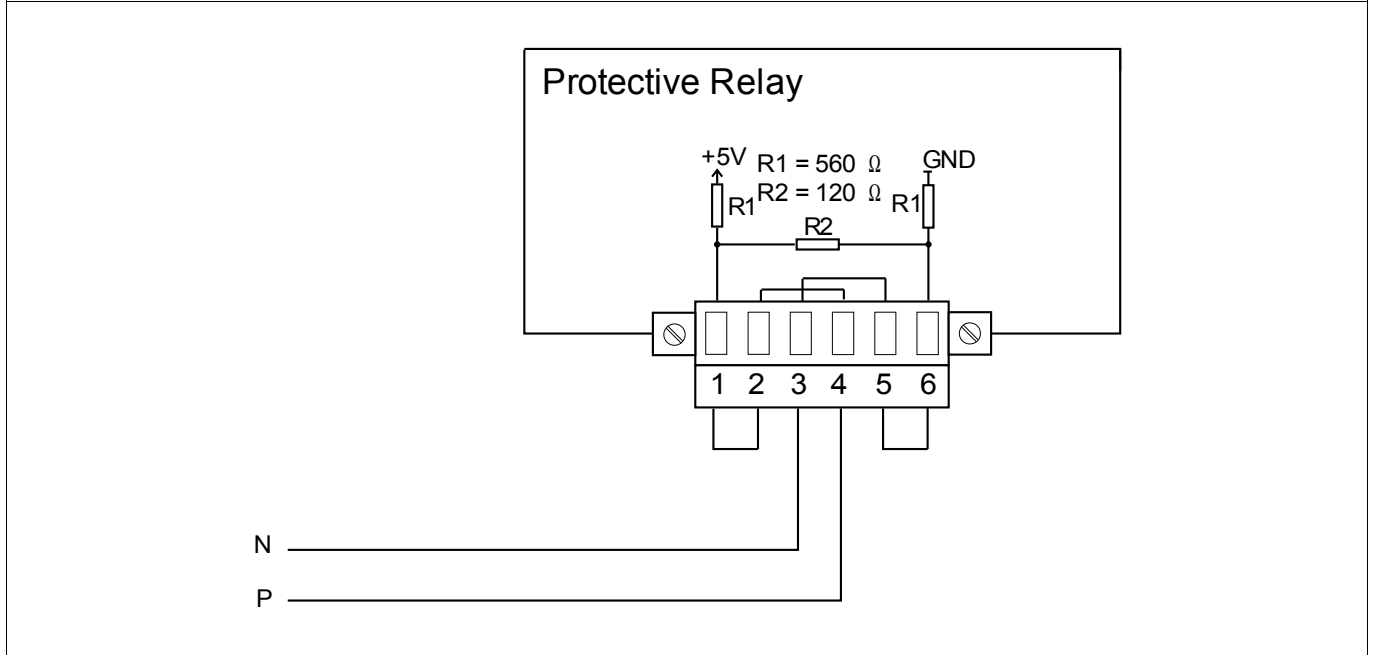
The Modbus® / IEC 60870-5-103 connection cable must be shielded. The shielding has to be fixed at the screw which is marked with the ground symbol at the rear side of the device.

The communication is Halfduplex.

Type 1 Wiring example, Device in the Middle of the BUS



Type 1 Wiring example, Device at the End of the BUS (using the integrated Terminal Resistor)





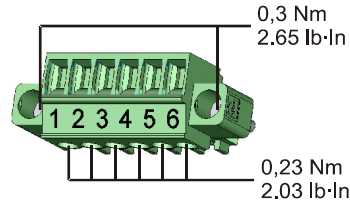
**WARNING**

There are two different versions of the RS485 interface. By means of the wiring diagram on the top of your device, you have to find out which version is built in your device (Type1 or Type2).

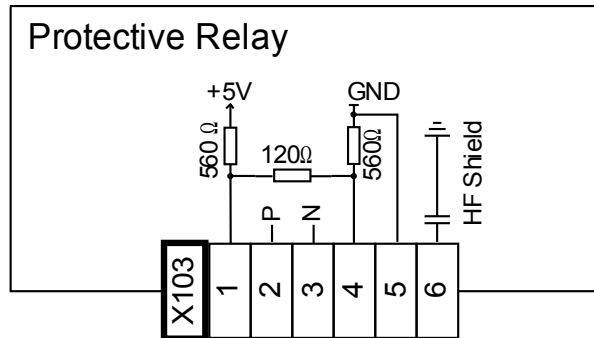


**WARNING**

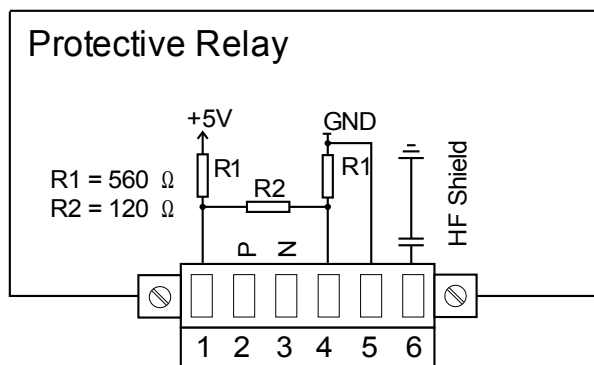
Ensure the correct tightening torques.



**RS485 – Type 2 (see wiring diagram)**



*Electro-mechanical assignment Type 2 (see wiring diagram)*

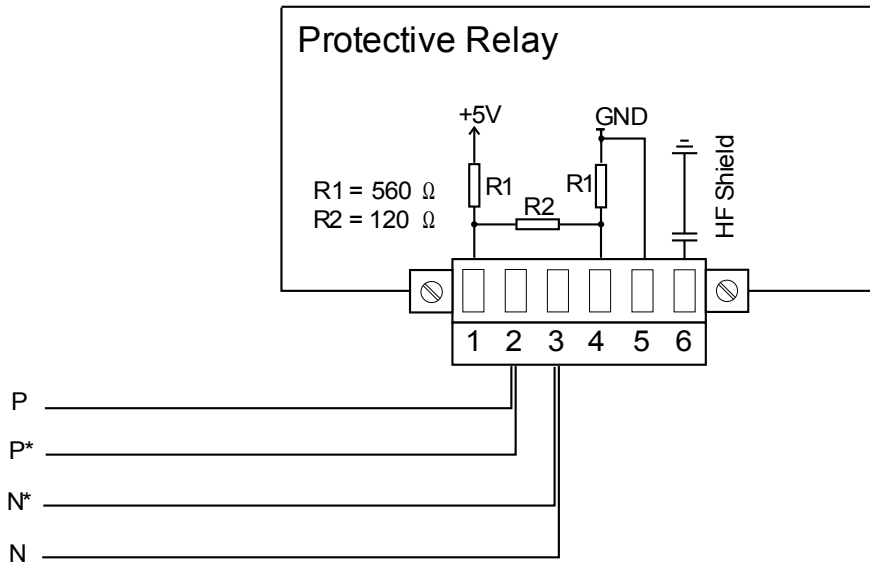


**NOTICE**

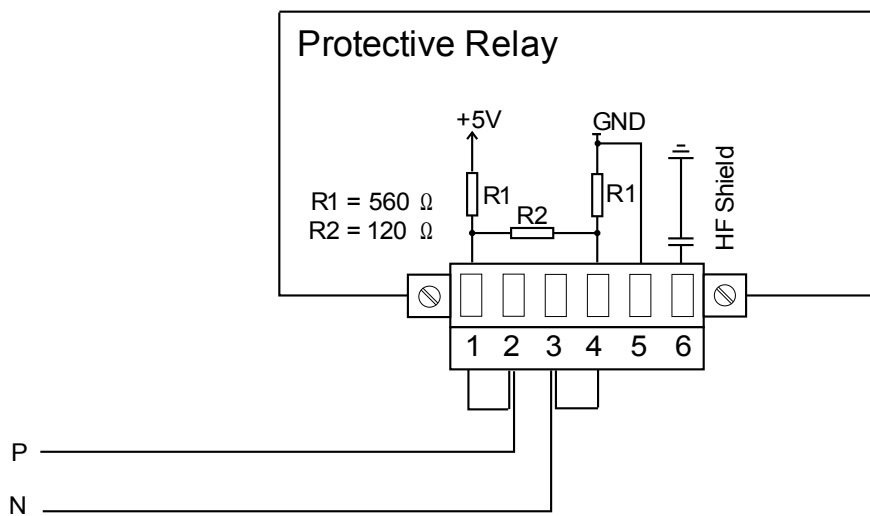
The Modbus® / IEC 60870-5-103 connection cable must be shielded. The shielding has to be fixed at the screw which is marked with the ground symbol at the rear side of the device.

The communication is Halfduplex.

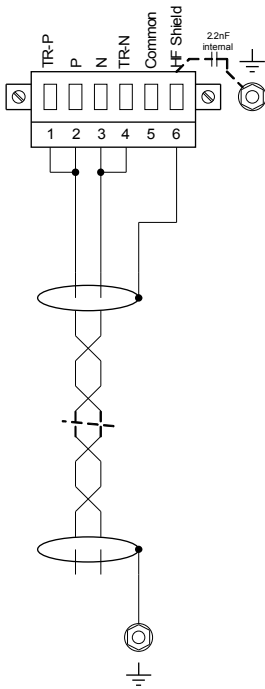
Type 2 Wiring example, Device in the Middle of the BUS



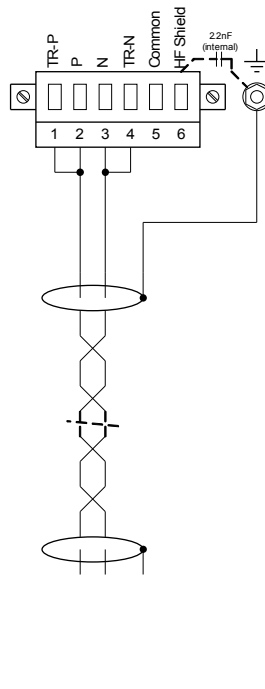
Type 2 Wiring example, Device at the End of the BUS (using the integrated Terminal Resistor)



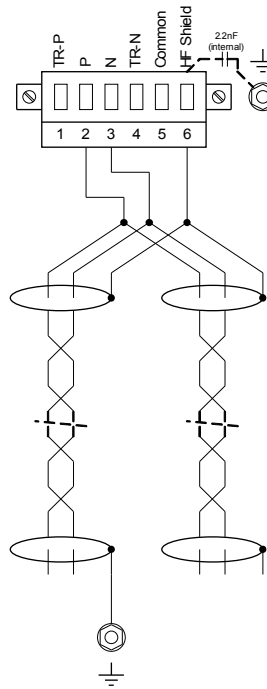
*Type 2 Shielding Options (2-wire + Shield)*



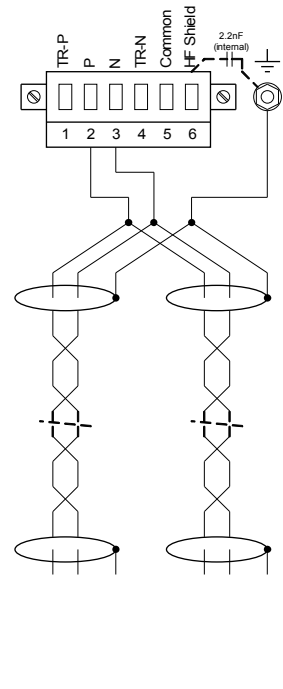
Shield at bus master side connected to earth termination resistors used



Shield at bus device side connected to earth termination resistors used

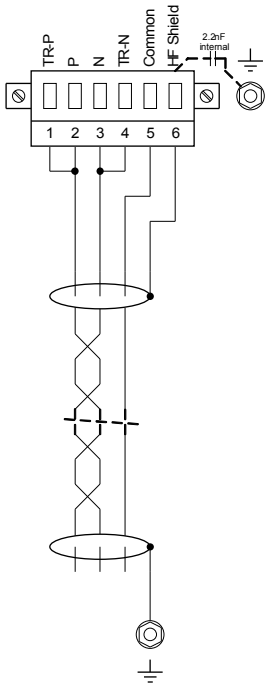


Shield at bus master side connected to earth termination resistors not used

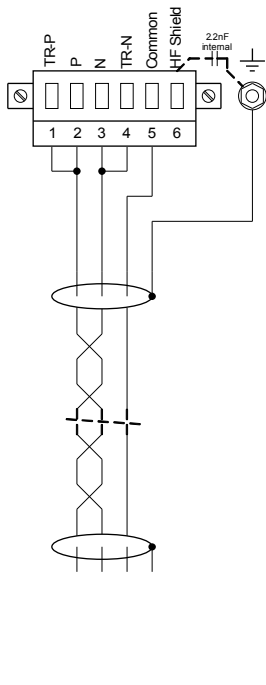


Shield at bus device side connected to earth termination resistors not used

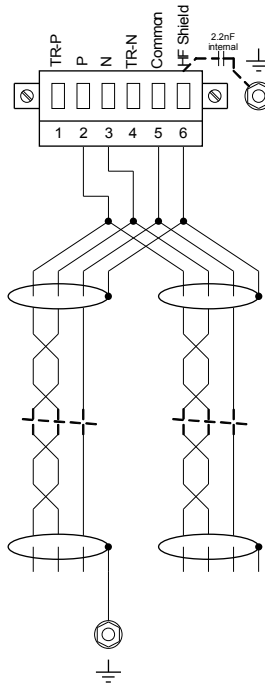
*Type 2 Shielding Options (3-wire + Shield)*



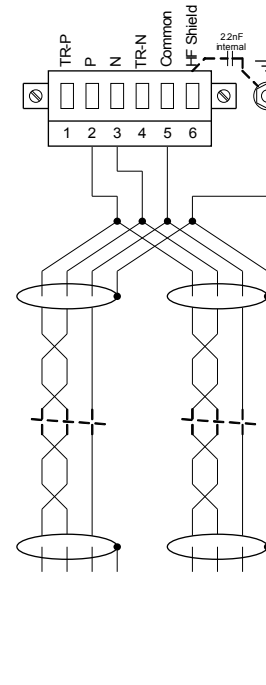
Shield at bus master side connected to earth termination resistors used



Shield at bus device side connected to earth termination resistors used



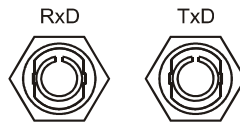
Shield at bus master side connected to earth termination resistors not used



Shield at bus device side connected to earth termination resistors not used

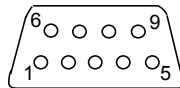
## Profibus DP/ Modbus® RTU / IEC 60870-5-103 via fibre optic

### Fibre Optic



## Modbus® RTU / IEC 60870-5-103 via D-SUB

### D-SUB



### Electro-mechanical assignment

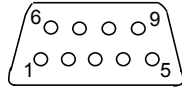
- D-SUB assignment - bushing
- 1 Earthing/shielding
  - 3 RxD TxD - P: High-Level
  - 4 RTS-signal
  - 5 DGND: Ground, neg. Potential of aux voltage supply
  - 6 VP: pos. Potential of the aux voltage supply
  - 8 RxD TxD - N: Low-Level

## NOTICE

The connection cable must be shielded. The shielding has to be fixed at the screw which is marked with the ground symbol at the back side of the device.

## Profibus DP via D-SUB

### D-SUB



### Electro-mechanical assignment

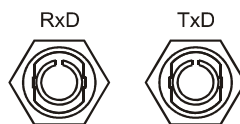
- D-SUB assignment - bushing
- 1 Earthing/shielding
- 3 RxD TxD - P: High-Level
- 4 RTS-signal
- 5 DGND: Ground, neg. Potential of aux voltage supply
- 6 VP: pos. Potential of the aux voltage supply
- 8 RxD TxD - N: Low-Level

## NOTICE

The connection cable must be shielded. The shielding has to be fixed at the screw which is marked with the ground symbol at the back side of the device.

## Profibus DP/ Modbus® RTU / IEC 60870-5-103 via fibre optic

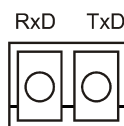
### Fibre Optic



## Ethernet / TCP/IP via Fiber Optics

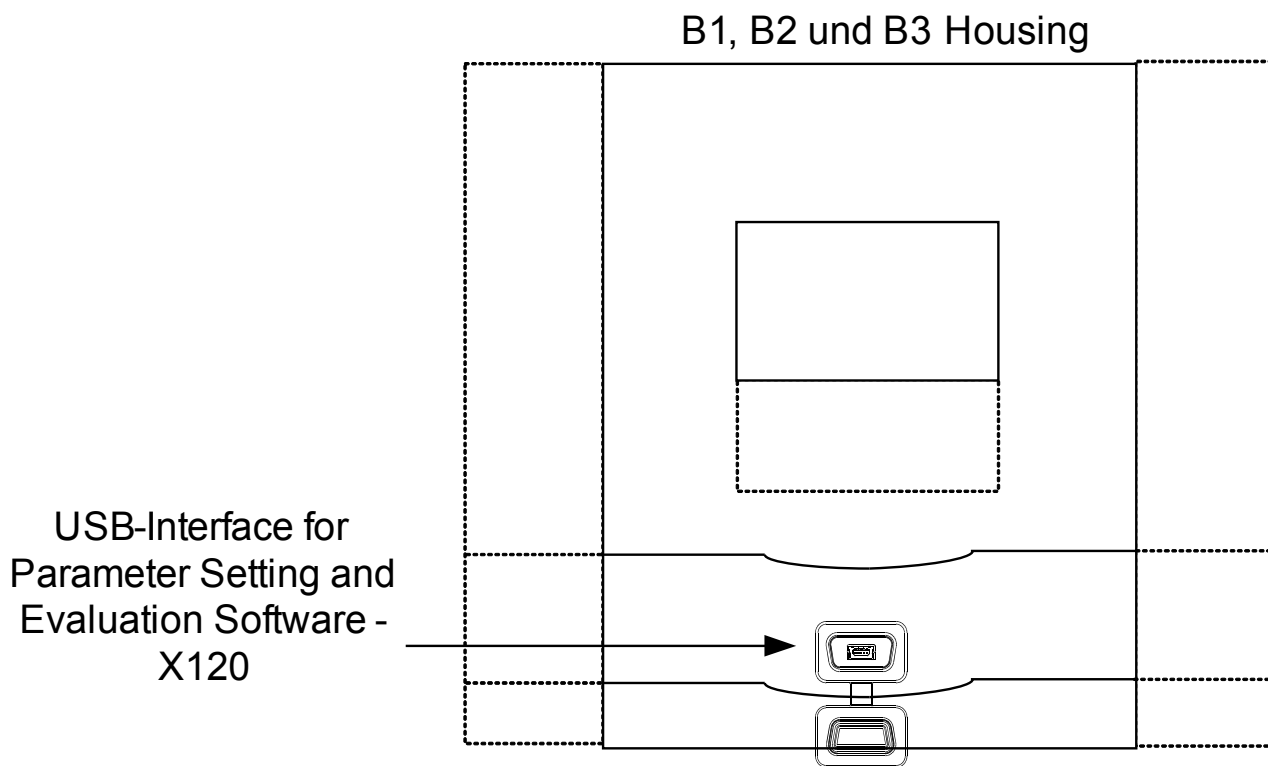
### Fiber Optics - FO

Fibre connection / LWL



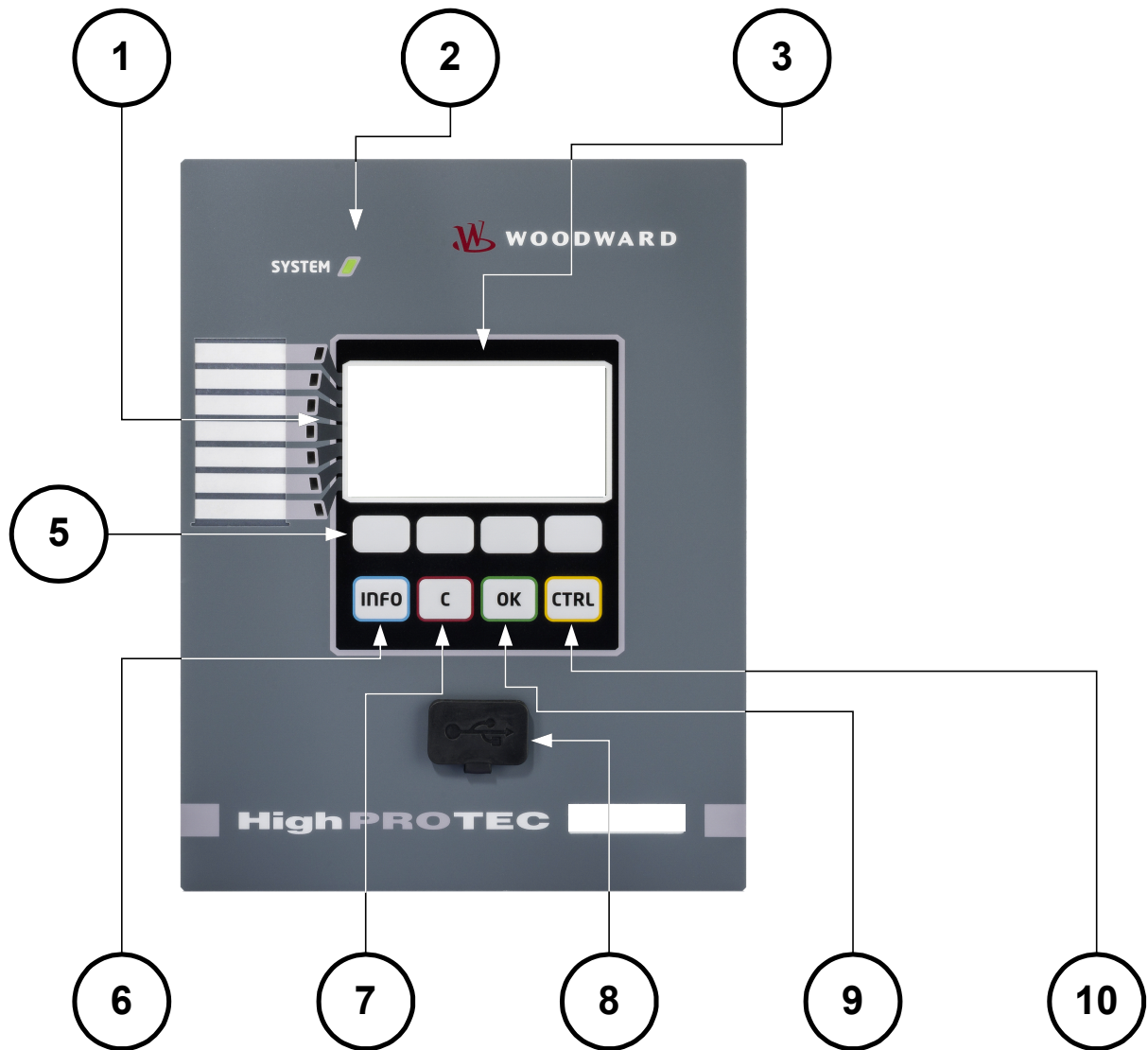
## PC Interface - X120


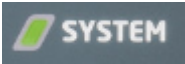
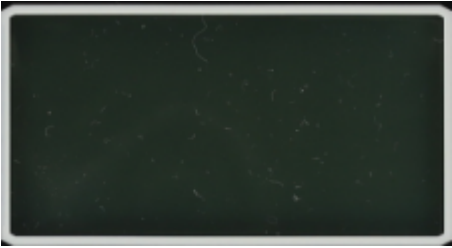

- USB (Mini-B)




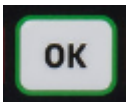
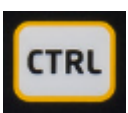


## Navigation - Operation



1		LEDs	<p>Messages inform you about operational conditions, system data or other device particulars. They additionally provide you with information regarding failures and functioning of the device as well as other states of the device and the equipment.</p> <p>Alarm signals can be freely allocated to LEDs out of the »ASSIGNMENT LIST«.</p> <p>An overview about all alarm signals available in the device can be obtained from the »ASSIGNMENT LIST« which can be found in the appendix.</p>
		LED »System OK«	<p>Should LED »System OK« flash red during operation, contact the Service Dept. immediately.</p>
3		Display	<p>Via the display you can read-out operational data and edit parameters.</p>
5		Softkeys	<p>The function of the »SOFTKEYS« are contextual. On the bottom line of the display the present function is displayed/symbolized.</p> <p>Possible functions are:</p> <ul style="list-style-type: none"> <li>■ Navigation</li> <li>■ Parameter decrement/increment.</li> <li>■ Scrolling up/down a menu page</li> <li>■ Moving to a digit</li> <li>■ Change into the parameter setting mode »wrench symbol«.</li> </ul>
















<p>6</p>		<p>INFO Key (Signals/Messages)</p>	<p>Looking through the present LED assignment. The direct select key can be actuated at any time. If the INFO key is actuated again you will leave the LED menu.</p> <p>Here only the first assignments of the LEDs will be shown. Every three seconds the »SOFTKEYS« will be shown (flashing).</p> <p><i>Displaying the multiple Assignments</i></p> <p>If the INFO-Button is pressed only the first assignments of any LED is shown. Every three seconds the »SOFTKEYS« will be shown (flashing).</p> <p>If there is more than one signal assigned to a LED (indicated by three dots) you can check the state of the multiple assignments if you proceed as follows.</p> <p>In order to show all (multiple) assignments select a LED by means of the »SOFTKEYS« »up« and »down«</p> <p>Via the »Softkey« »right« call up a Submenu of this LED that gives you detailed information on the state of all signals assigned to this LED. An arrow symbol points to the LED whose assignments are currently displayed.</p> <p>Via the »SOFTKEYS« »up« and »down« you can call up the next / previous LED.</p> <p>In order to leave the LED menu press the »SOFTKEY« »left« multiple times.</p>
<p>7</p>		<p>»C Key«</p>	<p>To abort changes and to acknowledge messages.</p> <p>In order to reset please press the Softkey »wrench« and enter the password.</p>

			The reset menu can be left by pressing the Softkey »Arrow-left«
8		RS232 Interface ( <i>Smart view</i> Connection)	Connection to software <i>Smart view</i> is done via the RS232 interface.
9		»OK Key«	When using the »OK« key parameter changes are temporarily stored. If the »OK« key is pressed again, those changes are stored definitely.
10		»CTRL Key«*	Direct Access to the Control Menu.

\*=Not for all devices available.

## Basic Menu Control

The graphic user interface is equivalent to a hierarchical structured menu tree. For access to the individual submenus the »SOFTKEYS«/Navigation Keys are used. The function of the »SOFTKEYS« can be found as symbol in the footer of the display.

<b>Softkey</b>	<b>Description</b>
	■ Via »SOFTKEY« »up« you will come to the prior menu point/one parameter up by scrolling upwards.
	■ Via »SOFTKEY« »left« you will go one step back.
	■ Via »SOFTKEY« »down« you will change to the next menu point/one parameter down by scrolling downwards.
	■ Via »SOFTKEY« »right« you will come to a submenu.
	■ Via »SOFTKEY« »Top of list« you will jump directly to the top of a list.
	■ Via »SOFTKEY« »Bottom of list« you will jump directly to the end of a list.
	■ Via »SOFTKEY« »+« the related digit will be incremented. (Continuous pressure -> fast).
	■ Via »SOFTKEY« »-« the related digit will be decremented. (Continuous pressure -> fast)
	■ Via »SOFTKEY« »left« you will go one digit to the left.
	■ Via »SOFTKEY« »right« you will go one digit to the right.
	■ Via »SOFTKEY« »Parameter setting« you will call up the parameter setting mode.
	■ Via »SOFTKEY« »Parameter setting« you will call up the parameter setting mode. Password authorization required.
	■ Via »SOFTKEY« »delete« data will be deleted.
	■ Fast forward scrolling is possible via »SOFTKEY« »Fast forward«
	■ Fast backward scrolling is possible via »SOFTKEY« »Fast backward«

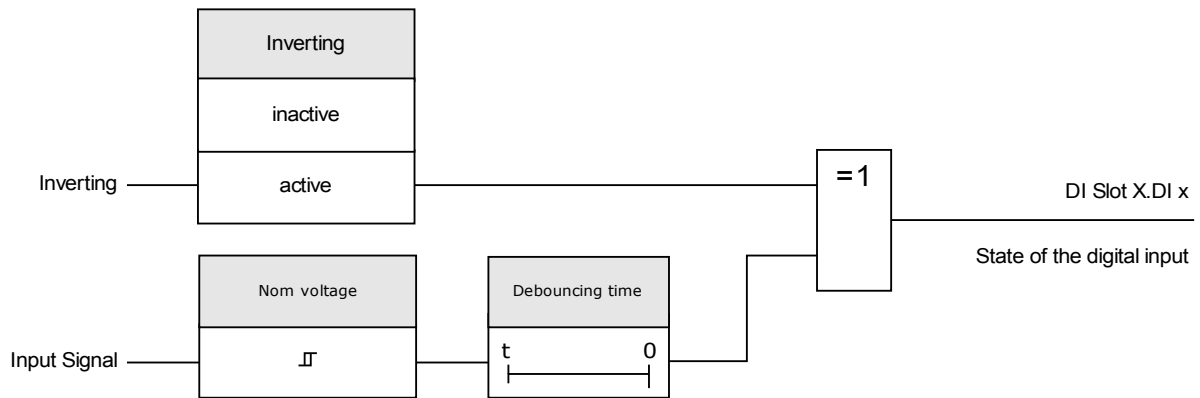
In order to return to the main menu, just keep pressing the Softkey »Arrow-Left« until you arrive at the »main menu«.

# Input, Output and LED Settings

## Configuration of the Digital Inputs

Set the following parameters for each of the digital inputs:

- »Nominal voltage«
- »Debouncing time«: A state change will only be adopted by the digital input after the debouncing time has expired.
- »Inverting« (where necessary)



**CAUTION**

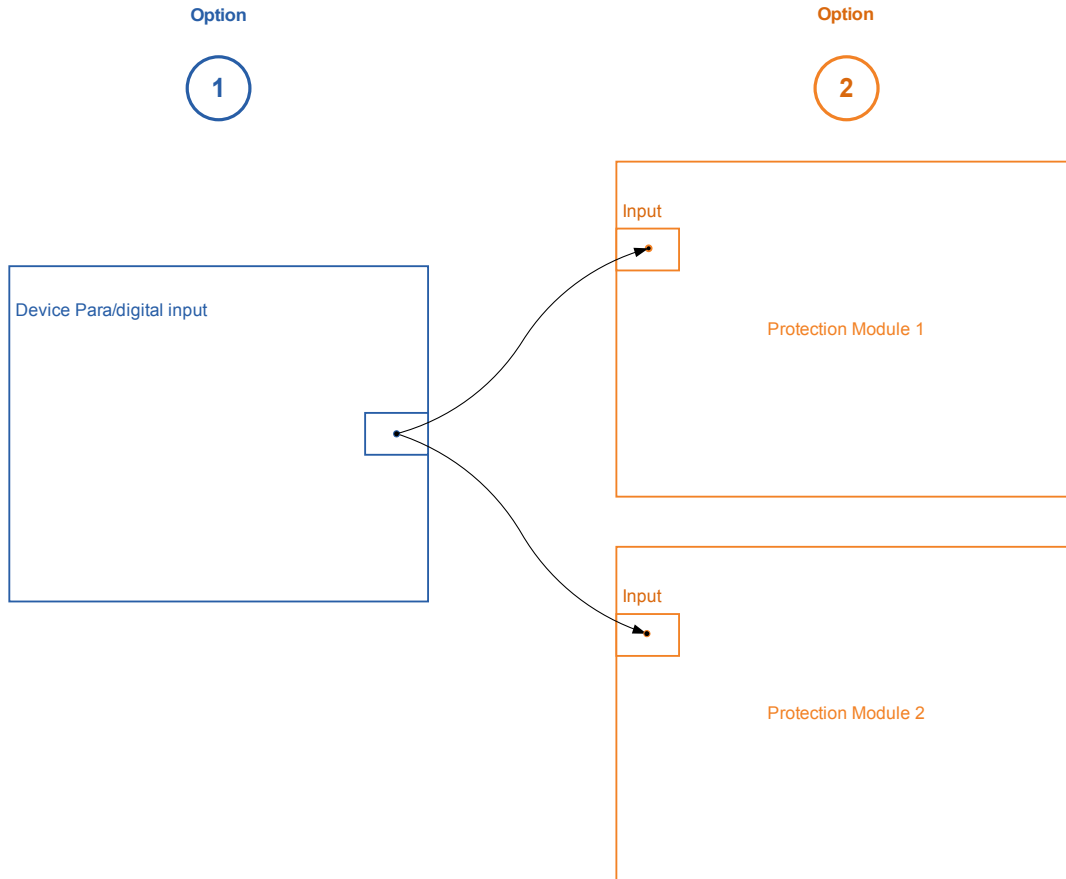
The debouncing time will be started each time the state of the input signal alternates.

**CAUTION**

In addition to the debouncing time that can be set via software, there is always a hardware debouncing time (approx 12 ms) that cannot be turned off.

## Assignment of Digital Inputs

There are two options available in order to determine where a Digital Input should be assigned to.



### Option 1 - Assigning a Digital Input onto one or multiple modules.

#### *Adding an assignment:*

Within menu [Device Parameter\Digital Inputs] Digital Inputs can be assigned onto one or multiple targets. Call up the Digital Input (Arrow right on the DI). Click on the Softkey »Parameter Setting/Wrench«. Click on »Add« and assign a target. Assign where required additional targets.

#### *Deleting an assignment:*

Select as described above a Digital Input that should be edited at the HMI. Call up the assignments of the Digital Input (Arrow-right on the DI) and select the assignment that should be removed/deleted (Please note, this has to be marked with the cursor). The assignment can now be deleted at the HMI by means of the Softkey »Parameter setting« and selection of »remove«. Confirm the parameter setting update.

### Option 2 – Connecting a Module Input with a Digital Input

Call a module. Within this module assign a Digital Input onto a module input. Example: A protection module should be blocked depending on the state of a Digital Input.. For this assign onto the blocking input within the Global Parameters the Digital Input (e.g. Ex Blo 1).

## Checking the Assignments of a Digital Input

In order to check the targets that a Digital Input is assigned to please proceed as follows:

Call up menu [Device Parameter\Digital Inputs].

Navigate to the Digital Input that should be checked.

*At the HMI:*







A multiple assignment, that means if a Digital Input is used more than once (if it is assigned to multiple targets), this will be indicated by an "...” behind a Digital Input. Call up this Digital Input by Softkey »Arrow right« in order to see the list of targets of this Digital Input.











## DI-8P X

### DI Slot X1

#### Device Parameters of the Digital Inputs on DI-8P X

Parameter	Description	Setting range	Default	Menu path
 Nom voltage	Nominal voltage of the digital inputs	24 V DC, 48 V DC, 60 V DC, 110 V DC, 230 V DC, 110 V AC, 230 V AC	24 V DC	[Device Para /Digital Inputs /DI Slot X1 /Group 1]
 Inverting 1	Inverting the input signals.	inactive, active	inactive	[Device Para /Digital Inputs /DI Slot X1 /Group 1]
 Debouncing time 1	A change of the state of a digital input will only be recognized after the debouncing time has expired (become effective). Thus, transient signals will not be misinterpreted.	no debouncing time, 20 ms, 50 ms, 100 ms	no debouncing time	[Device Para /Digital Inputs /DI Slot X1 /Group 1]
 Nom voltage	Nominal voltage of the digital inputs	24 V DC, 48 V DC, 60 V DC, 110 V DC, 230 V DC, 110 V AC, 230 V AC	24 V DC	[Device Para /Digital Inputs /DI Slot X1 /Group 2]
 Inverting 2	Inverting the input signals.	inactive, active	inactive	[Device Para /Digital Inputs /DI Slot X1 /Group 2]
 Debouncing time 2	A change of the state of a digital input will only be recognized after the debouncing time has expired (become effective). Thus, transient signals will not be misinterpreted.	no debouncing time, 20 ms, 50 ms, 100 ms	no debouncing time	[Device Para /Digital Inputs /DI Slot X1 /Group 2]

Parameter	Description	Setting range	Default	Menu path
Nom voltage 	Nominal voltage of the digital inputs	24 V DC, 48 V DC, 60 V DC, 110 V DC, 230 V DC, 110 V AC, 230 V AC	24 V DC	[Device Para /Digital Inputs /DI Slot X1 /Group 3]
Inverting 3 	Inverting the input signals.	inactive, active	inactive	[Device Para /Digital Inputs /DI Slot X1 /Group 3]
Debouncing time 3 	A change of the state of a digital input will only be recognized after the debouncing time has expired (become effective). Thus, transient signals will not be misinterpreted.	no debouncing time, 20 ms, 50 ms, 100 ms	no debouncing time	[Device Para /Digital Inputs /DI Slot X1 /Group 3]
Inverting 4 	Inverting the input signals.	inactive, active	inactive	[Device Para /Digital Inputs /DI Slot X1 /Group 3]
Debouncing time 4 	A change of the state of a digital input will only be recognized after the debouncing time has expired (become effective). Thus, transient signals will not be misinterpreted.	no debouncing time, 20 ms, 50 ms, 100 ms	no debouncing time	[Device Para /Digital Inputs /DI Slot X1 /Group 3]
Inverting 5 	Inverting the input signals.	inactive, active	inactive	[Device Para /Digital Inputs /DI Slot X1 /Group 3]
Debouncing time 5 	A change of the state of a digital input will only be recognized after the debouncing time has expired (become effective). Thus, transient signals will not be misinterpreted.	no debouncing time, 20 ms, 50 ms, 100 ms	no debouncing time	[Device Para /Digital Inputs /DI Slot X1 /Group 3]
Inverting 6 	Inverting the input signals.	inactive, active	inactive	[Device Para /Digital Inputs /DI Slot X1 /Group 3]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
 Debouncing time 6	A change of the state of a digital input will only be recognized after the debouncing time has expired (become effective). Thus, transient signals will not be misinterpreted.	no debouncing time, 20 ms, 50 ms, 100 ms	no debouncing time	[Device Para /Digital Inputs /DI Slot X1 /Group 3]
 Inverting 7	Inverting the input signals.	inactive, active	inactive	[Device Para /Digital Inputs /DI Slot X1 /Group 3]
 Debouncing time 7	A change of the state of a digital input will only be recognized after the debouncing time has expired (become effective). Thus, transient signals will not be misinterpreted.	no debouncing time, 20 ms, 50 ms, 100 ms	no debouncing time	[Device Para /Digital Inputs /DI Slot X1 /Group 3]
 Inverting 8	Inverting the input signals.	inactive, active	inactive	[Device Para /Digital Inputs /DI Slot X1 /Group 3]
 Debouncing time 8	A change of the state of a digital input will only be recognized after the debouncing time has expired (become effective). Thus, transient signals will not be misinterpreted. 8	no debouncing time, 20 ms, 50 ms, 100 ms	no debouncing time	[Device Para /Digital Inputs /DI Slot X1 /Group 3]

### Signals of the Digital Inputs on DI-8P X



<i>Signal</i>	<i>Description</i>
DI 1	Signal: Digital Input
DI 2	Signal: Digital Input
DI 3	Signal: Digital Input
DI 4	Signal: Digital Input
DI 5	Signal: Digital Input
DI 6	Signal: Digital Input
DI 7	Signal: Digital Input
DI 8	Signal: Digital Input

## DI-4P X

### DI Slot X1

#### Device Parameters of the Digital Inputs on DI-4P X

Parameter	Description	Setting range	Default	Menu path
 Nom voltage	Nominal voltage of the digital inputs	24 V DC, 48 V DC, 60 V DC, 110 V DC, 230 V DC, 110 V AC, 230 V AC	24 V DC	[Device Para /Digital Inputs /DI Slot X1]
 Inverting 1	Inverting the input signals.	inactive, active	inactive	[Device Para /Digital Inputs /DI Slot X1]
 Debouncing time 1	A change of the state of a digital input will only be recognized after the debouncing time has expired (become effective). Thus, transient signals will not be misinterpreted.	no debouncing time, 20 ms, 50 ms, 100 ms	no debouncing time	[Device Para /Digital Inputs /DI Slot X1]
 Inverting 2	Inverting the input signals.	inactive, active	inactive	[Device Para /Digital Inputs /DI Slot X1]
 Debouncing time 2	A change of the state of a digital input will only be recognized after the debouncing time has expired (become effective). Thus, transient signals will not be misinterpreted.	no debouncing time, 20 ms, 50 ms, 100 ms	no debouncing time	[Device Para /Digital Inputs /DI Slot X1]
 Inverting 3	Inverting the input signals.	inactive, active	inactive	[Device Para /Digital Inputs /DI Slot X1]
 Debouncing time 3	A change of the state of a digital input will only be recognized after the debouncing time has expired (become effective). Thus, transient signals will not be misinterpreted.	no debouncing time, 20 ms, 50 ms, 100 ms	no debouncing time	[Device Para /Digital Inputs /DI Slot X1]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Inverting 4 	Inverting the input signals.	inactive, active	inactive	[Device Para /Digital Inputs /DI Slot X1]
Debouncing time 4 	A change of the state of a digital input will only be recognized after the debouncing time has expired (become effective). Thus, transient signals will not be misinterpreted.	no debouncing time, 20 ms, 50 ms, 100 ms	no debouncing time	[Device Para /Digital Inputs /DI Slot X1]

### Signals of the Digital Inputs on DI-4P X

<i>Signal</i>	<i>Description</i>
DI 1	Signal: Digital Input
DI 2	Signal: Digital Input
DI 3	Signal: Digital Input
DI 4	Signal: Digital Input

## Output Relays Settings

The conditions of module outputs and signals/protective functions (such as reverse interlocking) can be passed by means of alarm relays. The alarm relays are potential-free contacts (which can be used as opening or closing contact). Each alarm relay can be assigned up to 7 functions out of the »assignment list«.

Set the following parameters for each of the binary output relays:

- Up to 7 signals from the »assignment list« (OR-connected)
- Each of the assigned signals can be inverted.
- The (collective) state of the binary output relay can be inverted (open or closed circuit current principle)
- By the Operating Mode it can be determined whether the relay output works in working current or closed-circuit principle.
- »Latched« active or inactive
  - »Latched = inactive«:  
If the latching function is »inactive«, the alarm relay respectively the alarm contact will adopt the state of those alarms that were assigned.
  - »Latched = active«  
If the »latching function« is »active«, the state of the alarm relay respectively alarm contact that was set by the alarms will be stored.

The alarm relay can only be acknowledged after reset of those signals that had initiated setting of the relay and after expiry of the minimum retention time.

- »Hold time«: At signal changes, the minimal latching time ensures that the relay will be maintained picked-up or released for at least this period.

### CAUTION

If binary outputs are parameterized »Latched=*active*«, they will keep (return into) their position even if there is a break within the power supply.

If binary output relays are parameterized »Latched=*active*«, The binary output will also retain, if the binary output is reprogrammed in another way. This applies also if »Latched is set to *inactive*«. Resetting a binary output that has latched a signal will always require an acknowledgement.

### NOTICE

The »System OK Relay« (watchdog) cannot be configured.

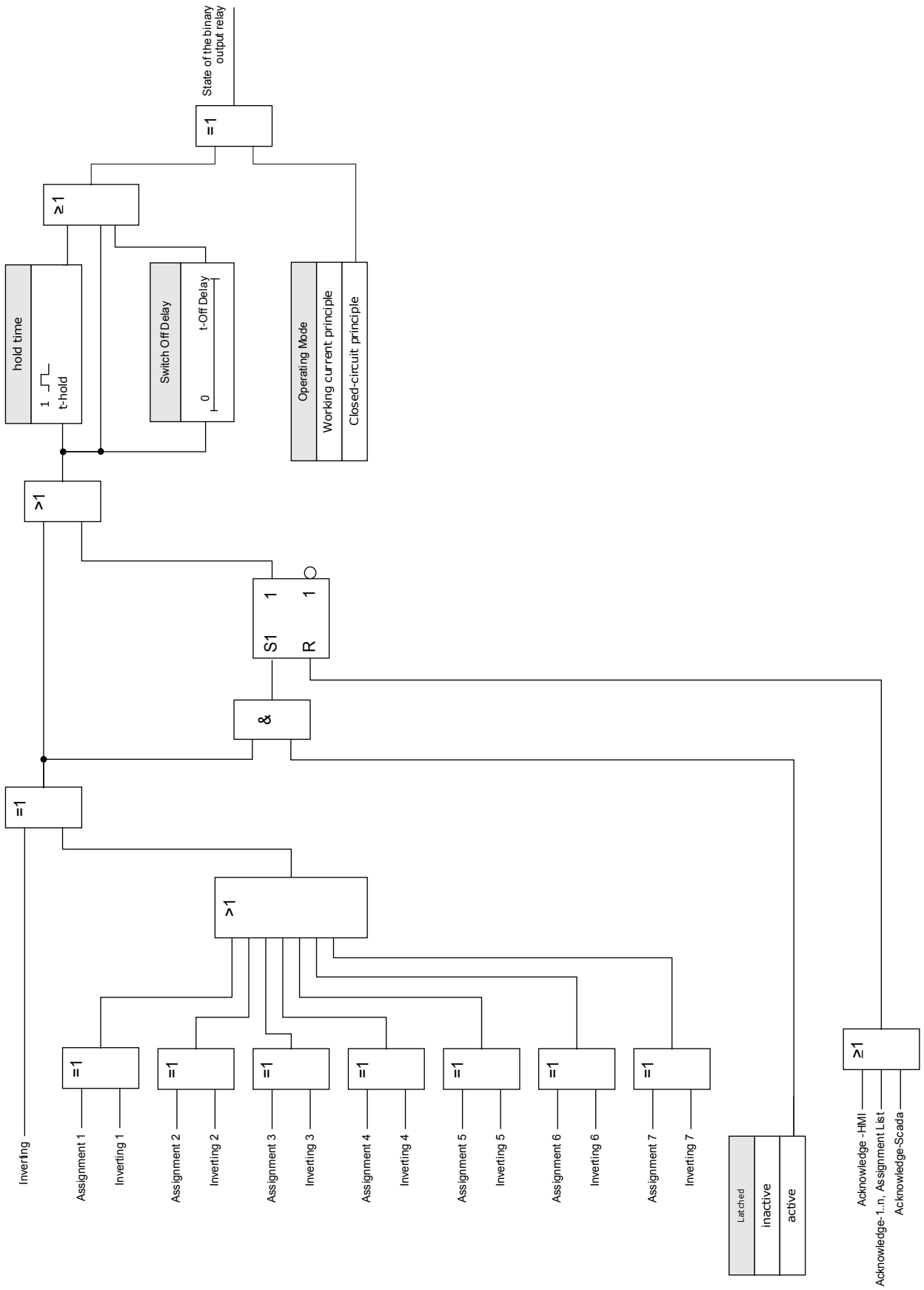
### *Acknowledgment options*

Binary output relays can be acknowledged:

- Via the push-button »C« at the operating panel.
- Each binary output relay can be acknowledged by a signal of the »assignment list« (If »*Latched is active*«).
- Via the module »Ex Acknowledge« all binary output relays can be acknowledged at once, if the signal for external acknowledgement that was selected from the »assignment list« becomes true. (e.g the state of a digital input).
- Via SCADA, all output relays can be acknowledged at once.



**Relay output contacts can be set by force or disarmed (for commissioning support, please refer to the „Service/Disarming the Output Relay Contacts“ and „Service/Forcing the Output Relay Contacts“ sections).**





## System Contact



The *System OK alarm relay (SC)* is the devices »LIFE CONTACT«. Its installation location depends on the housing type. Please refer to the wiring diagram of the device (WDC-contact).



The *System-OK relay (SC)* cannot be parameterized. The system contact is an operating current contact that picks-up, when the device is free from internal faults. While the device is booting up, the *System OK relay (SC)* remains dropped-off. As soon as the system was duly started up, the relay picks up and the assigned LED is activated accordingly (please refer to chapter Self Supervision).

## OR-5 X






### BO Slot X2

#### Direct Commands of OR-5 X

Parameter	Description	Setting range	Default	Menu path
 DISARMED	This is the second step, after the "DISARMED Ctrl" has been activated, that is required to DISARM the relay outputs. This will DISARM those output relays that are currently not latched and that are not on "hold" by a pending minimum hold time. CAUTION! RELAYS DISARMED in order to safely perform maintenance while eliminating the risk of taking an entire process off-line. (Note: Zone Interlocking and Supervision Contact cannot be disarmed). YOU MUST ENSURE that the relays are ARMED AGAIN after maintenance.  Only available if: DISARMED Ctrl = active	inactive, active	inactive	[Service /Test (Prot inhibit) /DISARMED /BO Slot X2]
 Force all Outs	By means of this function the normal Output Relay State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state. Forcing all outputs relays of an entire assembly group is superior to forcing a single output relay.	Normal, De-Energized, Energized	Normal	[Service /Test (Prot inhibit) /Force OR /BO Slot X2]
 Force OR1	By means of this function the normal Output Relay State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Normal, De-Energized, Energized	Normal	[Service /Test (Prot inhibit) /Force OR /BO Slot X2]
 Force OR2	By means of this function the normal Output Relay State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Normal, De-Energized, Energized	Normal	[Service /Test (Prot inhibit) /Force OR /BO Slot X2]
 Force OR3	By means of this function the normal Output Relay State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Normal, De-Energized, Energized	Normal	[Service /Test (Prot inhibit) /Force OR /BO Slot X2]




Parameter	Description	Setting range	Default	Menu path
Force OR4 	By means of this function the normal Output Relay State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Normal, De-Energized, Energized	Normal	[Service /Test (Prot inhibit) /Force OR /BO Slot X2]
Force OR5 	By means of this function the normal Output Relay State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Normal, De-Energized, Energized	Normal	[Service /Test (Prot inhibit) /Force OR /BO Slot X2]


### Device Parameters of the Binary Output Relays on OR-5 X









Parameter	Description	Setting range	Default	Menu path
Operating Mode 	Operating Mode	Working current principle, Closed-circuit principle	Working current principle	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
t-hold 	To clearly identify the state transition of a binary output relay, the "new state" is being hold, at least for the duration of the hold time.	0.00 - 300.00s	0.00s	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
t-Off Delay 	Switch Off Delay	0.00 - 300.00s	0.00s	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Latched 	Defines whether the Relay Output will be latched when it picks up.	inactive, active	active	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Acknowledgement 	Acknowledgement Signal - An acknowledgement signal (that acknowledges the corresponding binary output relay) can be assigned to each output relay. The acknowledgement-signal is only effective if the parameter "Latched" is set to active.  Only available if: Latched = active	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 1]

Parameter	Description	Setting range	Default	Menu path
Inverting 	Inverting of the Binary Output Relay.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Assignment 1 	Assignment	1..n, Assignment List	SG[1].TripCmd	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Inverting 1 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Assignment 2 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Inverting 2 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Assignment 3 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Inverting 3 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Assignment 4 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Inverting 4 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 1]


Parameter	Description	Setting range	Default	Menu path
Assignment 5 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Inverting 5 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Assignment 6 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Inverting 6 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Assignment 7 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Inverting 7 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Operating Mode 	Operating Mode	Working current principle, Closed-circuit principle	Working current principle	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
t-hold 	To clearly identify the state transition of a binary output relay, the "new state" is being hold, at least for the duration of the hold time.	0.00 - 300.00s	0.00s	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
t-Off Delay 	Switch Off Delay	0.00 - 300.00s	0.00s	[Device Para /Binary Outputs /BO Slot X2 /BO 2]






Parameter	Description	Setting range	Default	Menu path
Latched 	Defines whether the Relay Output will be latched when it picks up.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Acknowledgement 	Acknowledgement Signal - An acknowledgement signal (that acknowledges the corresponding binary output relay) can be assigned to each output relay. The acknowledgement-signal is only effective if the parameter "Latched" is set to active.  Only available if: Latched = active	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Inverting 	Inverting of the Binary Output Relay.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Assignment 1 	Assignment	1..n, Assignment List	Prot.Alarm	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Inverting 1 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Assignment 2 	Assignment	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Inverting 2 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Assignment 3 	Assignment	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Inverting 3 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Assignment 4 	Assignment	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Inverting 4 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Assignment 5 	Assignment	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Inverting 5 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Assignment 6 	Assignment	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Inverting 6 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Assignment 7 	Assignment	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Inverting 7 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Operating Mode 	Operating Mode	Working current principle, Closed-circuit principle	Working current principle	[Device Para /Binary Outputs /BO Slot X2 /BO 3]










Parameter	Description	Setting range	Default	Menu path
t-hold 	To clearly identify the state transition of a binary output relay, the "new state" is being hold, at least for the duration of the hold time.	0.00 - 300.00s	0.00s	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
t-Off Delay 	Switch Off Delay	0.00 - 300.00s	0.00s	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Latched 	Defines whether the Relay Output will be latched when it picks up.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Acknowledgement 	Acknowledgement Signal - An acknowledgement signal (that acknowledges the corresponding binary output relay) can be assigned to each output relay. The acknowledgement-signal is only effective if the parameter "Latched" is set to active.  Only available if: Latched = active	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Inverting 	Inverting of the Binary Output Relay.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Assignment 1 	Assignment	1..n, Assignment List	SG[1].ON Cmd	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Inverting 1 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Assignment 2 	Assignment	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Inverting 2 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]



<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Assignment 3 	Assignment	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Inverting 3 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Assignment 4 	Assignment	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Inverting 4 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Assignment 5 	Assignment	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Inverting 5 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Assignment 6 	Assignment	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Inverting 6 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Assignment 7 	Assignment	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 3]


Parameter	Description	Setting range	Default	Menu path
 Inverting 7	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
 Operating Mode	Operating Mode	Working current principle, Closed-circuit prin- ciple	Working current principle	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
 t-hold	To clearly identify the state transition of a binary output relay, the "new state" is being hold, at least for the duration of the hold time.	0.00 - 300.00s	0.00s	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
 t-Off Delay	Switch Off Delay	0.00 - 300.00s	0.00s	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
 Latched	Defines whether the Relay Output will be latched when it picks up.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
 Acknowledgement	Acknowledgement Signal - An acknowledgement signal (that acknowledges the corresponding binary output relay) can be assigned to each output relay. The acknowledgement-signal is only effective if the parameter "Latched" is set to active.  Only available if: Latched = active	1..n, Assignment List	---	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
 Inverting	Inverting of the Binary Output Relay.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
 Assignment 1	Assignment	1..n, Assignment List	SG[1].OFF Cmd	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
 Inverting 1	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 4]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Assignment 2 	Assignment	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
Inverting 2 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
Assignment 3 	Assignment	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
Inverting 3 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
Assignment 4 	Assignment	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
Inverting 4 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
Assignment 5 	Assignment	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
Inverting 5 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
Assignment 6 	Assignment	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 4]

Parameter	Description	Setting range	Default	Menu path
 Inverting 6	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
 Assignment 7	Assignment	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
 Inverting 7	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
 Operating Mode	Operating Mode	Working current principle, Closed-circuit prin- ciple	Working current principle	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
 t-hold	To clearly identify the state transition of a binary output relay, the "new state" is being hold, at least for the duration of the hold time.	0.00 - 300.00s	0.00s	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
 t-Off Delay	Switch Off Delay	0.00 - 300.00s	0.00s	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
 Latched	Defines whether the Relay Output will be latched when it picks up.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
 Acknowledgement	Acknowledgement Signal - An acknowledgement signal (that acknowledges the corresponding binary output relay) can be assigned to each output relay. The acknowledgement-signal is only effective if the parameter "Latched" is set to active.  Only available if: Latched = active	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
 Inverting	Inverting of the Binary Output Relay.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 5]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Assignment 1 	Assignment	1..n, Assignment List	MStart.Blo	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
Inverting 1 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
Assignment 2 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
Inverting 2 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
Assignment 3 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
Inverting 3 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
Assignment 4 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
Inverting 4 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
Assignment 5 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 5]

Parameter	Description	Setting range	Default	Menu path
 Inverting 5	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
 Assignment 6	Assignment	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
 Inverting 6	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
 Assignment 7	Assignment	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
 Inverting 7	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
 DISARMED Ctrl	Enables and disables the disarming of the relay outputs. This is the first step of a two step process, to inhibit the operation or the relay outputs. Please refer to "DISARMED" for the second step.	inactive, active	inactive	[Service /Test (Prot inhibit) /DISARMED /BO Slot X2]
 Disarm Mode	CAUTION!RELAYS DISARMED in order to safely perform maintenance while eliminating the risk of taking an entire process off-line. (Note: The Supervision Contact cannot be disarmed). YOU MUST ENSURE that the relays are ARMED AGAIN after maintenance.	permanent, timeout	permanent	[Service /Test (Prot inhibit) /DISARMED /BO Slot X2]
 t-Timeout DISARM	The relays will be armed again after expiring of this time.  Only available if: Mode = Timeout DISARM	0.00 - 300.00s	0.03s	[Service /Test (Prot inhibit) /DISARMED /BO Slot X2]
 Force Mode	By means of this function the normal Output Relay States can be overwritten (forced) in case that the Relay is not in a disarmed state. The relays can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	permanent, timeout	permanent	[Service /Test (Prot inhibit) /Force OR /BO Slot X2]

Parameter	Description	Setting range	Default	Menu path
t-Timeout Force 	The Output State will be set by force for the duration of this time. That means for the duration of this time the Output Relay does not show the state of the signals that are assigned on it.  Only available if: Mode = Timeout DISARM	0.00 - 300.00s	0.03s	[Service /Test (Prot inhibit) /Force OR /BO Slot X2]

### Input States of the Binary Output Relays on OR-5 X

Name	Description	Assignment via
BO1.1	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
BO1.2	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
BO1.3	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
BO1.4	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
BO1.5	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
BO1.6	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
BO1.7	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 1]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Ack signal BO 1	Module input state: Acknowledgement signal for the binary output relay. If latching is set to active, the binary output relay can only be acknowledged if those signals that initiated the setting are fallen back and the hold time is expired.	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
BO2.1	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
BO2.2	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
BO2.3	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
BO2.4	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
BO2.5	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
BO2.6	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
BO2.7	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Ack signal BO 2	Module input state: Acknowledgement signal for the binary output relay. If latching is set to active, the binary output relay can only be acknowledged if those signals that initiated the setting are fallen back and the hold time is expired.	[Device Para /Binary Outputs /BO Slot X2 /BO 2]



## Input, Output and LED Settings

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
BO3.1	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
BO3.2	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
BO3.3	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
BO3.4	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
BO3.5	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
BO3.6	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
BO3.7	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Ack signal BO 3	Module input state: Acknowledgement signal for the binary output relay. If latching is set to active, the binary output relay can only be acknowledged if those signals that initiated the setting are fallen back and the hold time is expired.	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
BO4.1	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 4]

## Input, Output and LED Settings

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
BO4.2	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
BO4.3	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
BO4.4	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
BO4.5	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
BO4.6	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
BO4.7	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
Ack signal BO 4	Module input state: Acknowledgement signal for the binary output relay. If latching is set to active, the binary output relay can only be acknowledged if those signals that initiated the setting are fallen back and the hold time is expired.	[Device Para /Binary Outputs /BO Slot X2 /BO 4]
BO5.1	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
BO5.2	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 5]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
BO5.3	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
BO5.4	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
BO5.5	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
BO5.6	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
BO5.7	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 5]
Ack signal BO 5	Module input state: Acknowledgement signal for the binary output relay. If latching is set to active, the binary output relay can only be acknowledged if those signals that initiated the setting are fallen back and the hold time is expired.	[Device Para /Binary Outputs /BO Slot X2 /BO 5]


### Signals of the Binary Output Relays on OR-5 X

<i>Signal</i>	<i>Description</i>
BO 1	Signal: Binary Output Relay
BO 2	Signal: Binary Output Relay
BO 3	Signal: Binary Output Relay
BO 4	Signal: Binary Output Relay
BO 5	Signal: Binary Output Relay
DISARMED!	Signal: CAUTION! RELAYS DISARMED in order to safely perform maintenance while eliminating the risk of taking an entire process off-line. (Note: The Self Supervision Contact cannot be disarmed). YOU MUST ENSURE that the relays are ARMED AGAIN after maintenance
Outs forced	Signal: The State of at least one Relay Output has been set by force. That means that the state of at least one Relay is forced and hence does not show the state of the assigned signals.

## OR-3AI X







### BO Slot X2

#### Direct Commands of OR- 3AI X


Parameter	Description	Setting range	Default	Menu path
 DISARMED	This is the second step, after the "DISARMED Ctrl" has been activated, that is required to DISARM the relay outputs. This will DISARM those output relays that are currently not latched and that are not on "hold" by a pending minimum hold time. CAUTION! RELAYS DISARMED in order to safely perform maintenance while eliminating the risk of taking an entire process off-line. (Note: Zone Interlocking and Supervision Contact cannot be disarmed). YOU MUST ENSURE that the relays are ARMED AGAIN after maintenance.  Only available if: DISARMED Ctrl = active	inactive, active	inactive	[Service /Test (Prot inhibit) /DISARMED /BO Slot X2]
 Force all Outs	By means of this function the normal Output Relay State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state. Forcing all outputs relays of an entire assembly group is superior to forcing a single output relay.	Normal, De-Energized, Energized	Normal	[Service /Test (Prot inhibit) /Force OR /BO Slot X2]
 Force OR1	By means of this function the normal Output Relay State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Normal, De-Energized, Energized	Normal	[Service /Test (Prot inhibit) /Force OR /BO Slot X2]
 Force OR2	By means of this function the normal Output Relay State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Normal, De-Energized, Energized	Normal	[Service /Test (Prot inhibit) /Force OR /BO Slot X2]
 Force OR3	By means of this function the normal Output Relay State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Normal, De-Energized, Energized	Normal	[Service /Test (Prot inhibit) /Force OR /BO Slot X2]

### Device Parameters of the Binary Output Relays on OR- 3AI X


Parameter	Description	Setting range	Default	Menu path
Operating Mode 	Operating Mode	Working current principle, Closed-circuit principle	Working current principle	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
t-hold 	To clearly identify the state transition of a binary output relay, the "new state" is being hold, at least for the duration of the hold time.	0.00 - 300.00s	0.00s	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
t-Off Delay 	Switch Off Delay	0.00 - 300.00s	0.00s	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Latched 	Defines whether the Relay Output will be latched when it picks up.	inactive, active	active	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Acknowledgement 	Acknowledgement Signal - An acknowledgement signal (that acknowledges the corresponding binary output relay) can be assigned to each output relay. The acknowledgement-signal is only effective if the parameter "Latched" is set to active.  Only available if: Latched = active	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Inverting 	Inverting of the Binary Output Relay.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Assignment 1 	Assignment	1..n, Assignment List	SG[1].TripCmd	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Inverting 1 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Assignment 2 	Assignment	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 1]





<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Inverting 2 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Assignment 3 	Assignment	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Inverting 3 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Assignment 4 	Assignment	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Inverting 4 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Assignment 5 	Assignment	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Inverting 5 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Assignment 6 	Assignment	1..n, Assignment List	--	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Inverting 6 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 1]









Parameter	Description	Setting range	Default	Menu path
Assignment 7 	Assignment	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Inverting 7 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Operating Mode 	Operating Mode	Working current principle, Closed-circuit principle	Working current principle	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
t-hold 	To clearly identify the state transition of a binary output relay, the "new state" is being hold, at least for the duration of the hold time.	0.00 - 300.00s	0.00s	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
t-Off Delay 	Switch Off Delay	0.00 - 300.00s	0.00s	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Latched 	Defines whether the Relay Output will be latched when it picks up.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Acknowledgement 	Acknowledgement Signal - An acknowledgement signal (that acknowledges the corresponding binary output relay) can be assigned to each output relay. The acknowledgement-signal is only effective if the parameter "Latched" is set to active.  Only available if: Latched = active	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Inverting 	Inverting of the Binary Output Relay.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Assignment 1 	Assignment	1..n, Assignment List	SG[1].ON Cmd	[Device Para /Binary Outputs /BO Slot X2 /BO 2]



<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Inverting 1 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Assignment 2 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Inverting 2 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Assignment 3 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Inverting 3 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Assignment 4 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Inverting 4 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Assignment 5 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
Inverting 5 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]



Parameter	Description	Setting range	Default	Menu path
 Assignment 6	Assignment	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
 Inverting 6	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
 Assignment 7	Assignment	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
 Inverting 7	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
 Operating Mode	Operating Mode	Working current principle, Closed-circuit principle	Working current principle	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
 t-hold	To clearly identify the state transition of a binary output relay, the "new state" is being hold, at least for the duration of the hold time.	0.00 - 300.00s	0.00s	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
 t-Off Delay	Switch Off Delay	0.00 - 300.00s	0.00s	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
 Latched	Defines whether the Relay Output will be latched when it picks up.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
 Acknowledgement	<p>Acknowledgement Signal - An acknowledgement signal (that acknowledges the corresponding binary output relay) can be assigned to each output relay. The acknowledgement-signal is only effective if the parameter "Latched" is set to active.</p> <p>Only available if: Latched = active</p>	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 3]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Inverting 	Inverting of the Binary Output Relay.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Assignment 1 	Assignment	1..n, Assignment List	SG[1].OFF Cmd	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Inverting 1 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Assignment 2 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Inverting 2 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Assignment 3 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Inverting 3 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Assignment 4 	Assignment	1..n, Assignment List	-.-	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Inverting 4 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]

Parameter	Description	Setting range	Default	Menu path
Assignment 5 	Assignment	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Inverting 5 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Assignment 6 	Assignment	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Inverting 6 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Assignment 7 	Assignment	1..n, Assignment List	.-	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Inverting 7 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
DISARMED Ctrl 	Enables and disables the disarming of the relay outputs. This is the first step of a two step process, to inhibit the operation or the relay outputs. Please refer to "DISARMED" for the second step.	inactive, active	inactive	[Service /Test (Prot inhibit) /DISARMED /BO Slot X2]
Disarm Mode 	CAUTION!RELAYS DISARMED in order to safely perform maintenance while eliminating the risk of taking an entire process off-line. (Note: The Supervision Contact cannot be disarmed). YOU MUST ENSURE that the relays are ARMED AGAIN after maintenance.	permanent, timeout	permanent	[Service /Test (Prot inhibit) /DISARMED /BO Slot X2]
t-Timeout DISARM 	The relays will be armed again after expiring of this time.  Only available if: Mode = Timeout DISARM	0.00 - 300.00s	0.03s	[Service /Test (Prot inhibit) /DISARMED /BO Slot X2]

Parameter	Description	Setting range	Default	Menu path
Force Mode 	By means of this function the normal Output Relay States can be overwritten (forced) in case that the Relay is not in a disarmed state. The relays can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	permanent, timeout	permanent	[Service /Test (Prot inhibit) /Force OR /BO Slot X2]
t-Timeout Force 	The Output State will be set by force for the duration of this time. That means for the duration of this time the Output Relay does not show the state of the signals that are assigned on it.  Only available if: Mode = Timeout DISARM	0.00 - 300.00s	0.03s	[Service /Test (Prot inhibit) /Force OR /BO Slot X2]

### Input States of the Binary Output Relays on OR- 3AI X

Name	Description	Assignment via
BO1.1	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
BO1.2	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
BO1.3	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
BO1.4	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
BO1.5	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
BO1.6	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 1]

Input, Output and LED Settings

Name	Description	Assignment via
BO1.7	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
Ack signal BO 1	Module input state: Acknowledgement signal for the binary output relay. If latching is set to active, the binary output relay can only be acknowledged if those signals that initiated the setting are fallen back and the hold time is expired.	[Device Para /Binary Outputs /BO Slot X2 /BO 1]
BO2.1	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
BO2.2	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
BO2.3	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
BO2.4	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
BO2.5	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
BO2.6	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
BO2.7	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 2]

Input, Output and LED Settings

Name	Description	Assignment via
Ack signal BO 2	Module input state: Acknowledgement signal for the binary output relay. If latching is set to active, the binary output relay can only be acknowledged if those signals that initiated the setting are fallen back and the hold time is expired.	[Device Para /Binary Outputs /BO Slot X2 /BO 2]
BO3.1	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
BO3.2	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
BO3.3	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
BO3.4	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
BO3.5	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
BO3.6	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
BO3.7	Module input state: Assignment	[Device Para /Binary Outputs /BO Slot X2 /BO 3]
Ack signal BO 3	Module input state: Acknowledgement signal for the binary output relay. If latching is set to active, the binary output relay can only be acknowledged if those signals that initiated the setting are fallen back and the hold time is expired.	[Device Para /Binary Outputs /BO Slot X2 /BO 3]

## Signals of the Binary Output Relays on OR- 3AI X

<i>Signal</i>	<i>Description</i>
BO 1	Signal: Binary Output Relay
BO 2	Signal: Binary Output Relay
BO 3	Signal: Binary Output Relay
DISARMED!	Signal: CAUTION! RELAYS DISARMED in order to safely perform maintenance while eliminating the risk of taking an entire process off-line. (Note: The Self Supervision Contact cannot be disarmed). YOU MUST ENSURE that the relays are ARMED AGAIN after maintenance
Outs forced	Signal: The State of at least one Relay Output has been set by force. That means that the state of at least one Relay is forced and hence does not show the state of the assigned signals.

## Configuration of the Analog Outputs

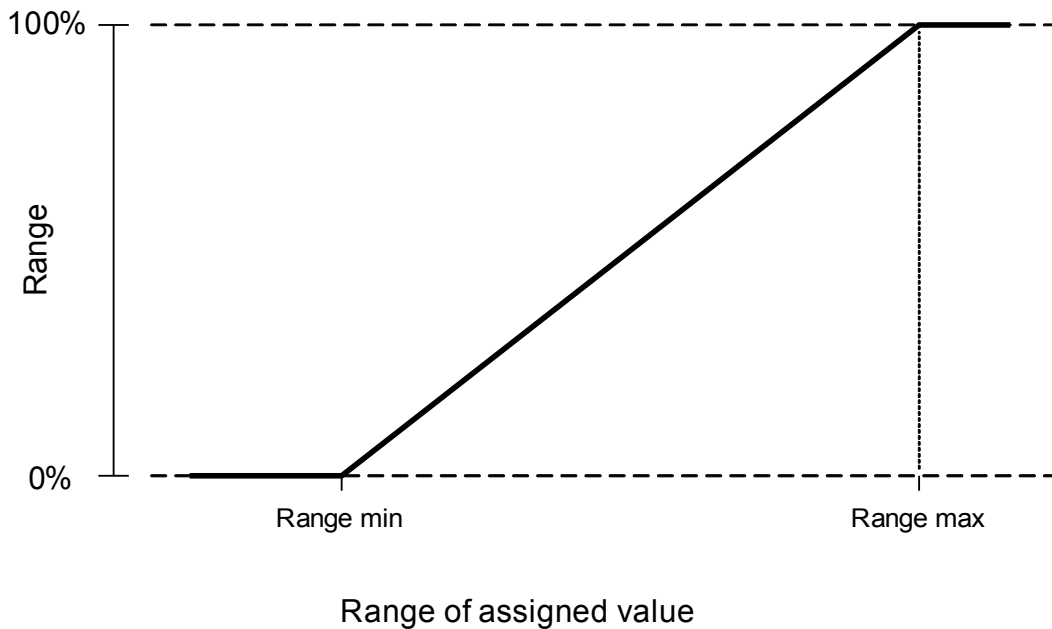
Available Elements:

AnOut[1]

The Analog Outputs can be programmed to output for three different ranges of either »0- 20mA«, »4- 20 mA«, or »0-10 Volts«.

These outputs can be configured by the User to represent the status of User programmed parameters that are available from the relay. The User will find the configuration menu for this feature under the [Device Para/ Analog Outputs] menu option. Here the User can define to which parameter the output will correlate.

Once the assignment has been made, the User can select the expected range of the parameter that will correlate to the analog output. The User will be required to enter a »Range min«, and »Range max«. The »Range min« will determine the value at which value the transmission will start. Likewise, the »Range max« value will determine the value that will result in the end value of the transmission.





## Setting Example: Analog Output with Active Power P\*

\*=only available in Devices that offer Power Protection

All settings/thresholds within the power module are to be set as per unit thresholds. Per definition  $S_n$  is to be used as scale basis.

$$S_n = \sqrt{3} * \text{VoltageTransformer}_{\text{Line-to-Line\_Rated\_Voltage}} * \text{CurrentTransformer}_{\text{Rated\_Current}}$$

*If thresholds should base on primary side values:*

$$S_n = \sqrt{3} * \text{VoltageTransformer}_{\text{Pri\_Line-to-Line\_Rated\_Voltage}} * \text{CurrentTransformer}_{\text{Pri\_Rated\_Current}}$$

*If thresholds should base on secondary side values*

$$S_n = \sqrt{3} * \text{VoltageTransformer}_{\text{Sec\_Line-to-Line\_Rated\_Voltage}} * \text{CurrentTransformer}_{\text{Sec\_Rated\_Current}}$$

### Example – Field Data

- CurrentTransformer CT pri =200 A; CT sec = 5 A
- VoltageTransformer VT pri = 10 kV; VT sec =100 V
- Active power range 1 MW to 4 MW is mapped to an Analog Outputs 0% to 100%.

*Calculating setting for Range min and Range max based on primary side values*

Active power range is 1 MW to 4 MW.

First  $S_n$  is to be calculated:

$$S_n = \sqrt{3} * \text{VoltageTransformer}_{\text{Pri\_Line-to-Line\_Rated\_Voltage}} * \text{CurrentTransformer}_{\text{Pri\_Rated\_Current}}$$

$$S_n = 1.73 * 10000 \text{ V} * 200 \text{ A} = 3.464 \text{ MVA}$$

Calculating the range settings based to  $S_n$  :

$$\text{Range min (0\%)} = 1 \text{ MW} / 3.464 \text{ MVA} = \underline{0.29 S_n}$$

$$\text{Range max (100\%)} = 4 \text{ MW} / 3.464 \text{ MVA} = \underline{1.15 S_n}$$

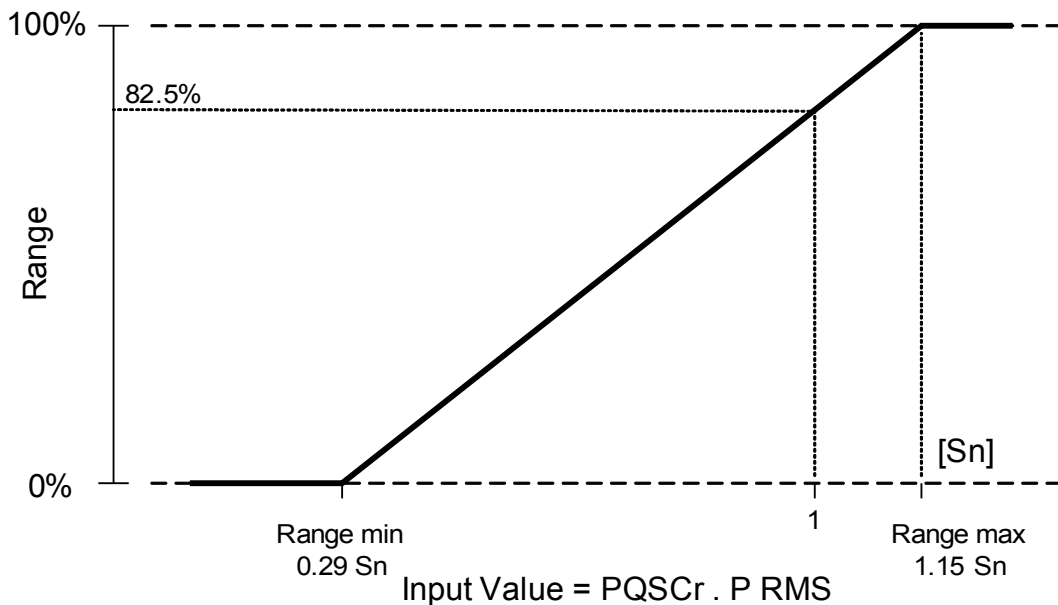
Calculate the Analog Output percentage for specific value:

$$\text{AnalogOutput (InputValue)} = 100\% / (\text{Range max} - \text{Range min}) * (\text{InputValue} - \text{Range min})$$

For e.g. Input value  $1 S_n$  :

$$\text{AnalogOutput}(1 S_n) = 100\% / 0.86 S_n * (1 S_n - 0.29 S_n) = \underline{82.5\%}$$

The Output current for e.g. 4...20mA type is then 17.7 mA = 4mA + 82.5% \* (20mA – 4mA)



### Setting Example: Analog Output with Power Factor PF\*

\*=only available in Devices that offer Power Protection

Since the sign of Power Factor PF follows the sign of Active Power P, there is no distinguish between capacitive and inductive Reactive Power. Hence, for Analog Output assignment the setting for PF output range uses a Power Factor with a "Sign Convention":

- a positive sign (+) PF, if Active and Reactive Power has same sign
- a negative sign (-) PF, if Active and Reactive Power has different sign

For e.g. if Active Power is flowing into the load and Current lags the voltage for a inductive load, PF with sign convention uses a positive sign. This is important to set the right range settings for Analog Ouput.

Use case for analog instrument with 4...20mA with linear scale, where scale is in range from 0.8 capacitive to 0.3 inductive, following setting should be uses:

$$\begin{aligned} \text{Range min (0\%)} &= \underline{-0.8} \\ \text{Range max (100\%)} &= \underline{+0.3} \end{aligned}$$

Calculate the Analog Output percentage for specific value for e.g. unity:  $|PF|=1$  at  $\phi = 0^\circ$ :

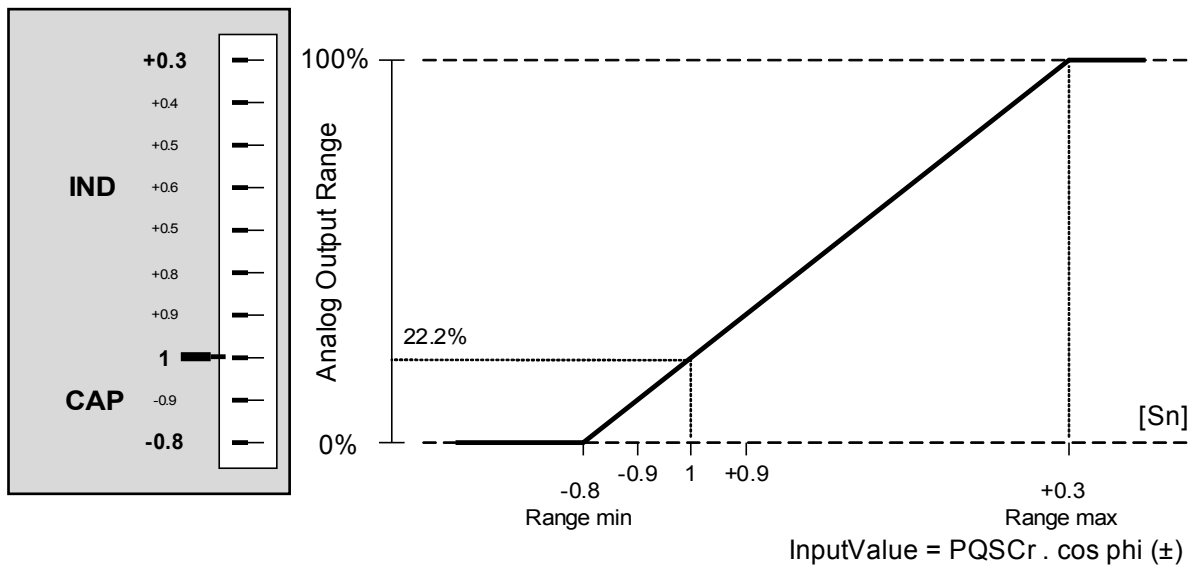
First the signed PF needs to be converted into a linear range:

$$\begin{aligned} \text{Range min' (0\%)} &= -1 - (-0.8) = \underline{-0.2} \\ \text{Range max' (100\%)} &= +1 - (+0.3) = \underline{+0.7} \\ \text{InputValue'} &= +1 - (+1) = \underline{0.0} \end{aligned}$$







$$\text{AnalogOutput (InputValue')} = 100\% / (\text{Range max'} - \text{Range min}') * (\text{InputValue'} - \text{Range min}')$$

$$\text{AnalogOutput( 0 )} = 100\% / 0.9 * 0.2 = \underline{22.2\%}$$



The Output current for e.g. 4...20mA type is then  $\underline{7.5 \text{ mA}} = 4\text{mA} + 22.2\% * (20\text{mA} - 4\text{mA})$



## Global Protection Parameters of the Analog Outputs

Parameter	Description	Setting range	Default	Menu path
Assignment 	Assignment	1..n, AnalogOutputList	-.-	[Device Para /Analog Outputs /AnOut[1]]
Range 	Adjustable range	0...20mA, 4...20mA	0...20mA	[Device Para /Analog Outputs /AnOut[1]]
Range max 	Adjustable range maximum.	-999999.00 - 999999.00°C	1.00°C	[Device Para /Analog Outputs /AnOut[1]]
Range min 	Adjustable range minimum.	-999999.00 - 999999.00°C	0.00°C	[Device Para /Analog Outputs /AnOut[1]]
Force Mode 	For commissioning purposes or for maintenance, Analog Outputs can be set by force. By means of this function the normal Analog Outputs can be overwritten (forced).	permanent, timeout	permanent	[Service /Test (Prot inhibit) /Analog Outputs /AnOut[1]]
t-Timeout Force 	The Analog Output Value will be set by force for the duration of this time. That means for the duration of this time the Analog Output does not show the value of the signals that are assigned on it.  Only available if: Force Mode = active	0.00 - 300.00s	0.03s	[Service /Test (Prot inhibit) /Analog Outputs /AnOut[1]]

## Direct Commands of the Analog Outputs

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Function 	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Service /Test (Prot inhibit) /Analog Outputs /AnOut[1]]
Force Value 	By means of this function the Analog Output Value can be overwritten (forced).	0.00 - 100.00%	0%	[Service /Test (Prot inhibit) /Analog Outputs /AnOut[1]]

## Signals of the Analog Outputs










<i>Signal</i>	<i>Description</i>
Force Mode	For commissioning purposes or for maintenance, Analog Outputs can be set by force. By means of this function the normal Analog Outputs can be overwritten (forced).











## List of the Analog Outputs

<i>Name</i>	<i>Description</i>
--	No assignment
CT.IL1 RMS	Measured value: Phase current (RMS)
CT.IL2 RMS	Measured value: Phase current (RMS)
CT.IL3 RMS	Measured value: Phase current (RMS)
CT.IG meas RMS	Measured value (measured): IG (RMS)
CT.IG calc RMS	Measured value (calculated): IG (RMS)
CT.I1	Measured value (calculated): Positive phase sequence current (fundamental)
CT.I2	Measured value (calculated): Unbalanced load current (fundamental)
CT.%IL1 THD	Measured value (calculated): IL1 Total Harmonic Distortion
CT.%IL2 THD	Measured value (calculated): IL2 Total Harmonic Distortion
CT.%IL3 THD	Measured value (calculated): IL3 Total Harmonic Distortion
CT.IL1 THD	Measured value (calculated): IL1 Total Harmonic Current
CT.IL2 THD	Measured value (calculated): IL2 Total Harmonic Current
CT.IL3 THD	Measured value (calculated): IL3 Total Harmonic Current
MStart.IL1 Ib	Measured value: Phase current as multiple of Ib
MStart.IL2 Ib	Measured value: Phase current as multiple of Ib
MStart.IL3 Ib	Measured value: Phase current as multiple of Ib
MStart.I3 P (%Ib) avg	Average RMS current of all 3 phases as percentages of Ib
MStart.I3P Fla Demand	RMS current of all 3 phases calculated in a fixed demand window as percentages of Ib
ThR.I2T Used	Thermal capacity used.
ThR.I2T Remained	Thermal capacity remained.
URTD.Windg1	Winding 1
URTD.Windg2	Winding 2
URTD.Windg3	Winding 3
URTD.Windg4	Winding 4
URTD.Windg5	Winding 5
URTD.Windg6	Winding 6
URTD.MotBear1	Motor Bearing 1
URTD.MotBear2	Motor Bearing 2
URTD.LoadBear1	Load Bearing 1
URTD.LoadBear2	Load Bearing 2
URTD.Aux1	Auxiliary1
URTD.Aux2	Auxiliary2
URTD.RTD Max	Maximum temperature of all channels.
RTD.HottestWindingTemp	Hottest motor winding temperature in degrees C.
RTD.Hottest MotBearTemp	Hottest motor bearing temperature in degrees C.












## Global Protection Parameters of the LED Module











### LEDs group A











Parameter	Description	Setting range	Default	Menu path
Latched 	Defines whether the LED will be latched when it picks up.	inactive, active	active	[Device Para /LEDs /LED 1]
Ack signal 	Acknowledgement signal for the LED. If latching is set to active the LED can only be acknowledged if those signals that initiated the setting are no longer present.  Dependency Only available if: Latched = active	1..n, Assignment List	-.	[Device Para /LEDs /LED 1]
LED active color 	The LED lights up in this color if the state of the OR-assignment of the signals is true.	green, red, red flash, green flash, -	red	[Device Para /LEDs /LED 1]
LED inactive color 	The LED lights up in this color if the state of the OR-assignment of the signals is untrue.	green, red, red flash, green flash, -	-	[Device Para /LEDs /LED 1]
Assignment 1 	Assignment	1..n, Assignment List	SG[1].TripCmd	[Device Para /LEDs /LED 1]
Inverting 1 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 1]
Assignment 2 	Assignment	1..n, Assignment List	-.	[Device Para /LEDs /LED 1]
Inverting 2 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 1]
Assignment 3 	Assignment	1..n, Assignment List	-.	[Device Para /LEDs /LED 1]



Parameter	Description	Setting range	Default	Menu path
Inverting 3 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 1]
Assignment 4 	Assignment	1..n, Assignment List	--	[Device Para /LEDs /LED 1]
Inverting 4 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 1]
Assignment 5 	Assignment	1..n, Assignment List	--	[Device Para /LEDs /LED 1]
Inverting 5 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 1]
Latched 	Defines whether the LED will be latched when it picks up.	inactive, active	active	[Device Para /LEDs /LED 2]
Ack signal 	Acknowledgement signal for the LED. If latching is set to active the LED can only be acknowledged if those signals that initiated the setting are no longer present.  Only available if: Latched = active	1..n, Assignment List	--	[Device Para /LEDs /LED 2]
LED active color 	The LED lights up in this color if the state of the OR-assignment of the signals is true.	green, red, red flash, green flash, -	red	[Device Para /LEDs /LED 2]
LED inactive color 	The LED lights up in this color if the state of the OR-assignment of the signals is untrue.	green, red, red flash, green flash, -	-	[Device Para /LEDs /LED 2]
Assignment 1 	Assignment	1..n, Assignment List	Prot.Alarm	[Device Para /LEDs /LED 2]
























<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Inverting 1 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 2]
Assignment 2 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 2]
Inverting 2 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 2]
Assignment 3 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 2]
Inverting 3 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 2]
Assignment 4 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 2]
Inverting 4 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 2]
Assignment 5 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 2]
Inverting 5 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 2]
Latched 	Defines whether the LED will be latched when it picks up.	inactive, active	active	[Device Para /LEDs /LED 3]
Ack signal 	Acknowledgement signal for the LED. If latching is set to active the LED can only be acknowledged if those signals that initiated the setting are no longer present.  Only available if: Latched = active	1..n, Assignment List	-.-	[Device Para /LEDs /LED 3]











Parameter	Description	Setting range	Default	Menu path
LED active color 	The LED lights up in this color if the state of the OR-assignment of the signals is true.	green, red, red flash, green flash, -	red	[Device Para /LEDs /LED 3]
LED inactive color 	The LED lights up in this color if the state of the OR-assignment of the signals is untrue.	green, red, red flash, green flash, -	-	[Device Para /LEDs /LED 3]
Assignment 1 	Assignment	1..n, Assignment List	ThR.Alarm	[Device Para /LEDs /LED 3]
Inverting 1 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 3]
Assignment 2 	Assignment	1..n, Assignment List	I[1].Alarm	[Device Para /LEDs /LED 3]
Inverting 2 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 3]
Assignment 3 	Assignment	1..n, Assignment List	--	[Device Para /LEDs /LED 3]
Inverting 3 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 3]
Assignment 4 	Assignment	1..n, Assignment List	--	[Device Para /LEDs /LED 3]
Inverting 4 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 3]








Parameter	Description	Setting range	Default	Menu path
Assignment 5 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 3]
Inverting 5 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 3]
Latched 	Defines whether the LED will be latched when it picks up.	inactive, active	active	[Device Para /LEDs /LED 4]
Ack signal 	Acknowledgement signal for the LED. If latching is set to active the LED can only be acknowledged if those signals that initiated the setting are no longer present.  Only available if: Latched = active	1..n, Assignment List	-.-	[Device Para /LEDs /LED 4]
LED active color 	The LED lights up in this color if the state of the OR-assignment of the signals is true.	green, red, red flash, green flash, -	red	[Device Para /LEDs /LED 4]
LED inactive color 	The LED lights up in this color if the state of the OR-assignment of the signals is untrue.	green, red, red flash, green flash, -	-	[Device Para /LEDs /LED 4]
Assignment 1 	Assignment	1..n, Assignment List	MStart.Blo	[Device Para /LEDs /LED 4]
Inverting 1 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 4]
Assignment 2 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 4]
Inverting 2 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 4]

Parameter	Description	Setting range	Default	Menu path
Assignment 3 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 4]
Inverting 3 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 4]
Assignment 4 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 4]
Inverting 4 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 4]
Assignment 5 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 4]
Inverting 5 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 4]
Latched 	Defines whether the LED will be latched when it picks up.	inactive, active	inactive	[Device Para /LEDs /LED 5]
Ack signal 	Acknowledgement signal for the LED. If latching is set to active the LED can only be acknowledged if those signals that initiated the setting are no longer present.  Only available if: Latched = active	1..n, Assignment List	-.-	[Device Para /LEDs /LED 5]
LED active color 	The LED lights up in this color if the state of the OR-assignment of the signals is true.	green, red, red flash, green flash, -	red flash	[Device Para /LEDs /LED 5]
LED inactive color 	The LED lights up in this color if the state of the OR-assignment of the signals is untrue.	green, red, red flash, green flash, -	-	[Device Para /LEDs /LED 5]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Assignment 1 	Assignment	1..n, Assignment List	MStart.Start	[Device Para /LEDs /LED 5]
Inverting 1 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 5]
Assignment 2 	Assignment	1..n, Assignment List	.-.	[Device Para /LEDs /LED 5]
Inverting 2 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 5]
Assignment 3 	Assignment	1..n, Assignment List	.-.	[Device Para /LEDs /LED 5]
Inverting 3 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 5]
Assignment 4 	Assignment	1..n, Assignment List	.-.	[Device Para /LEDs /LED 5]
Inverting 4 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 5]
Assignment 5 	Assignment	1..n, Assignment List	.-.	[Device Para /LEDs /LED 5]
Inverting 5 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 5]
Latched 	Defines whether the LED will be latched when it picks up.	inactive, active	inactive	[Device Para /LEDs /LED 6]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Ack signal 	Acknowledgement signal for the LED. If latching is set to active the LED can only be acknowledged if those signals that initiated the setting are no longer present.  Only available if: Latched = active	1..n, Assignment List	.-	[Device Para /LEDs /LED 6]
LED active color 	The LED lights up in this color if the state of the OR-assignment of the signals is true.	green, red, red flash, green flash, -	red	[Device Para /LEDs /LED 6]
LED inactive color 	The LED lights up in this color if the state of the OR-assignment of the signals is untrue.	green, red, red flash, green flash, -	-	[Device Para /LEDs /LED 6]
Assignment 1 	Assignment	1..n, Assignment List	MStart.Run	[Device Para /LEDs /LED 6]
Inverting 1 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 6]
Assignment 2 	Assignment	1..n, Assignment List	.-	[Device Para /LEDs /LED 6]
Inverting 2 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 6]
Assignment 3 	Assignment	1..n, Assignment List	.-	[Device Para /LEDs /LED 6]
Inverting 3 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 6]
Assignment 4 	Assignment	1..n, Assignment List	.-	[Device Para /LEDs /LED 6]

Parameter	Description	Setting range	Default	Menu path
 Inverting 4	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 6]
 Assignment 5	Assignment	1..n, Assignment List	--	[Device Para /LEDs /LED 6]
 Inverting 5	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 6]
 Latched	Defines whether the LED will be latched when it picks up.	inactive, active	inactive	[Device Para /LEDs /LED 7]
 Ack signal	Acknowledgement signal for the LED. If latching is set to active the LED can only be acknowledged if those signals that initiated the setting are no longer present.  Only available if: Latched = active	1..n, Assignment List	--	[Device Para /LEDs /LED 7]
 LED active color	The LED lights up in this color if the state of the OR-assignment of the signals is true.	green, red, red flash, green flash, -	green	[Device Para /LEDs /LED 7]
 LED inactive color	The LED lights up in this color if the state of the OR-assignment of the signals is untrue.	green, red, red flash, green flash, -	-	[Device Para /LEDs /LED 7]
 Assignment 1	Assignment	1..n, Assignment List	MStart.Stop	[Device Para /LEDs /LED 7]
 Inverting 1	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 7]
 Assignment 2	Assignment	1..n, Assignment List	--	[Device Para /LEDs /LED 7]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Inverting 2 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 7]
Assignment 3 	Assignment	1..n, Assignment List	--	[Device Para /LEDs /LED 7]
Inverting 3 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 7]
Assignment 4 	Assignment	1..n, Assignment List	--	[Device Para /LEDs /LED 7]
Inverting 4 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 7]
Assignment 5 	Assignment	1..n, Assignment List	--	[Device Para /LEDs /LED 7]
Inverting 5 	Inverting of the state of the assigned signal.	inactive, active	inactive	[Device Para /LEDs /LED 7]

### LED Module Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
LED1.1	Module input state: LED	[Device Para /LEDs /LED 1]
LED1.2	Module input state: LED	[Device Para /LEDs /LED 1]
LED1.3	Module input state: LED	[Device Para /LEDs /LED 1]



Input, Output and LED Settings

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
LED1.4	Module input state: LED	[Device Para /LEDs /LED 1]
LED1.5	Module input state: LED	[Device Para /LEDs /LED 1]
Acknow Sig 1	Module input state: Acknowledgement Signal (only for automatic acknowledgement)	[Device Para /LEDs /LED 1]
LED2.1	Module input state: LED	[Device Para /LEDs /LED 2]
LED2.2	Module input state: LED	[Device Para /LEDs /LED 2]
LED2.3	Module input state: LED	[Device Para /LEDs /LED 2]
LED2.4	Module input state: LED	[Device Para /LEDs /LED 2]
LED2.5	Module input state: LED	[Device Para /LEDs /LED 2]
Acknow Sig 2	Module input state: Acknowledgement Signal (only for automatic acknowledgement)	[Device Para /LEDs /LED 2]
LED3.1	Module input state: LED	[Device Para /LEDs /LED 3]
LED3.2	Module input state: LED	[Device Para /LEDs /LED 3]
LED3.3	Module input state: LED	[Device Para /LEDs /LED 3]
LED3.4	Module input state: LED	[Device Para /LEDs /LED 3]

## Input, Output and LED Settings

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
LED3.5	Module input state: LED	[Device Para /LEDs /LED 3]
Acknow Sig 3	Module input state: Acknowledgement Signal (only for automatic acknowledgement)	[Device Para /LEDs /LED 3]
LED4.1	Module input state: LED	[Device Para /LEDs /LED 4]
LED4.2	Module input state: LED	[Device Para /LEDs /LED 4]
LED4.3	Module input state: LED	[Device Para /LEDs /LED 4]
LED4.4	Module input state: LED	[Device Para /LEDs /LED 4]
LED4.5	Module input state: LED	[Device Para /LEDs /LED 4]
Acknow Sig 4	Module input state: Acknowledgement Signal (only for automatic acknowledgement)	[Device Para /LEDs /LED 4]
LED5.1	Module input state: LED	[Device Para /LEDs /LED 5]
LED5.2	Module input state: LED	[Device Para /LEDs /LED 5]
LED5.3	Module input state: LED	[Device Para /LEDs /LED 5]
LED5.4	Module input state: LED	[Device Para /LEDs /LED 5]
LED5.5	Module input state: LED	[Device Para /LEDs /LED 5]

Input, Output and LED Settings

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Acknow Sig 5	Module input state: Acknowledgement Signal (only for automatic acknowledgement)	[Device Para /LEDs /LED 5]
LED6.1	Module input state: LED	[Device Para /LEDs /LED 6]
LED6.2	Module input state: LED	[Device Para /LEDs /LED 6]
LED6.3	Module input state: LED	[Device Para /LEDs /LED 6]
LED6.4	Module input state: LED	[Device Para /LEDs /LED 6]
LED6.5	Module input state: LED	[Device Para /LEDs /LED 6]
Acknow Sig 6	Module input state: Acknowledgement Signal (only for automatic acknowledgement)	[Device Para /LEDs /LED 6]
LED7.1	Module input state: LED	[Device Para /LEDs /LED 7]
LED7.2	Module input state: LED	[Device Para /LEDs /LED 7]
LED7.3	Module input state: LED	[Device Para /LEDs /LED 7]
LED7.4	Module input state: LED	[Device Para /LEDs /LED 7]
LED7.5	Module input state: LED	[Device Para /LEDs /LED 7]
Acknow Sig 7	Module input state: Acknowledgement Signal (only for automatic acknowledgement)	[Device Para /LEDs /LED 7]

## LED configuration

The LEDs can be configured within menu:

[Device Para/LEDs/Group X]

### CAUTION

Attention must be paid that there are no overlapping functions due to double or multiple LED assignment of colors and flashing codes.

### CAUTION

If LEDs are parameterized »Latched=*active*«, they will keep (return into) their blink code/color even if there is a break within the power supply.

If LEDs are parameterized »Latched=*active*«, The LED blink code will also retain, if the LED is reprogrammed in another way. This applies also if »Latched is set to *inactive*«. Resetting a LED that has latched a signal will always require an acknowledgement.

### NOTICE

This chapter contains information on the LEDs that are placed on the left hand of the display (group A).

If your device is also equipped with LEDs on the right hand of the display (group B), the information in this chapter is valid analog. The only difference is “group A” and “group B” within the menu paths.

Via push button »INFO« it is always possible to display the current alarms/alarm texts that are assigned to an LED. Please refer to chapter *Navigation* (description of the »INFO-key«).

Set the following parameters for each LED:

- »Latching/self holding function«: If »Latching« is set to »*active*«, the state that is set by the alarms will be stored. If latching »Latching« is set to »*inactive*«, the LED always adopts the state of those alarms that were assigned.
- »Acknowledgment« (signal from the »assignment list«)
- »LED active color«, LED lights up in this color in case that at least one of the allocated functions is valid (red, red flashing, green, green flashing, off).
- »LED inactive color«, LED lights up in this color in case that none of the allocated functions is valid (red, red flashing, green, green flashing, off).
- Apart from the *LED for System OK*, each LED can be assigned up to five functions/alarms out of the »assignment list«.
- »Inverting« (of the signals), if necessary.

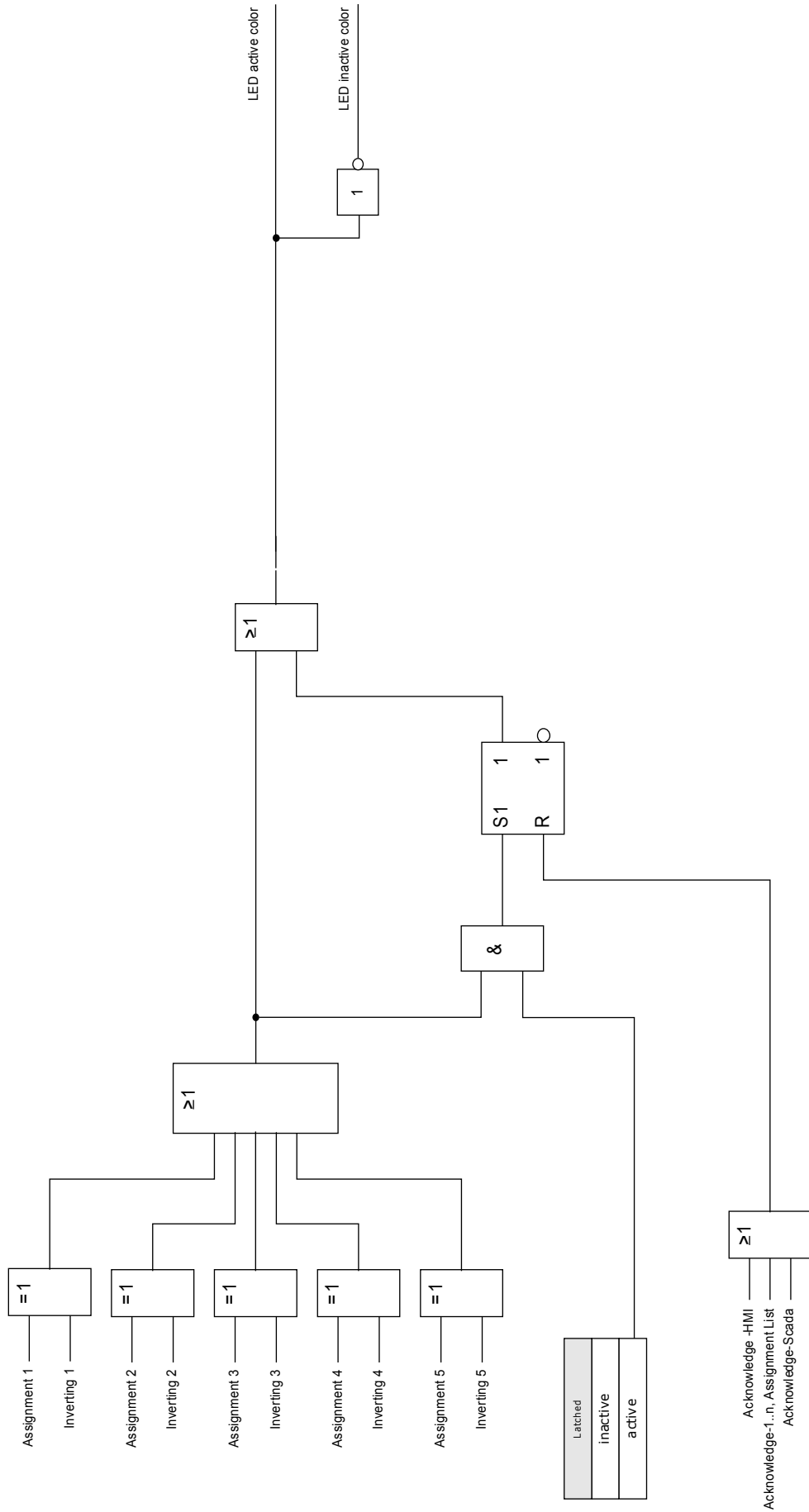
### *Acknowledgment options*

LEDs can be acknowledged by:

- Via the push-button »C« at the operating panel.
- Each LED can be acknowledged by a signal of the »assignment list« (If »*Latched = active*«).
- Via the module »Ex Acknowledge« all LEDs can be acknowledged at once, if the signal for external acknowledgment that was selected from the »assignment list« becomes true (e.g. the state of a digital input).
- Via SCADA, all LEDs can be acknowledged at once.

### **NOTICE**

The Product-CD that is delivered with the device contains a PDF-Template in order to create and print out self adhesive films for LED assignment texts (front foil) by means of a laser printer. Recommendation: (AVERY Zweckform Art.Nr.3482)



## The »System OK« LED

This LED flashes green while the device is booting. After completed booting, the LED for *System OK* lights up in green thus signaling that the *protection* (function) is »*activated*«. Please refer to chapter "Self-Supervision" and to the external document "*Trouble Shooting Guide*" to find out further information on blink codes of the *System OK LED*

*LED System OK* cannot be parameterized.

## Smart View

*Smart view* is a parameter setting and evaluation software.

- Menu-controlled parameter setting incl. validity checks
- Offline configuration of all relay types
- Reading and evaluating of statistical data and measuring values
- Setting into operation assistance
- Display of the device status
- Fault analysis via event- and fault recorder



## Measuring Values

### Read out Measured Values

In menu »Operation/Measured Values« both measured and calculated values can be viewed. The measured values are ordered by »Standard values« and »special values« (depending on the type of device).

### Measurement Display

Menu [Device Para\Measurem Display] offers options to change the display of measured values.

#### *Scaling of Measured values*

By means of the parameter »Scaling« the user can determine how measured values are to be displayed within the HMI and *Smart view*.

- Primary quantities
- Secondary quantities
- Per Unit quantities

#### *Power Units (applies only for devices with power measurement)*

By means of the parameter »Power Units« the User can determine how measured values are to be displayed within the HMI and *Smart view*.

- Power Auto Scaling
- kW, kVAr or kVA
- MW, MVar or MVA
- GW, GVar or GVA

### *Energy Units (applies only for devices with energy measurement)*

By means of the parameter »*Energy Units*« the User can determine how measured values are to be displayed within the HMI and *Smart view*:

- Energy Auto Scaling
- kWh, kVAh or kVAh
- MWh, MVAh or MVAh
- GWh, GVAh or GVAh

In case of an overflow of the counter, the counter will start counting again at zero. A corresponding signal will indicate the counter overflow.

#### **Counter overflow at:**

- |                       |  |
|-----------------------|--|
| ■ Energy Auto Scaling | Depends on the settings for the current and voltage transformers |
| ■ kWh, kVAh or kVAh   | 999,999.99   |
| ■ MWh, MVAh or MVAh   | 999,999.99   |
| ■ GWh, GVAh or GVAh   | 999,999.99   |

### *Temperature Unit (applies only for devices with temperature measurement)*

By means of the parameter »*Temperatur Unit*« the User can determine how measured values are to be displayed within the HMI and *Smart view*:

- ° Celsius
- ° Fahrenheit

### *Cutoff level*

In order to suppress noise within measured values that are close to zero the user has the option to set cutoff levels. By means of the cutoff levels, measuring quantities that are close to zero will be displayed as zero. These parameters have no impact on recorded values.

## Current - Measured Values

Verfügbare Elemente:  
[StW Sternp, StW Netz]

### CT

If the device is not equipped with an voltage measuring card the first measuring input on the first current measuring card (slot with the lowest number) will be used as the reference angle (»IL 1«).

Value	Description	Menu path
IL1	Measured value: Phase current (fundamental)	[Operation /Measured Values /Current ]
IL2	Measured value: Phase current (fundamental)	[Operation /Measured Values /Current ]
IL3	Measured value: Phase current (fundamental)	[Operation /Measured Values /Current ]
IG meas	Measured value (measured): IG (fundamental)	[Operation /Measured Values /Current ]
IG calc	Measured value (calculated): IG (fundamental)	[Operation /Measured Values /Current ]
I0	Measured value (calculated): Zero current (fundamental)	[Operation /Measured Values /Current ]
I1	Measured value (calculated): Positive phase sequence current (fundamental)	[Operation /Measured Values /Current ]
I2	Measured value (calculated): Unbalanced load current (fundamental)	[Operation /Measured Values /Current ]
phi IL1	Measured value (calculated): Angle of Phasor IL1	[Operation /Measured Values /Current ]

## Measuring Values

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
phi IL2	Measured value (calculated): Angle of Phasor IL2	[Operation /Measured Values /Current ]
phi IL3	Measured value (calculated): Angle of Phasor IL3	[Operation /Measured Values /Current ]
phi IG meas	Measured value (calculated): Angle of Phasor IG meas	[Operation /Measured Values /Current ]
phi IG calc	Measured value (calculated): Angle of Phasor IG calc	[Operation /Measured Values /Current ]
phi I0	Measured value (calculated): Angle Zero Sequence System	[Operation /Measured Values /Current ]
phi I1	Measured value (calculated): Angle of Positive Sequence System	[Operation /Measured Values /Current ]
phi I2	Measured Value (calculated): Angle of Negative Sequence System	[Operation /Measured Values /Current ]
IL1 RMS	Measured value: Phase current (RMS)	[Operation /Measured Values /Current RMS]
IL2 RMS	Measured value: Phase current (RMS)	[Operation /Measured Values /Current RMS]
IL3 RMS	Measured value: Phase current (RMS)	[Operation /Measured Values /Current RMS]
IG meas RMS	Measured value (measured): IG (RMS)	[Operation /Measured Values /Current RMS]
IG calc RMS	Measured value (calculated): IG (RMS)	[Operation /Measured Values /Current RMS]
%IL1 THD	Measured value (calculated): IL1 Total Harmonic Distortion	[Operation /Measured Values /Current RMS]

## Measuring Values

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
%IL2 THD	Measured value (calculated): IL2 Total Harmonic Distortion	[Operation /Measured Values /Current RMS]
%IL3 THD	Measured value (calculated): IL3 Total Harmonic Distortion	[Operation /Measured Values /Current RMS]
IL1 THD	Measured value (calculated): IL1 Total Harmonic Current	[Operation /Measured Values /Current RMS]
IL2 THD	Measured value (calculated): IL2 Total Harmonic Current	[Operation /Measured Values /Current RMS]
IL3 THD	Measured value (calculated): IL3 Total Harmonic Current	[Operation /Measured Values /Current RMS]
%(I2/I1)	Measured value (calculated): I2/I1, phase sequence will be taken into account automatically.	[Operation /Measured Values /Current ]

# Statistics

## Statistics

In menu »Operation/Statistics« the min., max. and mean values of the measured and calculated measured quantities can be found.

### Configuration of the Minimum and Maximum Values

The calculation of the minimum and maximum values will be started:

- When a Reset signal becomes active (Min/Max)
- When the device is restarted
- After configuration

<i>Minimum and Maximum Values (Peak Values/Pointers)</i>		
	<b>Time interval for the calculation of the minimum and maximum values</b>	<b>Reset</b>
<i>Configuration Options</i>  Where to configure? Within menu [Device Para\ Statistics\ Min/Max]	The minimum and maximum values will be reset with the rising edge of the corresponding reset signal.	Res Min  Res Max  (e.g. via digital Inputs). These signals will reset the minimum and maximum pointers.
<i>Display of Minimum Values</i>	Where? Within menu [Operation\Statistics\Min]	
<i>Display of Maximum Values</i>	Where? Within menu [Operation\Statistics\Max]	

## Configuration of the Average Value Calculation

### Configuration of the Current Based Average Value Calculation\*

\*=Availability depends on the ordered device code.

<b>Current based Average Values and Peak Values</b>			
	<b>Time period for the calculation of the average and peak values</b>	<b>Start options</b>	<b>Reset of the average and peak values</b>
<b>Configuration Options</b> Where to configure? In [Device Para\ Statistics\ Demand\ Current Demand]	sliding: (sliding: average calculation based on sliding period)  fixed: (fixed: Average calculation is reset by the end of the period, that means with the next starting period)	duration: (fixed or sliding period)  Start Fct: (The average values are calculated based on the time period between two rising edges of this signal)	Res Fc  (e.g. via Digital Input in order to reset the average values in advance (before the next rising edge of the start signal). This applies to option „Start FC“ only.
<i>Trip (command) option to limit the average current demand: Yes</i>	Please refer to chapter „System Alarms“		
<i>View average values and peak values</i>	Where? Within menu [Operation\Statistics\Demand]		

### Configuration of the Voltage Based Average Value Calculation\*

\*=Availability depends on the ordered device code.

<b>Voltage based Average Values</b>			
	<b>Time period for the calculation of the average values</b>	<b>Start options</b>	<b>Reset of the average and peak values</b>
<b>Configuration Options</b> Where to configure? In [Device Para\ Statistics\ Umit]	sliding: (sliding: average calculation based on sliding period)  fixed: (fixed: Average calculation is reset by the end of the period, that means with the next starting period)	duration: (fixed or sliding period)  Start Fct: (The average values are calculated based on the time period between two rising edges of this signal)	Res Fc  (e.g. via Digital Input in order to reset the average values in advance (before the next rising edge of the start signal). This applies to option „Start FC“ only.
<i>View average values</i>	Where? Within menu [Operation\Statistics\Vavg]		





## Configuration of the Power Based Average Value Calculation\*

\*=Availability depends on the ordered device code.





<b>Power based Average Values (Demand) and Peak Values</b>			
	<b>Time period for the calculation of the average and peak values</b>	<b>Start options</b>	<b>Reset of the average and peak values</b>
<b>Configuration Options</b> Where to configure? In [Device Para\ Statistics\ Bezugsmanagm\ Power Demand]	sliding: (sliding: average calculation based on sliding period)  fixed: (fixed: Average calculation is reset by the end of the period, that means with the next starting period)	duration: (fixed or sliding period)  Start Fct: (The average values are calculated based on the time period between two rising edges of this signal)	Res Fc  (e.g. via Digital Input in order to reset the average values in advance (before the next rising edge of the start signal). This applies to option „Start FC“ only.
<i>Trip (command) option to limit the average power demand: Yes</i>	Please refer to chapter „System Alarms“		
<i>View average values and peak values</i>	Where? Within menu [Operation\Statistics\Demand]		






## Direct Commands

Parameter	Description	Setting range	Default	Menu path
ResFc all 	Resetting of all Statistic values (Current Demand, Power Demand, Min, Max)	inactive, active	inactive	[Operation / Reset/Acknowledg e /Reset]
ResFc I Demand 	Resetting of Statistics - Current Demand (avg, peak avg)	inactive, active	inactive	[Operation / Reset/Acknowledg e /Reset]
ResFc Min 	Resetting of all Minimum values	inactive, active	inactive	[Operation / Reset/Acknowledg e /Reset]
ResFc Max 	Resetting of all Maximum values	inactive, active	inactive	[Operation / Reset/Acknowledg e /Reset]

## Global Protection Parameters of the Statistics Module

Parameter	Description	Setting range	Default	Menu path
ResFc Max 	Resetting of all Maximum values	1..n, Assignment List	.-	[Device Para / Statistics / Min / Max]
ResFc Min 	Resetting of all Minimum values	1..n, Assignment List	.-	[Device Para / Statistics / Min / Max]
Start I Demand via: 	Start Current demand by:	Duration, StartFct	Duration	[Device Para / Statistics / Demand / Current Demand]
Start I Demand Fc 	Start of the calculation, if the assigned signal becomes true.  Only available if: Start I Demand via: = StartFct	1..n, Assignment List	.-	[Device Para / Statistics / Demand / Current Demand]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
ResFc I Demand 	Resetting of Statistics - Current Demand (avg, peak avg)	1..n, Assignment List	.-.	[Device Para /Statistics /Demand /Current Demand]
Duration I Demand 	Recording time  Only available if: Start I Demand via: = Duration	2 s, 5 s, 10 s, 15 s, 30 s, 1 min, 5 min, 10 min, 15 min, 30 min, 1 h, 2 h, 6 h, 12 h, 1 d, 2 d, 5 d, 7 d, 10 d, 30 d	15 s	[Device Para /Statistics /Demand /Current Demand]
Window I Demand 	Window configuration	sliding, fixed	sliding	[Device Para /Statistics /Demand /Current Demand]

### States of the Inputs of the Statistics Module

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
StartFc I Demand-I	State of the module input: Start of the Statistics of the Current Demand	[Device Para /Statistics /Demand /Current Demand]
ResFc Vavg-I	State of the module input: Resetting of the sliding average calculation.	[]
ResFc I Demand-I	State of the module input: Resetting of Statistics - Current Demand (avg, peak avg)	[Device Para /Statistics /Demand /Current Demand]
ResFc P Demand-I	State of the module input: Resetting of Statistics - Power Demand (avg, peak avg)	[]
ResFc Max-I	State of the module input: Resetting of all Maximum values	[Device Para /Statistics /Min / Max]
ResFc Min-I	State of the module input: Resetting of all Minimum values	[Device Para /Statistics /Min / Max]

### Signals of the Statistics Module

<i>Signal</i>	<i>Description</i>
ResFc all	Signal: Resetting of all Statistic values (Current Demand, Power Demand, Min, Max)
ResFc I Demand	Signal: Resetting of Statistics - Current Demand (avg, peak avg)
ResFc Max	Signal: Resetting of all Maximum values
ResFc Min	Signal: Resetting of all Minimum values

### Counters of the Module Statistics

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
Res Cr I Demand	Number of resets since last booting. The timestamp shows date and time of the last reset.	[Operation /Statistics /Demand /Current Demand]
Res Cr Min values	Number of resets since last booting. The timestamp shows date and time of the last reset.	[Operation /Statistics /Min /Current]
Res Cr Max values	Number of resets since last booting. The timestamp shows date and time of the last reset.	[Operation /Statistics /Max /URTD]

### Current - Statistic Values

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
I1 max	Maximum value positive phase sequence current (fundamental)	[Operation /Statistics /Max /Current]
I1 min	Minimum value positive phase sequence current (fundamental)	[Operation /Statistics /Min /Current]
I2 max	Maximum value unbalanced load (fundamental)	[Operation /Statistics /Max /Current]
I2 min	Minimum value unbalanced load current (fundamental)	[Operation /Statistics /Min /Current]

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
IL1 max RMS	IL1 maximum value (RMS)	[Operation /Statistics /Max /Current]
IL1 avg RMS	IL1 average value (RMS)	[Operation /Statistics /Demand /Current Demand]
IL1 min RMS	IL1 minimum value (RMS)	[Operation /Statistics /Min /Current]
IL2 max RMS	IL2 maximum value (RMS)	[Operation /Statistics /Max /Current]
IL2 avg RMS	IL2 average value (RMS)	[Operation /Statistics /Demand /Current Demand]
IL2 min RMS	IL2 minimum value (RMS)	[Operation /Statistics /Min /Current]
IL3 max RMS	IL3 maximum value (RMS)	[Operation /Statistics /Max /Current]
IL3 avg RMS	IL3 average value (RMS)	[Operation /Statistics /Demand /Current Demand]
IL3 min RMS	IL3 minimum value (RMS)	[Operation /Statistics /Min /Current]

Statistics

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
IG meas max RMS	Measured value: IG maximum value (RMS)	[Operation /Statistics /Max /Current]
IG meas min RMS	Measured value: IG minimum value (RMS)	[Operation /Statistics /Min /Current]
IG calc max RMS	Measured value (calculated):IG maximum value (RMS)	[Operation /Statistics /Max /Current]
IG calc min RMS	Measured value (calculated):IG minimum value (RMS)	[Operation /Statistics /Min /Current]
%(I2/I1) max	Measured value (calculated): I2/I1 maximum value, phase sequence will be taken into account automatically	[Operation /Statistics /Max /Current]
%(I2/I1) min	Measured value (calculated): I2/I1 minimum value, phase sequence will be taken into account automatically	[Operation /Statistics /Min /Current]
IL1 Peak demand	IL1 Peak value, RMS value	[Operation /Statistics /Demand /Current Demand]
IL2 Peak demand	IL2 Peak value, RMS value	[Operation /Statistics /Demand /Current Demand]
IL3 Peak demand	IL3 Peak value, RMS value	[Operation /Statistics /Demand /Current Demand]

## System Alarms

Available Elements:

SysA

### **NOTICE**

**Please note that Power Protection and (Active/Reactive/Apparent) Power Demand is only available within Protective Devices that offer current and voltage measurement.**

Within the System Alarms menu [SysA] the User can configure:

- General Settings (activate/inactivate the Demand Management, optional assign a signal, that will block the Demand Management);
- Power Protection (Peak values);
- Demand Management (Power and Current); and
- THD Protection.

Please note, that all thresholds are to be set as primary values.

## Demand Management

Demand is the average of system current or power over a time interval (window). Demand management supports the User to keep energy demand below target values bound by contract (with the energy supplier). If the contractual target values are exceeded, extra charges are to be paid to the energy supplier.

Therefore, demand management helps the User detect and avoid averaged peak loads that are taken into account for the billing. In order to reduce the demand charge respective to demand rate, peak loads, if possible, should be diversified. That means, if possible, avoiding large loads at the same time. In order to assist the User in analyzing the demand, demand management might inform the User by an alarm. The User might also use demand alarms and assign them on relays in order to perform load shedding (where applicable).

Demand management comprises:

- Power Demand
  - Watt Demand (Active Power);
  - VAr Demand (Reactive Power);
  - VA Demand (Apparent Power); and
- Current Demand.

## Configuring the Demand

Configuring the demand is a two step procedure. Proceed as follows.

Step1: Configure the general settings within the [Device Para/Statistics/Demand] menu:

- Set the trigger source to »*Duration*«.
- Select a time base for the »*window*«.
- Determine if the window is »*fixed*« or »*sliding*«.
- If applicable assign a reset signal.

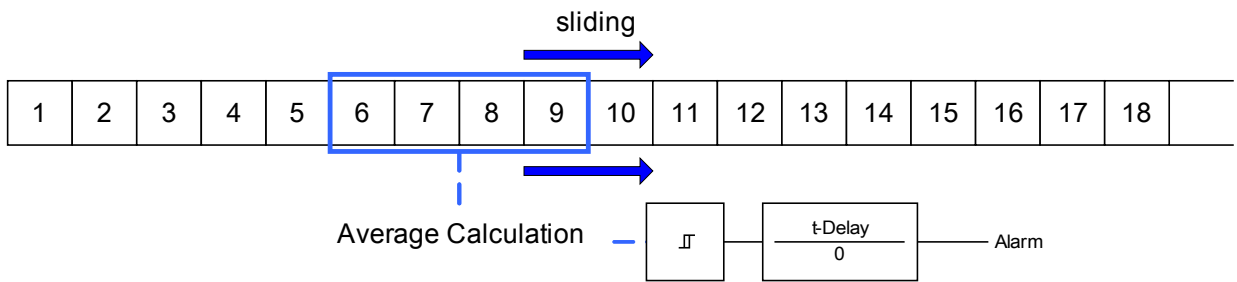
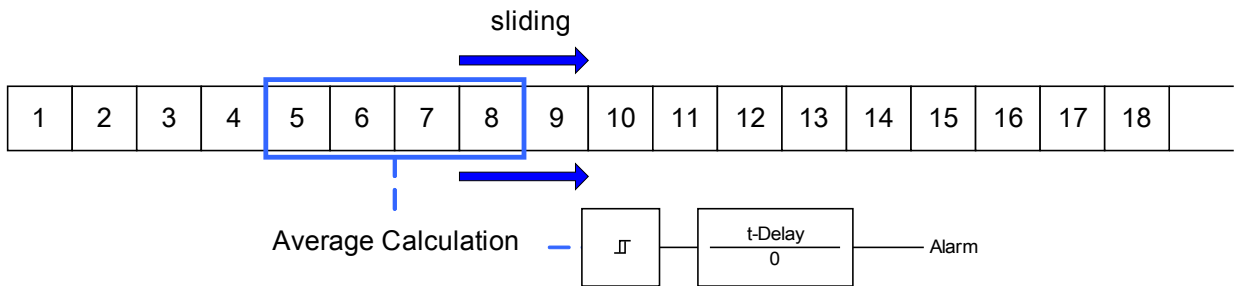
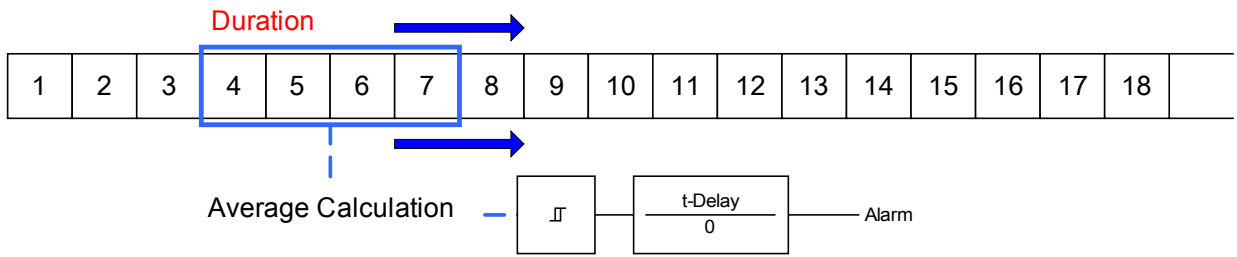
The interval time (window) can be set to fixed or sliding.

**Example for a fixed window:** If the range is set for 15 minutes, the protective device calculates the average current or power over the past 15 minutes and updates the value every 15 minutes.

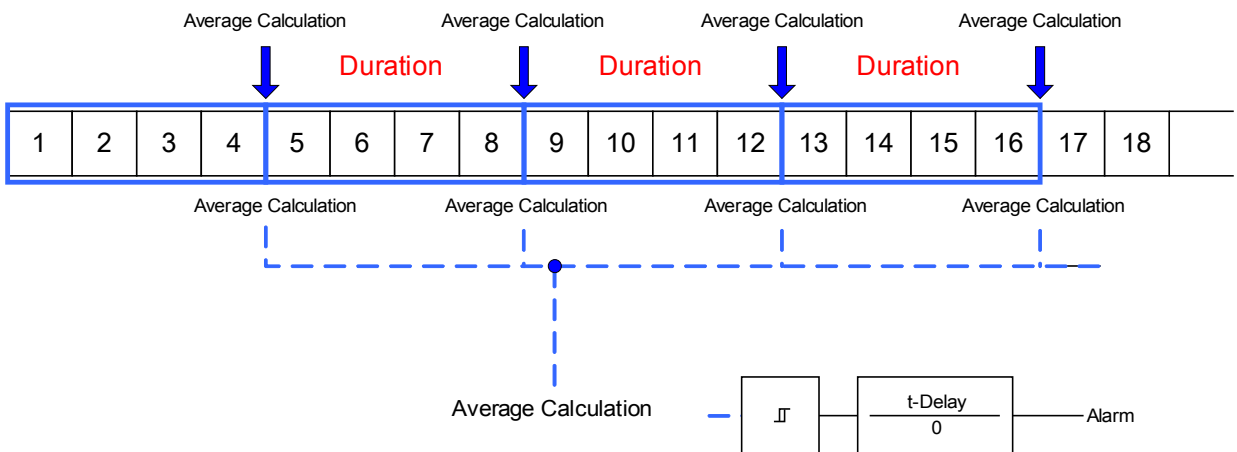
**Example for a sliding window:** If the sliding window is selected and the interval is set to 15 minutes, the protective device calculates and updates the average current or power continuously, for the past 15 minutes (the newest measuring value replaces the oldest measuring value continuously).



**Window configuration = sliding**



**Window configuration = fixed**



Step 2:

- In addition, the Demand specific settings have to be configured in the [SysA/Demand] menu.
- Determine if the demand should generate an alarm or if it should run in the silent mode. (Alarm active/inactive).
- Set the threshold.
- Where applicable, set a delay time for the alarm.

## Peak Values

The protective device also saves the peak demand values for current and power. The quantities represent the largest demand value since the demand values were last reset. Peak demands for current and system power are date and time stamped.

Within the [Operation/Statistics] menu, the current Demand and Peak demand values can be seen.

## Configuring the Peak Value Supervision

The supervision for the peak values can be configured within menu [SysA/Power] in order to monitor:

- Active Power (Watt),
- Reactive Power (VAr)
- Apparent Power (VA)

The specific settings are to be set within menu [SysA/Power].

- Determine if the peak value supervision should generate an alarm or if it should run in the silent mode. (Alarm active/inactive).
- Set the threshold.
- Where applicable, set a delay time for the alarm.

## Min. and Max. Values.

Within [Operation/Statistics] menu the minimum (min.) and maximum (max.) values can be seen.

**Minimum values since last reset:** The minimum values are continuously compared to the last minimum value for that measuring value. If the new value is less than the last minimum, the value is updated. Within the [Device Para/Statistics/"Min / Max"] menu, a reset signal can be assigned.

**Maximum values since last reset:** The maximum values are continuously compared to the last maximum value for that measuring value. If the new value is greater than the last maximum, the value is updated. Within the [Device Para/Statistics/"Min / Max"] menu, a reset signal can be assigned.


## THD Protection

In order to supervise power quality, the protective device can monitor the voltage (phase-to-phase) and current THDs.

Within the [SysA/THD] menu:

- Determine if an alarm is to be issued or not (Alarm active/inactive);
- Set the threshold; and
- Where applicable, set a delay time for the alarm.


## Device Planning Parameters of the Demand Management

Parameter	Description	Options	Default	Menu path
Mode 	Mode	do not use, use	do not use	[Device planning]

## Signals of the Demand Management (States of the Outputs)

Signal	Description
active	Signal: active
ExBlo	Signal: External Blocking
Alm Current Demd	Signal: Alarm averaged demand current
Alarm I THD	Signal: Alarm Total Harmonic Distortion Current
Trip Current Demand	Signal: Trip averaged demand current
Trip I THD	Signal: Trip Total Harmonic Distortion Current

### Global Protection Parameter of the Demand Management

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[SysA /General settings]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo Fc=active".	1..n, Assignment List	.-	[SysA /General settings]
Alarm 	Alarm	inactive, active	inactive	[SysA /Demand /Current Demand]
Threshold 	Threshold (to be entered as primary value)	10 - 500000A	500A	[SysA /Demand /Current Demand]
t-Delay 	Tripping Delay	0 - 60min	0min	[SysA /Demand /Current Demand]
Alarm 	Alarm	inactive, active	inactive	[SysA /THD /I THD]
Threshold 	Threshold (to be entered as primary value)	1 - 500000A	500A	[SysA /THD /I THD]
t-Delay 	Tripping Delay	0 - 3600s	0s	[SysA /THD /I THD]

### States of the Inputs of the Demand Management

Name	Description	Assignment via
ExBlo-I	Module input state: External blocking	[SysA /General settings]

# Acknowledgments

Collective Acknowledgments for latched signals:

<b>Collective Acknowledgments</b>					
	<i>LEDs</i>	<i>Binary Output Relays</i>	<i>SCADA</i>	<i>Pending Trip Command</i>	<i>LEDs+ Binary Output Relays+ SCADA+ Pending Trip Command</i>
<p>Via <b>Smart view</b> or at the <b>panel all...</b> can be acknowledged.</p> <p>At the panel, the menu [Operation\ Acknowledge] can directly be accessed via the <b>»C«</b> key</p>	<p>All LEDs at once: Where? [Operation\ Acknowledge]</p>	<p>All Binary Output Relays at once: Where? [Operation\ Acknowledge]</p>	<p>All SCADA signals at once: Where? [Operation\ Acknowledge]</p>	<p>All pending trip commands at once: Where? [Operation\ Acknowledge]</p>	<p>All at once: Where? [Operation\ Acknowledge]</p>
<p><b>External Acknowledgment*:</b> Via a signal from the assignment list (e.g. a digital Input) <b>all...</b> can be acknowledged.</p>	<p>All LEDs at once: Where? Within the menu <u>Ex Acknowledge</u></p>	<p>All Binary Output Relays at once: <u>Where? Within the menu Ex Acknowledge</u></p>	<p>All SCADA signals at once: <u>Where? Within the menu Ex Acknowledge</u></p>	<p>All pending trip commands at once: <u>Where? Within the menu Ex Acknowledge</u></p>	

\*The External Acknowledgement might be disabled if parameter »Ex Ack «is set to »inactive« within menu [Device Para/Ex Acknowledge]. This blocks also the acknowledgement via Communication (e.g. Modbus).

Options for individual acknowledgments for latched signals:

<b>Individual Acknowledgment</b>			
	<i>LEDs</i>	<i>Binary Output Relays</i>	<i>Pending Trip Command</i>
Via a signal from the assignment list (e.g.:a digital Input) a <b>single</b> ... can be acknowledged.	<p>Single LED:</p> <p>Where?</p> <p>Within the configuration menu of this single LED.</p>	<p>Binary Output Relay:</p> <p>Where?</p> <p>Within the configuration menu of this single Binary Output Relay.</p>	<p>Pending Trip Command.</p> <p>Where?</p> <p>Within the module <u><i>TripControl</i></u></p>

**NOTICE** As long as you are within the parameter setting mode, you cannot acknowledge.

**NOTICE** In case of a fault during parameter setting via the operating panel, you must first leave the parameter mode by pressing either push-button »C« or »OK« before you may access to menu »Acknowledgments« via push-button.

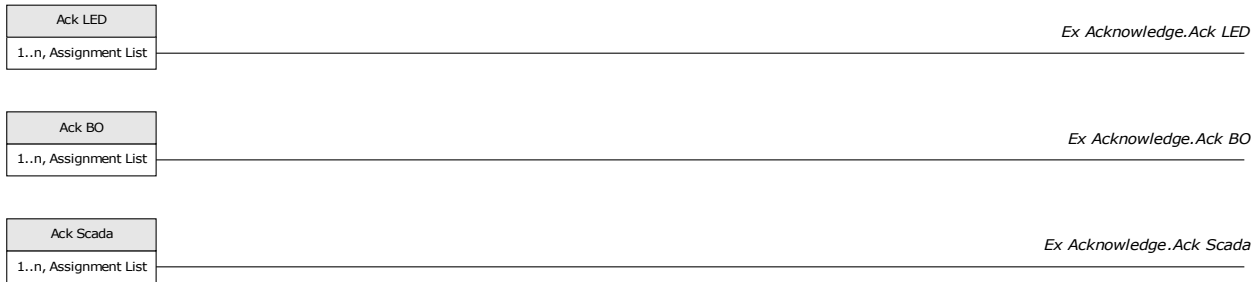
## Manual Acknowledgment

- Press the C-Button at the panel.
- Select the item to be acknowledged via the Softkeys:
  - Binary output relays,
  - LEDs,
  - SCADA,
  - a pending trip command or
  - all (above) mentioned items at once.
  
- Press the Softkey with the »Wrench-Symbol«.
- Enter your password.

## External Acknowledgments

Within the menu [Ex Acknowledge] you can assign a signal (e.g. the state of a digital input) from the assignment list that:

- acknowledges all (acknowledgeable) LEDs at once;
- acknowledges all (acknowledgeable) binary outputs at once:
- acknowledges all (acknowledgeable) SCADA-signals at once.



Within the menu [Protection Para\Global Prot Para\TripControl] you can assign a signal that:

- acknowledges a pending trip command.

For details, please refer to chapter »*TripControl*«.

## Manual Resets

In menu »Operation/Reset« you can:

- reset counters,
- delete records (e.g. disturbance records) and
- reset special things (like statistics, thermal replica...).

### **NOTICE**

The description of the reset commands can be found within the corresponding modules.

## Reset to Factory Defaults

### **⚠ WARNING**

This Function will reset the device to the factory defaults. All records will be deleted and the measured values and counters will be reset. The operation hours counter will be kept.



This Function is available at the HMI only.

- Press the »C-key« during a cold start, in order to access the »Reset« menu.
- Select »Reset to factory default«.
- Confirm »Reset device to factory defaults and reboot« with »Yes« in order to execute the reset to factory defaults.«



## Status Display

In the status display within the »Operation« menu, the present state of all signals can be viewed. This means the User is able to see if the individual signals are active or inactive at that moment. The User can see all signals sorted by protective elements/modules.

<i>State of the module input/signal is...</i>	<i>Is shown at the panel as...</i>
false / »0«	
true / »1«	


## Operating Panel (HMI)

### HMI





### Special Parameters of the Panel

This menu »Device Parameter/HMI« is used to define the contrast of the display, the maximum admissible edit time and the menu language (after expiry of which, all unsaved parameter changes will be rejected).

### Direct Commands of the Panel

Parameter	Description	Setting range	Default	Menu path
Contrast 	Contrast	0 - 100%	50%	[Device Para /HMI]

### Global Protection Parameters of the Panel

Parameter	Description	Setting range	Default	Menu path
t-max Edit/Access 	If no other key(s) is pressed at the panel, after expiration of this time, all cached (changed) parameters are canceled. The device access will be locked by falling back into Read-only level Lv0.	20 - 3600s	180s	[Device Para /HMI]
Display Off 	The display back light will be turned off when this timer has expired.	20 - 3600s	180s	[Device Para /HMI]
Menu language 	Selection of the language	English, German, Russian, Polish, French, Portuguese, Spanish	English	[Device Para /HMI]
Display ANSI Device Numbers 	Display ANSI Device Numbers	inactive, active	active	[Device Para /HMI]

## Recorders

### Disturbance Recorder

Available elements:

Disturb rec

The disturbance recorder works with 32 samples per cycle. The disturbance recorder can be started by one of eight start events (selection from the »assignment list«/OR-Logic). The disturbance record contains the measuring values inclusively pre-trigger-time. By means of *Smart view/Datavisualizer* (option) the oscillographic curves of the analogue (current, voltage) and digital channels/traces can be shown and evaluated in a graphical form. The disturbance recorder has a storage capacity of 120s. The disturbance recorder is able to record up to 10 s (adjustable) per record. The amount of records depends on the file size of each record.

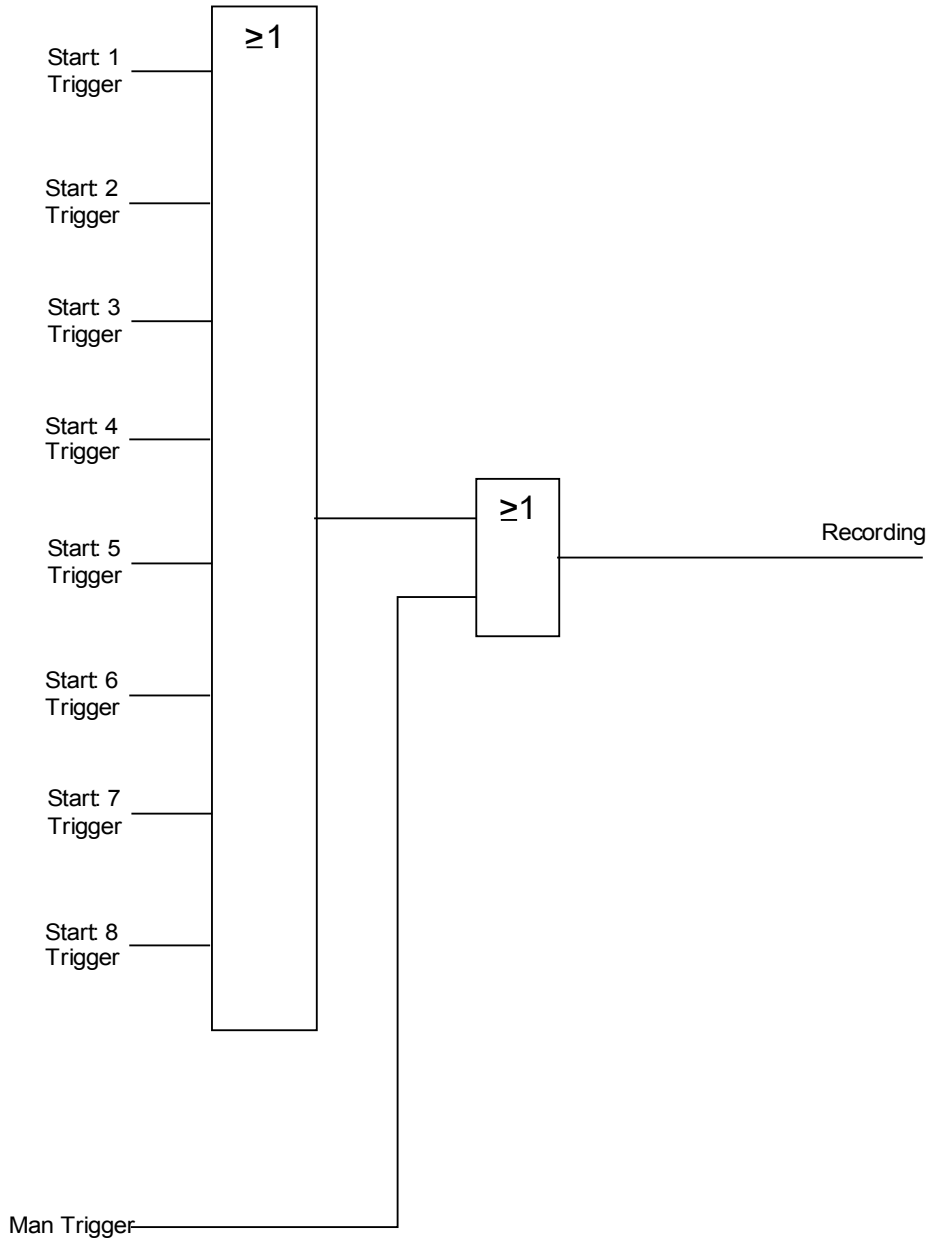
The disturbance recorder can be parameterized in the menu »*Device Parameter/Recorder/Disturb rec*«.

Determine the max. recording time to register a disturbance event. The max. total length of a recording is 10s (inclusive pre-trigger and post-trigger time).

To trigger the disturbance recorder, up to 8 signals can be selected from the »assignment list«. The trigger events are OR-linked. If a disturbance record is written, a new disturbance record cannot be triggered until all trigger signals, which have triggered the previous disturbance record, are gone. Recording is only done for the time the assigned event exists (event controlled), plus the time for the pre- and post-trigger, but not longer than 10s. The time for forward run and tracking of the disturbance recorder is shown in percent of the total recording length.

#### **NOTICE**

**The post-trigger time will be up to "Post-trigger time" depending on the duration of the trigger signal. The post-trigger will be the remaining time of the "Max file size" but at maximum "Post-trigger time"**



**Example**

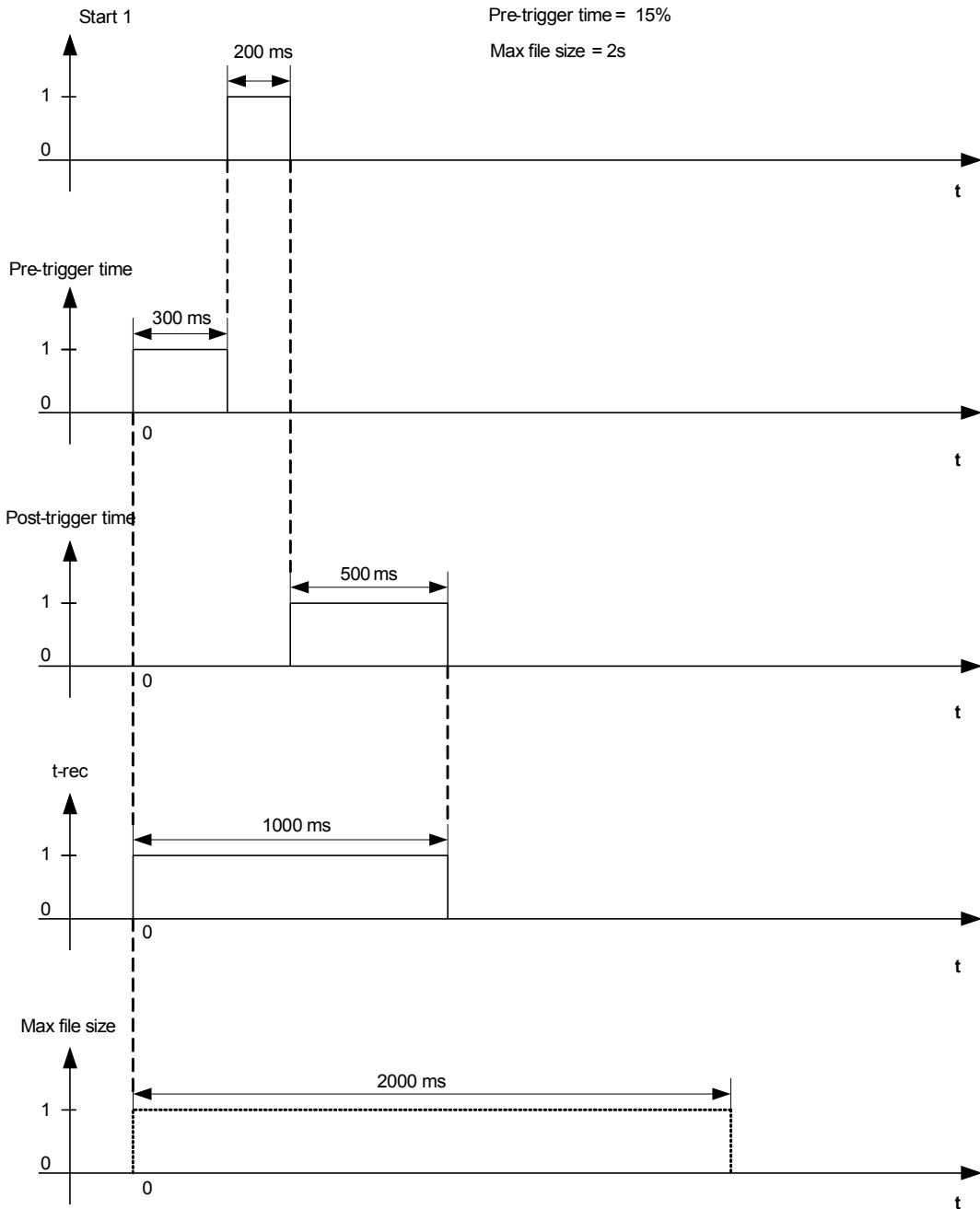
The disturbance recorder is started by the general activation facility. After the fault has been cancelled (+ follow-up time), the recording process is stopped (but after 10s at the latest).

The parameter »Auto Delete« defines how the device shall react if there is no saving place available. In case »Auto Delete« is »active«, the first recorded disturbance will be overwritten according to the FIFO principle. If the parameter is set to »inactive«, recording of the disturbance events will be stopped until the storage location is released manually.

Example Disturbance Recorder Timing Chart I

- Start 1 = Prot. Trip
- Start 2 = -.-
- Start 3 = -.-
- Start 4 = -.-
- Start 5 = -.-
- Start 6 = -.-
- Start 7 = -.-
- Start 8 = -.-
- Auto overwriting = active
- Post-trigger time = 25%
- Pre-trigger time = 15%
- Max file size = 2s

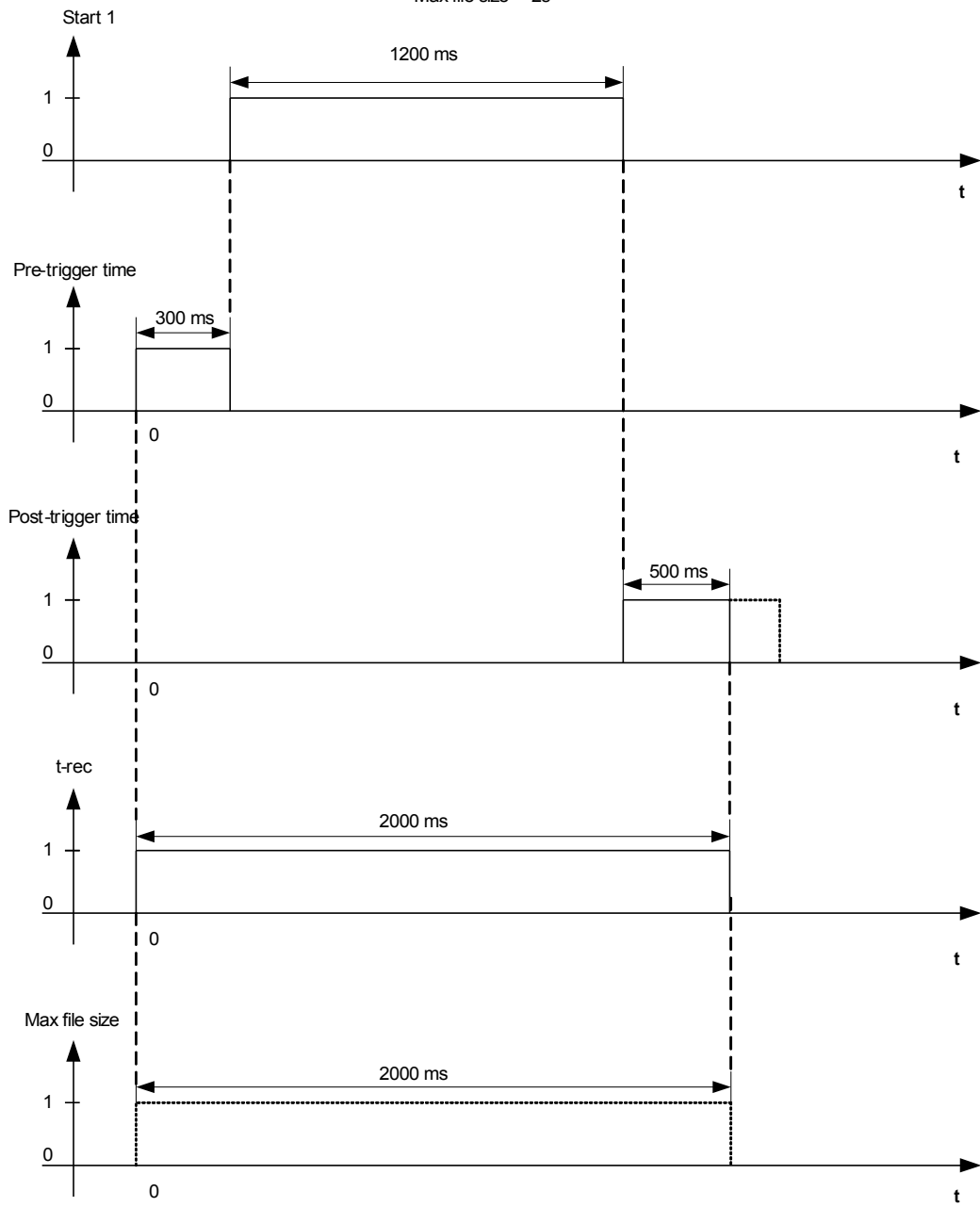
**t-rec < Max file size**



Example Disturbance Recorder Timing Chart II

- Start 1 = Prot.Alarm
- Start 2 = -.-
- Start 3 = -.-
- Start 4 = -.-
- Start 5 = -.-
- Start 6 = -.-
- Start 7 = -.-
- Start 8 = -.-
- Auto overwriting = active
- Post-trigger time = 25%
- Pre-trigger time = 15%
- Max file size = 2s

**t-rec = Max file size**



## Read Out Disturbance Records

Within the Menu Operation/Disturb rec you can

- Detect accumulated Disturbance Records.

### **NOTICE**



**Within the Menu »Operation/Recorders/Man Trigger« you can trigger the disturbance recorder manually.**

## Deleting Disturbance Records








Within the Menu Operation/Disturb rec you can

- Delete Disturbance Records.
- Choose via »SOFTKEY« »up« and »SOFTKEY« »down« the disturbance record that is to be deleted.
- Call up the detailed view of the disturbance record via »SOFTKEY« »right«.
- Confirm by pressing »SOFTKEY« »delete«
- Enter your password followed by pressing the key »OK«
- Choose whether only the current or whether all disturbance records should be deleted.
- Confirm by pressing »SOFTKEY« »OK«

### Direct Commands of the Disturbance Recorder






Parameter	Description	Setting range	Default	Menu path
Man Trigger 	Manual Trigger	False, True	False	[Operation /Recorders /Man Trigger]
Res all rec 	Reset all records	inactive, active	inactive	[Operation / Reset/Acknowledge /Reset]

### Global Protection Parameters of the Disturbance Recorder

Parameter	Description	Setting range	Default	Menu path
Start: 1 	Start recording if the assigned signal is true.	1..n, Assignment List	Prot.Alarm	[Device Para /Recorders /Disturb rec]
Start: 2 	Start recording if the assigned signal is true.	1..n, Assignment List	.-.	[Device Para /Recorders /Disturb rec]
Start: 3 	Start recording if the assigned signal is true.	1..n, Assignment List	.-.	[Device Para /Recorders /Disturb rec]
Start: 4 	Start recording if the assigned signal is true.	1..n, Assignment List	.-.	[Device Para /Recorders /Disturb rec]
Start: 5 	Start recording if the assigned signal is true.	1..n, Assignment List	.-.	[Device Para /Recorders /Disturb rec]
Start: 6 	Start recording if the assigned signal is true.	1..n, Assignment List	.-.	[Device Para /Recorders /Disturb rec]
Start: 7 	Start recording if the assigned signal is true.	1..n, Assignment List	.-.	[Device Para /Recorders /Disturb rec]



## Recorders

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Start: 8 	Start recording if the assigned signal is true.	1..n, Assignment List	.-	[Device Para /Recorders /Disturb rec]
Auto overwriting 	If there is no more free memory capacity left, the oldest file will be overwritten.	inactive, active	active	[Device Para /Recorders /Disturb rec]
Post-trigger time 	The post trigger time is settable up to a maximum of 50% of the Maximum file size setting. The post-trigger will be the remaining time of the "Max file size" but at maximum "Post-trigger time"	0 - 50%	20%	[Device Para /Recorders /Disturb rec]
Pre-trigger time 	The pre trigger time is settable up to a maximum of 50% of the Maximum file size setting.	0 - 50%	20%	[Device Para /Recorders /Disturb rec]
Max file size 	The maximum storage capacity per record is 10 seconds, including pre-trigger and post-trigger time. The disturbance recorder has a total storage capacity of 120 seconds.	0.1 - 10.0s	2s	[Device Para /Recorders /Disturb rec]

### Disturbance Recorder Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Start1-l	State of the module input:: Trigger event / start recording if:	[Device Para /Recorders /Disturb rec]
Start2-l	State of the module input:: Trigger event / start recording if:	[Device Para /Recorders /Disturb rec]
Start3-l	State of the module input:: Trigger event / start recording if:	[Device Para /Recorders /Disturb rec]
Start4-l	State of the module input:: Trigger event / start recording if:	[Device Para /Recorders /Disturb rec]
Start5-l	State of the module input:: Trigger event / start recording if:	[Device Para /Recorders /Disturb rec]
Start6-l	State of the module input:: Trigger event / start recording if:	[Device Para /Recorders /Disturb rec]
Start7-l	State of the module input:: Trigger event / start recording if:	[Device Para /Recorders /Disturb rec]
Start8-l	State of the module input:: Trigger event / start recording if:	[Device Para /Recorders /Disturb rec]

### Disturbance Recorder Signals

<i>Signal</i>	<i>Description</i>
recording	Signal: Recording
memory full	Signal: Memory full
Clear fail	Signal: Clear failure in memory
Res all records	Signal: All records deleted
Res rec	Signal: Delete record
Man Trigger	Signal: Manual Trigger

### Special Parameters of the Disturbance Recorder

Value	Description	Default	Size	Menu path
Rec state	Recording state	Ready	Ready, Recording, Writing file, Trigger Blo	[Operation /Status Display /Recorders /Disturb rec]
Error code	Error code	OK	OK, Write err, Clear fail, Calculation err, File not found, Auto overwriting off	[Operation /Status Display /Recorders /Disturb rec]

### Fault Recorder

Fault rec

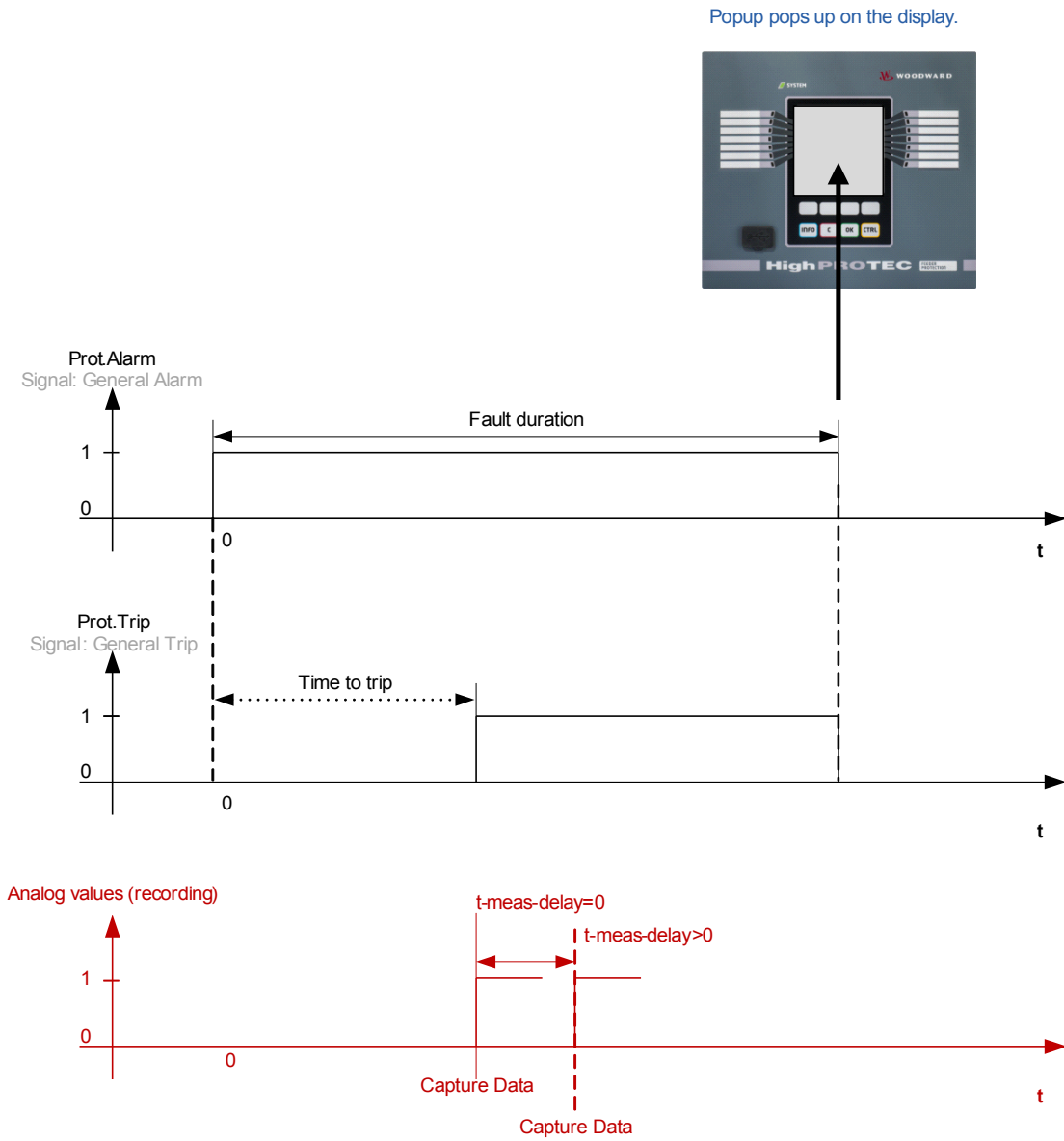
#### Purpose of the Fault recorder

The *Fault Recorder* provides compressed information about faults (e.g. Trip Causes). The compressed information can be read out also at the HMI. This might be helpful for fast fault analysis already at the HMI. After a fault, a popup window will be sent onto the display in order to draw the users attention to the fault. The *Fault Recorder* will provide information on the causes of the fault. A detailed fault analysis (in oscillographic form) can be done means of the Disturbance Recorder. The reference between the Fault Records and the corresponding Disturbance Records are the »*Fault Number*« and the »*Grid Fault Number*«.

### Definitions

**Time to Trip:** Time between *First Alarm* (Prot.Pickup) and *First Trip* (Prot.Trip) decision

**Fault Duration:** Time period from the rising edge of the General Pickup (»PROT.PICKUP«) signal up to the falling edge of the General Pickup Signal. Please note that General Pickup is an or-connection (disjunction) of all Pickup signals. General Trip is an OR-connection of all Trips.



## Behaviour of the Fault Recorder

### *Who triggers the Fault Recorder?*

The *Fault Recorder* will be triggered by the rising edge of the »PROT.PICKUP« (General Pickup) signal. Please note that »PROT.PICKUP« (General Pickup) is an or-connection of all Pickup signals. The first Pickup will trigger the Fault recorder.

### *At which point of time will the fault measurements be captured?*

The fault measurements will be captured (written) when the trip decision is taken. The point in time, when the measurements are captured (after a trip) can be delayed optionally by the parameter »*t-meas-delay*«. This might be reasonable in order to achieve more reliable measuring values (e.g. in order to avoid measuring disturbances caused by significant DC-components).

### *Modes*

In case of a fault record should be written even if an general alarm has not lead to a trip, the parameter »*Record-Mode*« is to be set to »*Alarms and Trips*« .

Set parameter »*Record-Mode*« to »*Trips only*«, if an Alarm that is not followed by a trip decision should not lead to a trip.

### *When does the overlay (popup) appears on the display of the HMI?*

A popup will appear on the HMI display, when the General Pickup (Prot.Pickup) disappears.

## NOTICE

**No time to trip will be shown if the pickup signal that triggers the fault recorder is issued by another protection module than the trip signal. This might happen if more than one protection module is involved into a fault.**

## NOTICE

**Please note: The parameter settings (thresholds etc.) that are shown in a fault record are not part of the fault record itself. They are always read out from the current device setting. If parameters settings that are shown in a fault record could have been updated, they will be indicated with an asterisk symbol within the fault record.**

**To prevent this please proceed as follows:**

**Save any fault record that should be archived to your local network/hard disk before doing any parameter change. Delete all the fault records in your fault recorder afterwards.**

### *Memory*

The last stored fault record is saved (fail-safe) within the Fault Recorder (the others are saved within a memory that depends on the auxiliary power of the protective relay). If there is no more memory free, the oldest record will be overwritten (FIFO). Up to 20 records can be stored.

### *How to close the overlay/popup?*

By using Softkey »OK«.

### *How to find out fast, if a fault has lead to a trip or not?*

Faults that lead to a trip will be indicated by a flash icon  (right side) within the overview menu of the fault recorder.

### *Which fault record pops up?*

The newest fault.

## Content of a Fault Record





A fault record comprises information about:

Date/Time	Date and Time of the Fault			
FaultNr	The number of the fault will be incremented with each fault (General Alarm or »PROT.PICKUP«)			
Grid Fault No.	This counter will be incremented by each General Pickup (Exception AR: this applies only to devices that offer auto reclosing).			
Active Set	The active parameter set			
Time to trip	The time between pickup and trip. Please note: No time to trip will be shown if the first pickup and the first trip are issued by different protection modules.			
Alarm	Name of the module that picked up first.			
Trip	Name of the module that tripped first. The information that will be displayed depends on which protection module has tripped. That means e.g. that the thresholds are shown. In case that the trip was initiated by the MotorStart (applies to motor protection relays) protection module, additional information will be displayed.			
Adaptive Set	In case that adaptive sets are used, the number of the active set will be displayed.			
Fault type	In case of overcurrent trips, the fault type will be evaluated based on the energized phases.			
	Alarm Phase A	Alarm Phase B	Alarm Phase C	Fault Type
	x			L1G
		x		L2G
			x	L3G
	x	x		L1B
		x	x	L2L3
	x		x	L1L3
	x	x	x	L1L2L3
Direction	In case that a direction has been detected, the evaluated direction will be displayed (this applies to directional phase and ground overcurrent relays only).			
Measured Values	Various measuring values at the time of tripping (or delayed depending on parameter setting) will be displayed.			

## How to set up the Fault Recorder

The »Record-Mode« will determine if trips only cause a fault record or if also Alarms without a consecutively trip should cause a fault record. This parameter is to be set within menu [Device Para\Recorders\Fault rec]

## How to navigate within the Fault Recorder

<i>Navigation within the Fault recorder</i>	Softkey
Back to overview.	
Next (upper) item within this fault record.	
Previous fault record.	
Next (lower) item within this fault record.	

## How to read Out the Fault Recorder

In order to read out a fault record there are two options available:

- Option 1: A Fault has popped up on the HMI (because an trip or pickup has occurred).
- Option 2: Call up manually the Fault recorder menu.

*Option 1 (in case a fault record pops up on the display (overlay):*


- Analyze the fault record by using Softkeys Arrow Up and Arrow Down.
- Or close the Popup by using Softkey OK

*Option 2 :*



- Call up the main menu;
- Call up the sub-menu »Operation/Recorders/Fault rec.«;
- Select a fault record; and
- Analyze the fault record by using Softkeys Arrow Up and Arrow Down.



### Direct Commands of the Fault Recorder

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Res all rec 	Reset all records	inactive, active	inactive	[Operation / Reset/Acknowledge /Reset]

### Global Protection Parameters of the Fault Recorder

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Record-Mode 	Recorder Mode (Set the behaviour of the recorder)	Alarms and Trips, Trips only	Trips only	[Device Para /Recorders /Fault rec]
t-meas-delay 	After the Trip, the measurement will be delayed for this time.	0 - 60ms	0ms	[Device Para /Recorders /Fault rec]

### Fault Recorder Signals

<i>Signal</i>	<i>Description</i>
Res rec	Signal: Delete record

## Event Recorder

### Event rec

The event recorder can register up to 300 events and the last (minimum) 50 saved events are recorded fail-safe. The following information is provided for any of the events:

*Events are logged as follows:*

<i>Record No.</i>	<i>Fault No.</i>	<i>No of grid faults</i>	<i>Date of Record</i>	<i>Module.Name</i>	<i>State</i>
Sequential Number	Number of the ongoing fault  This counter will be incremented by each General Alarm (Prot.Alarm)	A grid fault No. can have several Fault No.  This counter will be incremented by each General Alarm  (Exception AR: this applies only to devices that offer auto reclosing)	Time stamp	What has changed?	Changed Value


*There are three different classes of events:*

- **Alternation of binary states are shown as:**
  - 0->1 if the signal changes physically from »0« to »1«.
  - 1->0 if the signal changes physically from »1« to »0«.
  
- **Counters increment is shown as:**
  - Old Counter state -> New Counter state (e.g. 3->4)
  
- **Alternation of multiple states are shown as:**
  - Old state -> New state (e.g. 0->2)

### Read Out the Event Recorder

- Call up the »main menu«.
- Call up the submenu »Operation/Recorders/Event rec«.
- Select an event.

### Direct Commands of the Event Recorder

Parameter	Description	Setting range	Default	Menu path
Res all rec 	Reset all records	inactive, active	inactive	[Operation / Reset/Acknowledg e /Reset]

### Event Recorder Signals

Signal	Description
Res all records	Signal: All records deleted

### Trend Recorder

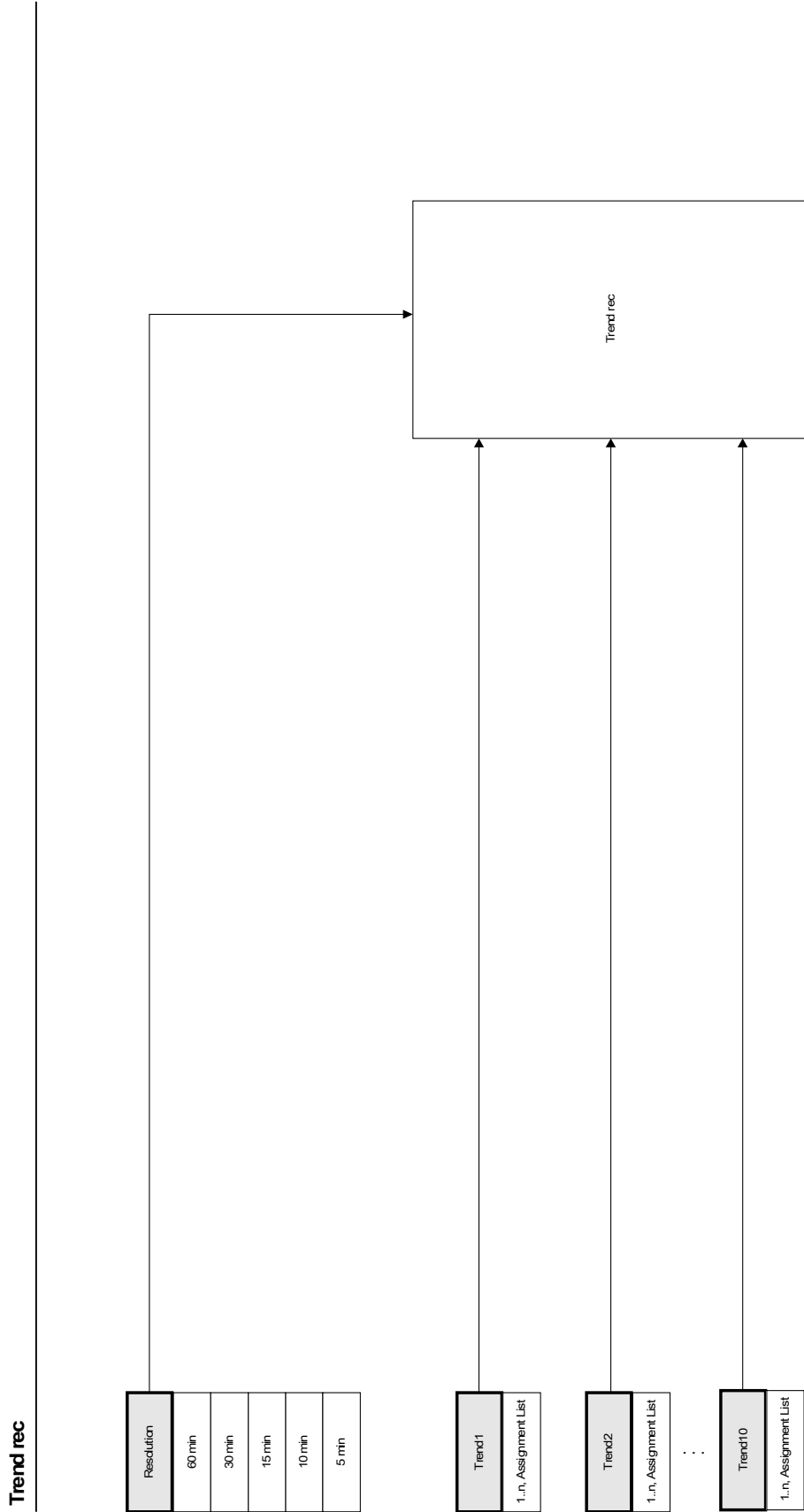
Available Elements:  
[Trend rec](#)

### Configuring the Trend Recorder











The Trend Recorder is to be configured within [Device Para/Recorders/Trend Recorder] menu.

The User has to set the time interval. This defines the distance between two measuring points.


The User can select up to ten values that will be recorded.



**Global Protection Parameters of the Trend Recorder**

Parameter	Description	Setting range	Default	Menu path
Resolution 	Resolution (recording frequency)	60 min, 30 min, 15 min, 10 min, 5 min	15 min	[Device Para /Recorders /Trend rec]
Trend1 	Observed Value1	1..n, TrendRecList	CT.IL1 RMS	[Device Para /Recorders /Trend rec]
Trend2 	Observed Value2	1..n, TrendRecList	CT.IL2 RMS	[Device Para /Recorders /Trend rec]
Trend3 	Observed Value3	1..n, TrendRecList	CT.IL3 RMS	[Device Para /Recorders /Trend rec]
Trend4 	Observed Value4	1..n, TrendRecList	CT.IG meas RMS	[Device Para /Recorders /Trend rec]
Trend5 	Observed Value5	1..n, TrendRecList	-.-	[Device Para /Recorders /Trend rec]
Trend6 	Observed Value6	1..n, TrendRecList	-.-	[Device Para /Recorders /Trend rec]
Trend7 	Observed Value7	1..n, TrendRecList	-.-	[Device Para /Recorders /Trend rec]
Trend8 	Observed Value8	1..n, TrendRecList	-.-	[Device Para /Recorders /Trend rec]
Trend9 	Observed Value9	1..n, TrendRecList	-.-	[Device Para /Recorders /Trend rec]


## Recorders

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Trend10 	Observed Value10	1..n, TrendRecList	.-	[Device Para /Recorders /Trend rec]

### Trend Recorder Signals (Output States)

<i>Signal</i>	<i>Description</i>
Hand Reset	Hand Reset

### Direct Commands of the Trend Recorder

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Reset 	Delete all entries	inactive, active	inactive	[Operation / Reset/Acknowledge /Reset]

### General Values of the Trend Recorder

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
Max avail Entries	Maximum available entries in the current configuration	0	0 - 9999999999	[Operation /Count and RevData /Trend rec]

### Global Values of the Trend Recorder

The »TrendRecList« below summarizes all signals that the User can assign.

Name	Description
.-.	No assignment
CT.IL1	Measured value: Phase current (fundamental)
CT.IL2	Measured value: Phase current (fundamental)
CT.IL3	Measured value: Phase current (fundamental)
CT.IG meas	Measured value (measured): IG (fundamental)
CT.IG calc	Measured value (calculated): IG (fundamental)
CT.IL1 RMS	Measured value: Phase current (RMS)
CT.IL2 RMS	Measured value: Phase current (RMS)
CT.IL3 RMS	Measured value: Phase current (RMS)
CT.IG meas RMS	Measured value (measured): IG (RMS)
CT.IG calc RMS	Measured value (calculated): IG (RMS)
CT.I0	Measured value (calculated): Zero current (fundamental)
CT.I1	Measured value (calculated): Positive phase sequence current (fundamental)
CT.I2	Measured value (calculated): Unbalanced load current (fundamental)
CT.%(I2/I1)	Measured value (calculated): I2/I1, phase sequence will be taken into account automatically.
CT.%(I2/I1) max	Measured value (calculated): I2/I1 maximum value, phase sequence will be taken into account automatically
CT.IL1 avg RMS	IL1 average value (RMS)
CT.IL2 avg RMS	IL2 average value (RMS)
CT.IL3 avg RMS	IL3 average value (RMS)
CT.IL1 THD	Measured value (calculated): IL1 Total Harmonic Current
CT.IL2 THD	Measured value (calculated): IL2 Total Harmonic Current
CT.IL3 THD	Measured value (calculated): IL3 Total Harmonic Current
MStart.IL1 lb	Measured value: Phase current as multiple of lb
ThR.I2T Used	Thermal capacity used.
URTD.Windg1	Winding 1
URTD.Windg1 max	Winding1 Maximum Value
URTD.Windg2	Winding 2
URTD.Windg2 max	Winding2 Maximum Value
URTD.Windg3	Winding 3
URTD.Windg3 max	Winding3 Maximum Value
URTD.Windg4	Winding 4
URTD.Windg4 max	Winding4 Maximum Value
URTD.Windg5	Winding 5
URTD.Windg5 max	Winding5 Maximum Value
URTD.Windg6	Winding 6

## Recorders

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<i>Name</i>	<i>Description</i>
URTD.Windg6 max	Winding6 Maximum Value
URTD.MotBear1	Motor Bearing 1
URTD.MotBear1 max	Motor Bearing1 Maximum Value
URTD.MotBear2	Motor Bearing 2
URTD.MotBear2 max	Motor Bearing2 Maximum Value
URTD.LoadBear1	Load Bearing 1
URTD.LoadBear1 max	Load Bearing1 Maximum Value
URTD.LoadBear2	Load Bearing 2
URTD.LoadBear2 max	Load Bearing2 Maximum Value
URTD.Aux1	Auxiliary1
URTD.Aux1 max	Auxiliary1 Maximum Value
URTD.Aux2	Auxiliary2
URTD.Aux2 max	Auxiliary2 Maximum Value
URTD.RTD Max	Maximum temperature of all channels.
RTD.HottestWindingTemp	Hottest motor winding temperature in degrees C.
RTD.Hottest MotBearTemp	Hottest motor bearing temperature in degrees C.
RTD.Hottest LoadBearTemp	Hottest load bearing temperature in degrees C.
RTD.Hottest Aux Temp	Hottest Auxiliary temperature in degrees C.



## Motor Start Recorder

Available Elements:

Start rec

The Motor Start Recorder is accessed using *Smart view* or via the front panel interface of the relay. This feature provides information recorded at the time of each start of the motor such as:







- Date of the motor start event;
- Record number;

And the summary data:

- Maximum RMS phase current of each phase at the time of start;
- Current unbalance;
- TSTI and TSTR values;
- Thermal capacity used ( I2T Used); and
- Number of successful starts.

## Managing Start Records

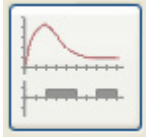
The start recorder data can be downloaded by means of *Smart view* from the device when the User has selected the “Start Rec” feature. To navigate to this feature, the User must go to the [Operation / Recorders] menu. Here the User will find the »Start Rec« menu item. By selecting »Start Rec«, the Start Recorder Window will appear.

-  To access data that has been stored in the device using *Smart view*, the User must select the “Receive Start Recorder” button in the upper left hand corner of the “Start Rec” window. When clicked, the *Smart view* software will retrieve the highlighted record from the device.
-  A summary of the Start Recorder data can be retrieved by selecting the “Receive Summary Data” button in the upper left hand corner of the “Start Rec” window.
-  A list of all currently available Start Records is viewable by selecting the “Refresh Start Recorder” button on the start recorder.
-  It is possible to delete individual records that are stored on the protective device. First, select “Receive Start Recorder”, and then select the record to be deleted by clicking on the record number, followed by the selection of the “Delete Start Record” button in the upper left hand corner of the “Start Rec” window.
-  To permanently remove all start records within a device's start recorder, select the “Delete All Start Records” button also located in the upper left hand corner of the “Start Rec” window. This will remove all previously stored start records within the device to which the User is presently connected.
-  Open a Start Record file from a local storage device. Please note that it is possible to compare an archived Start Record against archived Parameter settings that are also stored on a local device. Read the “Caution Information at the end of this chapter”.

When using *Smart view* to view the Start Recorder data, the Start Recorder features can also be found by right clicking anywhere within the “Start Rec” window.

## Displaying Start Records

When a Start Record is called up, a window with the following options pops up.



View motor start data graphically in the *Data visualizer* software. In the *Data visualizer* software the User can view the RMS value of the phase currents, thermal capacity used, and temperatures measured by the URTD module if a URTD is installed and attached to the relay.



View motor start data overlaid with the Motor Protection Curves (Starting Profile Plot versus Protection limits). The User can view the average current recorded during the motor start versus protection elements such as 50P, or the Thermal Model. Please note, that protective elements, that are not projected within the device planning wont be visible. The user has the option to alter the displayed setting groups.

*The Starting Profile Plot offers two User Scenarios:*

1. Adapting the protection settings to the recorded start curve. The User will see the impact of parameter changes in the Profile Plot. By means of this he can decide if the relay settings match the protection requirements.
2. Analyzing a Start Record. Since a Start Record does not include the relay settings, the User has to ensure, that backups of the relay settings are available that were valid at the time of recording.




**Please Note that the Starting Profile Plot shows the recorded average current versus the current relay settings. The relay settings itself are not part of a Start Record.**

**Adaptive parameters and their impacts wont be visible within the Starting Profile.**

**Blockings wont be visible within the Starting Profile.**

**Please make sure to save the setting files together with this record to guarantee the graph represents the conditions of when this event occurred.**



### Global Protection Parameters of the Motor Start Recorder

Parameter	Description	Setting range	Default	Menu path
Resolution 	Resolution (recording frequency)	50ms, 100ms, 1s	50ms	[Device Para /Recorders /Start rec]

### Motor Start Recorder Signals (Output States)

Signal	Description
Storing	Signal: Data are saved

### Direct Commands of the Motor Start Recorder

Parameter	Description	Setting range	Default	Menu path
ClearStartRec 	Delete all start recorder records	inactive, active	inactive	[Operation / Reset/Acknowledg e /Reset]
ClearStatisticRec 	Delete all statistic recorder records (start trending)	inactive, active	inactive	[Operation / Reset/Acknowledg e /Reset]

### Statistic Recorder

The Statistic Recorder shows motor specific statistical data on a monthly base.

The Statistic Recorder can record up to 24 monthly reports. The reports are power fail safe stored.

In order to view information from the Statistic Recorder, the User has to select [Operation/Recorder/Statisticrec] from the menu tree.


By double clicking on the »Date of Record« statistics information can be viewed such as the number of starts, the number of successful starts, the average start time, the »average I2T« value during any start, and the average of all maximum currents value seen during each start.

# Communication Protocols

## SCADA Interface

Scada

### Device Planning Parameters of the Serial Scada Interface

<i>Parameter</i>	<i>Description</i>	<i>Options</i>	<i>Default</i>	<i>Menu path</i>
Protocol 	Select used SCADA protocol	do not use, Modbus RTU, Modbus TCP, DNP3 RTU, DNP3 TCP, DNP3 UDP, IEC60870-5-103, IEC61850, Profibus	do not use	[Device planning]




### Signals (Output States) of the SCADA Interface

<i>Signal</i>	<i>Description</i>
SCADA connected	At least one SCADA System is connected to the device.
SCADA not connected	No SCADA System is connected to the device

## TCP/IP Parameter

Tcplp

### Global TCP/IP Parameters

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
 Keep Alive Time	Keep Alive Time is the duration between two keep alive transmissions in idle condition	1 - 7200s	720s	[Device Para /TCP/IP /Advanced Settings]
 Keep Alive Interval	Keep Alive Interval is the duration between two successive keep alive retransmissions, if the acknowledgement to the previous keepalive transmission was not received.	1 - 60s	15s	[Device Para /TCP/IP /Advanced Settings]
 Keep Alive Retry	Keep alive retry is the number of retransmissions to be carried out before declaring that the remote end is not available.	3 - 3	3	[Device Para /TCP/IP /Advanced Settings]

## Modbus®

### Modbus

## Modbus® Protocol Configuration

The time-controlled Modbus® protocol is based on the Master-Slave working principle. This means that the substation control and protection system sends an enquiry or instruction to a certain device (slave address) which will then be answered or carried out accordingly. If the enquiry/instruction cannot be answered/carried out (e.g. because of an invalid slave address), a failure message is returned to the master.

The Master (substation control and protection system) can query information from the device, such as:

- Type of unit version
- Measuring values/Statistical measured values
- Switch operating position
- State of device
- Time and date
- State of the device's digital inputs
- Protection-/State alarms

The Master (control system) can give commands/instructions to the device, such as:

- Control of switchgear (where applicable, i.e. each acc. to the applied device version)
- Change-over of parameter set
- Reset and acknowledgement of alarms/signals
- Adjustment of date and time
- Control of alarm relays

For detailed information on data point lists and error handling, please refer to the Modbus® documentation.

To allow configuration of the devices for Modbus® connection, some default values of the control system must be available.

## Modbus RTU

### Part 1: Configuration of the Devices

Call up »Device parameter/Modbus« and set the following communication parameters there:

- Slave-address, to allow clear identification of the device.
- Baud-Rate

Also, select below indicated RS485 interface-related parameters from there, such as:

- Number of data bits
- One of the following supported communication variants: Number of data bits, even, odd, parity or no parity, number of stop bits.
- »t-timeout«: communication errors are only identified after expiry of a supervision time »t-timeout«.
- Response time (defining the period within which an enquiry from the master has to be answered).

### Part 2: Hardware Connection

- For hardware connection to the control system, there is an RS485 interface at the rear side of the device (RS485, fiber optic or terminals).
- Connect bus and device (wiring).

### Error Handling - Hardware Errors

Information on physical communication errors, such as:

- Baudrate Error
- Parity Error ...

can be obtained from the event recorder.

### Error Handling – Errors on protocol level

If, for example, an invalid memory address is enquired, error codes will be returned by the device that need to be interpreted.



## Modbus TCP

### NOTICE

Establishing a connection via TCP/IP to the device is only possible if your device is equipped with an Ethernet Interface (RJ45).

Contact your IT administrator in order to establish the network connection.

#### *Part 1: Setting the TCP/IP Parameters*

Call up »Device parameter/TCP/IP« at the HMI (panel) and set the following parameters:

- TCP/IP address
- Subnetmask
- Gateway

#### *Part 2: Configuration of the Devices*


Call up »Device parameter/Modbus« and set the following communication parameters:

- Setting a Unit Identifier is only necessary if a TCP network should be coupled to a RTU network.
- If a different port than the default port 502 should be used please proceed as follows:
  - Choose "Private" within the TCP-Port-Configuration.
  - Set the port-number.
- Set the maximum accepted time of "no communication". If this time has expired – without any communication, the device concludes a failure within the master system.
- Allow or disallow the blocking of SCADA commands.







#### *Part 3: Hardware Connection*








- There is a RJ45 interface at the rear side of the device for the hardware connection to the control system.
- Establish the connection to the device by means of a proper Ethernet cable.










**Direct Commands of the Modbus®**










Parameter	Description	Setting range	Default	Menu path
Res Diagn Cr 	All Modbus Diagnosis Counters will be reset.	inactive, active	inactive	[Operation / Reset/Acknowledge /Reset]










**Global Protection Parameters of the Modbus®**










Parameter	Description	Setting range	Default	Menu path
Slave ID 	Device address (Slave ID) within the bus system. Each device address has to be unique within a bus system.	1 - 247	1	[Device Para /Modbus /Communication]
Unit ID 	The Unit Identifier is used for routing. This parameter is to be set, if a Modbus RTU and a Modbus TCP network should be coupled.	1 - 255	255	[Device Para /Modbus /Communication]
TCP Port Config 	TCP Port Configuration. This parameter is to be set only if the default Modbus TCP Port should not be used.	Default, Private	Default	[Device Para /Modbus /Communication]
Port 	Port number  And Only available if: TCP Port Config = Private	502 - 65535	502	[Device Para /Modbus /Communication]
t-timeout 	Within this time the answer has to be received by the SCADA system, otherwise the request will be disregarded. In that case the Scada system detects a communication failure and the Scada System has to send a new request.	0.01 - 10.00s	1s	[Device Para /Modbus /Communication]
Baud rate 	Baud rate	1200, 2400, 4800, 9600, 19200, 38400	19200	[Device Para /Modbus /Communication]










Parameter	Description	Setting range	Default	Menu path
Physical Settings 	Digit 1: Number of bits. Digit 2: E=even parity, O=odd parity, N=no parity. Digit 3: Number of stop bits. More information on the parity: It is possible that the last data bit is followed by a parity bit which is used for recognition of communication errors. The parity bit ensures that with even parity ("EVEN") always an even number of bits with valence "1" or with odd parity ("ODD") an odd number of "1" valence bits are transmitted. But it is also possible to transmit no parity bits (here the setting is "Parity = None"). More information on the stop-bits: The end of a data byte is terminated by the stop-bits.	8E1, 8O1, 8N1, 8N2	8E1	[Device Para /Modbus /Communication]
t-call 	If there is no request telegram sent from Scada to the device after expiry of this time - the device concludes a communication failure within the Scada system.	1 - 3600s	10s	[Device Para /Modbus /Communication]
Scada CmdBlo 	Activating (allowing)/ Deactivating (disallowing) the blocking of the Scada Commands	inactive, active	inactive	[Device Para /Modbus /Communication]
Disable Latching 	Disable Latching: If this parameter is active (true), none of the Modbus states will be latched. That means that trip signals wont be latched by Modbus.	inactive, active	inactive	[Device Para /Modbus /Communication]
AllowGap 	If this parameter is active (True), the user can request a set of modbus register without getting an exception, because of invalid address in the requested array. The invalid addresses have a special value 0xFAFA, but the user is responsible for ignoring invalid addresses. Attention: This special value can be valid, if address is valid.	inactive, active	inactive	[Device Para /Modbus /Communication]
Optical rest position 	Optical rest position	Light off, Light on	Light on	[Device Para /Modbus /Communication]
Config Bin Inp1 	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp1 	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
 Config Bin Inp2	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp2	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp3	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp3	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp4	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp4	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp5	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp5	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp6	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]










<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Latched Config Bin Inp6 	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp7 	Configurable Binary Input	1..n, Assignment List	--	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp7 	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp8 	Configurable Binary Input	1..n, Assignment List	--	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp8 	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp9 	Configurable Binary Input	1..n, Assignment List	--	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp9 	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp10 	Configurable Binary Input	1..n, Assignment List	--	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp10 	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]










<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
 Config Bin Inp11	Configurable Binary Input	1..n, Assignment List	--	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp11	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp12	Configurable Binary Input	1..n, Assignment List	--	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp12	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp13	Configurable Binary Input	1..n, Assignment List	--	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp13	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp14	Configurable Binary Input	1..n, Assignment List	--	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp14	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp15	Configurable Binary Input	1..n, Assignment List	--	[Device Para /Modbus /Configb Registers /States]










<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Latched Config Bin Inp15 	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp16 	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp16 	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp17 	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp17 	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp18 	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp18 	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp19 	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp19 	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]







<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
 Config Bin Inp20	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp20	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp21	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp21	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp22	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp22	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp23	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp23	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp24	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]



<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Latched Config Bin Inp24 	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp25 	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp25 	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp26 	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp26 	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp27 	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp27 	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp28 	Configurable Binary Input	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp28 	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
 Config Bin Inp29	Configurable Binary Input	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp29	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp30	Configurable Binary Input	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp30	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp31	Configurable Binary Input	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp31	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp32	Configurable Binary Input	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp32	Latched Configurable Binary Input	inactive, active	inactive	[Device Para /Modbus /Configb Registers /States]
 Mapped Meas 1	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendReclList	.-	[Device Para /Modbus /Configb Registers /Measured Values]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Mapped Meas 2 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendReclList	-.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 3 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendReclList	-.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 4 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendReclList	-.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 5 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendReclList	-.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 6 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendReclList	-.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 7 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendReclList	-.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 8 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendReclList	-.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 9 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendReclList	-.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 10 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendReclList	-.-	[Device Para /Modbus /Configb Registers /Measured Values]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Mapped Meas 11 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendReclList	-.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 12 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendReclList	-.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 13 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendReclList	-.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 14 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendReclList	-.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 15 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendReclList	-.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 16 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendReclList	-.-	[Device Para /Modbus /Configb Registers /Measured Values]

**States of the Module Inputs of the MODBUS® Protocol**

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Config Bin Inp1-l	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp2-l	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp3-l	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp4-l	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp5-l	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp6-l	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp7-l	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp8-l	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp9-l	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Config Bin Inp10-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp11-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp12-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp13-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp14-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp15-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp16-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp17-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp18-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Config Bin Inp19-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp20-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp21-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp22-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp23-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp24-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp25-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp26-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp27-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Config Bin Inp28-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp29-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp30-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp31-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp32-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]



**Values of the MODBUS® Protocol**

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
Mapped Meas 1	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 2	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 3	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 4	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 5	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 6	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 7	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 8	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 9	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 10	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 11	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
Mapped Meas 12	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 13	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 14	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 15	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 16	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]

**Counters of the MODBUS® Protocol**

<i>Parameter</i>	<i>Description</i>
Device Type	Device Type: Device type code for relationship between devcie name and its Modbus code: Woodward: MRI4 - 1000 MRU4 - 1001 MRA4 - 1002 MCA4 - 1003 MRDT4 - 1005 MCDTV4 - 1006 MCDGV4 - 1007 MRM4 - 1009 MRMV4 - 1010
Comm Version	Modbus Communication version. This version number changes if something becomes incompatible between different Modbus releases.

## Modbus® Signals (Output States)

**NOTICE** Some signals (that are for a short time active only) have to be acknowledged separately (e.g. Trip signals) by the Communication System.

<i>Signal</i>	<i>Description</i>
Transmission	Signal: SCADA active
Scada Cmd 1	Scada Command
Scada Cmd 2	Scada Command
Scada Cmd 3	Scada Command
Scada Cmd 4	Scada Command
Scada Cmd 5	Scada Command
Scada Cmd 6	Scada Command
Scada Cmd 7	Scada Command
Scada Cmd 8	Scada Command
Scada Cmd 9	Scada Command
Scada Cmd 10	Scada Command
Scada Cmd 11	Scada Command
Scada Cmd 12	Scada Command
Scada Cmd 13	Scada Command
Scada Cmd 14	Scada Command
Scada Cmd 15	Scada Command
Scada Cmd 16	Scada Command

**Modbus® Values**

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NoOfRequestsTotal	Total number of requests. Includes requests for other slaves.	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfRequestsForMe	Total Number of requests for this slave.	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfResponse	Total number of requests having been responded.	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfResponTimeO verruns	Total number of requests with exceeded response time. Physically corrupted Frame.	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfOverrunErros	Total Number of Overrun Failures. Physically corrupted Frame.	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfParityErrors	Total number of parity errors. Physically corrupted Frame.	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfFrameErrors	Total Number of Frame Errors. Physically corrupted Frame.	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfBreaks	Number of detected communication aborts	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfQueryInvalid	Total number of Request errors. Request could not be interpreted	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfInternalError	Total Number of Internal errors while interpreting the request.	0	0 - 9999999999	[Operation /Count and RevData /Modbus]

## Profibus

### Profibus

#### *Part 1: Configuration of the Devices*

Call up »*Device parameter/Profibus*« and set the following communication parameter:

- Slave-address, to allow clear identification of the device.

In addition to that the Master has to be provided with the GSD-file. The GSD-file can be taken from the Product-CD.

#### *Part 2: Hardware Connection*

- For hardware connection to the control system, there is optional an D-SUB interface at the rear side of the device.
- Connect bus and device (wiring).
- Up to 123 slaves can be connected.
- Terminate the Bus by means of an Terminate Resistor.

#### *Error Handling*

Information on physical communication errors, such as:

- Baudrate Error


can be obtained from the event recorder or the status display.

#### *Error Handling – Status LED at the rear side*









The Profibus D-SUB interface at the rear side of the device is equipped with an status LED.









- Baud Search -> red flashing
- Baud Found -> green flashing
- Data Exchange -> green
- No Profibus/Unplugged, not connected -> red












### Direct Commands of the Profibus

Parameter	Description	Setting range	Default	Menu path
Reset Comds 	All Profibus Commands will be reset.	inactive, active	inactive	[Operation / Reset/Acknowledge /Reset]












### Global Protection Parameters of the Profibus












Parameter	Description	Setting range	Default	Menu path
Assignment 1 	Assignment	1..n, Assignment List	.-	[Device Para /Profibus /Assignment 1-16]
Latched 1 	Defines whether the Input is latched. Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 1-16]
Assignment 2 	Assignment	1..n, Assignment List	.-	[Device Para /Profibus /Assignment 1-16]
Latched 2 	Defines whether the Input is latched. Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 1-16]
Assignment 3 	Assignment	1..n, Assignment List	.-	[Device Para /Profibus /Assignment 1-16]
Latched 3 	Defines whether the Input is latched. Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 1-16]
Assignment 4 	Assignment	1..n, Assignment List	.-	[Device Para /Profibus /Assignment 1-16]
Latched 4 	Defines whether the Input is latched. Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 1-16]












<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Assignment 5 	Assignment	1..n, Assignment List	.-.	[Device Para /Profibus /Assignment 1-16]
Latched 5 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 1-16]
Assignment 6 	Assignment	1..n, Assignment List	.-.	[Device Para /Profibus /Assignment 1-16]
Latched 6 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 1-16]
Assignment 7 	Assignment	1..n, Assignment List	.-.	[Device Para /Profibus /Assignment 1-16]
Latched 7 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 1-16]
Assignment 8 	Assignment	1..n, Assignment List	.-.	[Device Para /Profibus /Assignment 1-16]
Latched 8 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 1-16]
Assignment 9 	Assignment	1..n, Assignment List	.-.	[Device Para /Profibus /Assignment 1-16]
Latched 9 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 1-16]
Assignment 10 	Assignment	1..n, Assignment List	.-.	[Device Para /Profibus /Assignment 1-16]



<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Latched 10 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 1-16]
Assignment 11 	Assignment	1..n, Assignment List	--	[Device Para /Profibus /Assignment 1-16]
Latched 11 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 1-16]
Assignment 12 	Assignment	1..n, Assignment List	--	[Device Para /Profibus /Assignment 1-16]
Latched 12 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 1-16]
Assignment 13 	Assignment	1..n, Assignment List	--	[Device Para /Profibus /Assignment 1-16]
Latched 13 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 1-16]
Assignment 14 	Assignment	1..n, Assignment List	--	[Device Para /Profibus /Assignment 1-16]
Latched 14 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 1-16]
Assignment 15 	Assignment	1..n, Assignment List	--	[Device Para /Profibus /Assignment 1-16]
Latched 15 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 1-16]



<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Assignment 16 	Assignment	1..n, Assignment List	.-.	[Device Para /Profibus /Assignment 1-16]
Latched 16 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 1-16]
Assignment 17 	Assignment	1..n, Assignment List	.-.	[Device Para /Profibus /Assignment 17-32]
Latched 17 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 17-32]
Assignment 18 	Assignment	1..n, Assignment List	.-.	[Device Para /Profibus /Assignment 17-32]
Latched 18 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 17-32]
Assignment 19 	Assignment	1..n, Assignment List	.-.	[Device Para /Profibus /Assignment 17-32]
Latched 19 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 17-32]
Assignment 20 	Assignment	1..n, Assignment List	.-.	[Device Para /Profibus /Assignment 17-32]
Latched 20 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 17-32]
Assignment 21 	Assignment	1..n, Assignment List	.-.	[Device Para /Profibus /Assignment 17-32]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Latched 21 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 17-32]
Assignment 22 	Assignment	1..n, Assignment List	--	[Device Para /Profibus /Assignment 17-32]
Latched 22 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 17-32]
Assignment 23 	Assignment	1..n, Assignment List	--	[Device Para /Profibus /Assignment 17-32]
Latched 23 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 17-32]
Assignment 24 	Assignment	1..n, Assignment List	--	[Device Para /Profibus /Assignment 17-32]
Latched 24 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 17-32]
Assignment 25 	Assignment	1..n, Assignment List	--	[Device Para /Profibus /Assignment 17-32]
Latched 25 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 17-32]
Assignment 26 	Assignment	1..n, Assignment List	--	[Device Para /Profibus /Assignment 17-32]
Latched 26 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 17-32]

Parameter	Description	Setting range	Default	Menu path
Assignment 27 	Assignment	1..n, Assignment List	.-	[Device Para /Profibus /Assignment 17-32]
Latched 27 	Defines whether the Input is latched. Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 17-32]
Assignment 28 	Assignment	1..n, Assignment List	.-	[Device Para /Profibus /Assignment 17-32]
Latched 28 	Defines whether the Input is latched. Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 17-32]
Assignment 29 	Assignment	1..n, Assignment List	.-	[Device Para /Profibus /Assignment 17-32]
Latched 29 	Defines whether the Input is latched. Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 17-32]
Assignment 30 	Assignment	1..n, Assignment List	.-	[Device Para /Profibus /Assignment 17-32]
Latched 30 	Defines whether the Input is latched. Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 17-32]
Assignment 31 	Assignment	1..n, Assignment List	.-	[Device Para /Profibus /Assignment 17-32]
Latched 31 	Defines whether the Input is latched. Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 17-32]
Assignment 32 	Assignment	1..n, Assignment List	.-	[Device Para /Profibus /Assignment 17-32]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Latched 32 	Defines whether the Input is latched.  Only available if: Latched = active	inactive, active	inactive	[Device Para /Profibus /Assignment 17-32]
Slave ID 	Device address (Slave ID) within the bus system. Each device address has to be unique within a bus system.	2 - 125	2	[Device Para /Profibus /Bus parameters]

### Inputs of the Profibus

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Assignment 1-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 1-16]
Assignment 2-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 1-16]
Assignment 3-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 1-16]
Assignment 4-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 1-16]
Assignment 5-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 1-16]
Assignment 6-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 1-16]
Assignment 7-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 1-16]
Assignment 8-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 1-16]
Assignment 9-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 1-16]
Assignment 10-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 1-16]
Assignment 11-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 1-16]
Assignment 12-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 1-16]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Assignment 13-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 1-16]
Assignment 14-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 1-16]
Assignment 15-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 1-16]
Assignment 16-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 1-16]
Assignment 17-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 17-32]
Assignment 18-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 17-32]
Assignment 19-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 17-32]
Assignment 20-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 17-32]
Assignment 21-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 17-32]
Assignment 22-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 17-32]
Assignment 23-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 17-32]
Assignment 24-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 17-32]
Assignment 25-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 17-32]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Assignment 26-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 17-32]
Assignment 27-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 17-32]
Assignment 28-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 17-32]
Assignment 29-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 17-32]
Assignment 30-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 17-32]
Assignment 31-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 17-32]
Assignment 32-I	Module input state: Scada Assignment	[Device Para /Profibus /Assignment 17-32]

### Profibus Signals (Output States)

<i>Signal</i>	<i>Description</i>
Data OK	Data within the Input field are OK (Yes=1)
SubModul Err	Assignable Signal, Failure in Sub-Module, Communication Failure.
Connection active	Connection active
Scada Cmd 1	Scada Command
Scada Cmd 2	Scada Command
Scada Cmd 3	Scada Command
Scada Cmd 4	Scada Command
Scada Cmd 5	Scada Command
Scada Cmd 6	Scada Command
Scada Cmd 7	Scada Command
Scada Cmd 8	Scada Command
Scada Cmd 9	Scada Command
Scada Cmd 10	Scada Command
Scada Cmd 11	Scada Command
Scada Cmd 12	Scada Command
Scada Cmd 13	Scada Command
Scada Cmd 14	Scada Command
Scada Cmd 15	Scada Command
Scada Cmd 16	Scada Command



## Profibus Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
Fr Sync Err	Frames, that were sent from the Master to the Slave are faulty.	1	1 - 99999999	[Operation /Count and RevData /Profibus]
crcErrors	Number of CRC errors that the ss manager has recognized in received response frames from ss (each error caused a subsystem reset)	1	1 - 99999999	[Operation /Count and RevData /Profibus]
frLossErrors	Number of frame loss errors that the ss manager recognized in received response frames from ss (each error caused a subsystem reset)	1	1 - 99999999	[Operation /Count and RevData /Profibus]
ssCrcErrors	Number of CRC errors that the subsystem has recognized in received trigger frames from host	1	1 - 99999999	[Operation /Count and RevData /Profibus]
ssResets	Number of subsystem resets/restarts from ss manager	1	1 - 99999999	[Operation /Count and RevData /Profibus]
Master ID	Device address (Master ID) within the bus system. Each device address has to be unique within a bus system.	1	1 - 125	[Operation /Status Display /Profibus /State]
HO Id PSub	Handoff Id of PbSub	0	0 - 9999999999	[Operation /Status Display /Profibus /State]
t-WatchDog	The Profibus Chip detects a communication issue if this timer is expired without any communication (Parameterising telegram).	0	0 - 9999999999	[Operation /Status Display /Profibus /State]

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
Slave State	Communication State between Slave and Master.	Baud Search	Baud Search, Baud Found, PRM OK, PRM REQ, PRM Fault, CFG Fault, Clear Data, Data exchange	[Operation /Status Display /Profibus /State]
Baud rate	The baud rate that has been detected lastly, will still be shown after a connection issue.	--	12 Mb/s, 6 Mb/s, 3 Mb/s, 1.5 Mb/s, 0.5 Mb/s, 187500 baud, 93750 baud, 45450 baud, 19200 baud, 9600 baud, --	[Operation /Status Display /Profibus /State]
PNO Id	PNO Identification Number. GSD Identification Number.	0C50h	0C50h	[Operation /Status Display /Profibus /State]

## IEC60870-5-103

### IEC 103

## IEC60870-5-103 Protocol Configuration

In order to use the IEC60870-5-103 protocol it has to be assigned to the X103 Interface within the Device Planning. The device will reboot after setting this parameter.

### **NOTICE**

**The parameter X103 is only available if the device is at the rear side equipped with an interface like RS485 or Fiber Optic.**

### **NOTICE**

**If the device is equipped with an Fiber Optic Interface, the Optical Rest Position has to be set within the Device Parameters .**

The time-controlled IEC60870-5-103 protocol is based on the Master-Slave working principle. This means that the substation control and protection system sends an enquiry or instruction to a certain device (slave address) which will then be answered or carried out accordingly.

The device meets the compatibility mode 2. Compatibility mode 3 is not supported.

The following IEC60870-5-103-functions will be supported:

- Initialization (Reset)
- Time Synchronization
- Reading out of time stamped, instantaneous signals
- General Queries
- Cyclic Signals
- General Commands
- Transmission of Disturbance Data

### *Initialization*

The communication has to be reset by a Reset Command each time that the device is turned on or that communication parameters have been changed. The "Reset CU" Command resets. The relay acts on both Reset Commands (Reset CU or Reset FCB).

The relay acts on the reset command by an identification signal ASDU 5 (Application Service Data Unit), as a reason (Cause Of Transmission, COT) for the transmission of the answer either a "Reset CU" or a "Reset FCB" will be sent depending on the type of the reset command. This information can be part of the data section of the ASDU-signal.

### *Name of the Manufacturer*

The section for the identification of the software contains three digits of the device code for the identification of the device type. Beside the upper mentioned identification number the device generates a communication start event.

### *Time Synchronization*

Time and date of the relay can be set by means of the time synchronization function of the IEC60870-5-103 protocol. If the time synchronization signal is send out with a confirmation request, the device will answer with a confirmation signal.

### *Spontaneous Events*

The events that are generated by the device will be forwarded to the master with numbers for standard function types / standard information. The data point list comprises all events that can be generated by the device.

### *Cyclic Measurement*

The device generates on a cyclic base measured values by means of ASDU 9. They can be read out via a class 2 query. Please take into account that the measured values will be send out as multiples (1.2 or 2.4 times the rated value). How to set 1.2 or 2.4 as multiplier for a value can be taken from the data point list.

The parameter "Transm priv meas val" defines if additional measurement values should be transmitted in the private part. Public and private measured values are transmitted by ASDU9. That means that either a "private" or a "public" ASDU9 will be transmitted. If this parameter is set, the ASDU9 will contain additional measured values that are an enhancement of the standard. The "private" ASDU9 is send with a fixed function type and information number that does not depend the type of device. Please refer to the data point list.

### *Commands*

The data point list comprises a list of the supported commands. Any command will be responded by the device with a positive or negative confirmation. If the command is executable, the execution with the corresponding reason for the transmission (COT) will be lead in at first, and subsequently the execution will be confirmed with COT1 within a ASDU9.

### *Disturbance Recording*

The disturbances recorded by the device can be read out by means described in standard IEC60870-5-103. The device is in compliance with the VDEW-Control System by transmission of an ASDU 23 without disturbance records at the beginning of an GI-Cycle.







A disturbance record contains the following information:

- Analog Measured Values, IL1, IL2, IL3, IN, Voltages VL1, VL2, VL3, VEN;
- Binary States, transmitted as marks, e.g. Alarms and Trips.
- The Transmission ratio will not be supported. The transmission ratio is included in the "Multiplier".

### *Blocking the Transmission Direction*

The relay does not support functions to block the transmission in a certain direction (supervision direction).

**Global Protection Parameters of the IEC60870-5-103**

Parameter	Description	Setting range	Default	Menu path
Slave ID 	Device address (Slave ID) within the bus system. Each device address has to be unique within a bus system.	1 - 247	1	[Device Para /IEC 103]
t-call 	If there is no request telegram sent from Scada to the device after expiry of this time - the device concludes a communication failure within the Scada system.	1 - 3600s	60s	[Device Para /IEC 103]
Transm priv meas val 	Transmit additional (private) measuring values	inactive, active	inactive	[Device Para /IEC 103]
Transfer Disturb Rec 	Activates the transmission of disturbance records	inactive, active	inactive	[Device Para /IEC 103]
Baud rate 	Baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600	19200	[Device Para /IEC 103]
Physical Settings 	Digit 1: Number of bits. Digit 2: E=even parity, O=odd parity, N=no parity. Digit 3: Number of stop bits. More information on the parity: It is possible that the last data bit is followed by a parity bit which is used for recognition of communication errors. The parity bit ensures that with even parity ("EVEN") always an even number of bits with valence "1" or with odd parity ("ODD") an odd number of "1" valence bits are transmitted. But it is also possible to transmit no parity bits (here the setting is "Parity = None"). More information on the stop-bits: The end of a data byte is terminated by the stop-bits.	8E1, 8O1, 8N1, 8N2	8E1	[Device Para /IEC 103]
Optical rest position 	Optical rest position	Light off, Light on	Light on	[Device Para /IEC 103]

### IEC60870-5-103 Signals (Output States)

<i>Signal</i>	<i>Description</i>
Scada Cmd 1	Scada Command
Scada Cmd 2	Scada Command
Scada Cmd 3	Scada Command
Scada Cmd 4	Scada Command
Scada Cmd 5	Scada Command
Scada Cmd 6	Scada Command
Scada Cmd 7	Scada Command
Scada Cmd 8	Scada Command
Scada Cmd 9	Scada Command
Scada Cmd 10	Scada Command
Transmission	Signal: SCADA active
Failure Event lost	Failure event lost

### IEC60870-5-103 Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NReceived	Total Number of received Messages	0	0 - 999999999	[Operation /Count and RevData /IEC 103]
NSent	Total Number of sent Messages	0	0 - 999999999	[Operation /Count and RevData /IEC 103]
NBadFramings	Number of bad Messages	0	0 - 999999999	[Operation /Count and RevData /IEC 103]
NBadParities	Number of Parity Errors	0	0 - 999999999	[Operation /Count and RevData /IEC 103]
NBreakSignals	Number of Communication Interrupts	0	0 - 999999999	[Operation /Count and RevData /IEC 103]
NInternalError	Number of Internal Errors	0	0 - 999999999	[Operation /Count and RevData /IEC 103]
NBadCharChecksum	Number of Checksum Errors	0	0 - 999999999	[Operation /Count and RevData /IEC 103]

## IEC61850

### IEC61850

#### Introduction

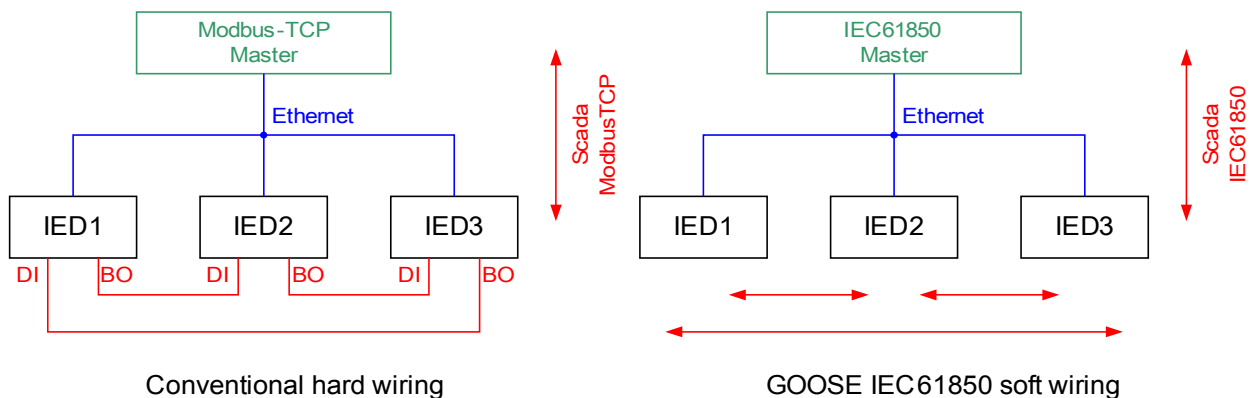
To understand the functioning and mode of operation of a substation in an IEC61850 automation environment, it is useful to compare the commissioning steps with those of a conventional substation in a Modbus TCP environment.

In a conventional substation the individual IEDs (Intelligent Electronic Devices) communicate in vertically direction with the higher level control center via SCADA. The horizontal communication is exclusively realized by wiring output relays (OR) and digital inputs (DI) among each other.

In an IEC61850 environment communication between the IEDs takes place digitally (via Ethernet) by a service called GOOSE (Generic Object Oriented Substation Event). By means of this service information about events is submitted between each IED. Therefore each IED has to know about the functional capability of all other connected IEDs.

Each IEC61850 capable device includes a description of it's own functionality and communications skills (IED Capability Description, \*.ICD).

By means of a Substation Configuration Tool to describe the structure of the substation, assignment of the devices to the primary technique, etc. a virtual wiring of the IEDs among each other and with other switch gear of the substation can be done. A description of the substation configuration will be generated in form of a \*.SCD file. At last this file has to be submitted to each device. Now the IEDs are able to communicate closed among each other, react to interlockings and operate switch gear.



#### Commissioning steps for a conventional substation with modbus TCP environment:

- Parameter setting of the IEDs
- Ethernet installation
- TCP/IP settings for the IEDs
- Wiring according to wiring scheme

#### Commissioning steps for a substation with IEC61850 environment:

1. Parameter setting of the IEDs  
Ethernet installation  
TCP/IP settings for the IEDs
2. IEC61850 configuration (software wiring)
  - a) Exporting an ICD file from each device
  - b) Configuration of the substation (generating a SCD file)
  - c) Transmit SCD file to each device

## **Generation/Export of a device specific ICD file**

Please refer to chapter "IEC61850" of the Smart view Manual.

## **Generation/Export of a SCD file**

Please refer to chapter "IEC61850" of the Smart view Manual.

## **Substation configuration, Generation of .SCD file (Station Configuration Description)**

The substation configuration, i. e. connection of all logical nodes of protection and control devices, as well as switch gear usually is done with a „Substation Configuration Tool“. Therefore the ICD files of all connected IEDs in the IEC61850 environment have to be available. The result of the station wide "software wiring" can be exported in the form of a SCD file (Station Configuration Description).

Suitable Substation Configuration Tools (SCT) are available by the following Companies:

H&S, Hard- & Software Technologie GmbH & Co. KG, Dortmund (Germany) ([www.hstech.de](http://www.hstech.de)).

Applied Systems Engineering Inc. ([www.ase-systems.com](http://www.ase-systems.com))

Kalki Communication Technologies Limited ([www.kalkitech.com](http://www.kalkitech.com))

## **Import of the .SCD file into the device**


Please refer to chapter "IEC61850" of the Smart view Manual.

## **IEC 61850 Virtual Outputs**



Additionally to the standardized logical node status information up to 32 free configurable status information can be assigned to 32 Virtual Outputs. This can be done in the menu [Device Para/IEC61850].








### Direct Commands of the IEC 61850

Parameter	Description	Setting range	Default	Menu path
 ResetStatistic	Reset of all IEC61850 diagnostic counters	inactive, active	inactive	[Operation / Reset/Acknowledg e /Reset]

### Global Parameters of the IEC 61850








Parameter	Description	Setting range	Default	Menu path
 Function	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Device Para /IEC61850]
 Deadb integr time	Deadband integration time.	0 - 300	0	[Device Para /IEC61850]

### Global Parameters of the IEC 61850

Parameter	Description	Setting range	Default	Menu path
 VirtualOutput1	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	..-	[Device Para /IEC61850]
 VirtualOutput2	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	..-	[Device Para /IEC61850]
 VirtualOutput3	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	..-	[Device Para /IEC61850]
 VirtualOutput4	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	..-	[Device Para /IEC61850]
 VirtualOutput5	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	..-	[Device Para /IEC61850]

Parameter	Description	Setting range	Default	Menu path
VirtualOutput6 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput7 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput8 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput9 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput10 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput11 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput12 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput13 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput14 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput15 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]

Parameter	Description	Setting range	Default	Menu path
VirtualOutput16 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput17 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput18 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput19 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput20 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput21 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput22 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput23 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput24 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]
VirtualOutput25 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	--	[Device Para /IEC61850]

Parameter	Description	Setting range	Default	Menu path
VirtualOutput26 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	-.-	[Device Para /IEC61850]
VirtualOutput27 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	-.-	[Device Para /IEC61850]
VirtualOutput28 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	-.-	[Device Para /IEC61850]
VirtualOutput29 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	-.-	[Device Para /IEC61850]
VirtualOutput30 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	-.-	[Device Para /IEC61850]
VirtualOutput31 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	-.-	[Device Para /IEC61850]
VirtualOutput32 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	-.-	[Device Para /IEC61850]

**States of the Inputs of the IEC 61850**

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
VirtOut1-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut2-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut3-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut4-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut5-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut6-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut7-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut8-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut9-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut10-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut11-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut12-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut13-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut14-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut15-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut16-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut17-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut18-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
VirtOut19-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut20-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut21-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut22-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut23-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut24-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut25-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut26-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut27-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut28-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut29-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut30-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut31-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut32-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]

**IEC 61850 Module Signals (Output States)**

<i>Signal</i>	<i>Description</i>
MMS Client connected	At least one MMS client is connected to the device
All Goose Subscriber active	All Goose subscriber in the device are working
VirtInp1	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp2	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp3	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp4	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp5	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp6	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp7	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp8	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp9	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp10	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp11	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp12	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp13	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp14	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp15	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp16	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp17	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp18	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp19	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp20	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp21	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp22	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp23	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp24	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp25	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp26	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp27	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp28	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp29	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp30	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp31	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp32	Signal: Virtual Input (IEC61850 GGIO Ind)
Quality of GGIO In1	Self-Supervision of the GGIO Input
Quality of GGIO In2	Self-Supervision of the GGIO Input
Quality of GGIO In3	Self-Supervision of the GGIO Input
Quality of GGIO In4	Self-Supervision of the GGIO Input

<i>Signal</i>	<i>Description</i>
Quality of GGIO In5	Self-Supervision of the GGIO Input
Quality of GGIO In6	Self-Supervision of the GGIO Input
Quality of GGIO In7	Self-Supervision of the GGIO Input
Quality of GGIO In8	Self-Supervision of the GGIO Input
Quality of GGIO In9	Self-Supervision of the GGIO Input
Quality of GGIO In10	Self-Supervision of the GGIO Input
Quality of GGIO In11	Self-Supervision of the GGIO Input
Quality of GGIO In12	Self-Supervision of the GGIO Input
Quality of GGIO In13	Self-Supervision of the GGIO Input
Quality of GGIO In14	Self-Supervision of the GGIO Input
Quality of GGIO In15	Self-Supervision of the GGIO Input
Quality of GGIO In16	Self-Supervision of the GGIO Input
Quality of GGIO In17	Self-Supervision of the GGIO Input
Quality of GGIO In18	Self-Supervision of the GGIO Input
Quality of GGIO In19	Self-Supervision of the GGIO Input
Quality of GGIO In20	Self-Supervision of the GGIO Input
Quality of GGIO In21	Self-Supervision of the GGIO Input
Quality of GGIO In22	Self-Supervision of the GGIO Input
Quality of GGIO In23	Self-Supervision of the GGIO Input
Quality of GGIO In24	Self-Supervision of the GGIO Input
Quality of GGIO In25	Self-Supervision of the GGIO Input
Quality of GGIO In26	Self-Supervision of the GGIO Input
Quality of GGIO In27	Self-Supervision of the GGIO Input
Quality of GGIO In28	Self-Supervision of the GGIO Input
Quality of GGIO In29	Self-Supervision of the GGIO Input
Quality of GGIO In30	Self-Supervision of the GGIO Input
Quality of GGIO In31	Self-Supervision of the GGIO Input
Quality of GGIO In32	Self-Supervision of the GGIO Input
SPCSO1	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO2	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO3	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO4	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO5	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO6	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO7	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO8	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO9	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO10	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO11	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO12	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).



<i>Signal</i>	<i>Description</i>
SPCSO13	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO14	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO15	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO16	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO17	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO18	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO19	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO20	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO21	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO22	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO23	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO24	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO25	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO26	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO27	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO28	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO29	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO30	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO31	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
SPCSO32	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).

**IEC 61850 Module Values**

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NoOfGooseRxAll	Total number of received GOOSE messages including messages for other devices (subscribed and not subscribed messages).	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfGooseRxSubscribed	Total Number of subscribed GOOSE messages including messages with incorrect content.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfGooseRxCorrect	Total Number of subscribed and correctly received GOOSE messages.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfGooseRxNew	Number of subscribed and correctly received GOOSE messages with new content.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfGooseTxAll	Total Number of GOOSE messages that have been published by this device.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfGooseTxNew	Total Number of new GOOSE messages (modified content) that have been published by this device.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfServerRequestsAll	Total number of MMS Server requests including incorrect requests.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfDataReadAll	Total Number of values read from this device including incorrect requests.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfDataReadCorrect	Total Number of correctly read values from this device.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfDataWrittenAll	Total Number of values written by this device including incorrect ones.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NoOfDataWrittenCorrect	Total Number of correctly written values by this device.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfDataChangeNotification	Number of detected changes within the datasets that are published with GOOSE messages.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
No of Client Connections	Number of active MMS client connections	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]

**Values of the IEC 61850**

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
GoosePublisherState	State of the GOOSE Publisher (on or off)	Off	Off, On, Error	[Operation /Status Display /IEC61850 /State]
GooseSubscriberState	State of the GOOSE Subscriber (on or off)	Off	Off, On, Error	[Operation /Status Display /IEC61850 /State]
MmsServerState	State of MMS Server (on or off)	Off	Off, On, Error	[Operation /Status Display /IEC61850 /State]

## DNP3

### DNP3

DNP (Distributed Network Protocol) is for data and information exchange between SCADA (Master) and IEDs (Intelligent Electronic Devices). The DNP protocol has been developed in first releases for serial communication. Due to further development of the DNP protocol, it offers now also TCP and UDP communication options via Ethernet.

### DNP Device Planning

Depending on the hardware of the protective device up to three DNP communication options are available within the Device Planning.

Call up the device planning menu.

Select (depending on device code) the appropriate SCADA Protocol.

- DNP3 RTU (via serial Port)
- DNP3 TCP (via Ethernet)
- DNP3 UDP (via Ethernet)

### DNP Protocol General Settings

#### **NOTICE**

**Please note that unsolicited reporting is not available for serial communication, if more than one slave is connected to the serial communication (collisions). Do not use in these cases unsolicited reporting for DNP RTU.**

**Unsolicited reporting is available also for serial communication, if each slave is connected via a separated connection to the Master-System. That means, the master is equipped with a separate serial interface for each slave (multi serial cards).**

Call up menu [Device Para/DNP3/Communication].

The Communication (General Settings) Settings have to be set according to the needs of the SCADA (Master) – System.

Self Addressing is available for DNP-TCP. That means that the Master and Slave id are auto-detected.

## Point Mapping

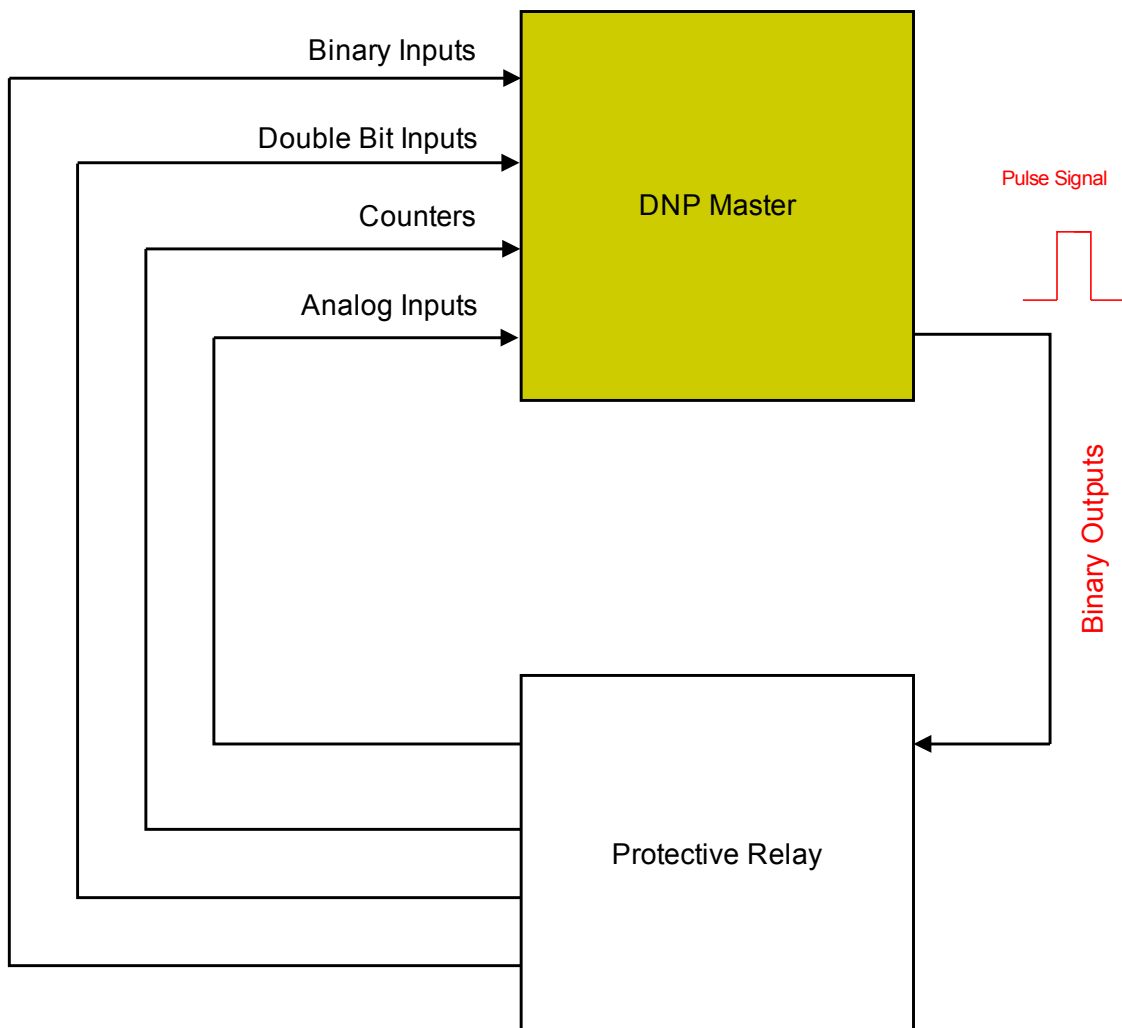
**NOTICE** Please take into account that the designations of inputs and outputs are set from the Masters perspective. This way of choosing the designations is due to a definition in the DNP standard. That means for example that Binary Inputs that can be set within the Device Parameters of the DNP protocol are the “Binary Inputs” of the Master.

Call up menu [Device Para/DNP3/Point Map]. Once the general settings of the DNP protocol are done, the point mapping is to be done as a next step.

- Binary Inputs (States to be send to the master)
- Double Bit Inputs (Breaker states to be send to the master)
- Counters (Counters to be send to the master)
- Analog Inputs (e.g. measured values to be send to the master). Please take into account that floating values have to be transmitted as integers. That means they have to be scaled (multiplied) with a scaling factor in order to bring them into the integer format.

Use Binary outputs in order to control e.g. LEDs or Relays within the protective device (via Logic).

### Point Mapping



Please try to avoid gaps that will slow down the performance of the DNP communication. That means do not leave unused inputs / outputs in between used inputs / outputs (e.g. Do not use Binary Output 1 and 3 when 2 is unused).

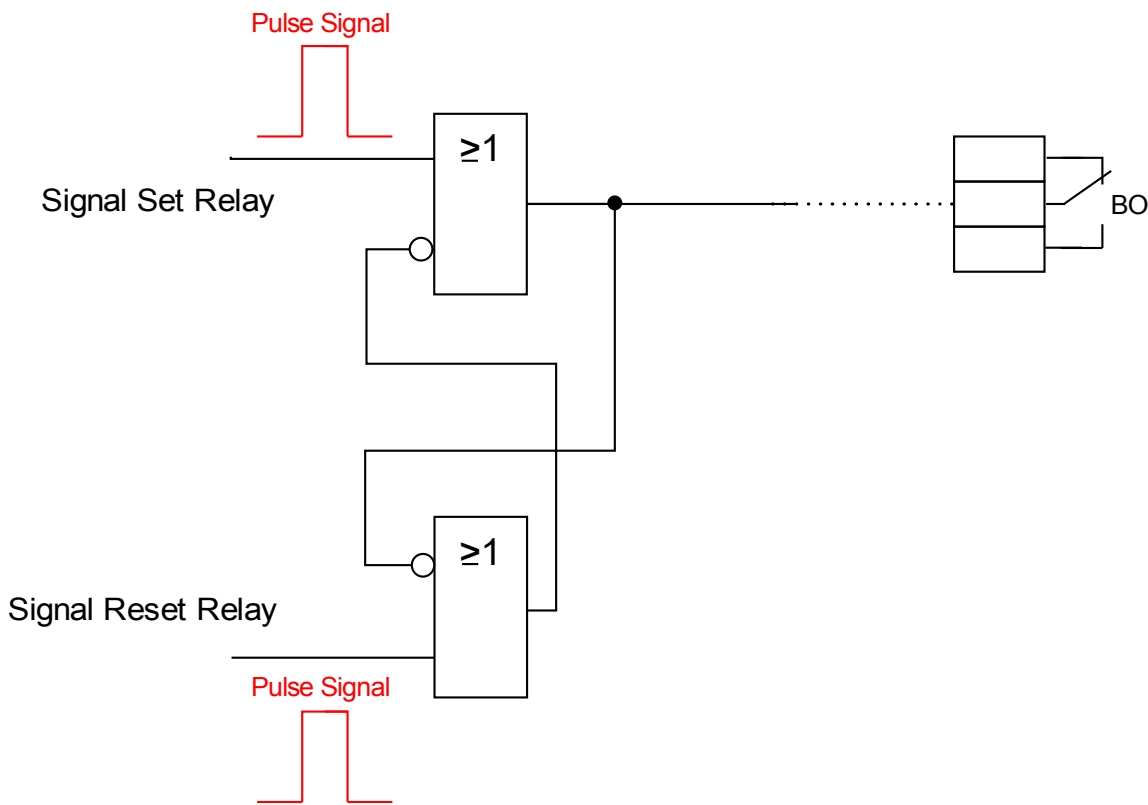
### Application Example Setting a Relay:

Binary Output signals of the DNP cannot directly be used in order to switch relays because the DNP Binary Outputs are pulse signals (by DNP definition, not steady state). Steady states can be created by means of Logic functions. The Logic Functions can be assigned onto the Relay Inputs.




Please note: You can use a Set/Reset element (Flip Flop) from Logics.

### Logics





Assign Logic Functions onto Relay Inputs













### Direct Commands of the DNP

Parameter	Description	Setting range	Default	Menu path
Res all Diag Cr 	Reset all diagnosis counters	inactive, active	inactive	[Operation / Reset/Acknowledge /Reset]
Slave Id 	SlaveId defines the DNP3 address of this device (Outstation)	0 - 65519	1	[Device Para /DNP3 /Communication]
Master Id 	MasterId defines the DNP3 address of master (SCADA)	0 - 65519	65500	[Device Para /DNP3 /Communication]










### Global Protection Parameters of the DNP





Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Device Para /DNP3 /Communication]
IP Port Number 	Port Number of the IP address	0 - 65535	20000	[Device Para /DNP3 /Communication]
Baud rate 	Baud rate for communication	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	19200	[Device Para /DNP3 /Communication]
Frame Layout 	Frame Layout	8E1, 8O1, 8N1, 8N2	8E1	[Device Para /DNP3 /Communication]





Parameter	Description	Setting range	Default	Menu path
 Optical rest position	Optical rest position	Light off, Light on	Light on	[Device Para /DNP3 /Communication]
 SelfAddress	Support of self (automatic) addresses	inactive, active	inactive	[Device Para /DNP3 /Communication]
 DataLink confirm	Enables or disables the data layer confirmation (ack).	Never, Always, On_Large	Never	[Device Para /DNP3 /Communication]
 t-DataLink confirm	Data layer confirmation timeout	0.1 - 10.0s	1s	[Device Para /DNP3 /Communication]
 DataLink num retries	Number of repetition of data link packet sending after failing	0 - 255	3	[Device Para /DNP3 /Communication]
 Direction Bit	Enables Direction Bit functionality. The Direction Bit is 0 for SlaveStation and 1 for MasterStation	inactive, active	inactive	[Device Para /DNP3 /Communication]
 Max Frame Size	This value is used to limit the net Frame Size	64 - 255	255	[Device Para /DNP3 /Communication]
 Test Link Period	This value specifies the time period when to send a Test Link-Frame	0.0 - 120.0s	0s	[Device Para /DNP3 /Communication]
 AppLink confirm	Determines if the device will request that the Application Layer response be confirmed or not	Never, Always, Event	Always	[Device Para /DNP3 /Communication]
 t-AppLink confirm	Application layer response timeout	0.1 - 10.0s	5s	[Device Para /DNP3 /Communication]
 AppLink num retries	The number of times the device will retransmit an Application Layer fragment	0 - 255	0	[Device Para /DNP3 /Communication]















Parameter	Description	Setting range	Default	Menu path
Unsol Reporting 	Enables supports unsolicited reporting. This is only for Network connections available. For serial connection this setting is fix set to inactive	inactive, active	inactive	[Device Para /DNP3 /Communication]
Unsol Reporting Timeout 	Set the amount of time that the outstation will wait for an Application Layer confirmation back from the master indicating that the master received the unsolicited response message.	1.0 - 60.0s	10s	[Device Para /DNP3 /Communication]
Unsol Reporting Retry 	Set the number of retries that an outstation transmits in each unsolicited response series if it does not receive confirmation back from the master.	0 - 255	2	[Device Para /DNP3 /Communication]
TestSeqNo 	Test if sequence number of request is incremented. If it is not correctly incremented the request will be ignored. It is recommended to have it inactive but some older DNP implementations need it activated.	inactive, active	inactive	[Device Para /DNP3 /Communication]
TestSBO 	It enables a stricter comparing of SBO and operate command. For older DNP versions it is recommended to deactivated it.	inactive, active	active	[Device Para /DNP3 /Communication]
Timeout SBO 	DNP Outputs can be controlled in a two stage procedure (SBO: Select Before Operate). These outputs are to be selected first by a select command. After this the bit is reserved for this operate request. When this timer is expired, the bit will be released.	1.0 - 60.0s	30s	[Device Para /DNP3 /Communication]
ColdRestart 	Enables support for Cold Restart function.	inactive, active	inactive	[Device Para /DNP3 /Communication]
Deadb integr time 	Deadband integration time.	0 - 300	1	[Device Para /DNP3 /Communication]
BinaryInput 0 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 1 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]










Parameter	Description	Setting range	Default	Menu path
BinaryInput 2 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 3 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 4 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 5 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 6 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 7 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 8 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 9 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 10 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]



<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
BinaryInput 11 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 12 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 13 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 14 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 15 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 16 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 17 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 18 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 19 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]

Parameter	Description	Setting range	Default	Menu path
BinaryInput 20 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 21 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 22 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 23 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 24 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 25 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 26 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 27 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 28 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]

Parameter	Description	Setting range	Default	Menu path
BinaryInput 29 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 30 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 31 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 32 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 33 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 34 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 35 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 36 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 37 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]









<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
BinaryInput 38 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 39 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 40 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 41 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 42 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 43 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 44 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 45 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 46 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]







Parameter	Description	Setting range	Default	Menu path
BinaryInput 47 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 48 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 49 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 50 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 51 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 52 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 53 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 54 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 55 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]







<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
BinaryInput 56 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 57 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 58 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 59 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 60 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 61 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 62 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput 63 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Binary Inputs]
DoubleBitInput 0 	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Double Bit Inputs]















Parameter	Description	Setting range	Default	Menu path
 DoubleBitInput 1	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Double Bit Inputs]
 DoubleBitInput 2	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Double Bit Inputs]
 DoubleBitInput 3	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Double Bit Inputs]
 DoubleBitInput 4	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Double Bit Inputs]
 DoubleBitInput 5	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /Double Bit Inputs]
 BinaryCounter 0	Counter can be used to report counter values to the DNP master.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /BinaryCounter]
 BinaryCounter 1	Counter can be used to report counter values to the DNP master.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /BinaryCounter]
 BinaryCounter 2	Counter can be used to report counter values to the DNP master.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /BinaryCounter]
 BinaryCounter 3	Counter can be used to report counter values to the DNP master.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /BinaryCounter]







Parameter	Description	Setting range	Default	Menu path
BinaryCounter 4 	Counter can be used to report counter values to the DNP master.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /BinaryCounter]
BinaryCounter 5 	Counter can be used to report counter values to the DNP master.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /BinaryCounter]
BinaryCounter 6 	Counter can be used to report counter values to the DNP master.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /BinaryCounter]
BinaryCounter 7 	Counter can be used to report counter values to the DNP master.	1..n, Assignment List	--	[Device Para /DNP3 /Point map /BinaryCounter]
Analog value 0 	Analog value can be used to report values to the master (DNP)	1..n, TrendReclList	--	[Device Para /DNP3 /Point map /Analog Input]
Scale Factor 0 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 0 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 1 	Analog value can be used to report values to the master (DNP)	1..n, TrendReclList	--	[Device Para /DNP3 /Point map /Analog Input]







Parameter	Description	Setting range	Default	Menu path
Scale Factor 1 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 1 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 2 	Analog value can be used to report values to the master (DNP)	1..n, TrendReclList	--	[Device Para /DNP3 /Point map /Analog Input]
Scale Factor 2 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 2 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 3 	Analog value can be used to report values to the master (DNP)	1..n, TrendReclList	--	[Device Para /DNP3 /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 3 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 3 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 4 	Analog value can be used to report values to the master (DNP)	1..n, TrendReclList	--	[Device Para /DNP3 /Point map /Analog Input]
Scale Factor 4 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 4 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 5 	Analog value can be used to report values to the master (DNP)	1..n, TrendReclList	--	[Device Para /DNP3 /Point map /Analog Input]







Parameter	Description	Setting range	Default	Menu path
Scale Factor 5 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 5 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 6 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]
Scale Factor 6 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 6 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 7 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]







Parameter	Description	Setting range	Default	Menu path
Scale Factor 7 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 7 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 8 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]
Scale Factor 8 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 8 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 9 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]







Parameter	Description	Setting range	Default	Menu path
Scale Factor 9 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 9 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 10 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]
Scale Factor 10 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 10 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 11 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]







Parameter	Description	Setting range	Default	Menu path
Scale Factor 11 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 11 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 12 	Analog value can be used to report values to the master (DNP)	1..n, TrendReclList	--	[Device Para /DNP3 /Point map /Analog Input]
Scale Factor 12 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 12 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 13 	Analog value can be used to report values to the master (DNP)	1..n, TrendReclList	--	[Device Para /DNP3 /Point map /Analog Input]















Parameter	Description	Setting range	Default	Menu path
Scale Factor 13 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 13 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 14 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]
Scale Factor 14 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 14 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 15 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]







Parameter	Description	Setting range	Default	Menu path
Scale Factor 15 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 15 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 16 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]
Scale Factor 16 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 16 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 17 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]







Parameter	Description	Setting range	Default	Menu path
Scale Factor 17 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 17 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 18 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]
Scale Factor 18 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 18 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 19 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 19 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 19 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 20 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]
Scale Factor 20 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 20 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 21 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]







Parameter	Description	Setting range	Default	Menu path
Scale Factor 21 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 21 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 22 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]
Scale Factor 22 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 22 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 23 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]



Parameter	Description	Setting range	Default	Menu path
Scale Factor 23 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 23 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 24 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]
Scale Factor 24 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 24 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 25 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 25 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 25 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 26 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]
Scale Factor 26 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 26 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 27 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 27 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 27 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 28 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]
Scale Factor 28 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 28 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 29 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]



Parameter	Description	Setting range	Default	Menu path
Scale Factor 29 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 29 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 30 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]
Scale Factor 30 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 30 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]
Analog value 31 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	--	[Device Para /DNP3 /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 31 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP3 /Point map /Analog Input]
Dead Band 31 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP3 /Point map /Analog Input]

### Inputs of the DNP

Name	Description	Assignment via
BinaryInput0-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput1-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput2-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput3-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput4-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]

Name	Description	Assignment via
BinaryInput5-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput6-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput7-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput8-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput9-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput10-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput11-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput12-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput13-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]

Name	Description	Assignment via
BinaryInput14-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput15-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput16-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput17-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput18-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput19-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput20-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput21-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput22-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]

Name	Description	Assignment via
BinaryInput23-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput24-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput25-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput26-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput27-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput28-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput29-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput30-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput31-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]

Name	Description	Assignment via
BinaryInput32-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput33-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput34-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput35-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput36-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput37-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput38-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput39-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput40-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]

Name	Description	Assignment via
BinaryInput41-l	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput42-l	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput43-l	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput44-l	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput45-l	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput46-l	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput47-l	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput48-l	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput49-l	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]

Name	Description	Assignment via
BinaryInput50-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput51-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput52-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput53-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput54-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput55-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput56-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput57-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput58-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]



Name	Description	Assignment via
BinaryInput59-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput60-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput61-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput62-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
BinaryInput63-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP3 /Point map /Binary Inputs]
DoubleBitInput0-I	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	[Device Para /DNP3 /Point map /Double Bit Inputs]
DoubleBitInput1-I	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	[Device Para /DNP3 /Point map /Double Bit Inputs]
DoubleBitInput2-I	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	[Device Para /DNP3 /Point map /Double Bit Inputs]
DoubleBitInput3-I	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	[Device Para /DNP3 /Point map /Double Bit Inputs]

Name	Description	Assignment via
DoubleBitInput4-I	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	[Device Para /DNP3 /Point map /Double Bit Inputs]
DoubleBitInput5-I	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	[Device Para /DNP3 /Point map /Double Bit Inputs]

### Options of the DNP

Name	Description
-.-	No assignment
Prot.FaultNo	Disturbance No
Prot.No of grid faults	Number of grid faults: A grid fault, e.g. a short circuit, might cause several faults with trip and autoreclosing, each fault being identified by an increased fault number. In this case, the grid fault number remains the same.
SG[1].TripCmd Cr	Counter: Total number of trips of the switchgear (circuit breaker, load break switch...). Resettable with Total or All.
MStart.StartPerHour	StartPerHour
MStart.SPH Release	In case that the Motor is blocked by a SPH blocking, this timer needs to be expired before the blocking is released and the next motor start is permitted. The next Motor Start will increment the SPH counter again.
MStart.ColdStartPermit	Number of cold starts remaining
MStart.OCNT	Motor Operation count since last reset.
MStart.RunTime	Motor Operation time since last reset.
MStart.nEmrgOvr	Number of emergency overrides since last reset.
MStart.TRunTime	Motor Operation (Motor run time) time since last reset.
MStart.TOCS	Total Motor Operation count since last reset.
MStart.nTRNTrips	Number of transition trips since last reset.
MStart.nRevTrips	Number of reverse spinning trips since last reset.
MStart.nZSWTrips	Number of zero speed switch trips since last reset.
MStart.nISQT	Number of incomplete sequence trips since last reset.
MStart.nSPHBlocks	Number of start per hour blocks since last reset.
MStart.nTBSBlocks	Number of time between start blocks since last reset.
Sys.Operating hours Cr	Operating hours counter of the protective device
Sys.Hours Counter	Hours Counter

## Selectable Switchgears of the DNP

<i>Name</i>	<i>Description</i>
-.-	No assignment
SG[1].Pos	Signal: Circuit Breaker Position (0 = Indeterminate, 1 = OFF, 2 = ON, 3 = Disturbed)

## DNP Signals (Output States)

**NOTICE** Some signals (that are for a short time active only) have to be acknowledged separately (e.g. Trip signals) by the Communication System.

<i>Signal</i>	<i>Description</i>
busy	This message is set if the protocol is started. It will be reset if the protocol is shut down.
ready	The message will be set if the protocol is successfully started and ready for data exchange.
active	The communication with the Master (Scada) is active.
BinaryOutput0	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput1	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput2	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput3	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput4	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput5	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput6	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput7	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput8	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput9	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput10	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput11	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput12	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput13	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput14	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput15	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput16	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput17	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput18	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput19	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput20	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput21	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput22	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput23	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput24	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput25	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput26	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput27	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput28	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput29	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput30	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput31	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.

**DNP Values**

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NReceived	Diagnostic counter: Number of received characters	0	0 - 9999999999	[Operation /Count and RevData /DNP3]
NSent	Diagnostic counter: Number of sent characters	0	0 - 9999999999	[Operation /Count and RevData /DNP3]
NBadFramings	Diagnostic counter: Number of bad framings. A large number indicates a disturbed serial connection.	0	0 - 9999999999	[Operation /Count and RevData /DNP3]
NBadParities	Diagnostic counter: Number of parity errors. A large number indicates a disturbed serial connection.	0	0 - 9999999999	[Operation /Count and RevData /DNP3]
NBreakSignals	Diagnostic counter: Number of break signals. A large number indicates a disturbed serial connection.	0	0 - 9999999999	[Operation /Count and RevData /DNP3]
NBadChecksum	Diagnostic counter: Number of frames received with bad checksum.	0	0 - 9999999999	[Operation /Count and RevData /DNP3]

# Time Synchronisation

## TimeZones

The user has the possibility to synchronise the device with a central time generator. This offers the following advantages:

- The time does not drift off from the reference time. A continuously accumulating deviation from the reference time thereby will be balanced. Also refer to the chapter Specifications (Tolerances Real Time Clock).
- All time synchronised devices operate with the same time. Thus logged events of the individual devices can be compared exactly and be evaluated in conjunction (single events of the event recorder, disturbance records).

The device's time can be synchronised via the following protocols:

- IRIG-B
- SNTP
- Communications-Protocol Modbus (RTU or TCP)
- Communications-Protocol IEC60870-5-103

The provided protocols use different hardware interfaces and differ also in their achieved time accuracy. Further information can be found in the chapter Specifications.

<i>Used Protocol</i>	<i>Hardware-Interface</i>	<i>Recommended Application</i>
Without time synchronisation	---	Not recommended
IRIG-B	IRIG-B Terminal	Recommended, if interface available
SNTP	RJ45 (Ethernet)	Recommended alternative to IRIG-B, especially when using IEC 61850 or Modbus TCP
Modbus RTU	RS485, D-SUB or Fibre Optic	Recommended when using Modbus RTU communication protocol and when no IRIG-B code generator is available
Modbus TCP	RJ45 (Ethernet)	Limited recommendation when Modbus TCP communication protocol is used and no IRIG-B code generator or SNTP-Server is available
IEC 60870-5-103	RS485, D-SUB or Fibre Optic	Recommended when using IEC 10870-5-103 communication protocol and no IRIG-B code generator is available

## Accuracy of Time Synchronisation

The accuracy of the device's synchronised system time depends on several factors:

- accuracy of the connected time generator
- used synchronisation protocol
- when using Modbus TCP or SNTP: Network load and data package transmission times

### **NOTICE**

**Please consider the accuracy of the used time generator. Fluctuations of the time generator's time will cause the same fluctuations of the protection relay's system time.**

## Selection of Timezone and Synchronisation Protocol

The protection relay masters both UTC and local time. This means that the device can be synchronised with UTC time while using local time for user display.

### Time Synchronisation with UTC time (recommended):

Time synchronisation is usually done using UTC time. This means for example that an IRIG-B time generator is sending UTC time information to the protection relay. This is the recommended use case, since here a continuous time synchronisation can be ensured. There are no “leaps in time” through change of summer- and wintertime.

To achieve that the device shows the current local time, the timezone and the change between summer- and wintertime can be configured.

Please carry out the following parameterization steps under [Device Para/ Time]:

1. Select your local timezone in the timezone menu.
2. There also configure the switching of daylight saving time.
3. Select the used time synchronisation protocol in the TimeSync menu (e.g. “IRIG-B”).
4. Set the parameters of the synchronisation protocol (refer to the according chapter).

### Time Synchronisation with local time:

Should the time synchronisation however be done using local time, then please leave the timezone to »UTC+0 London« and do not use switching of daylight saving time.

## NOTICE

The synchronisation of the relay's system time is exclusively done by the synchronisation protocol selected in the menu [Device Para/ Time/ TimeSync/ Used Protocol].

### Without Time Synchronisation:







To achieve that the device shows the current local time, the timezone and the change between summer- and wintertime can be configured.








Please carry out the following parameterization steps under [Device Para/ Time]:

1. Select your local timezone in the timezone menu.
2. There also configure the switching of daylight saving time.
3. Select »manual« as your used protocol in the TimeSync menu.
4. Set date and time.





### Global Protection Parameters of the Time Synchronization

Parameter	Description	Setting range	Default	Menu path
 DST offset	Difference to wintertime	-180 - 180min	60min	[Device Para /Time /Timezone]
 DST manual	Manual setting of the Daylight Saving Time	inactive, active	active	[Device Para /Time /Timezone]
 Summertime	Daylight Saving Time Only available if: DST manual = active	inactive, active	inactive	[Device Para /Time /Timezone]
 Summertime m	Month of clock change summertime Only available if: DST manual = inactive	January, February, March, April, May, June, July, August, September, October, November, December	March	[Device Para /Time /Timezone]
 Summertime d	Day of clock change summertime Only available if: DST manual = inactive	Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, General day	Sunday	[Device Para /Time /Timezone]
 Summertime w	Place of selected day in month (for clock change summertime) Only available if: DST manual = inactive	First, Second, Third, Fourth, Last	Last	[Device Para /Time /Timezone]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Summertime h 	Hour of clock change summertime Only available if: DST manual = inactive	0 - 23h	2h	[Device Para /Time /Timezone]
Summertime min 	Minute of clock change summertime Only available if: DST manual = inactive	0 - 59min	0min	[Device Para /Time /Timezone]
Wintertime m 	Month of clock change wintertime Only available if: DST manual = inactive	January, February, March, April, May, June, July, August, September, October, November, December	October	[Device Para /Time /Timezone]
Wintertime d 	Day of clock change wintertime Only available if: DST manual = inactive	Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, General day	Sunday	[Device Para /Time /Timezone]
Wintertime w 	Place of selected day in month (for clock change wintertime) Only available if: DST manual = inactive	First, Second, Third, Fourth, Last	Last	[Device Para /Time /Timezone]
Wintertime h 	Hour of clock change wintertime Only available if: DST manual = inactive	0 - 23h	3h	[Device Para /Time /Timezone]
Wintertime min 	Minute of clock change wintertime Only available if: DST manual = inactive	0 - 59min	0min	[Device Para /Time /Timezone]

Time Synchronisation

Parameter	Description	Setting range	Default	Menu path
Time Zones 	Time Zones	UTC+14 Kiritimati, UTC+13 Rawaki, UTC+12.75 Chat- ham Island, UTC+12 Welling- ton, UTC+11.5 Kings- ton, UTC+11 Port Vila, UTC+10.5 Lord Howe Island, UTC+10 Sydney, UTC+9.5 Adelaide, UTC+9 Tokyo, UTC+8 Hong Kong, UTC+7 Bangkok, UTC+6.5 Rangoon, UTC+6 Colombo, UTC+5.75 Kath- mandu, UTC+5.5 New Del- hi, UTC+5 Islamabad, UTC+4.5 Kabul, UTC+4 Abu Dhabi, UTC+3.5 Tehran, UTC+3 Moscow, UTC+2 Athens, UTC+1 Berlin, UTC+0 London, UTC-1 Azores, UTC-2 Fern. d. No- ronha, UTC-3 Buenos Ai- res, UTC-3.5 St. John's, UTC-4 Santiago, UTC-5 New York, UTC-6 Chicago, UTC-7 Salt Lake City, UTC-8 Los Ange- les,	UTC+0 London	[Device Para /Time /Timezone]

Parameter	Description	Setting range	Default	Menu path
TimeSync 	Time synchronisation	-, IRIG-B, SNTP, Modbus, IEC60870-5-103, DNP3	-	[Device Para /Time /TimeSync /TimeSync]

## SNTP

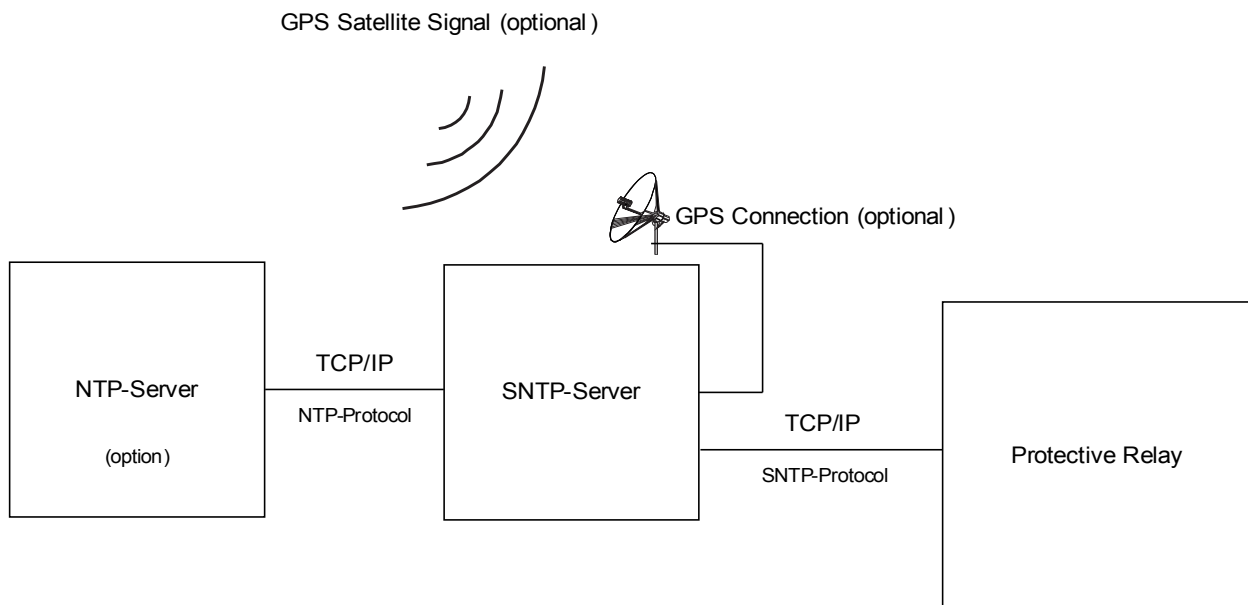
### SNTP

**NOTICE** Important pre-condition: The protective relay needs to have access to a SNTP server via the connected network. This server preferably should be installed locally.

### Principle – General Use

SNTP is a standard protocol for time synchronisation via a network. For this at least one SNTP server has to be available within the network. The device can be configured for one or two SNTP servers.

The protection relay's system time will be synchronised with the connected SNTP server 1-4 times per minute. In turn the SNTP server synchronises its time via NTP with other NTP servers. This is the normal case. Alternatively it can synchronise its time via GPS, radio controlled clock or the like.



## Accuracy

The accuracy of the used SNTP server and the excellence of its reference clock influences the accuracy of the protection relay's clock.

For further information about accuracy refer to chapter Specifications.

With each transmitted time information, the SNTP server also sends information about its accuracy:

- **Stratum:** The stratum indicates over how many interacting NTP-Servers the used SNTP server is connected to an atomic or radio controlled clock.
- **Precision:** This indicates the accuracy of the system time provided by the SNTP server.

Additionally the performance of the connected network (traffic and data package transmission times) has an influence on the accuracy of the time synchronisation.

Recommended is a locally installed SNTP server with an accuracy of  $\leq 200$   $\mu$ sec. If this cannot be realised, the connected server's excellence can be checked in the menu [Operation/Status Display/TimeSync]:

- The server quality gives information about the accuracy of the used server. The quality should be GOOD or SUFFICIENT. A server with BAD quality should not be used, because this could cause fluctuations in time synchronisation.
- The network quality gives information about the network's load and data package transmission time. The quality should be GOOD or SUFFICIENT. A network with BAD quality should not be used, because this could cause fluctuations in time synchronisation.

## Using two SNTP Servers

When configuring two SNTP servers, the device selects the server with the lower stratum value, because this generally provides a more precise time synchronisation. If the servers have the same stratum value, the device selects the server with the better precision. It does not matter, which of the servers is configured as server 1 or server 2.

When the last used server fails, the device automatically switches to the other server. Should the first server recover after some time, the device switches back to this (better) server automatically.

## SNTP Commissioning

Activate the SNTP time synchronisation by means of the menu [Device Para/ Time/ TimeSync]:

- Select »SNTP« in the time synchronisation menu.
- Set the IP address of the first server in the SNTP menu.
- Set the IP address of the second server, if available.
- Set all configured servers to "active".


## Fault Analysis

If there is no SNTP signal for more than 120 sec, the SNTP status changes from “active” to “inactive” and an entry in the Event Recorder will be created.


The SNTP functionality can be checked in the menu [Operation/Status Display/TimeSync/Sntp]:  
 If the SNTP status is not indicated as being “active”, please proceed as follows:

- Check if the wiring is correct (Ethernet-cable connected).
- Check if a valid IP address is set in the device (Device Para/TCP/IP).
- Check if the Ethernet connection is active (Device Para/TCP/IP/Link = Up?).
- Check if both the SNTP server and the protection device answer to a Ping.
- Check if the SNTP server is up and working.










## Device Planning Parameters of the SNTP


Parameter	Description	Options	Default	Menu path
Mode 	Mode	do not use, use	do not use	[Device planning]

## Direct Commands of the SNTP

Parameter	Description	Setting range	Default	Menu path
Res Counter 	Reset all Counters.	inactive, active	inactive	[Operation / Reset/Acknowledg e /Reset]

## Global Protection Parameters of the SNTP

Parameter	Description	Setting range	Default	Menu path
Server1 	Server 1	inactive, active	inactive	[Device Para /Time /TimeSync /SNTP]
IP Byte1 	IP1.IP2.IP3.IP4	0 - 255	0	[Device Para /Time /TimeSync /SNTP]
IP Byte2 	IP1.IP2.IP3.IP4	0 - 255	0	[Device Para /Time /TimeSync /SNTP]
IP Byte3 	IP1.IP2.IP3.IP4	0 - 255	0	[Device Para /Time /TimeSync /SNTP]
IP Byte4 	IP1.IP2.IP3.IP4	0 - 255	0	[Device Para /Time /TimeSync /SNTP]
Server2 	Server 2	inactive, active	inactive	[Device Para /Time /TimeSync /SNTP]
IP Byte1 	IP1.IP2.IP3.IP4	0 - 255	0	[Device Para /Time /TimeSync /SNTP]
IP Byte2 	IP1.IP2.IP3.IP4	0 - 255	0	[Device Para /Time /TimeSync /SNTP]
IP Byte3 	IP1.IP2.IP3.IP4	0 - 255	0	[Device Para /Time /TimeSync /SNTP]

Parameter	Description	Setting range	Default	Menu path
IP Byte4 	IP1.IP2.IP3.IP4	0 - 255	0	[Device Para /Time /TimeSync /SNTP]

## Signals of the SNTP

Signal	Description
SNTP active	Signal: If there is no valid SNTP signal for 120 sec, SNTP is regarded as inactive.

## SNTP Counters

Value	Description	Default	Size	Menu path
NoOfSyncs	Total Number of Synchronizations.	0	0 - 999999999	[Operation /Count and RevData /TimeSync /SNTP]
NoOfConnectLost	Total Number of lost SNTP Connections (no sync for 120 sec).	0	0 - 999999999	[Operation /Count and RevData /TimeSync /SNTP]
NoOfSmallSyncs	Service counter: Total Number of very small Time Corrections.	0	0 - 999999999	[Operation /Count and RevData /TimeSync /SNTP]
NoOfNormSyncs	Service counter: Total Number of normal Time Corrections	0	0 - 999999999	[Operation /Count and RevData /TimeSync /SNTP]
NoOfBigSyncs	Service counter: Total Number of big Time Corrections	0	0 - 999999999	[Operation /Count and RevData /TimeSync /SNTP]
NoOfFiltSyncs	Service counter: Total Number of filtered Time Corrections	0	0 - 999999999	[Operation /Count and RevData /TimeSync /SNTP]



## Time Synchronisation

---

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NoOfSlowTrans	Service counter: Total Number of slow Transfers.	0	0 - 9999999999	[Operation /Count and RevData /TimeSync /SNTP]
NoOfHighOffs	Service counter: Total Number of high Offsets.	0	0 - 9999999999	[Operation /Count and RevData /TimeSync /SNTP]
NoOfIntTimeouts	Service counter: Total Number of internal timeouts.	0	0 - 9999999999	[Operation /Count and RevData /TimeSync /SNTP]
StratumServer1	Stratum of Server 1	0	0 - 9999999999	[Operation /Status Display /TimeSync /SNTP]
StratumServer2	Stratum of Server 2	0	0 - 9999999999	[Operation /Status Display /TimeSync /SNTP]

## SNTP Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
Used Server	Which Server is used for SNTP synchronization.	None	Server1, Server2, None	[Operation /Status Display /TimeSync /SNTP]
PrecServer1	Precision of Server 1	0ms	0 - 1000.00000ms	[Operation /Status Display /TimeSync /SNTP]
PrecServer2	Precision of Server 2	0ms	0 - 1000.00000ms	[Operation /Status Display /TimeSync /SNTP]
ServerQty	Quality of Server used for Synchronization (GOOD, SUFFICIENT, BAD)	-	GOOD, SUFFICIENT, BAD, -	[Operation /Status Display /TimeSync /SNTP]
NetConn	Quality of Network Connection (GOOD, SUFFICIENT, BAD).	-	GOOD, SUFFICIENT, BAD, -	[Operation /Status Display /TimeSync /SNTP]

## IRIG-B00X

### IRIG-B

**NOTICE** Requirement: An IRIG-B00X time code generator is needed. IRIG-B004 and higher will support/transmit the “year information”.

If you are using an IRIG time code that does not support the “year information” (IRIG-B000, IRIG-B001, IRIG-B002, IRIG-B003), you have to set the “year” manually within the device. In these cases the correct year information is a precondition for a properly working IRIG-B.

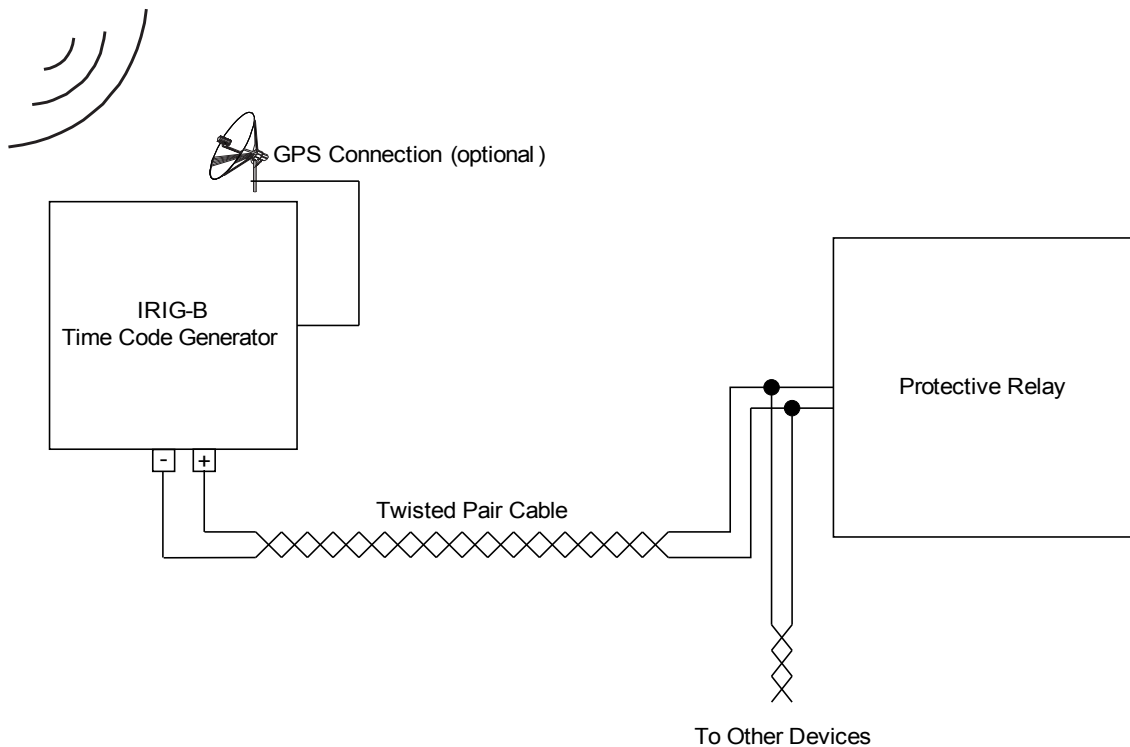
### Principle - General Use

The IRIG-B standard is the most used standard to synchronize the time of protection devices in medium voltage applications.

The protection device supports IRIG-B according to the IRIG STANDARD 200-04. This means that all time synchronization formats IRIG-B00X (IRIG-B000 / B001 / B002 / B003 / B004 / B005 / B006 / B007) are supported. It is recommended to use IRIG-B004 and higher which also transmits the “year information”.

The system time of the protection device is being synchronized with the connected IRIG-B code generator once a second. The accuracy of the used IRIG-B code generator can be increased by connecting a GPS-receiver to it.

GPS Satellite Signal (optional)



The location of the IRIG-B interface depends to the device type. Please refer to the wiring diagram supplied with the protective device.

## IRIG-B Commissioning

Activate the IRIG-B synchronization within menu [Device Para/ Time/ TimeSync]:

- Select »IRIG-B« in the time synchronisation menu.
- Set the time synchronization in the IRIG-B menu to »Active«.
- Select the IRIG-B type (choose B000 through B007).

## Fault Analysis

If the device does not receive any IRIG-B time code for more than 60 s, the IRIG-B status switches from »active« to »inactive« and there is created an entry within the Event Recorder.

Check the IRIG-B functionality through the menu [Operation/ Status display/ TimeSync/ IRIG-B]:  
Should the IRIG-B status not be reported as being »active«, please proceed as follows:


- To begin with check the IRIG-B wiring.
- Check, if the correct IRIG-B00X type is configured.

## IRIG-B Control Commands


In addition to the date and time information, the IRIG-B code offers the option to transmit up to 18 control commands that can be processed by the protective device. They have to be set and issued by the IRIG-B code generator.

The protective device offers up to 18 IRIG-B assignment options for those control commands in order to carry out the assigned action. If there is a control command assigned to an action, this action is being triggered as soon as the control command is transmitted as being true. As an example there can be triggered the start of statistics or the street lighting can be switched on through a relay.



### Device Planning Parameters of the IRIG-B00X

Parameter	Description	Options	Default	Menu path
Mode 	Mode	do not use, use	do not use	[Device planning]

### Direct Commands of the IRIG-B00X

Parameter	Description	Setting range	Default	Menu path
Res IRIG-B Cr 	Resetting of the Diagnosis Counters: IRIG-B	inactive, active	inactive	[Operation / Reset/Acknowledge /Reset]

### Global Protection Parameters of the IRIG-B00X

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Device Para /Time /TimeSync /IRIG-B]
IRIG-B00X 	Determination of the Type: IRIG-B00X. IRIG-B types differ in types of included "Coded Expressions" (year, control-functions, straight-binary-seconds).	IRIGB-000, IRIGB-001, IRIGB-002, IRIGB-003, IRIGB-004, IRIGB-005, IRIGB-006, IRIGB-007	IRIGB-000	[Device Para /Time /TimeSync /IRIG-B]

## Signals of the IRIG-B00X (Output States)

<i>Signal</i>	<i>Description</i>
IRIG-B active	Signal: If there is no valid IRIG-B signal for 60 sec, IRIG-B is regarded as inactive.
High-Low Invert	Signal: The High and Low signals of the IRIG-B are inverted. This does NOT mean that the wiring is faulty. If the wiring is faulty no IRIG-B signal will be detected.
Control Signal1	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal2	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal3	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal4	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal5	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal6	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal7	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal8	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal9	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal10	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal11	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal12	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal13	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal14	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal15	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal16	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal17	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal18	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).

**IRIG-B00X Values**

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NoOfFramesOK	Total Number valid Frames.	0	0 - 65535	[Operation /Count and RevData /TimeSync /IRIG-B]
NoOfFrameErrors	Total Number of Frame Errors. Physically corrupted Frame.	0	0 - 65535	[Operation /Count and RevData /TimeSync /IRIG-B]
Edges	Edges: Total number of rising and falling edges. This signal indicates if a signal is available at the IRIG-B input.	0	0 - 65535	[Operation /Count and RevData /TimeSync /IRIG-B]

## Parameters

Parameter setting and planning can be done:

- directly at the device or
- by way of the *Smart view* software.

## Parameter Definitions

### Device Parameters

**Device Parameters** are part of the Parameter Tree. By means of them you can (depending on the type of device):

- Set cutoff levels,
- Configure Digital Inputs,
- Configure Output Relays,
- Assign LEDs,
- Assign Acknowledgment Signals,
- Configure Statistics,
- Configure Protocol Parameters,
- Adapt HMI Settings,
- Configure Recorders (reports),
- Set Date and Time,
- Change Passwords,
- Check the version (build) of the device.

### Field Parameters

**Field Parameters** are part of the Parameter Tree. Field Parameters comprise the essential, basic settings of your switchboard such as rated frequency, transformer ratios.

### Protection Parameters

**Protection Parameters** are part of the Parameter Tree. This tree comprises:

- **Global Protection Parameters are part of the Protection Parameters:** All settings and assignments that are done within the Global Parameter Tree are valid independent of the Setting Groups. They have to be set once only. In addition to that they comprise the CB Management.
- **The Parameter Setting Switch is part of the Protection Parameters:** You can either direct switch onto a certain parameter setting group or you can determine the conditions for switching onto another parameter setting group.
- **Setting Group Parameters are part of the Protection Parameters:** By means of the Parameter Setting Group Parameters you can individually adapt your protective device to the current conditions or grid conditions. They can be individually set in each Setting group.



## Device Planning Parameters

**Device Planning Parameters** are part of the Parameter Tree.

- **Improving the Usability (clearness):** All protection modules that are currently not needed can be de-protected (switched to invisible) by means of Device Planning. In Menu Device Planning you can adapt the scope of functionality of the protective device exactly to your needs. You can improve the usability by de-projecting all modules that are currently not needed.
- **Adapting the device to your application:** For those modules that you need, determine how they should work (e.g. directional, non-directional, <, >...).

## Direct Commands

**Direct Commands** are part of the Device Parameter Tree but they are **NOT** part of the parameter file. They will be executed directly (e.g. Resetting of a Counter).

## State of the Module Inputs

**Module Inputs** are part of the Parameter Tree. The State of the Module Input is context-dependent.

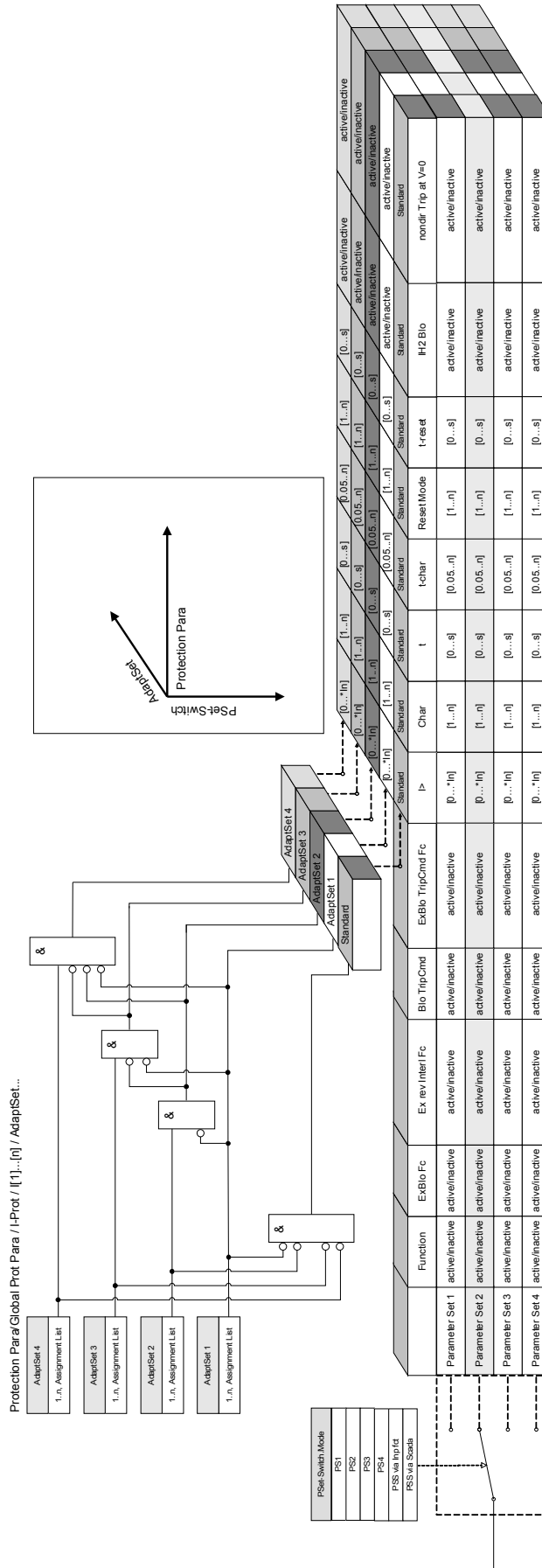
By means of the Module Inputs influence can be taken on the Modules. You can assign Signals onto **Module Inputs**. The state of the signals that are assigned to an input can be taken from the Status Display. Module Inputs can be identified by an „-I“ at the end of the name.

## Signals

**Signals** are part of the Parameter Tree. The state of the signal is context-dependent.

- **Signals** represent the state of your installation/equipment (e.g. Position Indicators of the Circuit Breaker).
- **Signals** are assessments of the state of the grid and the equipment (System OK, Transformer failure detected...).
- **Signals** represent decisions that are taken by the device (e.g. Trip command) based on your parameter settings.

# Adaptive Parameter Sets



**Adaptive Parameter Sets** are part of the Parameter Tree.

By means of **Adaptive Parameter Sets** you can modify temporarily single parameters within the parameter setting groups.

**NOTICE**

**Adaptive Parameters fall back automatically, if the acknowledged signal, that has activated them, has fallen back. Please take into account that Adaptive Set 1 is dominant to Adaptive Set 2. Adaptive Set 2 is dominant to Adaptive Set 3. Adaptive Set 3 is dominant to Adaptive Set 4.**

**NOTICE**

**In order to increase the usability (clearness) Adaptive Parameter Sets become visible if an corresponding activation signals has been assigned (Smart view 2.0 and higher).**

**Example: In order to use Adaptive Parameters within Protective Element I[1] please proceed as follows:**

- Assign within the Global Parameter tree within Protective Element I[1] an activation signal for AdaptiveParameterSet 1.
- AdaptiveParameterSet 1 becomes now visible within the Protection Parameter Sets for element I[1].

**By means of additional activation signals further Adaptive Parameter Sets can be used.**

The functionality of the IED (relay) can be enhanced / adapted by means of **Adaptive Parameters** in order to meet the requirements of modified states of the grid or the power supply system respectively to manage unpredictable events.

Moreover, the adaptive parameter can also be used to realize various special protective functions or to expand the existing function modules in a simple way without to redesign the existing hardware or software platform costly.

The **Adaptive Parameter** feature allows, besides a standard parameter set, one of the four parameter sets labeled from 1 to 4, to be used for example in a time overcurrent element under the control of the configurable Set Control Logics. The dynamical switch-over of the adaptive parameter set is only active for a particular element when its adaptive set control logic is configured and only as long as the activation signal is true.

For some protection elements such as time overcurrent and instantaneous overcurrent ( 50P, 51P, 50G, 51G...), besides the “default” setting there exist another 4 “alternative” settings for pickup value, curve type, time dial, reset mode set values which can be switched-over dynamically by means of the configurable adaptive setting control logics in the single set parameter.

If the **Adaptive Parameter** feature is not used, the adaptive set control logics will not be selected (assigned). The protective elements work in this case just like a normal protection using the “Default” settings. If one of the **Adaptive Set** Control logics” is assigned to a logic function, the protective element will be “switched-over” to the corresponding adaptive settings if the assigned logic function is asserted and will fall back to the “Default” Setting if the assigned signal that has been activated the **Adaptive Set** has fallen back.

### *Application Example*

During a Switch-OnTo-Fault condition, it is usually requested to make the embedded protective function tripping the faulted line faster, instantaneously or sometimes non-directionally.

Such a Switch-OnTo-Fault application can easily be realized using the **Adaptive Parameter** features above mentioned: The standard time overcurrent protection element (e.g. 51P) normally works with an inverse curve type (e.g. ANSI Type A), while in case of **SOTF** condition, it should trip instantaneously. If the **SOTF** logic function »SOTF\_ENABLED« is detecting a manual circuit breaker close condition the relay switches to **AdaptiveSet1** if the signal »SOTF\_ENABLED« is assigned to **AdaptiveSet1**. The corresponding **AdaptiveSet1** will become active and that means e.g. »curve type = DEFT« and »t = 0« sec.

The screenshot displays the 'adapt.HptPara - Smart view' application. The left sidebar contains navigation icons for Shortcuts, Operation, Device planning, Device Para, Field Para, Protection Para, Control, Logics, and Service. The tree view shows a hierarchy starting with 'MCA4', followed by 'Operation', 'Device planning', 'Device Para', 'Field Para', 'Protection Para', 'Global Prot Para', 'Prot', 'Interconnection\_', 'I-Prot', 'I[1]', 'V-Prot', 'f-Prot', 'P-Prot', 'SOTF', 'CLPU', 'PSet-Switch', 'Set 1', 'Interconnection\_', 'I-Prot', 'I[1]', 'V-Prot', 'f-Prot', 'P-Prot', 'SOTF', 'CLPU', 'Set 2', 'Set 3', 'Set 4', 'Control', 'Logics', and 'Service'.

Two data tables are shown in the main workspace:

**Table 1: Protection Para/Global Prot Para/I-Prot/I[1]**

Name	Value
ExBlo1	...
ExBlo2	...
ExBlo TripCmd	...
Ex rev Interf	...
AdaptSet 1	SOTF . enabled
AdaptSet 2	CLPU . enabled
AdaptSet 3	V[2] . Alarm
AdaptSet 4	V 012 [1] . Alarm

**Table 2: Protection Para/Set 1/I-Prot/I[1]**

Name	DefaultSet	SOTF . enabled	CLPU . enabled	V[2] . Alarm	V 012 [1] . Alarm	Unit
Function	active					
ExBlo Fc	inactive					
Ex rev Interf Fc	inactive					
Blo TripCmd	inactive					
ExBlo TripCmd Fc	inactive					
Measuring method	Fundamental					
I>	1.5		4	1.00	1.00	In
Char	IEC NINV	DEFT	IEC NINV	IEC NINV	IEC NINV	
t	1.00	1.00	1.00	1.00	1.00	s
I-char	1	1	1	1	1	
Reset Mode	instantaneous	instantaneous	instantaneous	instantaneous	instantaneous	
I-reset	0	0	0	0	0	s
IH2 Blo	inactive	inactive	inactive	inactive	inactive	
VRestraint	inactive	inactive	inactive	inactive	inactive	
Measuring Mode	Phase to Ne...	Phase to Ne...	Phase to Ne...	Phase to Ne...	Phase to Ne...	
VRestraint max	1.00	1.00	1.00	1.00	1.00	Vn
Meas Circut Superv	inactive	inactive	inactive	inactive	inactive	

The bottom status bar shows 'Ready' on the left and 'Device not connected (localhost)' on the right.

The screenshot above shows the adaptive setting configurations following applications based on only one simple overcurrent protection element:

1. Standard Set: Default settings
2. Adaptive Set 1: *SOTF* application (Switch-Onto-Fault)
3. Adaptive Set 2: *CLPU* application (Cold Load Pickup)
4. Adaptive Set 3: Voltage-Controlled time overcurrent protection (ANSI 51V)
5. Adaptive Set 4: Negative- Phase- Sequence- Voltage-Controlled time overcurrent protection

### *Application Examples*

- The output signal of the *Switch Onto Fault* module can be used to activate an **Adaptive Parameter Set** that sensibilizes the overcurrent protection.
- The output signal of the *Cold Load Pickup* module can be used to activate an **Adaptive Parameter Set** that desensitizes the overcurrent protection.
- By means of **Adaptive Parameter Sets** an Adaptive *Auto Reclosure* can be realized. After a reclosure attempt the tripping thresholds or tripping curves of the overcurrent protection can be adapted.
- Depending on undervoltage the overcurrent protection can be modified (Voltage Controlled).
- The earth overcurrent protection can be modified by the residual voltage.
- Matching the ground current protective settings dynamically and automatically according to the single-phase load diversity (Adaptive relay Setting – Normal Setting/Alternative Setting)

### **NOTICE**

**Adaptive Parameter Sets are only available for devices with current protection modules.**

## Adaptive Parameter Set Activation Signals

<i>Name</i>	<i>Description</i>
--	No assignment
Exp[1].Alarm	Signal: Alarm
Exp[2].Alarm	Signal: Alarm
Exp[3].Alarm	Signal: Alarm
Exp[4].Alarm	Signal: Alarm
CTS.Alarm	Signal: Alarm Current Transformer Measuring Circuit Supervision
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input
DI Slot X1.DI 5	Signal: Digital Input
DI Slot X1.DI 6	Signal: Digital Input
DI Slot X1.DI 7	Signal: Digital Input
DI Slot X1.DI 8	Signal: Digital Input
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input
Modbus.Scada Cmd 1	Scada Command
Modbus.Scada Cmd 2	Scada Command
Modbus.Scada Cmd 3	Scada Command
Modbus.Scada Cmd 4	Scada Command
Modbus.Scada Cmd 5	Scada Command
Modbus.Scada Cmd 6	Scada Command
Modbus.Scada Cmd 7	Scada Command
Modbus.Scada Cmd 8	Scada Command
Modbus.Scada Cmd 9	Scada Command
Modbus.Scada Cmd 10	Scada Command
Modbus.Scada Cmd 11	Scada Command
Modbus.Scada Cmd 12	Scada Command
Modbus.Scada Cmd 13	Scada Command
Modbus.Scada Cmd 14	Scada Command
Modbus.Scada Cmd 15	Scada Command
Modbus.Scada Cmd 16	Scada Command
IEC61850.VirtInp1	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp2	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp3	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp4	Signal: Virtual Input (IEC61850 GGIO Ind)

## Parameters

<i>Name</i>	<i>Description</i>
IEC61850.VirtInp5	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp6	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp7	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp8	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp9	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp10	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp11	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp12	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp13	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp14	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp15	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp16	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp17	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp18	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp19	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp20	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp21	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp22	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp23	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp24	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp25	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp26	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp27	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp28	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp29	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp30	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp31	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp32	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.SPSCO1	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC61850.SPSCO2	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC61850.SPSCO3	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC61850.SPSCO4	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC61850.SPSCO5	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC61850.SPSCO6	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC61850.SPSCO7	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC61850.SPSCO8	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC61850.SPSCO9	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC61850.SPSCO10	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC61850.SPSCO11	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC61850.SPSCO12	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).



## Parameters

<i>Name</i>	<i>Description</i>
IEC61850.SPCSO13	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC61850.SPCSO14	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC61850.SPCSO15	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC61850.SPCSO16	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC 103.Scada Cmd 1	Scada Command
IEC 103.Scada Cmd 2	Scada Command
IEC 103.Scada Cmd 3	Scada Command
IEC 103.Scada Cmd 4	Scada Command
IEC 103.Scada Cmd 5	Scada Command
IEC 103.Scada Cmd 6	Scada Command
IEC 103.Scada Cmd 7	Scada Command
IEC 103.Scada Cmd 8	Scada Command
IEC 103.Scada Cmd 9	Scada Command
IEC 103.Scada Cmd 10	Scada Command
Profibus.Scada Cmd 1	Scada Command
Profibus.Scada Cmd 2	Scada Command
Profibus.Scada Cmd 3	Scada Command
Profibus.Scada Cmd 4	Scada Command
Profibus.Scada Cmd 5	Scada Command
Profibus.Scada Cmd 6	Scada Command
Profibus.Scada Cmd 7	Scada Command
Profibus.Scada Cmd 8	Scada Command
Profibus.Scada Cmd 9	Scada Command
Profibus.Scada Cmd 10	Scada Command
Profibus.Scada Cmd 11	Scada Command
Profibus.Scada Cmd 12	Scada Command
Profibus.Scada Cmd 13	Scada Command
Profibus.Scada Cmd 14	Scada Command
Profibus.Scada Cmd 15	Scada Command
Profibus.Scada Cmd 16	Scada Command
Logics.LE1.Gate Out	Signal: Output of the logic gate
Logics.LE1.Timer Out	Signal: Timer Output
Logics.LE1.Out	Signal: Latched Output (Q)
Logics.LE1.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE2.Gate Out	Signal: Output of the logic gate
Logics.LE2.Timer Out	Signal: Timer Output
Logics.LE2.Out	Signal: Latched Output (Q)
Logics.LE2.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE3.Gate Out	Signal: Output of the logic gate
Logics.LE3.Timer Out	Signal: Timer Output

## Parameters

<i>Name</i>	<i>Description</i>
Logics.LE3.Out	Signal: Latched Output (Q)
Logics.LE3.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE4.Gate Out	Signal: Output of the logic gate
Logics.LE4.Timer Out	Signal: Timer Output
Logics.LE4.Out	Signal: Latched Output (Q)
Logics.LE4.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE5.Gate Out	Signal: Output of the logic gate
Logics.LE5.Timer Out	Signal: Timer Output
Logics.LE5.Out	Signal: Latched Output (Q)
Logics.LE5.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE6.Gate Out	Signal: Output of the logic gate
Logics.LE6.Timer Out	Signal: Timer Output
Logics.LE6.Out	Signal: Latched Output (Q)
Logics.LE6.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE7.Gate Out	Signal: Output of the logic gate
Logics.LE7.Timer Out	Signal: Timer Output
Logics.LE7.Out	Signal: Latched Output (Q)
Logics.LE7.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE8.Gate Out	Signal: Output of the logic gate
Logics.LE8.Timer Out	Signal: Timer Output
Logics.LE8.Out	Signal: Latched Output (Q)
Logics.LE8.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE9.Gate Out	Signal: Output of the logic gate
Logics.LE9.Timer Out	Signal: Timer Output
Logics.LE9.Out	Signal: Latched Output (Q)
Logics.LE9.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE10.Gate Out	Signal: Output of the logic gate
Logics.LE10.Timer Out	Signal: Timer Output
Logics.LE10.Out	Signal: Latched Output (Q)
Logics.LE10.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE11.Gate Out	Signal: Output of the logic gate
Logics.LE11.Timer Out	Signal: Timer Output
Logics.LE11.Out	Signal: Latched Output (Q)
Logics.LE11.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE12.Gate Out	Signal: Output of the logic gate
Logics.LE12.Timer Out	Signal: Timer Output
Logics.LE12.Out	Signal: Latched Output (Q)
Logics.LE12.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE13.Gate Out	Signal: Output of the logic gate
Logics.LE13.Timer Out	Signal: Timer Output

## Parameters

<i>Name</i>	<i>Description</i>
Logics.LE13.Out	Signal: Latched Output (Q)
Logics.LE13.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE14.Gate Out	Signal: Output of the logic gate
Logics.LE14.Timer Out	Signal: Timer Output
Logics.LE14.Out	Signal: Latched Output (Q)
Logics.LE14.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE15.Gate Out	Signal: Output of the logic gate
Logics.LE15.Timer Out	Signal: Timer Output
Logics.LE15.Out	Signal: Latched Output (Q)
Logics.LE15.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE16.Gate Out	Signal: Output of the logic gate
Logics.LE16.Timer Out	Signal: Timer Output
Logics.LE16.Out	Signal: Latched Output (Q)
Logics.LE16.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE17.Gate Out	Signal: Output of the logic gate
Logics.LE17.Timer Out	Signal: Timer Output
Logics.LE17.Out	Signal: Latched Output (Q)
Logics.LE17.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE18.Gate Out	Signal: Output of the logic gate
Logics.LE18.Timer Out	Signal: Timer Output
Logics.LE18.Out	Signal: Latched Output (Q)
Logics.LE18.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE19.Gate Out	Signal: Output of the logic gate
Logics.LE19.Timer Out	Signal: Timer Output
Logics.LE19.Out	Signal: Latched Output (Q)
Logics.LE19.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE20.Gate Out	Signal: Output of the logic gate
Logics.LE20.Timer Out	Signal: Timer Output
Logics.LE20.Out	Signal: Latched Output (Q)
Logics.LE20.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE21.Gate Out	Signal: Output of the logic gate
Logics.LE21.Timer Out	Signal: Timer Output
Logics.LE21.Out	Signal: Latched Output (Q)
Logics.LE21.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE22.Gate Out	Signal: Output of the logic gate
Logics.LE22.Timer Out	Signal: Timer Output
Logics.LE22.Out	Signal: Latched Output (Q)
Logics.LE22.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE23.Gate Out	Signal: Output of the logic gate
Logics.LE23.Timer Out	Signal: Timer Output

## Parameters

<i>Name</i>	<i>Description</i>
Logics.LE23.Out	Signal: Latched Output (Q)
Logics.LE23.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE24.Gate Out	Signal: Output of the logic gate
Logics.LE24.Timer Out	Signal: Timer Output
Logics.LE24.Out	Signal: Latched Output (Q)
Logics.LE24.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE25.Gate Out	Signal: Output of the logic gate
Logics.LE25.Timer Out	Signal: Timer Output
Logics.LE25.Out	Signal: Latched Output (Q)
Logics.LE25.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE26.Gate Out	Signal: Output of the logic gate
Logics.LE26.Timer Out	Signal: Timer Output
Logics.LE26.Out	Signal: Latched Output (Q)
Logics.LE26.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE27.Gate Out	Signal: Output of the logic gate
Logics.LE27.Timer Out	Signal: Timer Output
Logics.LE27.Out	Signal: Latched Output (Q)
Logics.LE27.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE28.Gate Out	Signal: Output of the logic gate
Logics.LE28.Timer Out	Signal: Timer Output
Logics.LE28.Out	Signal: Latched Output (Q)
Logics.LE28.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE29.Gate Out	Signal: Output of the logic gate
Logics.LE29.Timer Out	Signal: Timer Output
Logics.LE29.Out	Signal: Latched Output (Q)
Logics.LE29.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE30.Gate Out	Signal: Output of the logic gate
Logics.LE30.Timer Out	Signal: Timer Output
Logics.LE30.Out	Signal: Latched Output (Q)
Logics.LE30.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE31.Gate Out	Signal: Output of the logic gate
Logics.LE31.Timer Out	Signal: Timer Output
Logics.LE31.Out	Signal: Latched Output (Q)
Logics.LE31.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE32.Gate Out	Signal: Output of the logic gate
Logics.LE32.Timer Out	Signal: Timer Output
Logics.LE32.Out	Signal: Latched Output (Q)
Logics.LE32.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE33.Gate Out	Signal: Output of the logic gate
Logics.LE33.Timer Out	Signal: Timer Output

## Parameters

<i>Name</i>	<i>Description</i>
Logics.LE33.Out	Signal: Latched Output (Q)
Logics.LE33.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE34.Gate Out	Signal: Output of the logic gate
Logics.LE34.Timer Out	Signal: Timer Output
Logics.LE34.Out	Signal: Latched Output (Q)
Logics.LE34.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE35.Gate Out	Signal: Output of the logic gate
Logics.LE35.Timer Out	Signal: Timer Output
Logics.LE35.Out	Signal: Latched Output (Q)
Logics.LE35.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE36.Gate Out	Signal: Output of the logic gate
Logics.LE36.Timer Out	Signal: Timer Output
Logics.LE36.Out	Signal: Latched Output (Q)
Logics.LE36.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE37.Gate Out	Signal: Output of the logic gate
Logics.LE37.Timer Out	Signal: Timer Output
Logics.LE37.Out	Signal: Latched Output (Q)
Logics.LE37.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE38.Gate Out	Signal: Output of the logic gate
Logics.LE38.Timer Out	Signal: Timer Output
Logics.LE38.Out	Signal: Latched Output (Q)
Logics.LE38.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE39.Gate Out	Signal: Output of the logic gate
Logics.LE39.Timer Out	Signal: Timer Output
Logics.LE39.Out	Signal: Latched Output (Q)
Logics.LE39.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE40.Gate Out	Signal: Output of the logic gate
Logics.LE40.Timer Out	Signal: Timer Output
Logics.LE40.Out	Signal: Latched Output (Q)
Logics.LE40.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE41.Gate Out	Signal: Output of the logic gate
Logics.LE41.Timer Out	Signal: Timer Output
Logics.LE41.Out	Signal: Latched Output (Q)
Logics.LE41.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE42.Gate Out	Signal: Output of the logic gate
Logics.LE42.Timer Out	Signal: Timer Output
Logics.LE42.Out	Signal: Latched Output (Q)
Logics.LE42.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE43.Gate Out	Signal: Output of the logic gate
Logics.LE43.Timer Out	Signal: Timer Output

## Parameters

<i>Name</i>	<i>Description</i>
Logics.LE43.Out	Signal: Latched Output (Q)
Logics.LE43.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE44.Gate Out	Signal: Output of the logic gate
Logics.LE44.Timer Out	Signal: Timer Output
Logics.LE44.Out	Signal: Latched Output (Q)
Logics.LE44.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE45.Gate Out	Signal: Output of the logic gate
Logics.LE45.Timer Out	Signal: Timer Output
Logics.LE45.Out	Signal: Latched Output (Q)
Logics.LE45.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE46.Gate Out	Signal: Output of the logic gate
Logics.LE46.Timer Out	Signal: Timer Output
Logics.LE46.Out	Signal: Latched Output (Q)
Logics.LE46.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE47.Gate Out	Signal: Output of the logic gate
Logics.LE47.Timer Out	Signal: Timer Output
Logics.LE47.Out	Signal: Latched Output (Q)
Logics.LE47.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE48.Gate Out	Signal: Output of the logic gate
Logics.LE48.Timer Out	Signal: Timer Output
Logics.LE48.Out	Signal: Latched Output (Q)
Logics.LE48.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE49.Gate Out	Signal: Output of the logic gate
Logics.LE49.Timer Out	Signal: Timer Output
Logics.LE49.Out	Signal: Latched Output (Q)
Logics.LE49.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE50.Gate Out	Signal: Output of the logic gate
Logics.LE50.Timer Out	Signal: Timer Output
Logics.LE50.Out	Signal: Latched Output (Q)
Logics.LE50.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE51.Gate Out	Signal: Output of the logic gate
Logics.LE51.Timer Out	Signal: Timer Output
Logics.LE51.Out	Signal: Latched Output (Q)
Logics.LE51.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE52.Gate Out	Signal: Output of the logic gate
Logics.LE52.Timer Out	Signal: Timer Output
Logics.LE52.Out	Signal: Latched Output (Q)
Logics.LE52.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE53.Gate Out	Signal: Output of the logic gate
Logics.LE53.Timer Out	Signal: Timer Output

## Parameters

<i>Name</i>	<i>Description</i>
Logics.LE53.Out	Signal: Latched Output (Q)
Logics.LE53.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE54.Gate Out	Signal: Output of the logic gate
Logics.LE54.Timer Out	Signal: Timer Output
Logics.LE54.Out	Signal: Latched Output (Q)
Logics.LE54.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE55.Gate Out	Signal: Output of the logic gate
Logics.LE55.Timer Out	Signal: Timer Output
Logics.LE55.Out	Signal: Latched Output (Q)
Logics.LE55.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE56.Gate Out	Signal: Output of the logic gate
Logics.LE56.Timer Out	Signal: Timer Output
Logics.LE56.Out	Signal: Latched Output (Q)
Logics.LE56.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE57.Gate Out	Signal: Output of the logic gate
Logics.LE57.Timer Out	Signal: Timer Output
Logics.LE57.Out	Signal: Latched Output (Q)
Logics.LE57.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE58.Gate Out	Signal: Output of the logic gate
Logics.LE58.Timer Out	Signal: Timer Output
Logics.LE58.Out	Signal: Latched Output (Q)
Logics.LE58.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE59.Gate Out	Signal: Output of the logic gate
Logics.LE59.Timer Out	Signal: Timer Output
Logics.LE59.Out	Signal: Latched Output (Q)
Logics.LE59.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE60.Gate Out	Signal: Output of the logic gate
Logics.LE60.Timer Out	Signal: Timer Output
Logics.LE60.Out	Signal: Latched Output (Q)
Logics.LE60.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE61.Gate Out	Signal: Output of the logic gate
Logics.LE61.Timer Out	Signal: Timer Output
Logics.LE61.Out	Signal: Latched Output (Q)
Logics.LE61.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE62.Gate Out	Signal: Output of the logic gate
Logics.LE62.Timer Out	Signal: Timer Output
Logics.LE62.Out	Signal: Latched Output (Q)
Logics.LE62.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE63.Gate Out	Signal: Output of the logic gate
Logics.LE63.Timer Out	Signal: Timer Output

## Parameters

<i>Name</i>	<i>Description</i>
Logics.LE63.Out	Signal: Latched Output (Q)
Logics.LE63.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE64.Gate Out	Signal: Output of the logic gate
Logics.LE64.Timer Out	Signal: Timer Output
Logics.LE64.Out	Signal: Latched Output (Q)
Logics.LE64.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE65.Gate Out	Signal: Output of the logic gate
Logics.LE65.Timer Out	Signal: Timer Output
Logics.LE65.Out	Signal: Latched Output (Q)
Logics.LE65.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE66.Gate Out	Signal: Output of the logic gate
Logics.LE66.Timer Out	Signal: Timer Output
Logics.LE66.Out	Signal: Latched Output (Q)
Logics.LE66.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE67.Gate Out	Signal: Output of the logic gate
Logics.LE67.Timer Out	Signal: Timer Output
Logics.LE67.Out	Signal: Latched Output (Q)
Logics.LE67.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE68.Gate Out	Signal: Output of the logic gate
Logics.LE68.Timer Out	Signal: Timer Output
Logics.LE68.Out	Signal: Latched Output (Q)
Logics.LE68.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE69.Gate Out	Signal: Output of the logic gate
Logics.LE69.Timer Out	Signal: Timer Output
Logics.LE69.Out	Signal: Latched Output (Q)
Logics.LE69.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE70.Gate Out	Signal: Output of the logic gate
Logics.LE70.Timer Out	Signal: Timer Output
Logics.LE70.Out	Signal: Latched Output (Q)
Logics.LE70.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE71.Gate Out	Signal: Output of the logic gate
Logics.LE71.Timer Out	Signal: Timer Output
Logics.LE71.Out	Signal: Latched Output (Q)
Logics.LE71.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE72.Gate Out	Signal: Output of the logic gate
Logics.LE72.Timer Out	Signal: Timer Output
Logics.LE72.Out	Signal: Latched Output (Q)
Logics.LE72.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE73.Gate Out	Signal: Output of the logic gate
Logics.LE73.Timer Out	Signal: Timer Output



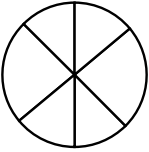









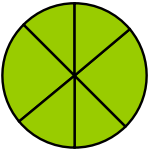

## Parameters

<i>Name</i>	<i>Description</i>
Logics.LE73.Out	Signal: Latched Output (Q)
Logics.LE73.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE74.Gate Out	Signal: Output of the logic gate
Logics.LE74.Timer Out	Signal: Timer Output
Logics.LE74.Out	Signal: Latched Output (Q)
Logics.LE74.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE75.Gate Out	Signal: Output of the logic gate
Logics.LE75.Timer Out	Signal: Timer Output
Logics.LE75.Out	Signal: Latched Output (Q)
Logics.LE75.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE76.Gate Out	Signal: Output of the logic gate
Logics.LE76.Timer Out	Signal: Timer Output
Logics.LE76.Out	Signal: Latched Output (Q)
Logics.LE76.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE77.Gate Out	Signal: Output of the logic gate
Logics.LE77.Timer Out	Signal: Timer Output
Logics.LE77.Out	Signal: Latched Output (Q)
Logics.LE77.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE78.Gate Out	Signal: Output of the logic gate
Logics.LE78.Timer Out	Signal: Timer Output
Logics.LE78.Out	Signal: Latched Output (Q)
Logics.LE78.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE79.Gate Out	Signal: Output of the logic gate
Logics.LE79.Timer Out	Signal: Timer Output
Logics.LE79.Out	Signal: Latched Output (Q)
Logics.LE79.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE80.Gate Out	Signal: Output of the logic gate
Logics.LE80.Timer Out	Signal: Timer Output
Logics.LE80.Out	Signal: Latched Output (Q)
Logics.LE80.Out inverted	Signal: Negated Latched Output (Q NOT)

## Access Authorizations (access areas)

### Passwords – Areas

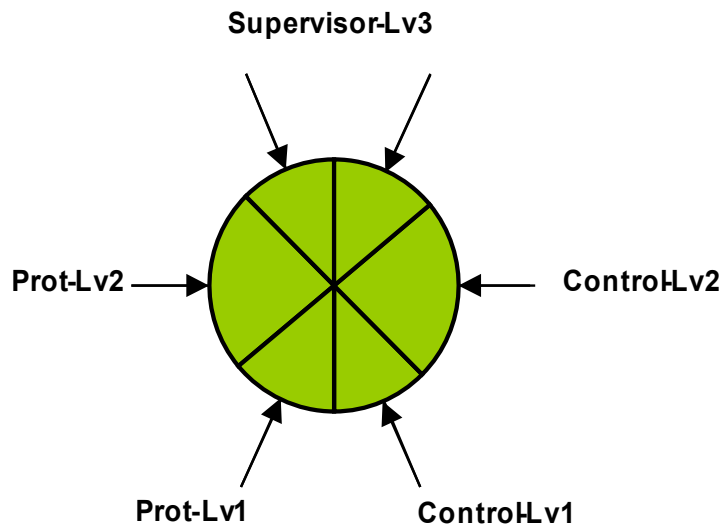
The following table shows the access areas and the authorization passwords that they require in order to access them.

<i>Area Symbol</i>	<i>Authorization Password</i>	<i>Access to:</i>
	 <b>Read Only-Lv0</b>	Level 0 provides Read Only access to all settings and parameters of the device. The device will fall back into this level automatically after a longer period or inactivity
	 <b>Prot-Lv1</b>	This password provides access to the reset- and acknowledge options. In addition to that, it permits the execution of manual trigger signals.
	 <b>Prot-Lv2</b>	This password provides access to the reset and acknowledge options. In addition to that it permits changing of protection settings and the configuration of the trip manager.
	 <b>Control-Lv1</b>	This password grants permission for switching operations (switching switchgears)
	 <b>Control-Lv2</b>	This password grants permission for switching operations (switching switchgears). In addition to that it gives access to the switchgear settings (switching authority, interlockings, general settings of switchgears, Breaker wear...).
	 <b>Supervisor-Lv3</b>	This password grants non-restricted access to all parameters and settings of the device (device configuration). This includes also the devices planning, device parameters (e.g. Date and Time), Field Parameters, Service Parameters and Logic Parameters.

### NOTICE

If the device was not active within the parameter setting mode for a longer time (can be set between 20 – 3600 seconds) it changes into »Read Only-Lv0« mode automatically. This parameter (t-max-Edit) can be modified within menu [Device Para\HMI].

Access Areas (Password Level):



**NOTICE**

You have to ensure, that the access authorizations are protected by secure passwords. These passwords have to be kept as a secret and to be known only by the authorized persons.

**NOTICE**

A lock symbol indicates in the upper right corner of the display if there are any access authorizations active at the moment . That means, within the mode "Read Only Lv0" a closed (locked) lock symbol will be shown in the upper right corner of the display. As soon as there are any access authorizations active (above the "Read Only-Lv0" level), the upper right corner of the display will show an unlocked (open) lock symbol.

**NOTICE**

During setting parameters the C-Button will be used for the cancelling of parameter changes. Because of that it is not possible, to acknowledge (LEDs, Output Relays...) as long as there are non saved (cached only) parameters.

Acknowledgement can only be executed, when the upper right corner of the display shows this symbol:



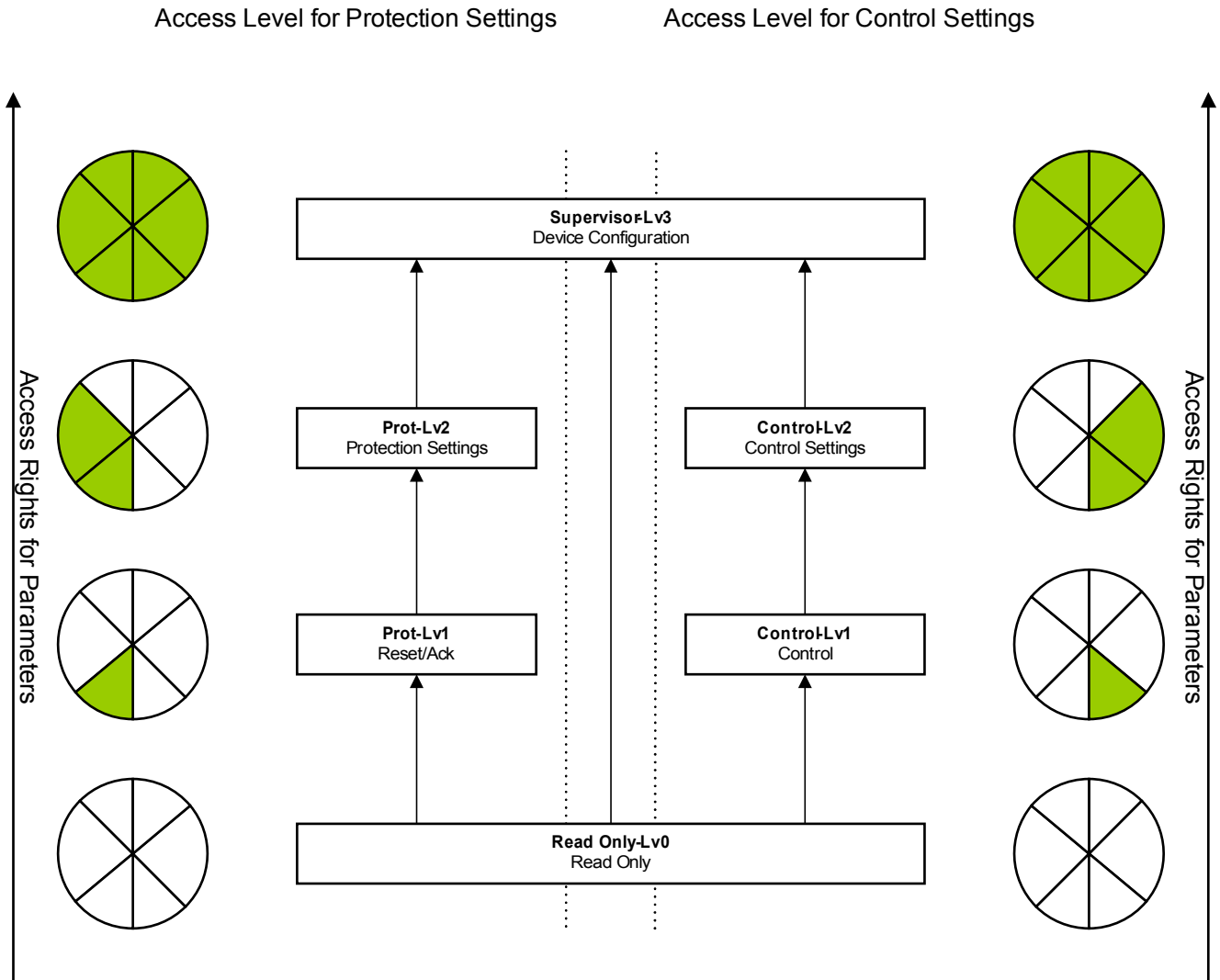
**NOTICE**

The passwords are part of the device (fixed assignments). That means, passwords will not be overwritten, if a parameter file is transmitted into a device.

Existing passwords are persistent (assigned to a device). If an offline created parameter file is transmitted into a device, or if a parameter file is transmitted from one device to another, this will have no impact on existing passwords within the device.

*Available Levels/Access Authorizations*

The access authorizations are designed in form of two hierachic strings.  
 The supervisor (administrator) password provides access to all parameters and settings.



Legend : Lv = Level  
 ◁ Parameters are read only  
 ▷ Parameters can be modified

**How to find out what access areas/levels are unlocked?**

The menu [Device para\Access levels] provides the information, which access areas (authorizations) are currently unlocked.

As soon as there is an unlocked access area (authorization) above »Read Only-Lv0«, this will be indicated by an unlocked lock symbol within the upper right corner of the device display.

## Unlocking Access Areas

Within the menu [Device Para\Access level] access areas can be unlocked or locked (at the HMI).

## Changing Passwords

Passwords can be changed at the device in menu [Device Para/Passwords] or by means of the *Smart view* software.

### NOTICE

**A password must be a user-defined combination of the numerics 1, 2, 3 and 4.**

**All other characters and keys won't be accepted.**

When you want to change a password, the existing one has to be entered firstly. The new password (up to 8 digits) is then to be confirmed twice. Please proceed as follows:

- In order to change the password please enter your old password by means of the Softkeys followed by pressing the »OK«-key.
- Enter the new password by means of the Softkeys and press the »OK«-key.
- Afterwards enter the new password once again by means of the Softkeys and press the »OK«-key.

## Deactivating Passwords during Commissioning

It is possible optionally to deactivate passwords during commissioning. It is not allowed to use this feature for other purposes than commissioning. In order to deactivate the password protection replace the existing password with an empty one for the corresponding access areas. All access authorizations (access areas) that are protected by an empty password are unlocked permanent. That means, that all parameters and settings within those areas can be modified without any further access authorization. It is no longer possible to change into the »*Read Only-Lv0*« level (the protective device will also not fall back into this mode if the maximum edit time is expired (t-max-Edit).

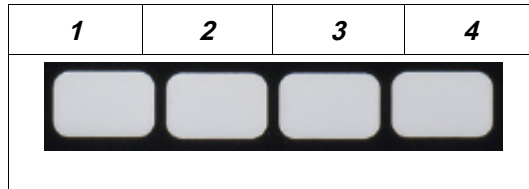
### WARNING

**You have to ensure that all passwords are activated again after the commissioning. That means, that all access areas have to be protected by a password that consists of 4 digits as minimum.**

**Woodward will not overtake any liability for any personal injuries or damages that are caused by deactivated password protection.**

## Password Entry at the Panel

Passwords can be entered by way of the Softkeys.



Example: For password (3244) press successively:

- Softkey 3
- Softkey 2
- Softkey 4
- Softkey 4

## Password Forgotten

By pressing the »C« key during cold booting a reset menu will be called up. By selecting »Reset All Passwords?« and confirming with »Yes« all passwords will be reset to the defaults »1234«.

## Parameter Setting at the HMI

Every parameter belongs to an access area. Editing and changing of a parameter requires a sufficient access authorization.

The User can obtain the required access authorizations by unlocking access areas in advance of parameter changes or context-dependent. In the following sections both options will be explained.

### Option 1: Direct Authorization for an Access Area

Call up menu [Device Para\Access level].

Select the required access level respectively navigate to the required access authorization (level). Enter the required password. If the correct password has been entered, the required access authorization will be obtained. In order to do the parameter changes please proceed as follows:

- Move to the parameter you want to change by using the Softkeys. If the parameter is selected, the lower right corner of the display should show a »Wrench« symbol.



This symbol indicates, that the parameter is unlocked and can be edited, because the required access authorization is available. Confirm the Softkey »Wrench«, in order to edit the parameter. Change the parameter.

Now you can:

- save the change you made and have them adopted by the system or:
- change additional parameters and save finally all the altered parameters and have them adopted by the system.

*To save parameter changes immediately,*

- press the »OK« key for saving changed parameters directly and to have them adopted by the device. Confirm the parameter changes by pressing the »Yes« Softkey or dismiss by pressing »No«.

*To change additional parameters and save afterwards,*

- move to other parameters and change them

**NOTICE**

A star symbol in front of the changed parameters indicates that the modifications have only been saved temporarily, they are not yet finally stored and adopted by the device.

In order to make things easier to follow, especially where complex parameter changes are involved, on every superior/higher-ranking menu level the intended change of the parameter is indicated by the star symbol (star trace). This makes it possible to control or follow up from the main menu level at any time where parameter changes have been made and have not been saved finally.

In addition to the star trace to the temporary saved parameter changes, a general parameter changing symbol is faded-in at the left corner of the display, and so it is possible from each point of the menu tree to see that there are parameter changes still not adopted by the device.

Press the »OK« key to initiate the final storage of all parameter changes. Confirm the parameter changes by pressing the »Yes« softkey or dismiss by pressing Softkey »No«.

**NOTICE**

If the display shows a Key Symbol instead of a Wrench-Symbol, this will indicate, that the required access authorization is not available.



In order to edit this parameter, a password is required, that provides the required authorization.

**NOTICE**

**Plausibility check:** In order to prevent obvious wrong settings the device monitors constantly all temporary saved parameter changes. If the device detects an implausibility, this is indicated by a question mark in front of the respective parameter.

In order to make things easier to follow up, especially where complex parameter changes are involved, on every superior/higher-ranking menu level, above the temporarily saved parameters an invalidity is indicated by the question mark (plausibility trace). This makes it possible to control or follow from the main menu level at any time where implausibilities are intended to be saved.

In addition to the question mark trace to the temporary saved implausible parameter changes a general implausibility symbol/question mark is faded-in at the left corner of the display, and so it is possible to see from each point of the menu tree that implausibilities have been detected by the device.

A star/parameter change indication is always overwritten by the question mark/implausibility symbol.

If a device detects an implausibility, it rejects saving and adopting of the parameters.



## Option 2: Context-dependent Access Authorization

Navigate to the parameter, that is to be changed. If the parameter is selected, the lower right corner of the display shows a »Key«-Symbol.



This symbol indicates, that the device is still within the »Read Only Lv0«-Level, or that the current level does not provide sufficient access rights to allow editing of this parameter.

Press this Softkey and enter the password<sup>1)</sup> that provides access to this parameter.  
Please change the parameter settings.

<sup>1)</sup> This page provides also information, which password/access authorization is required to do changes on this parameter.

Now you can:

- save the change you made and have them adopted by the system or:
- change additional parameters and save finally all the altered parameters and have them adopted by the system.

*To save parameter changes immediately,*

- press the »OK« key for saving changed parameters directly and to have them adopted by the device.  
Confirm the parameter changes by pressing the »Yes« Softkey or dismiss by pressing »No«.

*To change additional parameters and save afterwards,*

- move to other parameters and change them

### NOTICE

**A star symbol in front of the changed parameters indicates that the modifications have only been saved temporary, they are not yet finally stored and adopted by the device.**

**In order to make things easier to follow up, especially where complex parameter changes are involved, on every superior/higher-ranking menu level the intended change of the parameter is indicated by the star symbol (star trace). This makes it possible to control or follow from the main menu level at any time where parameter changes have been made and have not been saved finally.**

**In addition to the star trace to the temporary saved parameter changes, a general parameter changing symbol is faded-in at the left corner of the display, and so it is possible from each point of the menu tree to see that there are parameter changes still not adopted by the device.**

Press the »OK« key to initiate the final storage of all parameter changes. Confirm the parameter changes by pressing the »Yes« Softkey or dismiss by pressing Softkey »No«.

**NOTICE**

**Plausibility check:** In order to prevent obvious wrong settings the device monitors constantly all temporary saved parameter changes. If the device detects an implausibility, this is indicated by a question mark in front of the respective parameter.

In order to make things easier to follow up, especially where complex parameter changes are involved, on every superior/higher-ranking menu level, above the temporary saved parameters an invalidity is indicated by the question mark (plausibility trace). This makes it possible to control or follow from the main menu level at any time where implausibilities are intended to be saved.

In addition to the question mark trace to the temporary saved implausible parameter changes a general implausibility symbol/question mark is faded-in at the left corner of the display, and so it is possible to see from each point of the menu tree that implausibilities have been detected by the device.

A star/parameter change indication is always overwritten by the question mark/implausibility symbol.

If a device detects an implausibility, it rejects saving and adopting of the parameters.

## Setting Groups

### Setting Group Switch

Within the menu »Protection Para/P-Set Switch« you have the following possibilities:

- To set one of the four setting groups active manually.
- To assign a signal to each setting group that sets this group to active.
- Scada switches the setting groups.

<b>Option</b>	<b>Setting Group Switch</b>
<i>Manual Selection</i>	Switch over, if another setting group is chosen manually within the menu »Protection Para/P-Set Switch«
<i>Via Input Function (e.g. Digital Input)</i>	<p>Switch over not until the request is clear.</p> <p>That means, if there is more or less than one request signal active, no switch over will be executed.</p> <p>Example::</p> <p>DI3 is assigned onto Parameter set 1. DI3 is active „1“.</p> <p>DI4 is assigned onto Parameter set 2. DI4 is inactive „0“.</p> <p>Now the device should switch from parameter set 1 to parameter set 2. Therefore at first DI3 has to become inactive “0”. Than DI4 has to be active “1”.</p> <p>If DI4 becomes again inactive „0“, parameter set 2 will remain active “1” as long as there is no clear request (e.g. DI3 becomes active “1”, all the other assignments are inactive “0”)</p>
<i>Via Scada</i>	<p>Switch over if there is a clear SCADA request.</p> <p>Otherwise no switch over will be executed.</p>

### NOTICE

The description of the parameters can be found within chapter System Parameters.

## Signals that can be used for PSS

<i>Name</i>	<i>Description</i>
--	No assignment
CTS.Alarm	Signal: Alarm Current Transformer Measuring Circuit Supervision
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input
DI Slot X1.DI 5	Signal: Digital Input
DI Slot X1.DI 6	Signal: Digital Input
DI Slot X1.DI 7	Signal: Digital Input
DI Slot X1.DI 8	Signal: Digital Input
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input
Logics.LE1.Gate Out	Signal: Output of the logic gate
Logics.LE1.Timer Out	Signal: Timer Output
Logics.LE1.Out	Signal: Latched Output (Q)
Logics.LE1.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE2.Gate Out	Signal: Output of the logic gate
Logics.LE2.Timer Out	Signal: Timer Output
Logics.LE2.Out	Signal: Latched Output (Q)
Logics.LE2.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE3.Gate Out	Signal: Output of the logic gate
Logics.LE3.Timer Out	Signal: Timer Output
Logics.LE3.Out	Signal: Latched Output (Q)
Logics.LE3.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE4.Gate Out	Signal: Output of the logic gate
Logics.LE4.Timer Out	Signal: Timer Output
Logics.LE4.Out	Signal: Latched Output (Q)
Logics.LE4.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE5.Gate Out	Signal: Output of the logic gate
Logics.LE5.Timer Out	Signal: Timer Output
Logics.LE5.Out	Signal: Latched Output (Q)
Logics.LE5.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE6.Gate Out	Signal: Output of the logic gate
Logics.LE6.Timer Out	Signal: Timer Output
Logics.LE6.Out	Signal: Latched Output (Q)

## Parameters

<i>Name</i>	<i>Description</i>
Logics.LE6.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE7.Gate Out	Signal: Output of the logic gate
Logics.LE7.Timer Out	Signal: Timer Output
Logics.LE7.Out	Signal: Latched Output (Q)
Logics.LE7.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE8.Gate Out	Signal: Output of the logic gate
Logics.LE8.Timer Out	Signal: Timer Output
Logics.LE8.Out	Signal: Latched Output (Q)
Logics.LE8.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE9.Gate Out	Signal: Output of the logic gate
Logics.LE9.Timer Out	Signal: Timer Output
Logics.LE9.Out	Signal: Latched Output (Q)
Logics.LE9.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE10.Gate Out	Signal: Output of the logic gate
Logics.LE10.Timer Out	Signal: Timer Output
Logics.LE10.Out	Signal: Latched Output (Q)
Logics.LE10.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE11.Gate Out	Signal: Output of the logic gate
Logics.LE11.Timer Out	Signal: Timer Output
Logics.LE11.Out	Signal: Latched Output (Q)
Logics.LE11.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE12.Gate Out	Signal: Output of the logic gate
Logics.LE12.Timer Out	Signal: Timer Output
Logics.LE12.Out	Signal: Latched Output (Q)
Logics.LE12.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE13.Gate Out	Signal: Output of the logic gate
Logics.LE13.Timer Out	Signal: Timer Output
Logics.LE13.Out	Signal: Latched Output (Q)
Logics.LE13.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE14.Gate Out	Signal: Output of the logic gate
Logics.LE14.Timer Out	Signal: Timer Output
Logics.LE14.Out	Signal: Latched Output (Q)
Logics.LE14.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE15.Gate Out	Signal: Output of the logic gate
Logics.LE15.Timer Out	Signal: Timer Output
Logics.LE15.Out	Signal: Latched Output (Q)
Logics.LE15.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE16.Gate Out	Signal: Output of the logic gate
Logics.LE16.Timer Out	Signal: Timer Output
Logics.LE16.Out	Signal: Latched Output (Q)

## Parameters

<i>Name</i>	<i>Description</i>
Logics.LE16.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE17.Gate Out	Signal: Output of the logic gate
Logics.LE17.Timer Out	Signal: Timer Output
Logics.LE17.Out	Signal: Latched Output (Q)
Logics.LE17.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE18.Gate Out	Signal: Output of the logic gate
Logics.LE18.Timer Out	Signal: Timer Output
Logics.LE18.Out	Signal: Latched Output (Q)
Logics.LE18.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE19.Gate Out	Signal: Output of the logic gate
Logics.LE19.Timer Out	Signal: Timer Output
Logics.LE19.Out	Signal: Latched Output (Q)
Logics.LE19.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE20.Gate Out	Signal: Output of the logic gate
Logics.LE20.Timer Out	Signal: Timer Output
Logics.LE20.Out	Signal: Latched Output (Q)
Logics.LE20.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE21.Gate Out	Signal: Output of the logic gate
Logics.LE21.Timer Out	Signal: Timer Output
Logics.LE21.Out	Signal: Latched Output (Q)
Logics.LE21.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE22.Gate Out	Signal: Output of the logic gate
Logics.LE22.Timer Out	Signal: Timer Output
Logics.LE22.Out	Signal: Latched Output (Q)
Logics.LE22.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE23.Gate Out	Signal: Output of the logic gate
Logics.LE23.Timer Out	Signal: Timer Output
Logics.LE23.Out	Signal: Latched Output (Q)
Logics.LE23.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE24.Gate Out	Signal: Output of the logic gate
Logics.LE24.Timer Out	Signal: Timer Output
Logics.LE24.Out	Signal: Latched Output (Q)
Logics.LE24.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE25.Gate Out	Signal: Output of the logic gate
Logics.LE25.Timer Out	Signal: Timer Output
Logics.LE25.Out	Signal: Latched Output (Q)
Logics.LE25.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE26.Gate Out	Signal: Output of the logic gate
Logics.LE26.Timer Out	Signal: Timer Output
Logics.LE26.Out	Signal: Latched Output (Q)

## Parameters

<i>Name</i>	<i>Description</i>
Logics.LE26.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE27.Gate Out	Signal: Output of the logic gate
Logics.LE27.Timer Out	Signal: Timer Output
Logics.LE27.Out	Signal: Latched Output (Q)
Logics.LE27.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE28.Gate Out	Signal: Output of the logic gate
Logics.LE28.Timer Out	Signal: Timer Output
Logics.LE28.Out	Signal: Latched Output (Q)
Logics.LE28.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE29.Gate Out	Signal: Output of the logic gate
Logics.LE29.Timer Out	Signal: Timer Output
Logics.LE29.Out	Signal: Latched Output (Q)
Logics.LE29.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE30.Gate Out	Signal: Output of the logic gate
Logics.LE30.Timer Out	Signal: Timer Output
Logics.LE30.Out	Signal: Latched Output (Q)
Logics.LE30.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE31.Gate Out	Signal: Output of the logic gate
Logics.LE31.Timer Out	Signal: Timer Output
Logics.LE31.Out	Signal: Latched Output (Q)
Logics.LE31.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE32.Gate Out	Signal: Output of the logic gate
Logics.LE32.Timer Out	Signal: Timer Output
Logics.LE32.Out	Signal: Latched Output (Q)
Logics.LE32.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE33.Gate Out	Signal: Output of the logic gate
Logics.LE33.Timer Out	Signal: Timer Output
Logics.LE33.Out	Signal: Latched Output (Q)
Logics.LE33.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE34.Gate Out	Signal: Output of the logic gate
Logics.LE34.Timer Out	Signal: Timer Output
Logics.LE34.Out	Signal: Latched Output (Q)
Logics.LE34.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE35.Gate Out	Signal: Output of the logic gate
Logics.LE35.Timer Out	Signal: Timer Output
Logics.LE35.Out	Signal: Latched Output (Q)
Logics.LE35.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE36.Gate Out	Signal: Output of the logic gate
Logics.LE36.Timer Out	Signal: Timer Output
Logics.LE36.Out	Signal: Latched Output (Q)

## Parameters

<i>Name</i>	<i>Description</i>
Logics.LE36.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE37.Gate Out	Signal: Output of the logic gate
Logics.LE37.Timer Out	Signal: Timer Output
Logics.LE37.Out	Signal: Latched Output (Q)
Logics.LE37.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE38.Gate Out	Signal: Output of the logic gate
Logics.LE38.Timer Out	Signal: Timer Output
Logics.LE38.Out	Signal: Latched Output (Q)
Logics.LE38.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE39.Gate Out	Signal: Output of the logic gate
Logics.LE39.Timer Out	Signal: Timer Output
Logics.LE39.Out	Signal: Latched Output (Q)
Logics.LE39.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE40.Gate Out	Signal: Output of the logic gate
Logics.LE40.Timer Out	Signal: Timer Output
Logics.LE40.Out	Signal: Latched Output (Q)
Logics.LE40.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE41.Gate Out	Signal: Output of the logic gate
Logics.LE41.Timer Out	Signal: Timer Output
Logics.LE41.Out	Signal: Latched Output (Q)
Logics.LE41.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE42.Gate Out	Signal: Output of the logic gate
Logics.LE42.Timer Out	Signal: Timer Output
Logics.LE42.Out	Signal: Latched Output (Q)
Logics.LE42.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE43.Gate Out	Signal: Output of the logic gate
Logics.LE43.Timer Out	Signal: Timer Output
Logics.LE43.Out	Signal: Latched Output (Q)
Logics.LE43.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE44.Gate Out	Signal: Output of the logic gate
Logics.LE44.Timer Out	Signal: Timer Output
Logics.LE44.Out	Signal: Latched Output (Q)
Logics.LE44.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE45.Gate Out	Signal: Output of the logic gate
Logics.LE45.Timer Out	Signal: Timer Output
Logics.LE45.Out	Signal: Latched Output (Q)
Logics.LE45.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE46.Gate Out	Signal: Output of the logic gate
Logics.LE46.Timer Out	Signal: Timer Output
Logics.LE46.Out	Signal: Latched Output (Q)



## Parameters

<i>Name</i>	<i>Description</i>
Logics.LE46.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE47.Gate Out	Signal: Output of the logic gate
Logics.LE47.Timer Out	Signal: Timer Output
Logics.LE47.Out	Signal: Latched Output (Q)
Logics.LE47.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE48.Gate Out	Signal: Output of the logic gate
Logics.LE48.Timer Out	Signal: Timer Output
Logics.LE48.Out	Signal: Latched Output (Q)
Logics.LE48.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE49.Gate Out	Signal: Output of the logic gate
Logics.LE49.Timer Out	Signal: Timer Output
Logics.LE49.Out	Signal: Latched Output (Q)
Logics.LE49.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE50.Gate Out	Signal: Output of the logic gate
Logics.LE50.Timer Out	Signal: Timer Output
Logics.LE50.Out	Signal: Latched Output (Q)
Logics.LE50.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE51.Gate Out	Signal: Output of the logic gate
Logics.LE51.Timer Out	Signal: Timer Output
Logics.LE51.Out	Signal: Latched Output (Q)
Logics.LE51.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE52.Gate Out	Signal: Output of the logic gate
Logics.LE52.Timer Out	Signal: Timer Output
Logics.LE52.Out	Signal: Latched Output (Q)
Logics.LE52.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE53.Gate Out	Signal: Output of the logic gate
Logics.LE53.Timer Out	Signal: Timer Output
Logics.LE53.Out	Signal: Latched Output (Q)
Logics.LE53.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE54.Gate Out	Signal: Output of the logic gate
Logics.LE54.Timer Out	Signal: Timer Output
Logics.LE54.Out	Signal: Latched Output (Q)
Logics.LE54.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE55.Gate Out	Signal: Output of the logic gate
Logics.LE55.Timer Out	Signal: Timer Output
Logics.LE55.Out	Signal: Latched Output (Q)
Logics.LE55.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE56.Gate Out	Signal: Output of the logic gate
Logics.LE56.Timer Out	Signal: Timer Output
Logics.LE56.Out	Signal: Latched Output (Q)

## Parameters

<i>Name</i>	<i>Description</i>
Logics.LE56.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE57.Gate Out	Signal: Output of the logic gate
Logics.LE57.Timer Out	Signal: Timer Output
Logics.LE57.Out	Signal: Latched Output (Q)
Logics.LE57.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE58.Gate Out	Signal: Output of the logic gate
Logics.LE58.Timer Out	Signal: Timer Output
Logics.LE58.Out	Signal: Latched Output (Q)
Logics.LE58.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE59.Gate Out	Signal: Output of the logic gate
Logics.LE59.Timer Out	Signal: Timer Output
Logics.LE59.Out	Signal: Latched Output (Q)
Logics.LE59.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE60.Gate Out	Signal: Output of the logic gate
Logics.LE60.Timer Out	Signal: Timer Output
Logics.LE60.Out	Signal: Latched Output (Q)
Logics.LE60.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE61.Gate Out	Signal: Output of the logic gate
Logics.LE61.Timer Out	Signal: Timer Output
Logics.LE61.Out	Signal: Latched Output (Q)
Logics.LE61.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE62.Gate Out	Signal: Output of the logic gate
Logics.LE62.Timer Out	Signal: Timer Output
Logics.LE62.Out	Signal: Latched Output (Q)
Logics.LE62.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE63.Gate Out	Signal: Output of the logic gate
Logics.LE63.Timer Out	Signal: Timer Output
Logics.LE63.Out	Signal: Latched Output (Q)
Logics.LE63.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE64.Gate Out	Signal: Output of the logic gate
Logics.LE64.Timer Out	Signal: Timer Output
Logics.LE64.Out	Signal: Latched Output (Q)
Logics.LE64.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE65.Gate Out	Signal: Output of the logic gate
Logics.LE65.Timer Out	Signal: Timer Output
Logics.LE65.Out	Signal: Latched Output (Q)
Logics.LE65.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE66.Gate Out	Signal: Output of the logic gate
Logics.LE66.Timer Out	Signal: Timer Output
Logics.LE66.Out	Signal: Latched Output (Q)

## Parameters

<i>Name</i>	<i>Description</i>
Logics.LE66.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE67.Gate Out	Signal: Output of the logic gate
Logics.LE67.Timer Out	Signal: Timer Output
Logics.LE67.Out	Signal: Latched Output (Q)
Logics.LE67.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE68.Gate Out	Signal: Output of the logic gate
Logics.LE68.Timer Out	Signal: Timer Output
Logics.LE68.Out	Signal: Latched Output (Q)
Logics.LE68.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE69.Gate Out	Signal: Output of the logic gate
Logics.LE69.Timer Out	Signal: Timer Output
Logics.LE69.Out	Signal: Latched Output (Q)
Logics.LE69.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE70.Gate Out	Signal: Output of the logic gate
Logics.LE70.Timer Out	Signal: Timer Output
Logics.LE70.Out	Signal: Latched Output (Q)
Logics.LE70.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE71.Gate Out	Signal: Output of the logic gate
Logics.LE71.Timer Out	Signal: Timer Output
Logics.LE71.Out	Signal: Latched Output (Q)
Logics.LE71.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE72.Gate Out	Signal: Output of the logic gate
Logics.LE72.Timer Out	Signal: Timer Output
Logics.LE72.Out	Signal: Latched Output (Q)
Logics.LE72.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE73.Gate Out	Signal: Output of the logic gate
Logics.LE73.Timer Out	Signal: Timer Output
Logics.LE73.Out	Signal: Latched Output (Q)
Logics.LE73.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE74.Gate Out	Signal: Output of the logic gate
Logics.LE74.Timer Out	Signal: Timer Output
Logics.LE74.Out	Signal: Latched Output (Q)
Logics.LE74.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE75.Gate Out	Signal: Output of the logic gate
Logics.LE75.Timer Out	Signal: Timer Output
Logics.LE75.Out	Signal: Latched Output (Q)
Logics.LE75.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE76.Gate Out	Signal: Output of the logic gate
Logics.LE76.Timer Out	Signal: Timer Output
Logics.LE76.Out	Signal: Latched Output (Q)

Name	Description
Logics.LE76.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE77.Gate Out	Signal: Output of the logic gate
Logics.LE77.Timer Out	Signal: Timer Output
Logics.LE77.Out	Signal: Latched Output (Q)
Logics.LE77.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE78.Gate Out	Signal: Output of the logic gate
Logics.LE78.Timer Out	Signal: Timer Output
Logics.LE78.Out	Signal: Latched Output (Q)
Logics.LE78.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE79.Gate Out	Signal: Output of the logic gate
Logics.LE79.Timer Out	Signal: Timer Output
Logics.LE79.Out	Signal: Latched Output (Q)
Logics.LE79.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE80.Gate Out	Signal: Output of the logic gate
Logics.LE80.Timer Out	Signal: Timer Output
Logics.LE80.Out	Signal: Latched Output (Q)
Logics.LE80.Out inverted	Signal: Negated Latched Output (Q NOT)

## Setting Lock

By means of the Setting Lock, parameter settings can be locked against any changes as long as the assigned signal is true (active). The Setting Lock can be activated within menu [Field Para/General Settings/Lock Settings].

## Bypass of the Setting Lock

The setting lock can be overwritten (temporarily) in case that the status of the signal that activates the setting lock cannot be modified or should not be modified (spare key).

The Setting Lock can be bypassed by means of the Direct Control Parameter »Setting Lock Bypass« [Field Para/General Settings/Setting Lock Bypass]. The protective device will fall back into the Setting Lock either:

- Directly after a parameter change has been saved, else
- 10 minutes after the bypass has been activated.

## Device Parameters

Sys

### Date and Time

In menu »*Device parameters/Date/Time*« you can set date and time.

### Version

Within this menu »*Device parameters/Version*« you can obtain information on the soft- and hardware version.

### Display of ANSI-Codes

The display of ANSI codes can be activated within menu »*Device parameters/HMI//Display ANSI device numbers*«

### TCP/IP Settings

Within menu »*Device Para / TCP/IP/TCP/IP Config*« the TCP/IP settings have to be set.

The first-time setting of the TCP/IP Parameters can be done at the panel (HMI) only.

#### **NOTICE**

**Establishing a connection via TCP/IP to the device is only possible if your device is equipped with an Ethernet Interface (RJ45).**









**Contact your IT administrator in order to establish the network connection.**

Set the TCP/IP Parameters




Call up »*Device parameter/TCP/IP*« at the HMI (panel) and set the following parameters:

- TCP/IP address
- Subnetmask
- Gateway

## Direct Commands of the System Module






Parameter	Description	Setting range	Default	Menu path
Ack BO LED Scd TCmd 	Reset the binary output relays, LEDs, SCADA and the Trip Command.	inactive, active	inactive	[Operation / Reset/Acknowledg e /Acknowledge]
Ack LED 	All acknowledgeable LEDs will be acknowledged.	inactive, active	inactive	[Operation / Reset/Acknowledg e /Acknowledge]
Ack BO 	All acknowledgeable binary output relays will be acknowledged.	inactive, active	inactive	[Operation / Reset/Acknowledg e /Acknowledge]
Ack Scada 	SCADA will be acknowledged.	inactive, active	inactive	[Operation / Reset/Acknowledg e /Acknowledge]
Res OperationsCr 	Reset all counters in history group operations	inactive, active	inactive	[Operation / Reset/Acknowledg e /History]
Res AlarmCr 	Reset all counters in history group alarms	inactive, active	inactive	[Operation / Reset/Acknowledg e /History]
Res TripCmdCr 	Reset all counters in history group trips	inactive, active	inactive	[Operation / Reset/Acknowledg e /History]
Res TotalCr 	Reset all counters in history group total	inactive, active	inactive	[Operation / Reset/Acknowledg e /History]

Device Parameters







<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Res All 	Reset of all Counters	inactive, active	inactive	[Operation / Reset/Acknowledg e /History]
Reboot 	Rebooting the device.	no, yes	no	[Service /General]
Setting Lock Bypass 	Short-period unlock of the Setting Lock	inactive, active	inactive	[Field Para /General settings]

**CAUTION** CAUTION, rebooting the device manually will release the Supervision Contact.

## Global Protection Parameters of the System

Parameter	Description	Setting range	Default	Menu path
 PSet-Switch	Switching Parameter Set	PS1, PS2, PS3, PS4, PSS via Inp fct, PSS via Scada	PS1	[Protection Para /PSet-Switch]
 PS1: activated by	<p>This Setting Group will be the active one if: The Parameter Setting Group Switch is set to "Switch via Input" and the other three input functions are inactive at the same time. In case that there is more than one input function active, no Parameter Setting Group Switch will be executed. In case all input functions are inactive, the device will keep working with the Setting Group that was activated lastly.</p> <p>Only available if: PSet-Switch = PSS via Inp fct</p>	1..n, PSS	-.-	[Protection Para /PSet-Switch]
 PS2: activated by	<p>This Setting Group will be the active one if: The Parameter Setting Group Switch is set to "Switch via Input" and the other three input functions are inactive at the same time. In case that there is more than one input function active, no Parameter Setting Group Switch will be executed. In case all input functions are inactive, the device will keep working with the Setting Group that was activated lastly.</p> <p>Only available if: PSet-Switch = PSS via Inp fct</p>	1..n, PSS	-.-	[Protection Para /PSet-Switch]
 PS3: activated by	<p>This Setting Group will be the active one if: The Parameter Setting Group Switch is set to "Switch via Input" and the other three input functions are inactive at the same time. In case that there is more than one input function active, no Parameter Setting Group Switch will be executed. In case all input functions are inactive, the device will keep working with the Setting Group that was activated lastly.</p> <p>Only available if: PSet-Switch = PSS via Inp fct</p>	1..n, PSS	-.-	[Protection Para /PSet-Switch]
 PS4: activated by	<p>This Setting Group will be the active one if: The Parameter Setting Group Switch is set to "Switch via Input" and the other three input functions are inactive at the same time. In case that there is more than one input function active, no Parameter Setting Group Switch will be executed. In case all input functions are inactive, the device will keep working with the Setting Group that was activated lastly.</p> <p>Only available if: PSet-Switch = PSS via Inp fct</p>	1..n, PSS	-.-	[Protection Para /PSet-Switch]



Parameter	Description	Setting range	Default	Menu path
Remote Reset 	Enables or disables the option to acknowledge from external/remote via signals (assignments) and SCADA.	inactive, active	active	[Device Para /Ex Acknowledge]
Ack LED 	All acknowledgeable LEDs will be acknowledged if the state of the assigned signal becomes true.  Only available if: Remote Reset = active	1..n, Assignment List	-.-	[Device Para /Ex Acknowledge]
Ack BO 	All acknowledgeable binary output relays will be acknowledged if the state of the assigned signal becomes true.  Only available if: Remote Reset = active	1..n, Assignment List	-.-	[Device Para /Ex Acknowledge]
Ack Scada 	SCADA will be acknowledged if the state of the assigned signal becomes true.  Only available if: Remote Reset = active	1..n, Assignment List	-.-	[Device Para /Ex Acknowledge]
Scaling 	Display of the measured values as primary, secondary or per unit values	Per unit values, Primary values, Secondary values	Per unit values	[Device Para /Measurment Display /General settings]
Program Mode 	Program Mode	Either Motor Stopped or Running, Motor Stop	Either Motor Stopped or Running	[Field Para /General settings]

### System Module Input States

Name	Description	Assignment via
Ack LED-I	Module input state: LEDs acknowledgement by digital input	[Device Para /Ex Acknowledge]
Ack BO-I	Module input state: Acknowledgement of the binary Output Relays	[Device Para /Ex Acknowledge]
Ack Scada-I	Module input state: Acknowledge Scada via digital input. The replica that SCADA has got from the device is to be reset.	[Device Para /Ex Acknowledge]
PS1-I	State of the module input respectively of the signal, that should activate this Parameter Setting Group.	[Protection Para /PSet-Switch]
PS2-I	State of the module input respectively of the signal, that should activate this Parameter Setting Group.	[Protection Para /PSet-Switch]
PS3-I	State of the module input respectively of the signal, that should activate this Parameter Setting Group.	[Protection Para /PSet-Switch]
PS4-I	State of the module input respectively of the signal, that should activate this Parameter Setting Group.	[Protection Para /PSet-Switch]

## System Module Signals

<i>Signal</i>	<i>Description</i>
Reboot	Signal: Rebooting the device: 1=Normal Start-up; 2=Reboot by the Operator; 3=Reboot by means of Super Reset; 4=outdated; 5=outdated; 6=Unknown Error Source; 7=Forced Reboot (initiated by the main processor); 8=Exceeded Time Limit of the Protection Cycle; 9= Forced Reboot (initiated by the digital signal processor); 10=Exceeded Time Limit of the Measured Value Processing; 11=Sags of the Supply Voltage; 12=Illegal Memory Access.
Act Set	Signal: Active Parameter Set
PS 1	Signal: Parameter Set 1
PS 2	Signal: Parameter Set 2
PS 3	Signal: Parameter Set 3
PS 4	Signal: Parameter Set 4
PSS manual	Signal: Manual Switch over of a Parameter Set
PSS via Scada	Signal: Parameter Set Switch via Scada. Write into this output byte the integer of the parameter set that should become active (e.g. 4 => Switch onto parameter set 4).
PSS via Inp fct	Signal: Parameter Set Switch via input function
min 1 param changed	Signal: At least one parameter has been changed
Setting Lock Bypass	Signal: Short-period unlock of the Setting Lock
Param to be saved	Number of parameters to be saved. 0 means that all parameter changes are overtaken.
Ack LED	Signal: LEDs acknowledgement
Ack BO	Signal: Acknowledgement of the Binary Outputs
Ack Counter	Signal: Reset of all Counters
Ack Scada	Signal: Acknowledge Scada
Ack TripCmd	Signal: Reset Trip Command
Ack LED-HMI	Signal: LEDs acknowledgement :HMI
Ack BO-HMI	Signal: Acknowledgement of the Binary Outputs :HMI
Ack Counter-HMI	Signal: Reset of all Counters :HMI
Ack Scada-HMI	Signal: Acknowledge Scada :HMI
Ack TripCmd-HMI	Signal: Reset Trip Command :HMI
Ack LED-Sca	Signal: LEDs acknowledgement :SCADA
Ack BO-Sca	Signal: Acknowledgement of the Binary Outputs :SCADA
Ack Counter-Sca	Signal: Reset of all Counters :SCADA
Ack Scada-Sca	Signal: Acknowledge Scada :SCADA
Ack TripCmd-Sca	Signal: Reset Trip Command :SCADA
Res OperationsCr	Signal:: Res OperationsCr
Res AlarmCr	Signal:: Res AlarmCr
Res TripCmdCr	Signal:: Res TripCmdCr
Res TotalCr	Signal:: Res TotalCr

**Special Values of the System Module**



<i>Value</i>	<i>Description</i>	<i>Menu path</i>
Build	Build	[Device Para /Version]
Version	Version	[Device Para /Version]
Operating hours Cr	Operating hours counter of the protective device	[Operation /Count and RevData /Sys]
Hours Counter	Hours Counter	[Operation /History /TotalCr]

## Field Parameters








### Field Para

Within the field parameters you can set all parameters, that are relevant for the primary side and the mains operational method like frequency, primary and secondary values...




### General Field Parameters

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Phase Sequence 	Phase Sequence direction	ABC, ACB	ABC	[Field Para /General settings]
f 	Nominal frequency	50Hz, 60Hz	50Hz	[Field Para /General settings]

## Field Parameters – Current Related

Parameter	Description	Setting range	Default	Menu path
CT pri 	Nominal current of the primary side of the current transformers.	1 - 50000A	10A	[Field Para /CT]
CT sec 	Nominal current of the secondary side of the current transformers.	1A, 5A	1A	[Field Para /CT]
CT dir 	Protection functions with directional feature can only work properly if the connection of the current transformers is free of wiring errors. If all current transformers are connected to the device with an incorrect polarity, the wiring error can be compensated by this parameter. This parameter turns the current vectors by 180 degrees.	0°, 180°	0°	[Field Para /CT]
ECT pri 	This parameter defines the primary nominal current of the connected earth current transformer. If the earth current is measured via the Holmgreen connection, the primary value of the phase current transformer must be entered here.	1 - 50000A	50A	[Field Para /CT]
ECT sec 	This parameter defines the secondary nominal current of the connected earth current transformer. If the earth current is done via the Holmgreen connection, the primary value of the phase current transformer must be entered here.	1A, 5A	1A	[Field Para /CT]
ECT dir 	Earth fault protection with directional feature depends also on the correct wiring of the earth current transformer. An incorrect polarity/wiring can be corrected by means of the settings "0°" or "180°". The operator has the possibility of turning the current vector by 180 degrees (change of sign) without modification of the wiring. This means, that – in terms of figures - the determined current indicator was turned by 180° by the device.	0°, 180°	0°	[Field Para /CT]
IL1, IL2, IL3 Cutoff Level 	The Current shown in the Display or within the PC Software will be displayed as zero, if the Current falls below this Cutoff Level. This parameter has no impact on recorders.	0.0 - 0.100In	0.005In	[Device Para /Measurem Display /Current]

## Field Parameters

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
IG meas Cutoff Level 	The measured Earth Current shown in the Display or within the PC Software will be displayed as zero, if the measured Earth Current falls below this Cutoff Level. This parameter has no impact on recorders.	0.0 - 0.100In	0.005In	[Device Para /Measurem Display /Current]
IG calc Cutoff Level 	The calculated Earth Current shown in the Display or within the PC Software will be displayed as zero, if the calculated Earth Current falls below this Cutoff Level. This parameter has no impact on recorders.	0.0 - 0.100In	0.005In	[Device Para /Measurem Display /Current]
I012 Cutoff Level 	The Symmetrical Component shown in the Display or within the PC Software will be displayed as zero, if the Symmetrical Component falls below this Cutoff Level. This parameter has no impact on recorders.	0.0 - 0.100In	0.005In	[Device Para /Measurem Display /Current]

## Blockings

The device provides a function for temporary and permanent blocking of the complete protection functionality or of single protection stages.



**WARNING** Make absolutely sure that no illogical or even life-threatening blockings are allocated.

**Make sure that you do not carelessly deactivate protection functions which have to be available according to the protection concept.**

### Permanent Blocking

*Switching ON or OFF the complete protection functionality*

In module »*Protection*« the complete protection of the device can be switched on or off. Set the parameter *Function* to »*active*« or »*inactive*« in module »*Prot*«.



**WARNING** Only if in module »*Prot*« the parameter *Function* is = »*active*«, the protection is activated; i.e. with »*Function*« = »*inactive*«, no protection function is operating. Then the device cannot protect any components.

*Switching modules ON or OFF*

Each of the modules can be switched on or off (permanently). This is achieved when the parameter »*Function*« is set to »*active*« or »*inactive*« in the respective module.

*Activating or deactivating the tripping command of a protection stage permanently*

In each of the protection stages the tripping command to the CB can be permanently blocked. For this purpose the parameter »*TripCmd Blo*« has to be set to »*active*«.

### Temporary Blocking

*To block the complete protection of the device temporarily by a signal*

In module »*Prot*« the complete protection of the device can be blocked temporarily by a signal. On condition that a module-external blocking is permitted »*ExBlo Fc=active*«. In addition to this, a related blocking signal from the »assignment list« must have been assigned. For the time the allocated blocking signal is active, the module is blocked.



**WARNING** If the module »*Prot*« is blocked, the complete protection function does not work. As long as the blocking signal is active, the device cannot protect any components.

*To block a complete protection module temporarily by an active assignment*

- In order to establish a temporary blockage of a protection module, the parameter »*ExBlo Fc*« of the module has to be set to »*active*«. This gives the permission: »This module can be blocked«.
- Within the general protection parameters a signal has to be additionally chosen from the »ASSIGNMENT LIST«. The blocking only becomes active when the assigned signal is active.

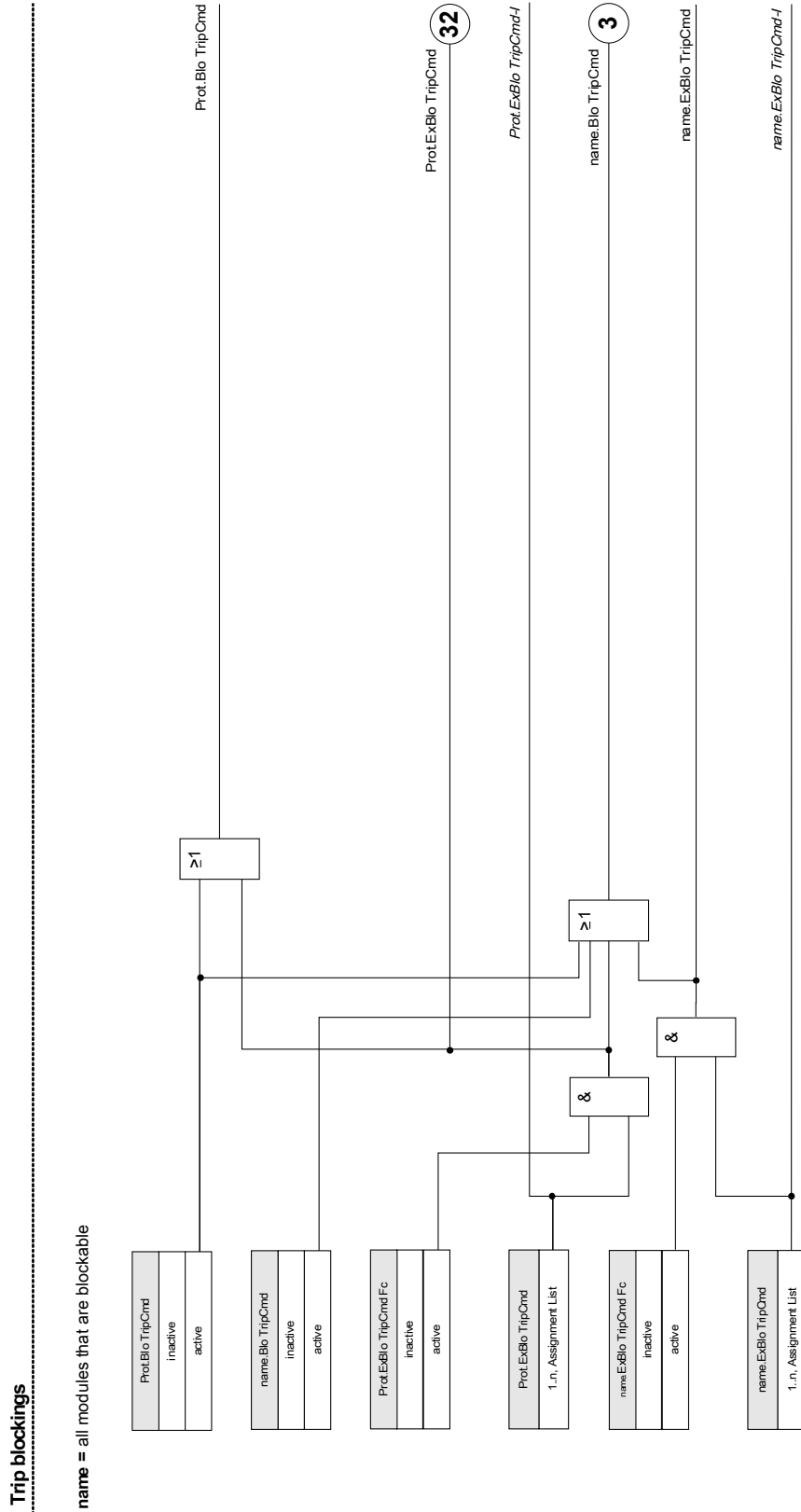
*To block the tripping command of a protection stage temporarily by an active assignment.*

The tripping command of any of the protection modules can be blocked from external. In this case, external does not only mean from outside the device, but also from outside the module. Not only real external signals are permitted to be used as blocking signals, as for example, the state of a digital input, but you can also choose any other signal from the »assignment list«.

- In order to establish a temporary blockage of a protection stage, the parameter »*ExBlo TripCmd Fc*« of the module has to be set to »*active*«. This gives the permission: »The tripping command of this stage can be blocked«.
- Within the general protection parameters, a signal has to be chosen additionally and assigned to the parameter »*ExBlo*« from the »assignment list«. If the selected signal is activated, the temporary blockage becomes effective.



## To Activate or Deactivate the Tripping Command of a Protection Module



# Activate, Deactivate respectively Block Temporarily Protection Functions

## Blockings

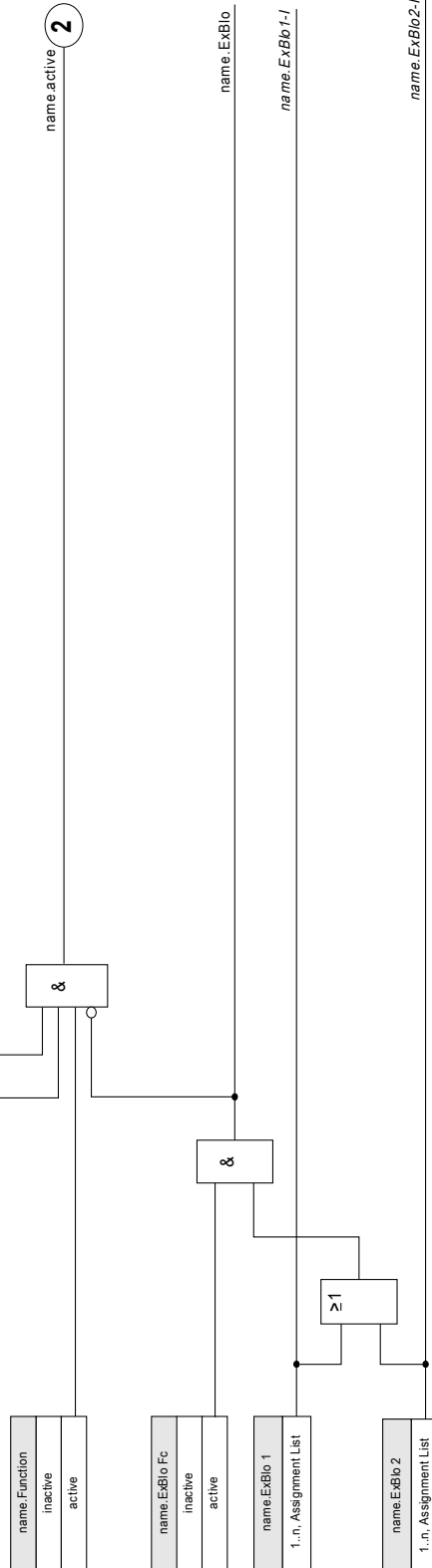
**name = all modules that are blockable**

Frequency is within the nominal frequency range.<sup>(1)(2)</sup>

**1** Please Refer To Diagram: **Prot**

Prot. active

(The General Protection module is not deactivat(ed) or blocked)

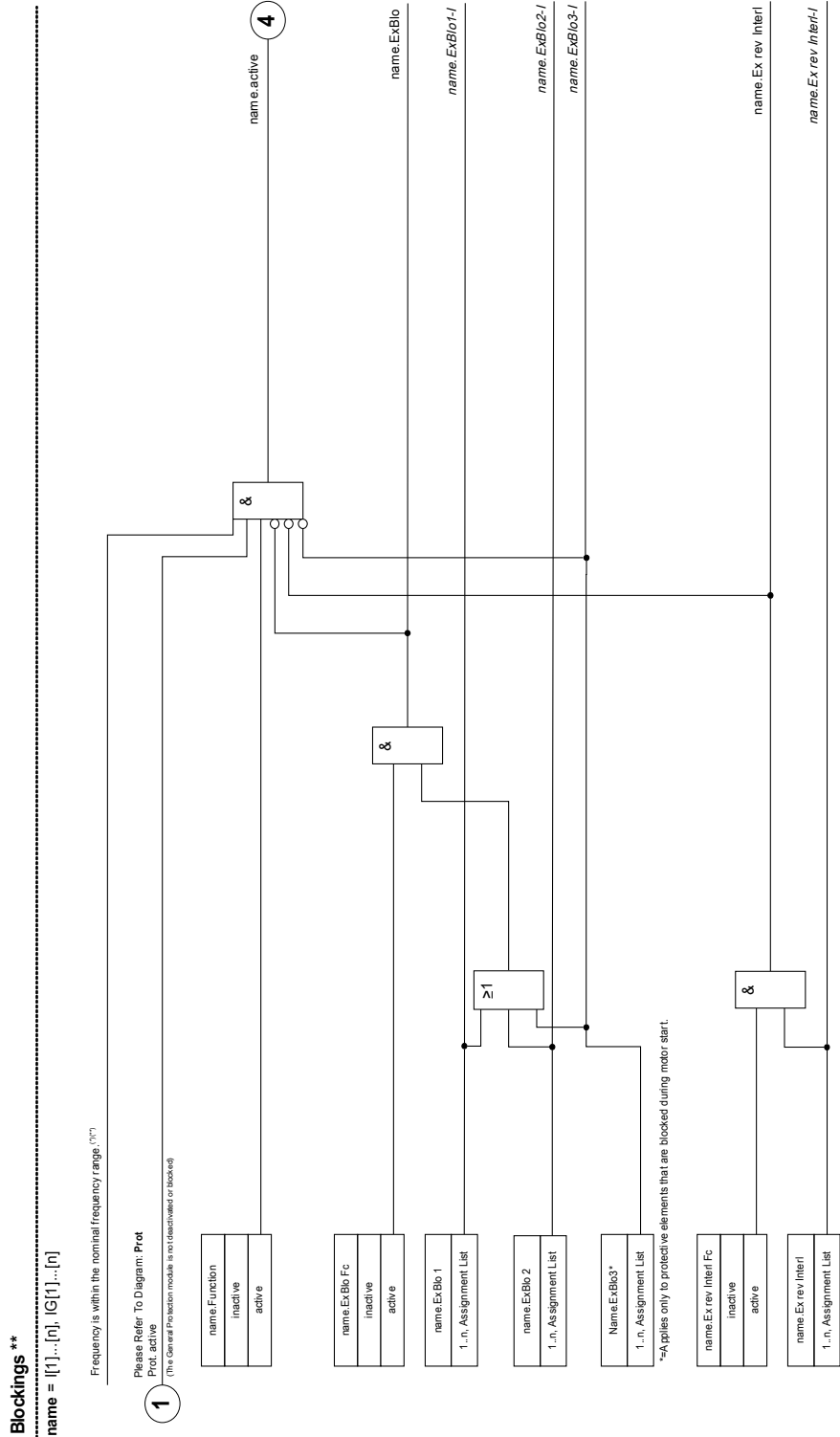


<sup>1</sup>All protective elements will be blocked that are using fundamental or harmonics measured values, if the frequency leaves the nominal frequency range. Protective elements that are using RMS values will remain active. See chapter "Wide frequency range".

<sup>2</sup>This applies to devices that offer wide frequency range measurement only.

Current protective functions cannot only be blocked permanently (»function = inactive«) or temporarily by any blocking signal from the »assignment list«, but also by »reverse Interlocking«.

All other protection functions can be activated, deactivated or blocked in the same manner.



## Module: Protection (Prot)

### Prot

The module *»Protection«* serves as outer frame for all other protection modules, i.e. they are all enclosed by the module *»Protection«*.



**WARNING** If in module *»Protection«* the parameter *»Function«* is set on *»inactive«* or in case the module is blocked, then the complete protective function of the device does not work anymore.

#### *Protection inactive*

If the master module *»Protection«* was permanently deactivated or if a temporary blockage of this module has occurred and the allocated blocking signal is still active, then the complete functionality (protection) of the device is zero. In such a case the protective function is *»inactive«*.

#### *Protection active*

If the master module *»Protection«* was activated and a blockade for this module was not activated respectively the assigned blocking signal is inactive at that moment, then the *»Protection«* is *»active«*.

## Blocking all Protective Elements enduringly

In order to allow (the principle use) of blocking the entire protection call up the menu [Protection/Para/Global Prot Para/Prot]:

- Set the parameter *»Function = inactive«*.

## Blocking all Protective Elements temporarily

In order to allow (the principle use) of blocking the entire protection call up the menu [Protection/Para/Global Prot Para/Prot]:

- Set the parameter *»ExBlo Fc = active«*;
- Choose an assignment for *»ExBlo1«*; and
- Optionally choose an assignment for *»ExBlo2«*.

If one of the signals becomes true, then the entire protection will be blocked as long as one of these signals are true.

## Blocking all Trip Commands enduringly

In order to allow (the principle use) of blocking the entire protection call up the menu [Protection/Para/Global Prot Para/Prot]:

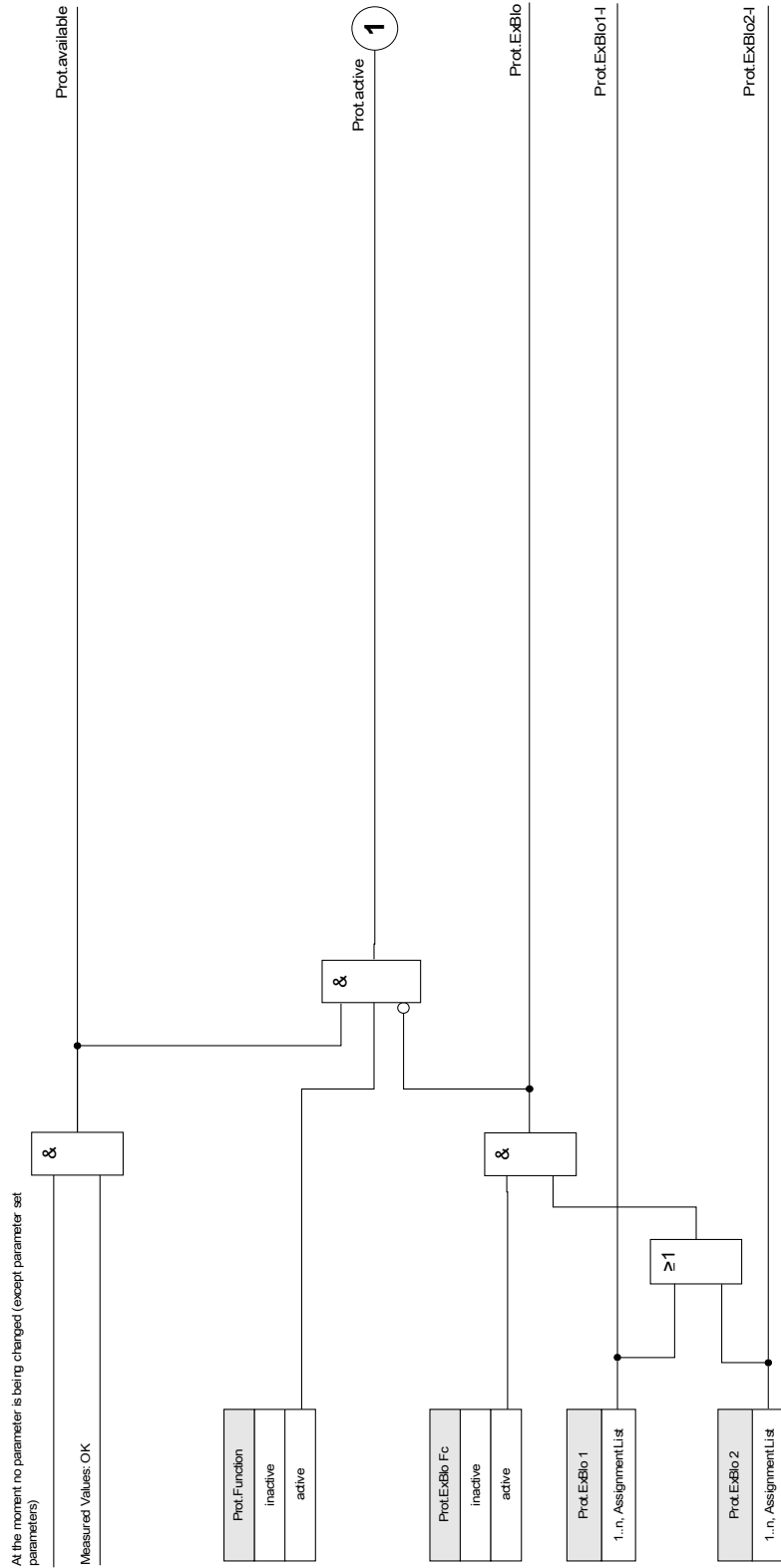
- Set the parameter »*Blo TripCmd = inactive*«.

## Blocking all Trip Commands temporarily

In order to allow (the principle use) of blocking the entire protection, call up the menu [Protection/Para/Global Prot Para/Prot]:

- Set the parameter »*ExBlo TripCmd Fc= active*«.
- Choose an assignment for »*ExBlo TripCmd*«. All Trip commands will be blocked temporarily if this assignment becomes true.

Prot - active



## General Alarms and General Trips

Each protective element generates it's own alarm and trip signals. All alarms and trip decision are passed on to the master module »Prot«.

If a protective element picks up, respectively has decided about a trip, two signals will be issued:

1. The module or the protection stage issues an alarm e.g. »I[1].ALARM« or »I[1].TRIP«.
2. The master module »Prot« collects/summarizes the signals and issues an alarm or a trip signal »PROT.ALARM« »PROT.TRIP«.

Further examples: »PROT.ALARM L1« is a collective signal (OR-connected) for all alarms issued by any of the protective elements concerning Phase L1.

»PROT.TRIP L1« is a collective signal (OR-connected) for all trips issued by any of the protective elements concerning Phase L1.

»PROT.ALARM« is the collective alarm signal OR-ed from all protection elements.»PROT.TRIP« is the collective alarm signal OR-ed from all protection elements.

The trip commands of a the protective elements have to be assigned within the Circuit Breaker Manager CB Manager. Only those trip decisions that are assigned within the CB Manager are issued to the Circuit Breaker.



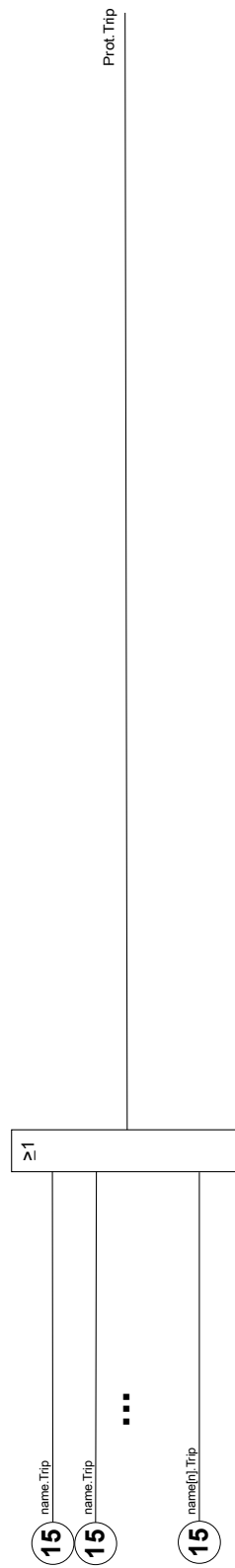
**Caution: Trip commands that are not assigned within the Circuit Breaker Manager (CB Manager) are not issued to a circuit breaker.**

**The CB Manager issues the trip commands to a circuit breaker.**

**Assign within the Circuit Breaker Manager all trip commands that have to switch a circuit breaker.**

**Prot.Trip**

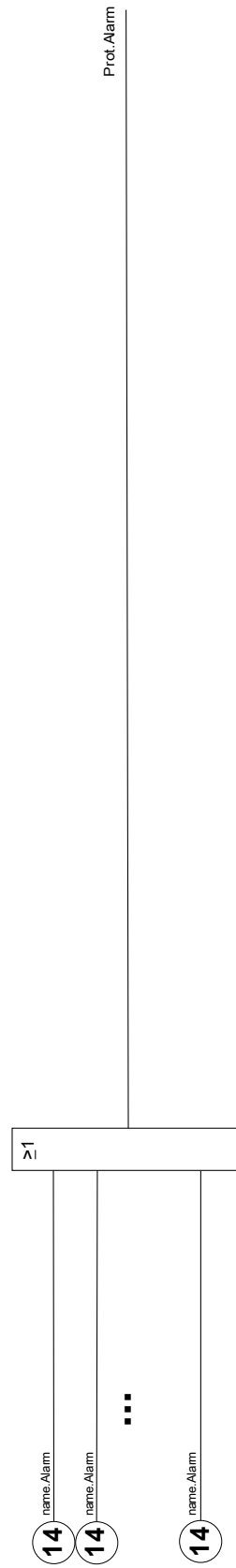
name = Each trip of an active, trip, authorized protection module will lead to a general trip.





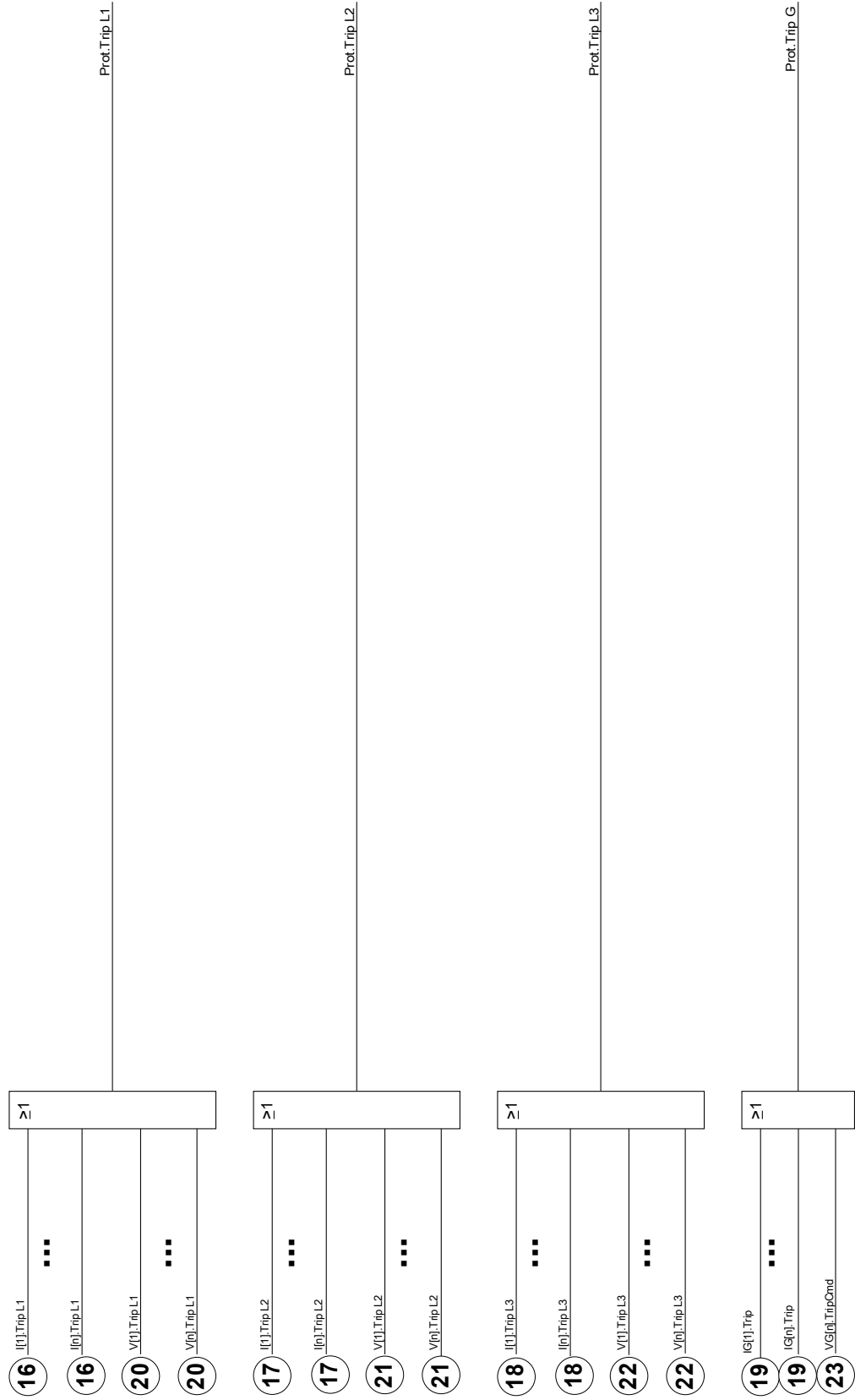
**Prot.Alarm**

name = Each alarm of a module (except from supervision modules but including CBF) will lead to a general alarm (collective alarm).



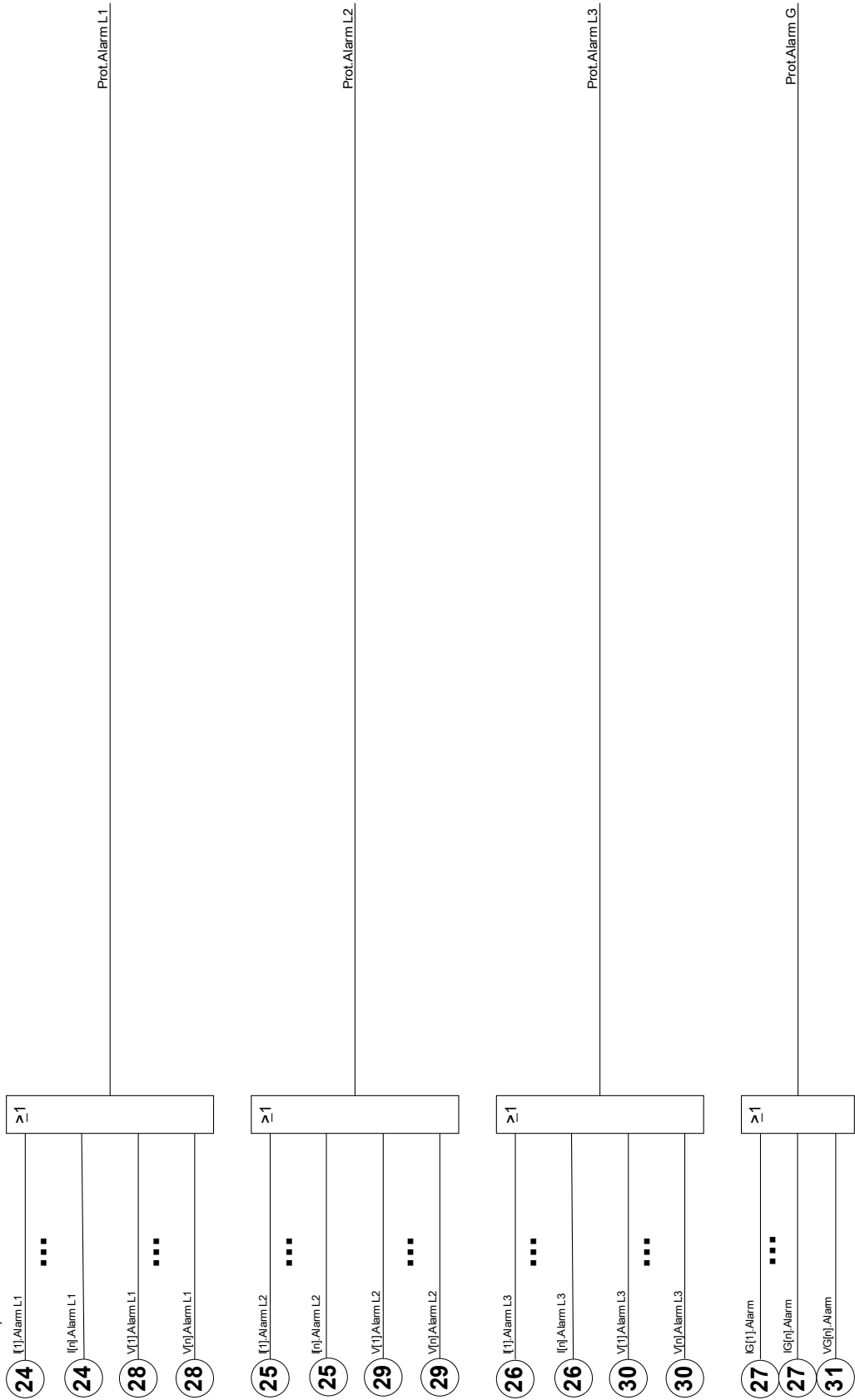
**Prot.Trip**

Each phase selective trip of a trip authorized module (I, IG, V, VX depending on the device type) will lead to a phase selective general trip.




**ProtAlarm**








Each phase selective alarm of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general alarm (collective alarm).



## Direct Commands of the Protection Module

Parameter	Description	Setting range	Default	Menu path
Res Fault a Mains No 	Resetting of fault number and number of grid faults.	inactive, active	inactive	[Operation / Reset/Acknowledge /Reset]

## Global Protection Parameters of the Protection Module

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/stage.	inactive, active	active	[Protection Para /Global Prot Para /Prot]
ExBlo Fc 	Activate (allow) the external blocking of the global protection functionality of the device.	inactive, active	inactive	[Protection Para /Global Prot Para /Prot]
ExBlo1 	If external blocking of this module is activated (allowed), the global protection functionality of the device will be blocked if the state of the assigned signal becomes true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Prot]
ExBlo2 	If external blocking of this module is activated (allowed), the global protection functionality of the device will be blocked if the state of the assigned signal becomes true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Prot]
Blo TripCmd 	Permanent blocking of the Trip Command of the entire Protection.	inactive, active	inactive	[Protection Para /Global Prot Para /Prot]
ExBlo TripCmd Fc 	Activate (allow) the external blocking of the trip command of the entire device.	inactive, active	inactive	[Protection Para /Global Prot Para /Prot]
ExBlo TripCmd 	If external blocking of the tripping command is activated (allowed), the tripping command of the entire device will be blocked if the state of the assigned signal becomes true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Prot]

## Protection Module Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module input state: External blocking1	[Protection Para /Global Prot Para /Prot]
ExBlo2-I	Module input state: External blocking2	[Protection Para /Global Prot Para /Prot]
ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command	[Protection Para /Global Prot Para /Prot]

## Protection Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
available	Signal: Protection is available
active	Signal: active
ExBlo	Signal: External Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Alarm L1	Signal: General-Alarm L1
Alarm L2	Signal: General-Alarm L2
Alarm L3	Signal: General-Alarm L3
Alarm G	Signal: General-Alarm - Earth fault
Alarm	Signal: General Alarm
Trip L1	Signal: General Trip L1
Trip L2	Signal: General Trip L2
Trip L3	Signal: General Trip L3
Trip G	Signal: General Trip Ground fault
Trip	Signal: General Trip
Res Fault a Mains No	Signal: Resetting of fault number and number of grid faults.

## Protection Module Values

<i>Parameter</i>	<i>Description</i>
FaultNo	Disturbance No
No of grid faults	Number of grid faults: A grid fault, e.g. a short circuit, might cause several faults with trip and autoreclosing, each fault being identified by an increased fault number. In this case, the grid fault number remains the same.
Trip	First trip cause which is the same as listed in fault record: See SCADA doc for code (section Cause of Trip). See manual (section Fault Recorder) for more information.

## Switchgear/Breaker – Manager



**WARNING** Misconfiguration of the switchgear can result in death or serious injury.

Beside protection functions, protective relays more and more will take care about controlling switchgear, like circuit breakers, load break switches, disconnectors and ground connectors.

The Switchgear/Breaker-Manager of this protective device is designed to manage one switchgear.

The correct configuration is an indispensable precondition for the proper functioning of the protective device. This also is the case, when the switchgear is not controlled, but supervised only.

## Single Line Diagram

The single line diagram includes the graphical description of the switchgear and its designation (name) as well as its features (short circuit proof or not ...). For displaying in the devices software, the switchgear' designations (e. g. QA1, QA2, instead of SG[x]) will be taken from the single line diagram (configuration file).

The configuration file includes the single line diagram and the switchgear properties. Switchgear properties and single line diagram are coupled via the configuration file.

## Switchgear Configuration

### Wiring

At first the switchgears' positioning indicators have to be connected to the digital inputs of the protection device. One of the position indicators (either the »Aux ON« or the »Aux OFF«) contact has to be connected necessarily. It is recommended to connect both contacts.

Thereafter the command outputs (relay outputs) have to be connected with the switchgear.

#### **NOTICE**

**Please observe the following option: In the general settings of a circuit breaker, the ON/OFF commands of a protection element can be issued to the same output relays, where the other control commands are issued. If the commands are issued to different relays output relays the amount of wiring increases.**

## Assignment of Position Indications

The position indication is needed by the device to get (evaluate) the information about the current status /position of the breaker. The switchgears' position is shown in the devices display. Each position change results in a change of the switchgear symbol.

### **NOTICE**

**For the detection of a switchgear's position always two separate Aux contacts are recommended! If only one Aux contact is used, no intermediate or disturbed positions can be detected.**

**A reduced transition supervision (time between issue of the command and position feedback indication of the switchgear) is also possible by one Aux contact.**

In the menu [Control/Bkr/Pos Indicators wiring] the assignments for the position indications have to be set.

### *Detection of switchgear position with two Aux contacts – Aux ON and Aux OFF (recommended!)*

For detection of position the switchgear is provided with Aux contacts (Aux ON and Aux OFF). It is recommended to use both contacts to detect intermediate and disturbed positions too.

The protection device continuously supervises the status of the inputs »Aux ON-I« and »Aux OFF-I«.

These signals are validated based on the supervision timers »t-Move ON« and »t-Move OFF« validation functions. As a result, the switchgear position will be detected by the following signals:

- Pos ON
- Pos OFF
- Pos Indeterm
- Pos Disturb.
- Pos (State=0,1,,2 or 3)



*Supervision of the ON command*

When an ON command is initiated, the »*t-Move ON*« timer will be started. While the timer is running, the »POS INDETERM« State will become true. If the command is executed and properly fed back from the switchgear before the timer has run down, »POS ON« will become true. Otherwise, if the timer has expired »POS DISTURB« will become true.

*Supervision of the OFF command*

When an OFF command is initiated, the »*t-Move OFF*« timer will be started. While the timer is running, the »POS INDETERM« State will become true. If the command is executed and properly fed back before the timer has run down, »POS OFF« will become true. Otherwise, if the timer has expired »POS DISTURB« will become true.

The following table shows how switchgear positions are validated:

<b>States of the Digital Inputs</b>		<b>Validated Switchgear Positions</b>				
<i>Aux ON-I</i>	<i>Aux OFF-I</i>	<i>POS ON</i>	<i>POS OFF</i>	<i>POS Indeterm</i>	<i>POS Disturb</i>	<i>POS State</i>
0	0	0	0	1 (while a Moving timer is running)	0 (while a Moving timer is running)	0 Intermediate
1	1	0	0	1 (while a Moving timer is running)	0 (while a Moving timer is running)	0 Intermediate
0	1	0	1	0	0	1 OFF
1	0	1	0	0	0	2 ON
0	0	0	0	0 (Moving timer elapsed)	1 (Moving timer elapsed)	3 Disturbed
1	1	0	0	0 (Moving timer elapsed)	1 (Moving timer elapsed)	3 Disturbed

*Single Position Indication **Aux ON or Aux OFF***

If the single pole indication is used, the »SI SINGLECONTACTIND« will become true.

The moving time supervision works only in one direction. If the Aux OFF signal is connected to the device, only the “OFF command” can be supervised and if the Aux ON signal is connected to the device, only the “ON command” can be supervised.

*Single Position Indication – **Aux ON***

If only the Aux ON signal is used for the Status Indication of an “ON command”, the switch command will also start the moving time, the position indication indicates an INTERMEDIATE position during this time interval. When the switchgear reaches the end position indicated by the signals »Pos ON« and »CES SUCCESF« before the moving time has elapsed the signal Pos Indeterm disappears.

If the moving time elapsed before the switchgear has reached the end position, the switching operation was not successful and the Position Indication will change to POS Disturb and the signal Pos Indeterm disappears.

*The following table shows how breaker positions are validated based on **Aux ON**:*

<b>States of the Digital Input</b>		<b>Validated Switchgear Positions</b>				
<i>Aux ON-I</i>	<i>Aux OFF-I</i>	<i>POS ON</i>	<i>POS OFF</i>	<i>POS Indeterm</i>	<i>POS Disturb</i>	<i>POS State</i>
0	Not wired	0	0	1 (while t-Move ON is running)	0 (while t-Move ON is running)	0 Intermediate
0	Not wired	0	1	0	0	1 OFF
1	Not wired	1	0	0	0	2 ON

If there is no digital input assigned to the »Aux On« contact, the position indication will have the value 3 (disturbed).

*Single Position Indication – Aux OFF*

If only the Aux OFF signal is used for the monitoring of the “OFF command”, the switch command will start the moving timer. The Position Indication will indicate an INTERMEDIATE position. When the the switchgear reaches its end position before the moving timer elapses, and »CES succesf« will be indicated. At the same time the signal »Pos Indeterm« disappears.

If the moving time elapsed before the switchgear has reached the OFF position, the switching operation was not successful and the Position Indication will change to »Pos Disturb« and the signal »Pos Indeterm« disappears.

The following table shows how breaker positions are validated based on **Aux OFF**:

<b>States of the Digital Input</b>		<b>Validated Switchgear Positions</b>				
<i>Aux ON-I</i>	<i>Aux OFF-I</i>	<i>POS ON</i>	<i>POS OFF</i>	<i>POS Indeterm</i>	<i>POS Disturb</i>	<i>POS State</i>
Not wired	0	0	0	1 (while t-Move OFF is running)	0 (while t-Move OFF is running)	0 Intermediate
Not wired	1	0	1	0	0	1 OFF
Not wired	0	1	0	0	0	2 ON

If there is no digital input assigned to the »Aux OFF« contact, the position indication will have the value 3 (disturbed).

**Setting of Supervision Times**

In the menu [Control/Bkr/General Settings] the supervision times of the individual switchgear have to be set. Dependent on the type of switchgear it can be necessary to set further parameters.

**Interlockings**

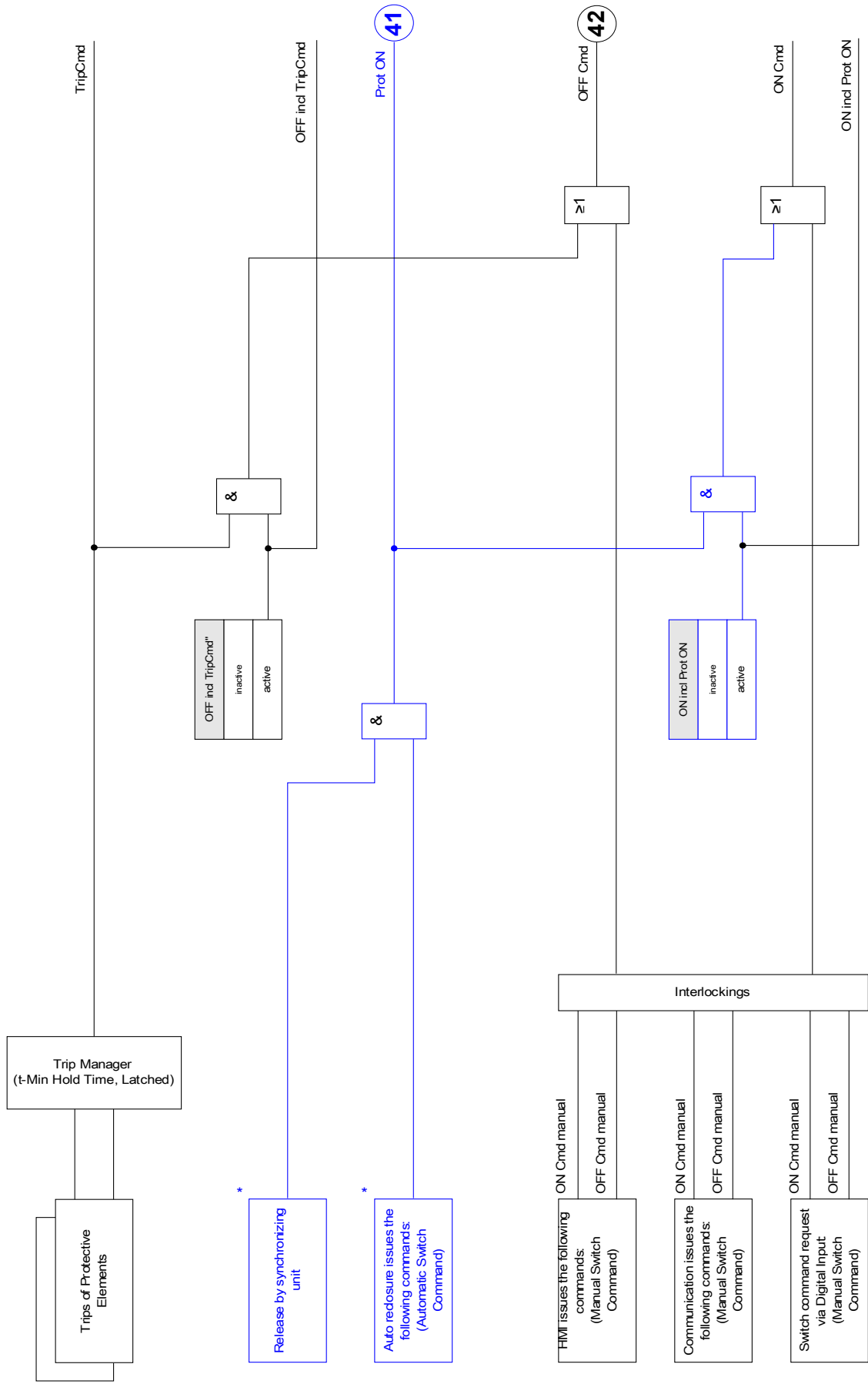
To avoid faulty operations, interlockings have to be provided. This can be realised mechanically, or electrically within the menu [Control/Bkr/General Settings] .

For a controllable switchgear up to three interlockings can be assigned in both switching directions (ON/OFF). These interlockings prevent switching in the corresponding direction.

The protection OFF command and the reclosing command of the AR\* module are always executed without interlockings. For the case, that a protection OFF command must not be issued, this must be blocked separately.

Further interlockings can be realised by means of the Logic module.

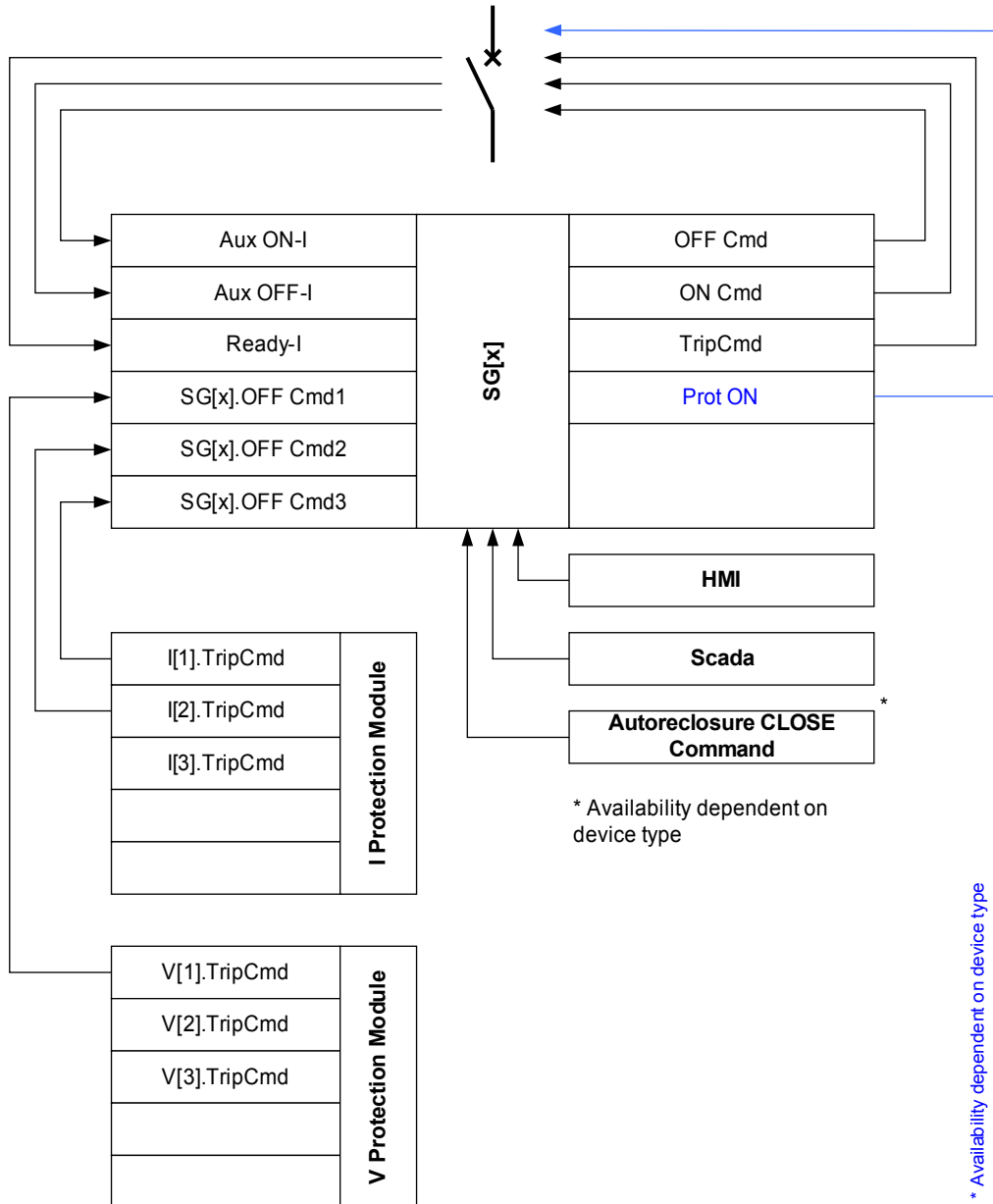
\*=availability depends on ordered device.



\* Availability dependent on device type

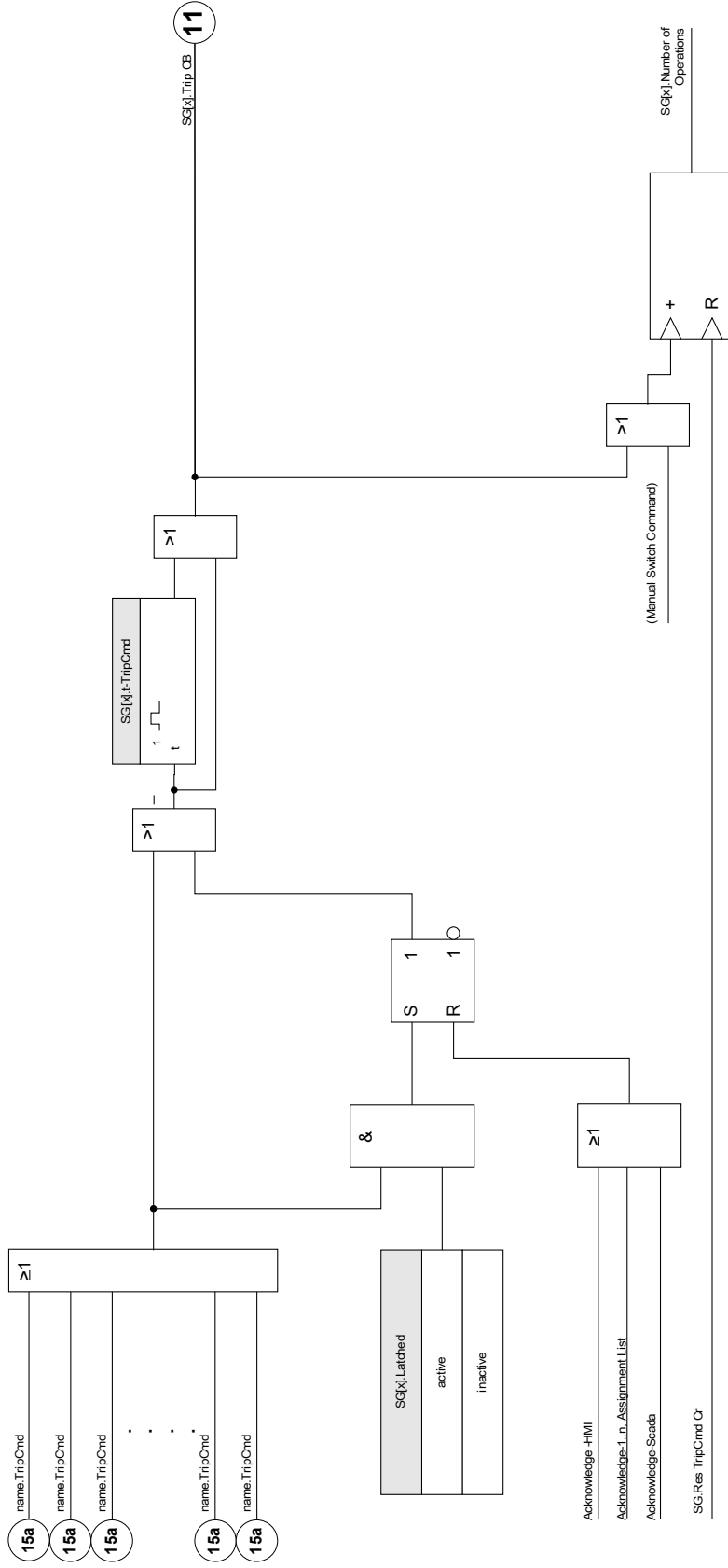
### Trip Manager – Assignment of commands

The trip commands of the protection elements have to be assigned within menu [Control/Bkr/Trip Manager] to the switchgear (presumed, that the switchgear is make/break capable) .  
 In the Trip Manger all tripping commands are combined by an “OR” logic. The actual tripping command to the switchgear is exclusively given by the Trip Manager. This means, that only tripping commands which are assigned in the Trip Manager lead to an operation of the switchgear. In addition to that, the User can set the minimum hold time of the tripping command within this module and define whether the tripping command is latched or not.



The exact name of the Switchgear is defined in the Single Line file.

**SG[x]. Trip CB**  
**name =Module name of the assigned trip command**



## Ex ON/OFF

If the switchgear should be opened or closed by an external signal, the User can assign one signal that will trigger the ON and one signal that will trigger the OFF command (e.g. digital inputs or output signals of the Logics) within menu [Control/Bkr/Ex ON/OFF Cmd] . An OFF command has priority. ON commands are slope oriented, OFF commands are level oriented

## Synchronised Switching\*

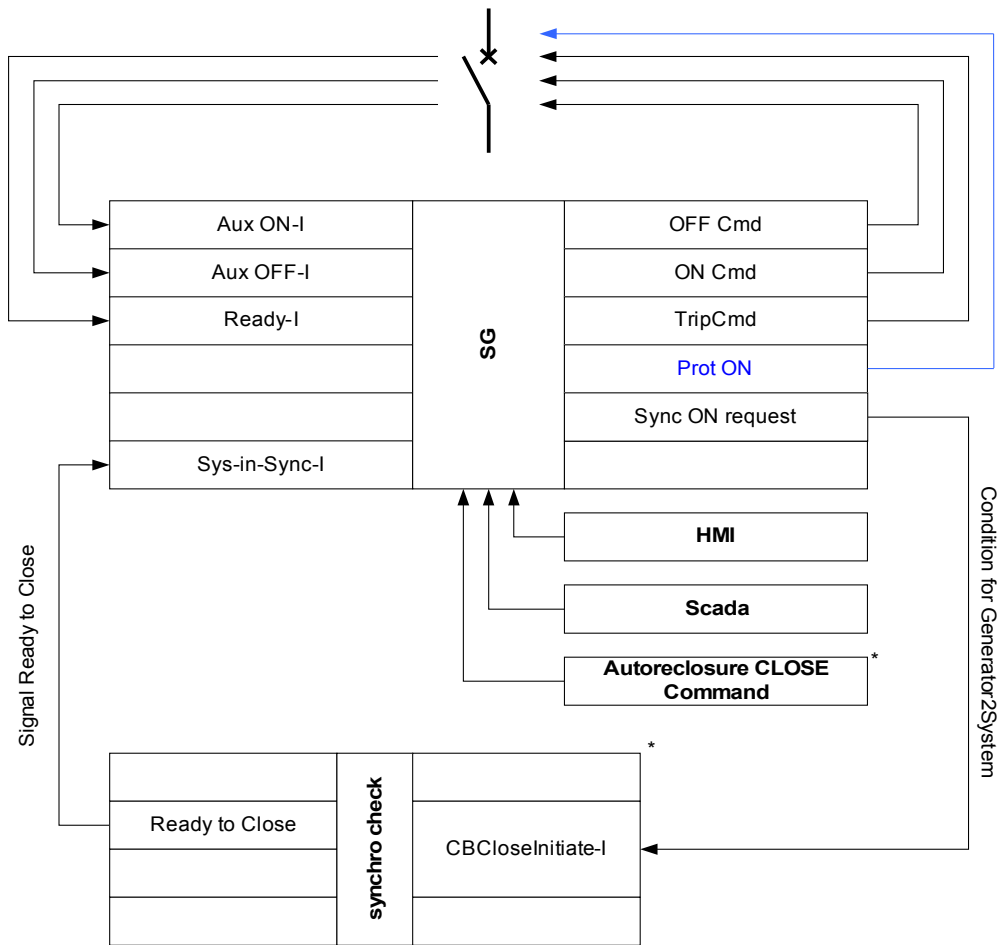
\*=availability depends on ordered device type

Before a switchgear may connect two mains sections, synchronism of these sections must be assured. In the submenu [Synchronous Switching] the parameter »Synchronism« defines which signal indicates synchronism.

If the synchronism condition shall be evaluated by the internal Synch-Check module the signal »*Sync. Ready to Close*« (release by synch-check module) has to be assigned. Alternatively a digital input or a logic output can be assigned.

In the synchronisation mode “Generator-to-System” additionally the synchronism request has to be assigned to the Sync-check function in the menu [Protection Para\Global Prot Para\Sync].

If a synchronism signal is assigned, the switching command will only be executed, when the synchronism signal will become true within the maximum supervision time »*t-MaxSyncSuperv*«. This supervision time will be started with the issued ON command. If no synchronism signal has been assigned, the synchronism release is permanently.



\* = \* Availability dependent on device type

\*\* = \* Availability dependent on device type

## Switching Authority

For the Switching Authority [Control\General Settings], the following general settings are possible:

- NONE: No control function;
- LOCAL: Control only via push buttons at the panel;
- REMOTE: Control only via SCADA, digital inputs, or internal signals; and
- LOCAL&REMOTE: Control via push buttons, SCADA, digital inputs, or internal signals.



## Non interlocked Switching

For test purposes, during commissioning and temporarily operations, interlockings can be disabled.



**WARNING: Non interlocked Switching can lead to serious injuries or death!**

For non interlocked switching the menü [Control\General Settings] provides the following options:

- Non interlocked switching for one single command
- Permanent
- Non interlocked switching for a certain time
- Non interlocked switching, activated by an assigned signal

The set time for non interlocked switching applies also for the „single Operation“ mode.

## Manual Manipulation of the Switchgear Position

In case of faulty position indication contacts (Aux contacts) or broken wires, the position indication resulted from the assigned signals can be manipulated (overwritten) manually, to keep the ability to switch the affected switchgear. A manipulated switchgearposition will be indicated on the display by an exclamation mark “!” beside the switchgear symbol.



**WARNING: Manipulation of the Switchgear Position can lead to serious injuries or death!**

## Double Operation Locking

All control commands to any switchgear in a bay have to be processed sequentially. During a running control command no other command will be handled.

## Switch Direction Control

Switching command are validated before execution. When the switchgear is already in the desired position, the switch command will not be issued again. An opened circuit breaker cannot be opened again. This also applies for switching command at the HMI or via SCADA.

## Anti Pumping

By pressing the ON command softkey only a single switching ON impulse will be issued independent, how low the softkey is actuated. The switchgear will close only once per close command.

## Counters of the Command Execution Supervision

Parameter	Description
CES SAuthority	Command Execution Supervision: Number of rejected Commands because of missing switching authority.
CES DoubleOperating	Command Execution Supervision: Number of rejected Commands because a second switch command is in conflict with a pending one.
CES No. of rej. Com	Command Execution Supervision: Number of rejected Commands because Locked by ParaSystem

## Switchgear Wear

### NOTICE

**NOTICE:** Current related functions of the switchgear wear element (e.g. breaker wear curve) are available in devices only, that offer minimum one current measurement (card).

## Switchgear Wear Features

The sum of the accumulated interrupted currents.

A »SGwear Slow Switchgear« might indicate malfunction at an early stage.

The protective relay will calculate the »SG OPEN Capacity« continuously. 100% means, that switchgear maintenance is mandatory now.

The protective relay will make a alarm decision based on the curve that the user provides.

The relay will monitor the frequency of ON/OFF cycles. The User can set thresholds for the maximum allowed sum of interrupt currents and the maximum allowed sum of interrupt currents per hour. By means of this alarm, excessive switchgear operations can be detected at an early stage.

## Slow Switchgear Alarm

An increase of the close or opening time of the switchgear is an indication for the maintenance need. If the measured time exceeds the time »*t-Move OFF*« or »*t-Move ON*«, the signal »SGwear Slow Switchgear« will be activated.

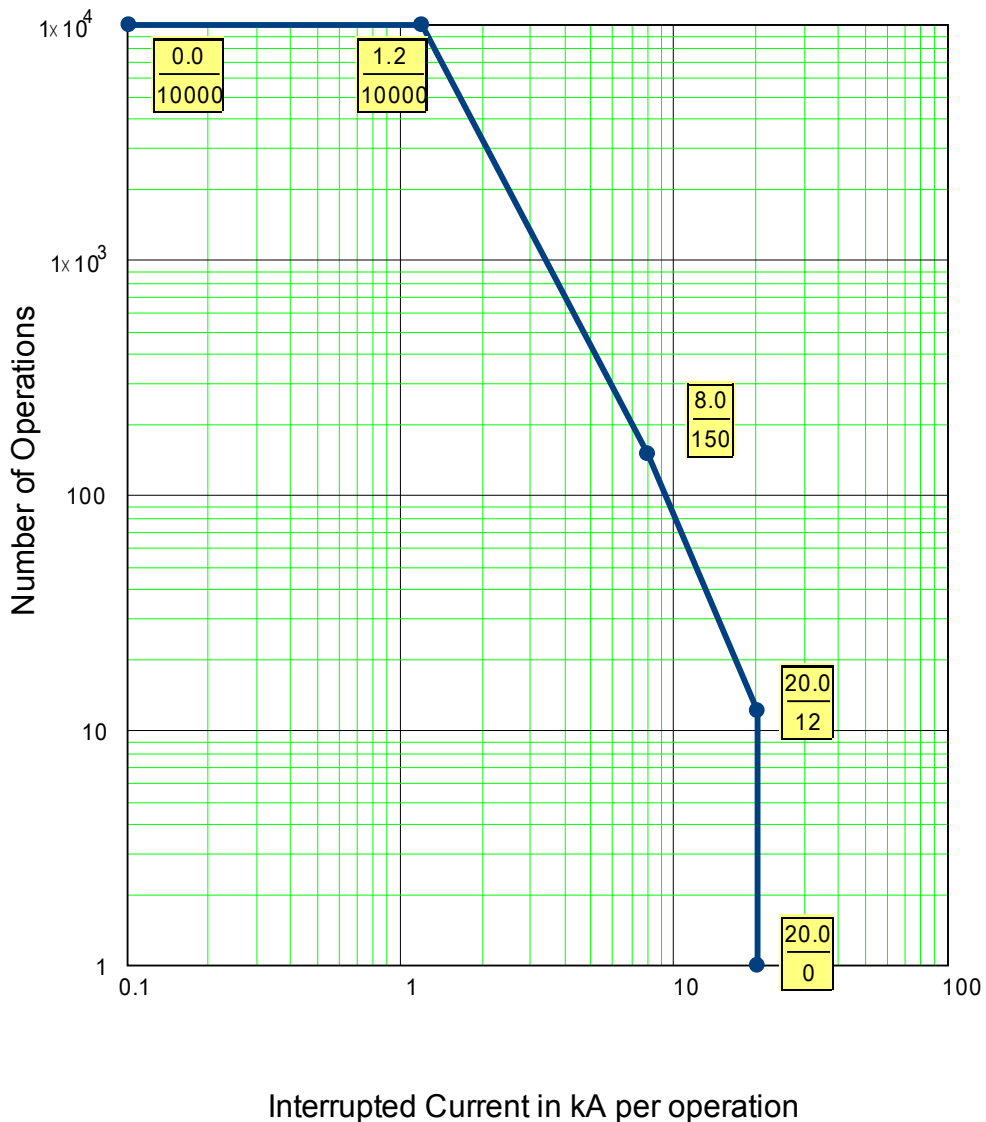
### Switchgear Wear Curve

In order to keep the switchgear in good working condition, the switchgear needs to be monitored. The switchgear health (operation life) depends above all on:









- The number of CLOSE/OPEN cycles.
- The amplitudes of the interrupting currents.
- The frequency that the switchgear operates (Operations per hour).

The User has to maintain the switchgear accordingly to the maintenance schedule that is to be provided by the manufacturer (switchgear operation statistics). By means of up to ten points that the user can replicate the switchgear wear curve within menu [Control/SG/SG[x]/SGW] . Each point has two settings: the interrupt current in kilo amperes and the allowed operation counts. No matter how many points are used, the operation counts the last point as zero. The protective relay will interpolate the allowed operations based on the switchgear wear curve. When the interrupted current is greater than the interrupt current at the last point, the protective relay will assume zero operation counts.

Breaker Maintenance Curve for a typical 25kV Breaker



**Global Protection Parameters of the Breaker Wear Module**

Parameter	Description	Setting range	Default	Menu path
 Operations Alarm	Service Alarm, too many Operations	1 - 100000	9999	[Control /SG /SG[1] /SG Wear]
 Isum Intr Alarm	Alarm, the Sum (Limit) of interrupting currents has been exceeded.	0.00 - 2000.00kA	100.00kA	[Control /SG /SG[1] /SG Wear]
 Isum Intr ph Alm	Alarm, the per hour Sum (Limit) of interrupting currents has been exceeded.	0.00 - 2000.00kA	100.00kA	[Control /SG /SG[1] /SG Wear]
 SGwear Curve Fc	The Circuit Breaker (load-break switch) Wear Curve defines the maximum allowed CLOSE/OPEN cycles depending on the brake currents. If the circuit breaker maintenance curve is exceeded, an alarm will be issued. The breaker maintenance curve is to be taken from the technical data sheet of the breaker manufacturer. By means of the available points this curve is to be replicated.	inactive, active	inactive	[Control /SG /SG[1] /SG Wear]
 WearLevel Alarm	Threshold for the Alarm  Only available if:SGwear Curve Fc = active	0.00 - 100.00%	80.00%	[Control /SG /SG[1] /SG Wear]
 WearLevel Lockout	Threshold for the Lockout Level  Only available if:SGwear Curve Fc = active	0.00 - 100.00%	95.00%	[Control /SG /SG[1] /SG Wear]
 Current1	Interrupted Current Level #1  Only available if:SGwear Curve Fc = active	0.00 - 2000.00kA	0.00kA	[Control /SG /SG[1] /SG Wear]
 Count1	Open Counts Allowed #1  Only available if:SGwear Curve Fc = active	1 - 32000	10000	[Control /SG /SG[1] /SG Wear]

Parameter	Description	Setting range	Default	Menu path
Current2 	Interrupted Current Level #2 Only available if:SGwear Curve Fc = active	0.00 - 2000.00kA	1.20kA	[Control /SG /SG[1] /SG Wear]
Count2 	Open Counts Allowed #2 Only available if:SGwear Curve Fc = active	1 - 32000	10000	[Control /SG /SG[1] /SG Wear]
Current3 	Interrupted Current Level #3 Only available if:SGwear Curve Fc = active	0.00 - 2000.00kA	8.00kA	[Control /SG /SG[1] /SG Wear]
Count3 	Open Counts Allowed #3 Only available if:SGwear Curve Fc = active	1 - 32000	150	[Control /SG /SG[1] /SG Wear]
Current4 	Interrupted Current Level #4 Only available if:SGwear Curve Fc = active	0.00 - 2000.00kA	20.00kA	[Control /SG /SG[1] /SG Wear]
Count4 	Open Counts Allowed #4 Only available if:SGwear Curve Fc = active	1 - 32000	12	[Control /SG /SG[1] /SG Wear]
Current5 	Interrupted Current Level #5 Only available if:SGwear Curve Fc = active	0.00 - 2000.00kA	20.00kA	[Control /SG /SG[1] /SG Wear]
Count5 	Open Counts Allowed #5 Only available if:SGwear Curve Fc = active	1 - 32000	1	[Control /SG /SG[1] /SG Wear]
Current6 	Interrupted Current Level #6 Only available if:SGwear Curve Fc = active	0.00 - 2000.00kA	20.00kA	[Control /SG /SG[1] /SG Wear]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Count6 	Open Counts Allowed #6 Only available if:SGwear Curve Fc = active	1 - 32000	1	[Control /SG /SG[1] /SG Wear]
Current7 	Interrupted Current Level #7 Only available if:SGwear Curve Fc = active	0.00 - 2000.00kA	20.00kA	[Control /SG /SG[1] /SG Wear]
Count7 	Open Counts Allowed #7 Only available if:SGwear Curve Fc = active	1 - 32000	1	[Control /SG /SG[1] /SG Wear]
Current8 	Interrupted Current Level #8 Only available if:SGwear Curve Fc = active	0.00 - 2000.00kA	20.00kA	[Control /SG /SG[1] /SG Wear]
Count8 	Open Counts Allowed #8 Only available if:SGwear Curve Fc = active	1 - 32000	1	[Control /SG /SG[1] /SG Wear]
Current9 	Interrupted Current Level #9 Only available if:SGwear Curve Fc = active	0.00 - 2000.00kA	20.00kA	[Control /SG /SG[1] /SG Wear]
Count9 	Open Counts Allowed #9 Only available if:SGwear Curve Fc = active	1 - 32000	1	[Control /SG /SG[1] /SG Wear]
Current10 	Interrupted Current Level #10 Only available if:SGwear Curve Fc = active	0.00 - 2000.00kA	20.00kA	[Control /SG /SG[1] /SG Wear]
Count10 	Open Counts Allowed #10 Only available if:SGwear Curve Fc = active	1 - 32000	1	[Control /SG /SG[1] /SG Wear]

## Breaker Wear Signals (Output States)

<i>Signal</i>	<i>Description</i>
Operations Alarm	Signal: Service Alarm, too many Operations
Isum Intr trip: IL1	Signal: Maximum permissible Summation of the interrupting (tripping) currents exceeded: IL1
Isum Intr trip: IL2	Signal: Maximum permissible Summation of the interrupting (tripping) currents exceeded: IL2
Isum Intr trip: IL3	Signal: Maximum permissible Summation of the interrupting (tripping) currents exceeded: IL3
Isum Intr trip	Signal: Maximum permissible Summation of the interrupting (tripping) currents exceeded in at least one phase.
Res TripCmd Cr	Signal: Resetting of the Counter: total number of trip commands
Res Sum trip	Signal: Reset summation of the tripping currents
WearLevel Alarm	Signal: Threshold for the Alarm
WearLevel Lockout	Signal: Threshold for the Lockout Level
Res SGwear Curve	Signal: Reset of the Circuit Breaker (load-break switch) Wear maintenance curve.
Isum Intr ph Alm	Signal: Alarm, the per hour Sum (Limit) of interrupting currents has been exceeded.
Res Isum Intr ph Alm	Signal: Reset of the Alarm, "the per hour Sum (Limit) of interrupting currents has been exceeded".

## Breaker Wear Counter Values





<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
TripCmd Cr	Counter: Total number of trips of the switchgear (circuit breaker, load break switch...). Resettable with Total or All.	0	0 - 200000	[Operation /Count and RevData /Control /SG[1]]

**Breaker Wear Values**

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
Sum trip IL1	Summation of the tripping currents phase	0.00A	0.00 - 1000.00A	[Operation /Count and RevData /Control /SG[1]]
Sum trip IL2	Summation of the tripping currents phase	0.00A	0.00 - 1000.00A	[Operation /Count and RevData /Control /SG[1]]
Sum trip IL3	Summation of the tripping currents phase	0.00A	0.00 - 1000.00A	[Operation /Count and RevData /Control /SG[1]]
Isum Intr per hour	Sum per hour of interrupting currents.	0.00kA	0.00 - 1000.00kA	[Operation /Count and RevData /Control /SG[1]]
SG OPEN capacity	Used capacity. 100% means, that the switchgear is to be maintained.	0.0%	0.0 - 100.0%	[Operation /Count and RevData /Control /SG[1]]





## Direct Commands of the Breaker Wear Module

Parameter	Description	Setting range	Default	Menu path
Res TripCmd Cr 	Resetting of the Counter: total number of trip commands	inactive, active	inactive	[Operation / Reset/Acknowledge /Reset]
Res Sum trip 	Reset summation of the tripping currents	inactive, active	inactive	[Operation / Reset/Acknowledge /Reset]
Res lsum Intr per hour 	Reset of the Sum per hour of interrupting currents.	inactive, active	inactive	[Operation / Reset/Acknowledge /Reset]
Res CB OPEN capacity 	Resetting of the CB OPEN capacity. 100% means, that the circuit breaker is to be maintained.	inactive, active	inactive	[Operation / Reset/Acknowledge /Reset]




## Control Parameters

Ctrl

## Direct Commands of the Control Module

Parameter	Description	Setting range	Default	Menu path
Switching Authority 	Switching Authority	None, Local, Remote, Local and Remote	Local	[Control /General settings]
NonInterl 	DC for Non-Interlocking	inactive, active	inactive	[Control /General settings]

## Global Protection Parameters of the Control Module

Parameter	Description	Setting range	Default	Menu path
Res NonIL 	Resetmode Non-Interlocking	single Operation, timeout, permanent	single Operation	[Control /General settings]
Timeout NonIL 	Timeout Non-Interlocking  Only available if: Res NonIL<>permanent	2 - 3600s	60s	[Control /General settings]
NonIL Assign 	Assignment Non-Interlocking	1..n, Assignment List	--	[Control /General settings]

## Control Moduel Input States

Name	Description	Assignment via
NonInterl-I	Non-Interlocking	[Control /General settings]

## Signals of the Control Module

Signal	Description
Local	Switching Authority: Local
Remote	Switching Authority: Remote
NonInterl	Non-Interlocking is active
SG Indeterm	Minimum one Switchgear is moving (Position cannot be determined).
SG Disturb	Minimum one Switchgear is disturbed.

## Synchronization inputs

Parameter	Description
--	No assignment




**Assignable Trip Commands (Trip Manager)**

<i>Name</i>	<i>Description</i>
--	No assignment
MStart.TripCmd	Signal: Trip Command
I[1].TripCmd	Signal: Trip Command
I[2].TripCmd	Signal: Trip Command
I[3].TripCmd	Signal: Trip Command
I[4].TripCmd	Signal: Trip Command
I[5].TripCmd	Signal: Trip Command
I[6].TripCmd	Signal: Trip Command
IG[1].TripCmd	Signal: Trip Command
IG[2].TripCmd	Signal: Trip Command
IG[3].TripCmd	Signal: Trip Command
IG[4].TripCmd	Signal: Trip Command
ThR.TripCmd	Signal: Trip Command
Jam[1].TripCmd	Signal: Trip Command
Jam[2].TripCmd	Signal: Trip Command
I<[1].TripCmd	Signal: Trip Command
I<[2].TripCmd	Signal: Trip Command
I<[3].TripCmd	Signal: Trip Command
I2>[1].TripCmd	Signal: Trip Command
I2>[2].TripCmd	Signal: Trip Command
ExP[1].TripCmd	Signal: Trip Command
ExP[2].TripCmd	Signal: Trip Command
ExP[3].TripCmd	Signal: Trip Command
ExP[4].TripCmd	Signal: Trip Command
RTD.TripCmd	Signal: Trip Command




## Controlled Circuit Breaker







SG[1]

### Direct Commands of a Controlled Circuit Breaker

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
 Manipulate Position	WARNING! Fake Position - Manual Position Manipulation	inactive, Pos OFF, Pos ON	inactive	[Control /SG /SG[1] /General settings]
 Res SGwear SI SG	Resetting the slow Switchgear Alarm	inactive, active	inactive	[Operation / Reset/Acknowledge /Reset]
 Ack TripCmd	Acknowledge Trip Command	inactive, active	inactive	[Operation / Reset/Acknowledge /Acknowledge]

### Global Protection Parameters of a Controlled Circuit Breaker

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
 Aux ON	The CB is in ON-position if the state of the assigned signal is true (52a).	1..n, DI-LogicList	-.-	[Control /SG /SG[1] /Pos Indicatrs Wirng]
 Aux OFF	The CB is in OFF-position if the state of the assigned signal is true (52b).	1..n, DI-LogicList	-.-	[Control /SG /SG[1] /Pos Indicatrs Wirng]
 Ready	Circuit breaker is ready for operation if the state of the assigned signal is true. This digital input can be used by some protective elements (if they are available within the device) like Auto Reclosure (AR), e.g. as a trigger signal.	1..n, DI-LogicList	-.-	[Control /SG /SG[1] /Pos Indicatrs Wirng]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Removed 	The withdrawable circuit breaker is Removed Dependency	1..n, DI-LogicList	--	[Control /SG /SG[1] /Pos Indicatrs Wiring]
Interl ON1 	Interlocking of the ON command	1..n, Assignment List	--	[Control /SG /SG[1] /Interlockings]
Interl ON2 	Interlocking of the ON command	1..n, Assignment List	MStart.Blo	[Control /SG /SG[1] /Interlockings]
Interl ON3 	Interlocking of the ON command	1..n, Assignment List	--	[Control /SG /SG[1] /Interlockings]
Interl OFF1 	Interlocking of the OFF command	1..n, Assignment List	--	[Control /SG /SG[1] /Interlockings]
Interl OFF2 	Interlocking of the OFF command	1..n, Assignment List	--	[Control /SG /SG[1] /Interlockings]
Interl OFF3 	Interlocking of the OFF command	1..n, Assignment List	--	[Control /SG /SG[1] /Interlockings]
SCmd ON 	Switching ON Command, e.g. the state of the Logics or the state of the digital input	1..n, DI-LogicList	--	[Control /SG /SG[1] /Ex ON/OFF Cmd]
SCmd OFF 	Switching OFF Command, e.g. the state of the Logics or the state of the digital input	1..n, DI-LogicList	--	[Control /SG /SG[1] /Ex ON/OFF Cmd]


Parameter	Description	Setting range	Default	Menu path
t-TripCmd 	Minimum hold time of the OFF-command (circuit breaker, load break switch)	0 - 300.00s	0.2s	[Control /SG /SG[1] /Trip Manager]
Latched 	Defines whether the Binary Output Relay will be Latched when it picks up.	inactive, active	inactive	[Control /SG /SG[1] /Trip Manager]
Ack TripCmd 	Ack TripCmd	1..n, Assignment List	--	[Control /SG /SG[1] /Trip Manager]
Off Cmd1 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	MStart.TripCmd	[Control /SG /SG[1] /Trip Manager]
Off Cmd2 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	I[1].TripCmd	[Control /SG /SG[1] /Trip Manager]
Off Cmd3 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	I[2].TripCmd	[Control /SG /SG[1] /Trip Manager]
Off Cmd4 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	I2>[1].TripCmd	[Control /SG /SG[1] /Trip Manager]
Off Cmd5 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	ThR.TripCmd	[Control /SG /SG[1] /Trip Manager]
Off Cmd6 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	Jam[1].TripCmd	[Control /SG /SG[1] /Trip Manager]

Parameter	Description	Setting range	Default	Menu path
Off Cmd7 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	I<[1].TripCmd	[Control /SG /SG[1] /Trip Manager]
Off Cmd8 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]
Off Cmd9 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]
Off Cmd10 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]
Off Cmd11 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]
Off Cmd12 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]
Off Cmd13 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]
Off Cmd14 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]
Off Cmd15 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Off Cmd16 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]
Off Cmd17 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]
Off Cmd18 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]
Off Cmd19 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]
Off Cmd20 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]
Off Cmd21 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]
Off Cmd22 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]
Off Cmd23 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]
Off Cmd24 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	--	[Control /SG /SG[1] /Trip Manager]



<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Off Cmd25 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	-.-	[Control /SG /SG[1] /Trip Manager]
Off Cmd26 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	-.-	[Control /SG /SG[1] /Trip Manager]
Off Cmd27 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	-.-	[Control /SG /SG[1] /Trip Manager]
Off Cmd28 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	-.-	[Control /SG /SG[1] /Trip Manager]
Off Cmd29 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	-.-	[Control /SG /SG[1] /Trip Manager]
Off Cmd30 	Off Command to the Circuit Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	-.-	[Control /SG /SG[1] /Trip Manager]
OFF incl TripCmd 	The OFF Command includes the OFF Command issued by the Protection module.	inactive, active	active	[Control /SG /SG[1] /General settings]
t-Move ON 	Time to move to the ON Position	0.01 - 100.00s	0.1s	[Control /SG /SG[1] /General settings]
t-Move OFF 	Time to move to the OFF Position	0.01 - 100.00s	0.1s	[Control /SG /SG[1] /General settings]

Parameter	Description	Setting range	Default	Menu path
t-Dwell 	Dwell time	0 - 100.00s	0s	[Control /SG /SG[1] /General settings]

## Controlled Circuit Breaker Input States

Name	Description	Assignment via
Aux ON-I	Module Input State: Position indicator/check-back signal of the CB (52a)	[Control /SG /SG[1] /Pos Indicatr Wirng]
Aux OFF-I	Module input state: Position indicator/check-back signal of the CB (52b)	[Control /SG /SG[1] /Pos Indicatr Wirng]
Ready-I	Module input state: CB ready	[Control /SG /SG[1] /Pos Indicatr Wirng]
Removed-I	State of the module input: The withdrawable circuit breaker is Removed	[Control /SG /SG[1] /Pos Indicatr Wirng]
Ack TripCmd-I	State of the module input: Acknowledgement Signal (only for automatic acknowledgement) Module input signal	[Control /SG /SG[1] /Trip Manager]
Interl ON1-I	State of the module input: Interlocking of the ON command	[Control /SG /SG[1] /Interlockings]
Interl ON2-I	State of the module input: Interlocking of the ON command	[Control /SG /SG[1] /Interlockings]


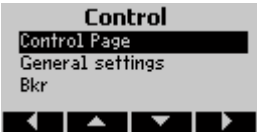

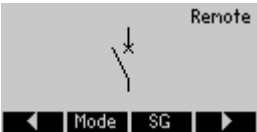
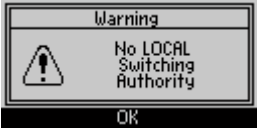

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Interl ON3-I	State of the module input: Interlocking of the ON command	[Control /SG /SG[1] /Interlockings]
Interl OFF1-I	State of the module input: Interlocking of the OFF command	[Control /SG /SG[1] /Interlockings]
Interl OFF2-I	State of the module input: Interlocking of the OFF command	[Control /SG /SG[1] /Interlockings]
Interl OFF3-I	State of the module input: Interlocking of the OFF command	[Control /SG /SG[1] /Interlockings]
SCmd ON-I	State of the module input: Switching ON Command, e.g. the state of the Logics or the state of the digital input	[Control /SG /SG[1] /Ex ON/OFF Cmd]
SCmd OFF-I	State of the module input: Switching OFF Command, e.g. the state of the Logics or the state of the digital input	[Control /SG /SG[1] /Ex ON/OFF Cmd]

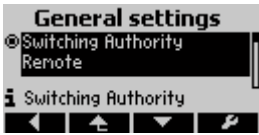
## Signals of a Controlled Circuit Breaker


<i>Signal</i>	<i>Description</i>
SI SingleContactInd	Signal: The Position of the Switchgear is detected by one auxiliary contact (pole) only. Thus indeterminate and disturbed Positions cannot be detected.
Pos not ON	Signal: Pos not ON
Pos ON	Signal: Circuit Breaker is in ON-Position
Pos OFF	Signal: Circuit Breaker is in OFF-Position
Pos Indeterm	Signal: Circuit Breaker is in Indeterminate Position
Pos Disturb	Signal: Circuit Breaker Disturbed - Undefined Breaker Position. The Position Indicators contradict themselves. After expiring of a supervision timer this signal becomes true.
Pos	Signal: Circuit Breaker Position (0 = Indeterminate, 1 = OFF, 2 = ON, 3 = Disturbed)
Ready	Signal: Circuit breaker is ready for operation.
t-Dwell	Signal: Dwell time
Removed	Signal: The withdrawable circuit breaker is Removed
Interl ON	Signal: One or more IL_On inputs are active.
Interl OFF	Signal: One or more IL_Off inputs are active.
CES succesf	Signal: Command Execution Supervision: Switching command executed successfully.
CES Disturbed	Signal: Command Execution Supervision: Switching Command unsuccessful. Switchgear in disturbed position.
CES Fail TripCmd	Signal: Command Execution Supervision: Command execution failed because trip command is pending.
CES SwitchDir	Signal: Command Execution Supervision respectively Switching Direction Control: This signal becomes true, if a switch command is issued even though the switchgear is already in the requested position. Example: A switchgear that is already OFF should be switched OFF again (doubly). The same applies to CLOSE commands.
CES ON d OFF	Signal: Command Execution Supervision: On Command during a pending OFF Command.
CES SG not ready	Signal: Command Execution Supervision: Switchgear not ready
CES Fiel Interl	Signal: Command Execution Supervision: Switching Command not executed because of field interlocking.
CES SG removed	Signal: Command Execution Supervision: Switching Command unsuccessful, Switchgear removed.
TripCmd	Signal: Trip Command
Ack TripCmd	Signal: Acknowledge Trip Command
OFF incl TripCmd	Signal: The OFF Command includes the OFF Command issued by the Protection module.
Position Ind manipul	Signal: Position Indicators faked
SGwear Slow SG	Signal: Alarm, the circuit breaker (load-break switch) becomes slower
Res SGwear SI SG	Signal: Resetting the slow Switchgear Alarm
ON Cmd	Signal: ON Command issued to the switchgear. Depending on the setting the signal may include the ON command of the Prot module.
OFF Cmd	Signal: OFF Command issued to the switchgear. Depending on the setting the signal may include the OFF command of the Prot module.
ON Cmd manual	Signal: ON Cmd manual
OFF Cmd manual	Signal: OFF Cmd manual

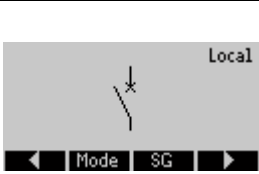
## Control - Example: Switching of a Circuit Breaker


The following example shows how to switch a circuit breaker via the HMI at the device.


	<p>Change into the menu »Control« or alternatively push the »CTRL« button at the device front.</p>
	<p>Change to the control page by pushing the »right arrow« softkey.</p>
	<p><b>Information only:</b> On the control page the current switchgear positions is displayed. By means of the softkey »Mode« it can be switched to the menu »General Settings«. In this menu switching authority and interlockings can be set. By means of the softkey »SG« it can be switched to the menu »SG«. In this menu specific settings for the switch gear can be done.</p>
	<p>To execute a switching operation, change into the switching menu by pushing the right arrow softkey button.</p>
	<p>Executing a switching command via the devices HMI is only possible when the switching authority is set to »Local«. If no switching authority is given, this has to be set first to »Local« or »Local and Remote«. With the softkey »OK« it can be switched back to the single line diagram page.</p>
	<p>Pushing the softkey »Mode« leads to the menu »General Settings«.</p>

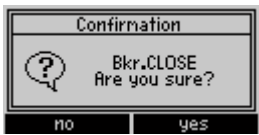
	<p>In this menu the switching authority can be changed.</p>
---	---

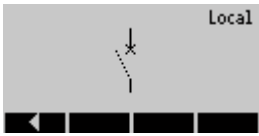
	<p>Select between »Local« or »Local and Remote«.</p>
---	--


	<p>Now it is possible to execute switching commands at the HMI.</p>
---	---


	<p>Push the »right arrow« softkey to get to the control page.</p>
--	---

	<p>The circuit breaker is opened, therefore it can be closed only. After pushing the softkey »CLOSE« a confirmation window appears.</p>
---	---

	<p>When you are sure to proceed with the switching operation, press the softkey »YES«.</p>
---	--

	<p>The switching command will be given to the circuit breaker. The display shows the intermediate position of the switchgear.</p>
---	---

	<p>It will be shown on the display when the switchgear reaches the new end position. Further possible switching operations (OPEN) will be displayed by softkeys.</p>
---	--

	<p>Notice: For the case, the switchgear does not reach the new end position within the set supervision time the following Warning appears on the display.</p>
---	---

## Protective Elements

### MStart - Motor Starting and Control [48,66]

Available elements:

MStart

#### General – Principle Use

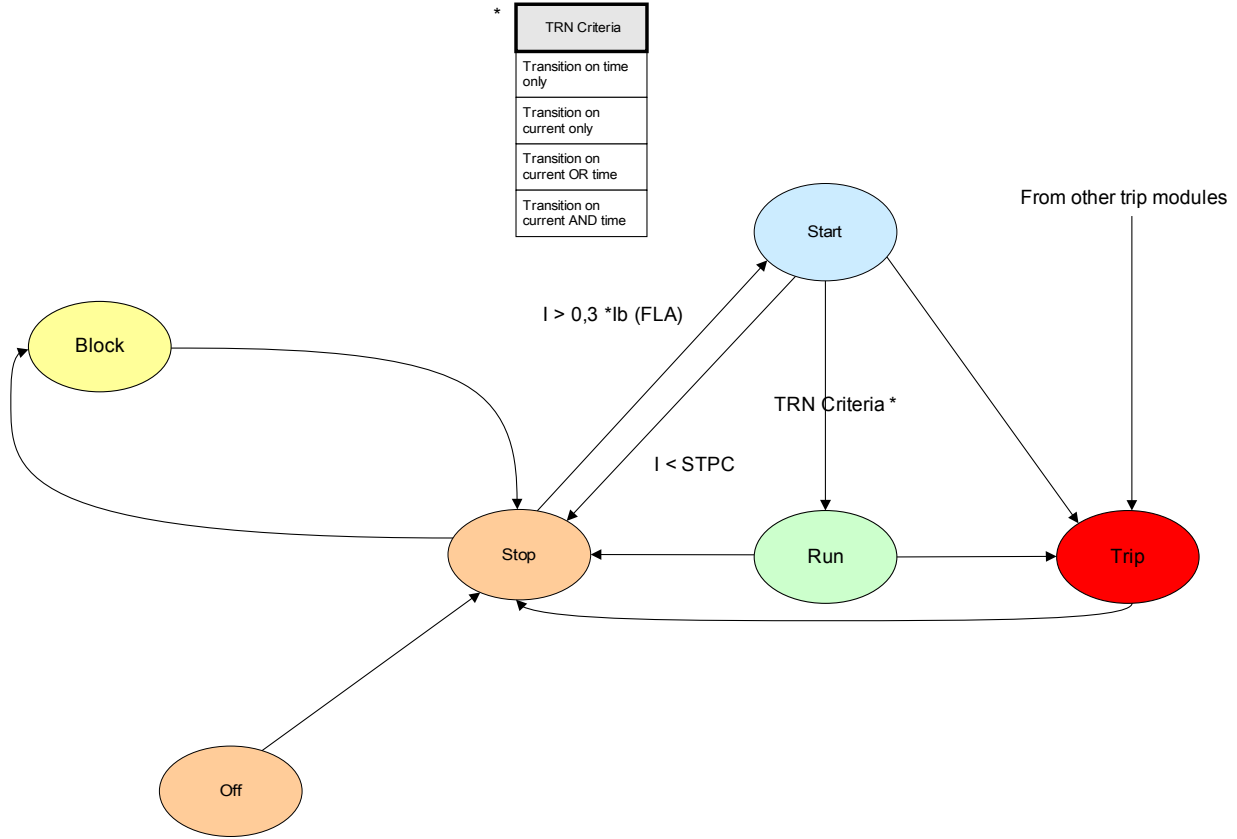
The motor start control logic is the core control and protective function for a motor protection device. The logic comprises:

- Motor Operation States,
- Motor Start Control
- Motor Start Blockings
- Motor Start / Transition Trips
- Motor Cold Warm Detection
- Emergency Override.



## Motor Operation States

### Motor Operation States



The basic motor operation states can be classified as four states that include:

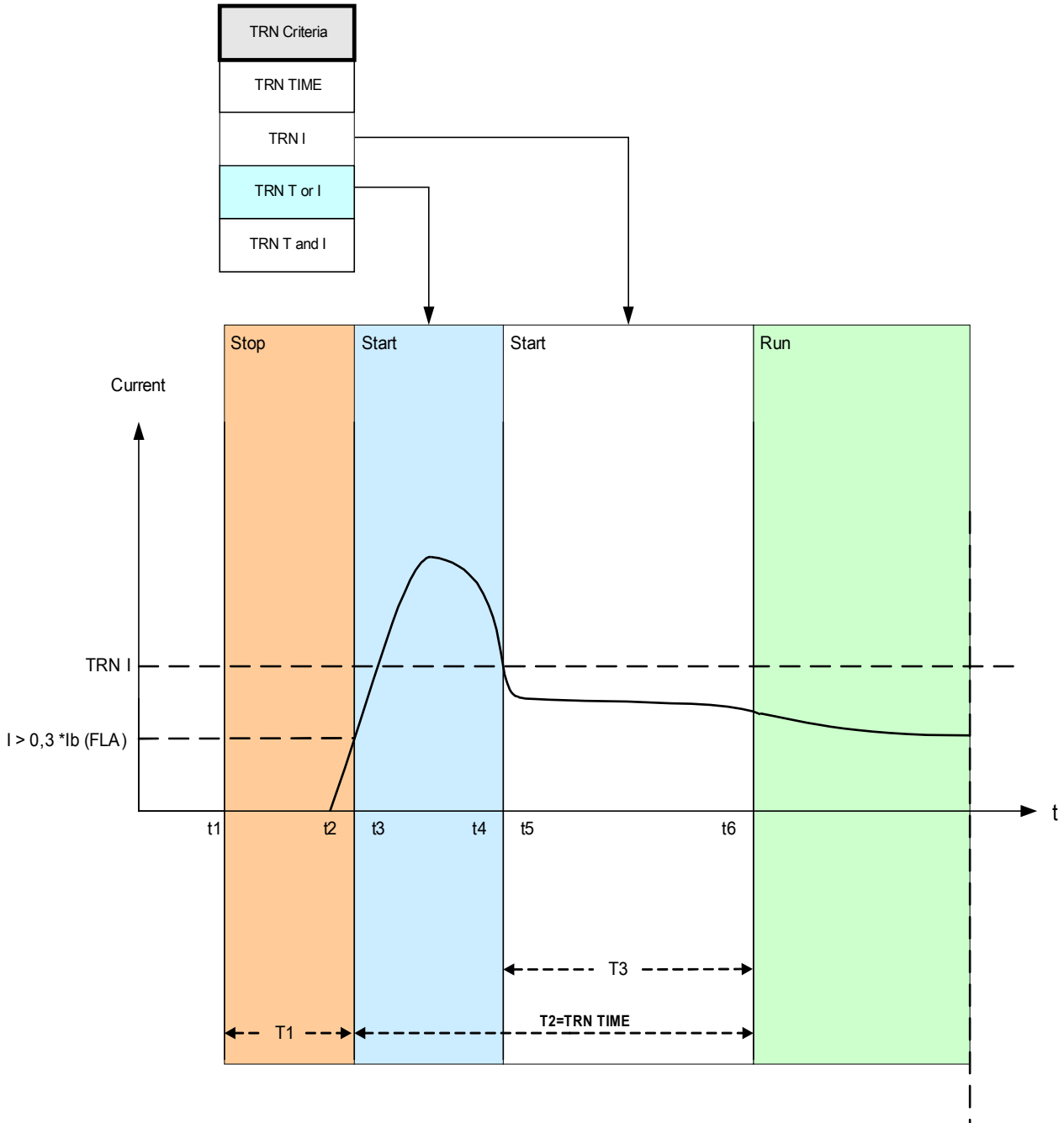
1. Start cycle;
2. Run cycle;
3. Stop cycle; and
4. Trip state.

Under normal conditions, the motor operations should go through »stop«, »start«, »run«, and »stop« cycles that are referred to as a complete operation sequence; while under certain abnormal conditions, the motor could go from »start« to »stop«, or »start« to »trip«, or »run« to »trip«.

If other protection trips occur at either the »start« or »run« cycle, the motor will be forced to go to »trip« mode. After motor currents are terminated, the motor will go into the »stop« cycle.

### Start Control

The parameters for the Start Control have to be set within menu [Protection Para\MStart\StartControl]



- T1: Stop Cycle**
- t4-t3: Start Cycle if TRNC is selected**
- t6-t3: Start Cycle if TRNT is selected**

The Start Control Module drawing shows an example of how the protective device reacts to a normal operating-cycle current profile. Initially, the motor is stopped and the current is zero. As long as the protective device is not in a »trip« state, it permits contactor energization by closing its trip contact in series with the contactor. The contactor

is energized by the operator or process control system through a normal two-wire or three-wire motor control scheme, external to the protective device. The protective device declares a motor start when it senses a motor current that exceeds 30% of the »*I<sub>b</sub>*« (FLA) setting. Meanwhile, the transition timer »*TRNT*« begins to run. The protective device also monitors the large starting current, noting when the current falls below the transition level »*TRNC*«.

The Start to Run transition is based on the setting »*TRN Criteria*«, which has four transition behaviors for the User to select:

- TRN T - Transition to RUN after time setting TRNT only. Current is ignored.
- TRN C - Transition when starting current drops below the setting only. If the time set in TRNT expires before the current transition, the motor trips.
- TRN T or C - Transition on time or current, whichever comes first.
- TRN T and C - Transition on time and current. Both must occur, and the current must drop below the setting before the time delay expires. If the timer expires before the current falls below the set transition level, the motor trips.

If there is no transition trip, the protective device relay declares a successful transition to »RUN« cycle and the corresponding transition signal(s) (current or time, or both, depending on the settings and motor current) is set. The transition signal(s) is the part of the global output list, which can be assigned to any module input or relay output. If it is assigned to a relay output, it can control a reduced-voltage starter, switching to full running voltage.

Even if the transition control output contact is not used, the transition function can provide clear indications of the actual state of the motor (»START« versus »RUN«) on the front panel display and via data communications. A good way to do this is to use the settings of TRN Criteria = TRN T or C and TRNC = 130% of »*I<sub>b</sub>*« (FLA). Modify the latter, if needed, to lie at a transition value between the starting current and post-start maximum load current. Set the transition timer well beyond the normal start time to avoid a transition trip.

### Start Delays

The parameters for the Start Delays have to be set within menu [Protection Para\MStart\Start Delay Timer]

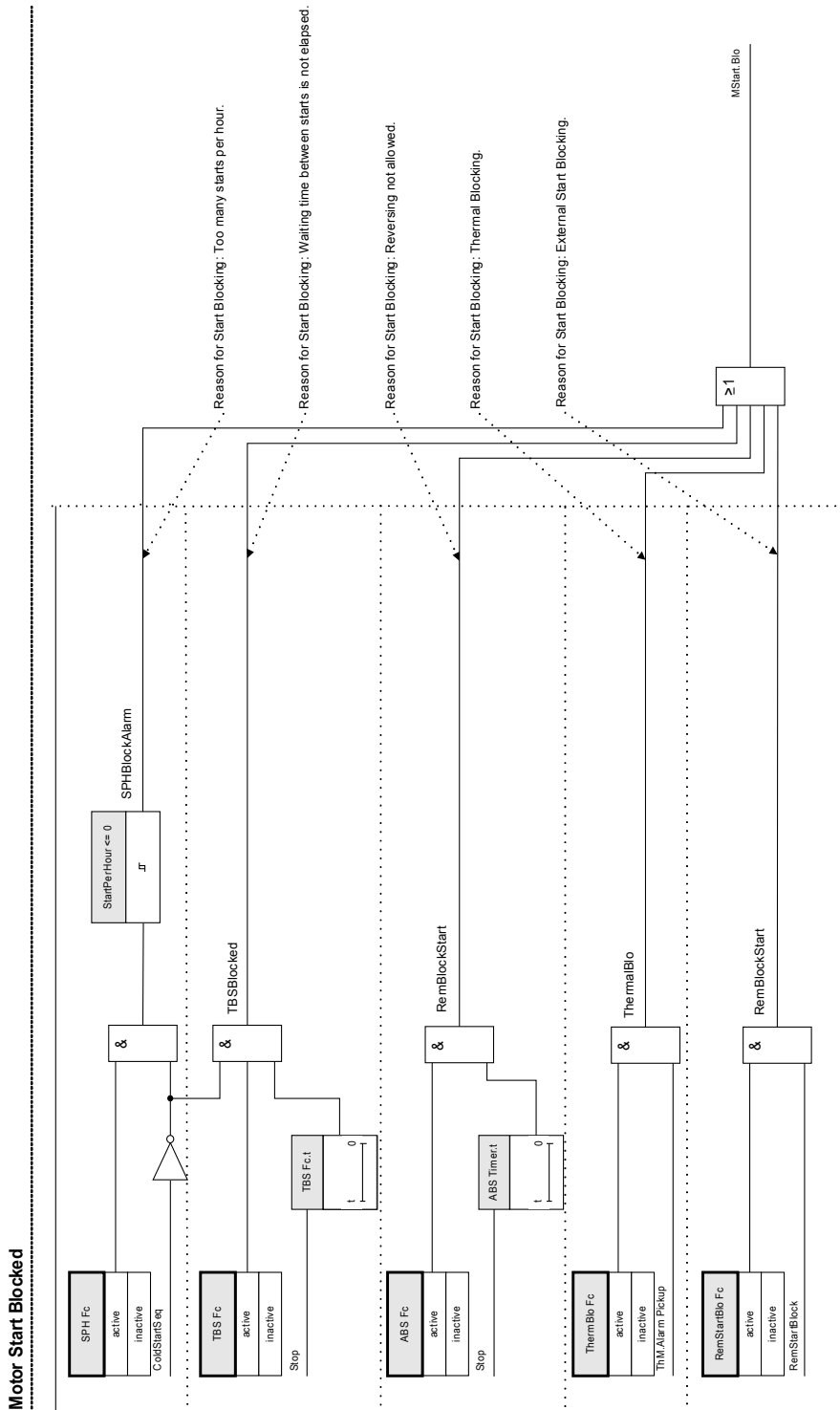
When the protective device declares a »START«, all start timers of the enabled functions begin to time. Each of these timers blocks the respective function until the set delay expires. These start timers are affected by transitions - they run for the set time, which may be less than or greater than the time of transition. These start delay timers include:

- IOC (Instantaneous overcurrent start delay);
- GOC (Ground fault start delay);
- UnderLoad (Underload trip and alarm start delay);
- IUnbalance (Current unbalance trip and alarm start delay);
- JAM (Jam trip and alarm start delay); and
- Generic1 to Generic5 (Generic start delay).

Note that the generic start delays are not tied to anything, and they can be used to block anything at the User's choice.

## Motor Start Blocked

A Motor Start can be blocked by certain events, if any of the following conditions are noted - motor starts limit, starting frequency, thermal and mechanical constraints. The User may choose to use the states to block the motor from starting or use it as an alarm or indication.



## Blocking Conditions

The reasons for a Motor Start Blocking are as follows:

The Motor Start will be blocked due to:

- There are too many starts per hour (if configured).
- The waiting time between starts is not elapsed (if configured).
- If the Anti Backspin protection detects a reversing of the motor (reversing not allowed, if configured).
- The thermal model blocks the motor (if configured).
- External Blocking becomes active (if configured).

When any of Anti-Backspin, thermal, and external blocks are on, the »MStart.Blo« signal will be set. The »TBS« and »SPH« can turn on the »MStart.Blo« signal only if the motor is not in a cold start sequence; »NOCS« block can not cause the »MStart.Blo« signal to be set.

## Start Limits

Because motor starting consumes a considerable amount of thermal energy compared to its normal load conditions, the number of starts in a given time period must be monitored and controlled. The protective device has three functions that contribute to the start limits monitoring. These are:

- TBS (Time between Starts);
- SPH (Starts per Hour); and
- NOCS (Number of Cold Starts).

Most motors can tolerate some number of consecutive cold starts before the time between starts is enforced. The protective device treats a start as the first in a sequence of cold starts if the motor has been stopped for at least the time period that is the greatest of »one hour« and »TBS«. Subsequent starts are treated as additional cold starts in the same sequence, only if they run no more than ten minutes, until the set number of cold starts is reached. Once the motor is in the cold starting sequence, it will ignore »TBS« and »SPH« limits. The cold start sequence will be terminated if the motor has run for more than ten minutes for a cold start before it exhausts »NOCS«, then starts after this are subject to time and count limits imposed by »TBS« and »SPH«. If the motor reaches the »NOCS« limit in a cold start sequence, »NOCS« block signal will be set and »TBS« will start to time. When »TBS« reaches its limit while the »NOCS« block signal is still set, the cold start sequence will be terminated and the »NOCS« block will be released. Meanwhile, the »SPH« will start to count at the last start in the complete cold start sequence.

## Stop Cycle

The run cycle continues until the motor current level falls below the Stop Current Threshold setting current on all three phases. Then a stop is declared. The start limits (also referred as Jogging start limits) and the anti-backspin time delay (ABS) are checked. If blocking conditions exist, the protective device can be configured to block a motor from starting. Remaining jogging block times are displayed and counted down, indicating how long to wait. If there are no such starting block conditions in effect, the protective device is ready for a new start.

### **Anti-Backspin Delay Time (ABS)**

»ABS« sets the time in seconds before a motor restart is permitted after a trip or stop condition. This function can be set to »inactive«.

This function is used with a motor driving a pump working into a head, or any other load that tends to spin in a reverse direction (backspin) when the motor is de-energized. It blocks starting during the time when the motor might be rotating in reverse following a trip. Also, this function may be used simply to set idle time (time between stop and start) before a restart is permitted.

### **External Start Blocking**

A motor can be blocked through a digital input. If this feature is enabled, the User must make sure that both the Motor Start and Digital Input modules are configured properly.

### **Thermal Block**

Besides the previously mentioned start monitoring and controlling means, the motor can be blocked if the thermal capacity used exceeds the alarm level. It is the User's choice to turn on or off this feature and set an appropriate alarm level in the thermal model module.

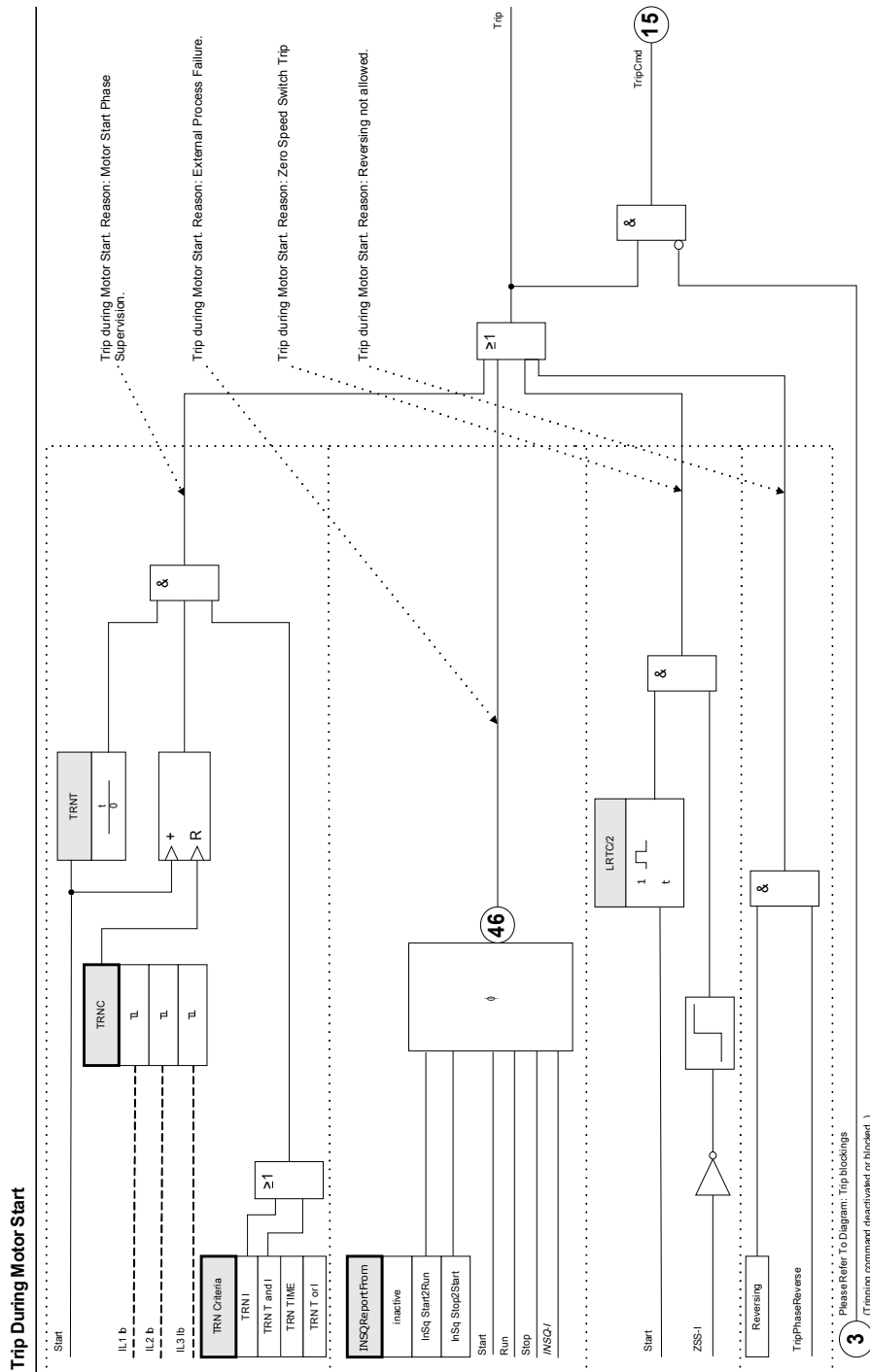
### **Forced Starting**

It is recommended that the User wires the »M<sub>START</sub>.BLO« output to the motor trip circuit for preventing the motor from starting under these blocked conditions. If the User chooses not to do this for their applications, a Forced Starting signal will be set when the motor is started with the blocked conditions. This signal can only be reset manually through *Smart view* or from the front panel (please refer to section Emergency Override).

## Motor Start / Transition Trips

The Motor will be tripped during the start phase, in case that:

- The Start Control detects an unsuccessful Start. (Please see section Start Control Module)
- There is an Incomplete Start Sequence. The device detects via an digital input, that the external process is not properly started.
- If a reverse direction is detected but reversing is not allowed.
- If case of a Zero Speed Switch trip.

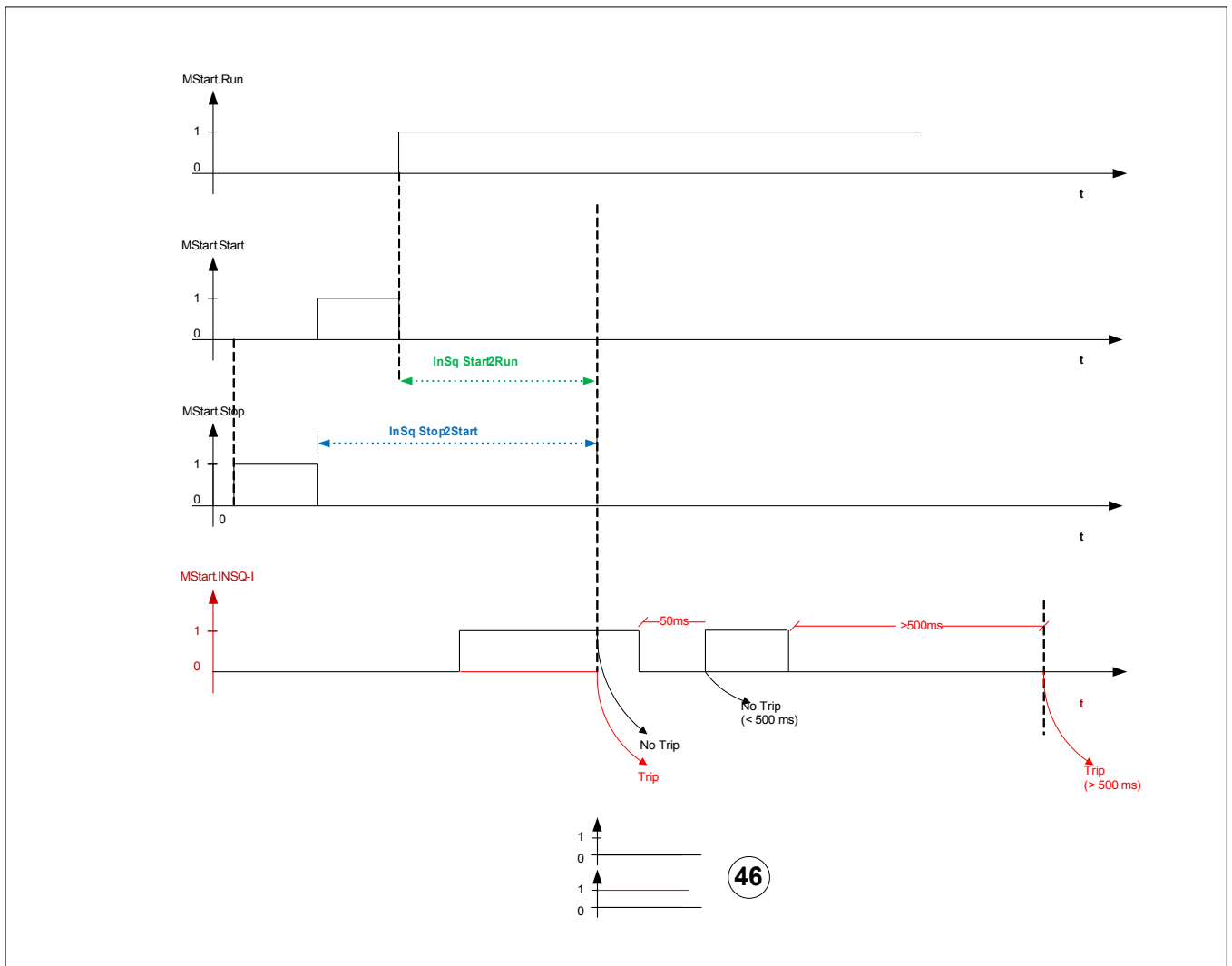


### Incomplete Sequence Report Back Time (INSQ)

The incomplete sequence function requires an input from the report back contact from the process that the motor is running. Shortly after the motor starts, the report back contact provides an indication that the process has started to operate as expected. If the process does not start up correctly, the contact does not close within the expected time. If a problem develops later on, the report back contact opens. In either case, the open contact state indicates that the motor should be tripped.

To use this function, set a time limit for report back here and define the start of report back timing. Connect the report back contact to one of the protective device Discrete Inputs. If this input is not energized before the set time expires, the relay will trip on an “Incomplete Sequence”.

Note that the input must be energized continuously after the time delay has expired to hold off this trip. Otherwise, if the incomplete sequence report back contact changes state for a period greater than 0.5 seconds, the relay will trip on an incomplete sequence. This delay allows for any momentary transient switching that may occur in the process report back contact, such as that which can occur in an open transition reduced voltage start.



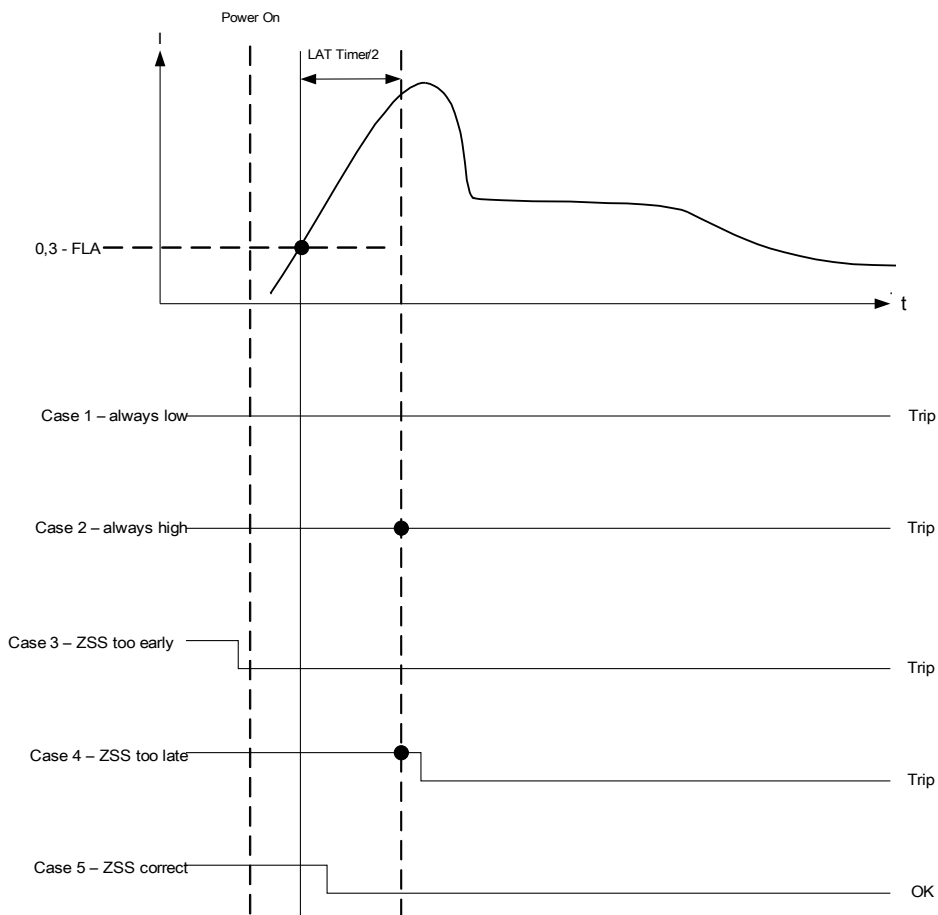


**Zero Speed Switch (ZSS ON or OFF)**

ZSS enables the function that verifies if the motor begins to physically spin after a start. It requires a zero-speed switch (digital switch) on the motor, which is closed at rest and opens as the rotor reaches (5%-10%) its normal speed. Connect the zero-speed switch contact to one of the protective device Digital Inputs. If the contact fails to open within »LRT/2« (one-half of locked-rotor time) after a start, the relay trips with a zero-speed switch trip message.

This protection is always useful, but is essential if the Long Acceleration Time (LAT) function setting is used.

With ZSS being enabled and being mapped to one of the digital inputs, the protective device checks the ZSS input status at the very moment it sees a start - it wants to sense the initially closed zero-speed switch, which opens shortly thereafter as the motor spins. If it fails to find the closed contact, it trips immediately. Check the wiring and contact for problems.



### Long Acceleration Time (LAT)

When the LAT function is enabled, the »LAT« timer is used to set a time interval during which the motor is permitted to accelerate a high-inertia load, which is longer than the locked-rotor time. This function can be (and usually should be) set to »inactive«. If the thermal-model accumulator bucket fills to 100% during the long acceleration time, it is limited to that value and the thermal trip is held off until the LAT timer expires. By then, the thermal bucket level must have decreased (thermal model cooled) below 100% or the motor trips.

The LAT function should be used but not limited only on motors with a zero-speed switch (a normally-closed contact that opens when the motor actually begins to spin). Connect the zero-speed switch contact to one of the protective device Digital Inputs. The Zero-Speed Switch function must be enabled (ZSS ON). The protective device requires the zero-speed switch to open within LRT/2 (one-half of locked-rotor time) after a start, or the motor is tripped by the ZSS function. This protects a completely stalled motor from being damaged when the LAT timer blocks the locked-rotor thermal trip.

#### CAUTION

**The long acceleration time (LAT) function can block the critical LRC-LRT rotor thermal protection during a start and destroy the motor. Turn LAT OFF unless absolutely needed and the motor's suitability for this starting duty has been confirmed. Use only with zero speed switch function ZSS ON and switch input connected to protect a stalled motor.**

The User can temporarily defeat the I2t thermal protection limit after a start by setting a Long Acceleration Time delay. This can be a dangerous setting that blocks thermal tripping and holds the bucket at a 100% level if the load takes a long time to reach running speed. An example is a motor spinning a large centrifuge. In using LAT, the User can take advantage of the partial cooling from airflow produced by the motor spinning at below-normal speed, as compared to unfanned heating of a locked rotor. The motor must be rated for this severe starting duty. Also, the User must ensure that the motor actually has begun to spin well before the locked-rotor time has expired. This is accomplished by connecting a zero-speed switch to a Digital Input and turning on ZSS function. The zero-speed switch is a contact that is closed when the motor is at rest, and opens as the motor begins to spin, usually at 5-10% of running speed. If ZSS is set to ON and the protective device relay does not sense the contact open in one-half the locked-rotor time setting, it trips the motor.

#### WARNING

**Turn OFF LAT unless the application specifically demands it. Use a zero speed switch with LAT. Using an LAT setting greater than locked rotor time without a zero speed switch temporarily defeats thermal protection and damages the motor if the rotor actually is locked.**

If »LAT« is used, check the settings of transition time »TRNT« and jam start delay to be sure they are coordinated with the prolonged starting cycle.

### Anti-Backspin Delay Time (ABS)

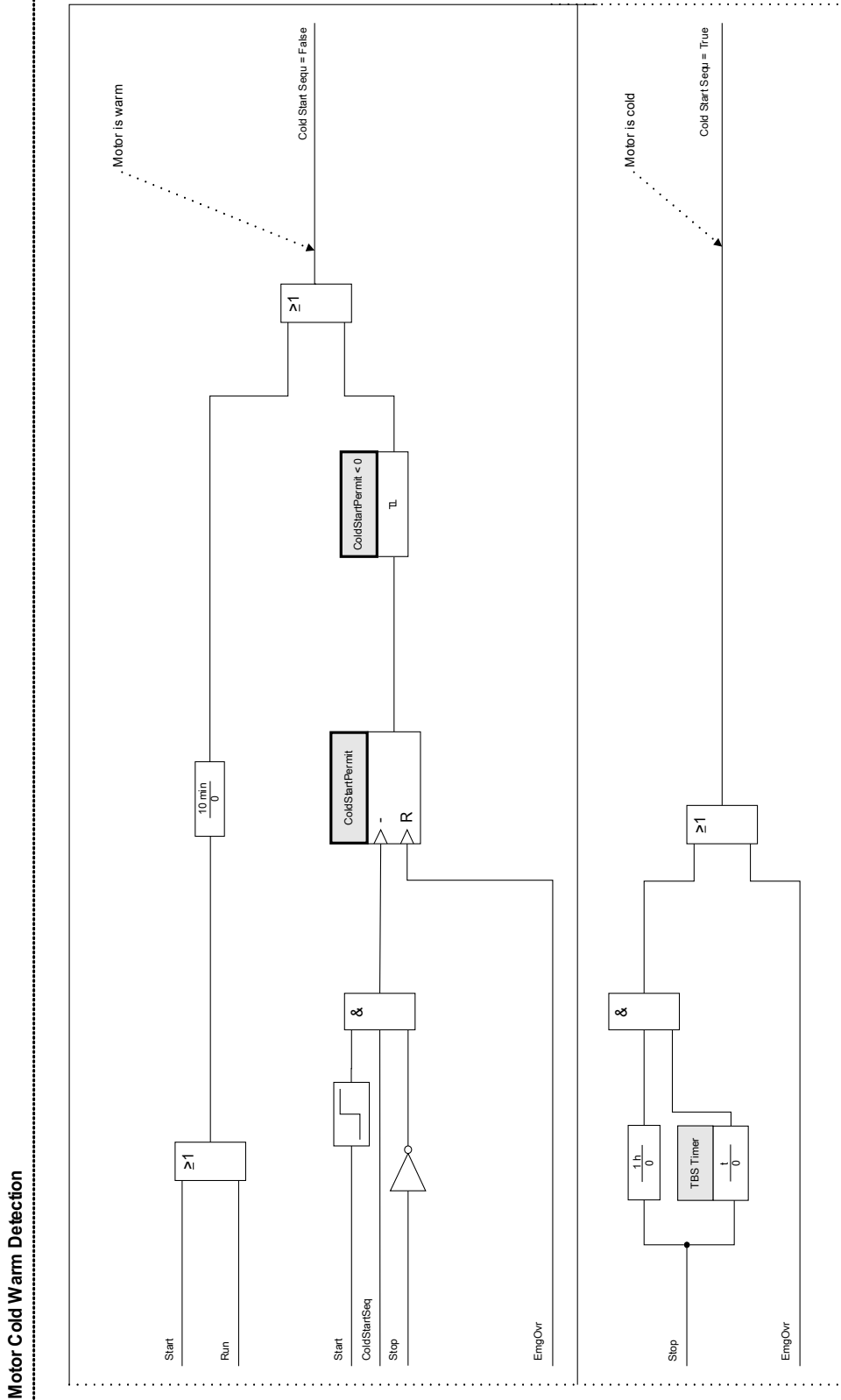
»ABS« sets the time in seconds before a motor restart is permitted after a trip or stop condition. This function can be set to »inactive«.

This function is used with a motor driving a pump working into a head, or any other load that tends to spin in a reverse direction (backspin) when the motor is de-energized. It blocks starting during the time when the motor might be rotating in reverse following a trip. Also, this function may be used simply to set idle time (time between stop and start) before a restart is permitted.

### Motor Cold Warm Detection

The motor will be considered as cold (»COLD SEQU = TRUE«) after being in the »stop« mode for more than one hour if the time between starts timer is set to a lower value than 1 hour.

Else, the motor will fall back into the »cold« state if the time between starts timer is elapsed. By means of the Emergency Override function, the motor can be forced to switch to the cold state.



## Emergency Override

The Emergency Override function can be enabled or disabled in the following menu [Protection Para\Global Prot Para\MStart\Start Control\EMGOVR]. Also it can be determined whether this function can be executed by a DI or by a softkey at the HMI or both.

If enabled, an emergency override can be executed by pushing the »*Emrg Override*« Softkey at the front panel. In any case, an emergency override can be performed by a remote contact connected to any one of the digital inputs programmed as »*EMG OVR*«, or via front panel under [Operations\Reset\EMGOVR] menu. The as-shipped setting is disabled.









Emergency override allows a panic restart of a tripped motor without completely disabling protection. When the override request is received, the thermal-model accumulator bucket is drained to its initial level of 40°C (104°F). Cold starts are fully restored.

The motor protection is now in the state it would be in if the motor had been standing for a long time prior to the moment of the override. This allows an immediate restart of the motor. The override can also delay an impending thermal trip of a running motor. The emergency override action is counted in the history record, and noted with its time tag in the logbook record.

### CAUTION

**The emergency override function clears and restarts all protective functions of the protective device. Using this function can damage the motor. Use it only for true emergencies, when it is known what caused the trip. Override permits the risk of motor damage to avoid an even more dangerous process situation caused by the tripping of the motor.**








### Global Protection Parameters of the Motor Start Module

Parameter	Description	Setting range	Default	Menu path
Reversing 	Reversing or non reversing starter. This option will affect the sequence current calculations.	inactive, active	inactive	[Field Para /Motor Nominal Values]
Ib 	Full load current (amperes). Set to maximum stator continuous RMS current primary (actual motor winding) amperes in each phase. Use motor nameplate or manufacturers data. Note that the ratio Ib/CT prim must lie between 0.25 and 1.5 in order to have reliable motor protection.	10 - 6000A	10A	[Field Para /Motor Nominal Values]
LRC 	Set to the locked-rotor current (the current the motor draws when stalled), in times of Ib. Use motor nameplate or manufacturers data.	3.00 - 12.00Ib	3.00Ib	[Field Para /Motor Nominal Values]
LRTC 	Specifies how long a locked-rotor or stall condition can be maintained before the motor is damaged, in seconds, for a cold start. Use motor nameplate or manufacturers data.	1 - 120s	1s	[Field Para /Motor Nominal Values]
STPC 	Stop current threshold, in percent of Ib, if the actual current is below the threshold for at least 300 milliseconds. If a stop state occurs, the jogging functions Starts per Hour Allowed (SPH), Time Between Starts (TBS) and Anti-Backspin (ABS) are enforced. All phases of the current must be below this level before a stop will be declared.	0.02 - 0.20Ib	0.02Ib	[Field Para /Motor Nominal Values]
k-Factor 	The k-Factor is to be calculated by the maximum allowed continuous current over the rated current transformer current (e.g. 1.2 times rated motor current over rated transformer current).	0.25 - 1.50	0.85	[Field Para /Motor Nominal Values]
RemStartBlo Fc 	RemStartBlo Fc	inactive, active	inactive	[Protection Para /Global Prot Para /MStart /Start Control]
ThermBlo Fc 	ThermBlo Fc	inactive, active	inactive	[Protection Para /Global Prot Para /MStart /Start Control]










## Protective Elements

Parameter	Description	Setting range	Default	Menu path
TRN Criteria 	Start transition criterion	TRN I, TRN TIME, TRN T and I, TRN T or I	TRN T and I	[Protection Para /Global Prot Para /MStart /Start Control]
TRNT 	Motor start transition time limit  Only available if: TRN Criteria = TRN T and I Or TRN Criteria = TRN TIME	0 - 1200s	10s	[Protection Para /Global Prot Para /MStart /Start Control]
TRNC 	Motor start transitions current level in Ib%  Only available if: TRN Criteria = TRN T and I Or TRN Criteria = TRN I	0.10 - 3.00Ib	1.30Ib	[Protection Para /Global Prot Para /MStart /Start Control]
NOCS 	Number of cold starts limit	1 - 5	1	[Protection Para /Global Prot Para /MStart /Start Control]
TBS Fc 	Time Between Starts on/off	inactive, active	inactive	[Protection Para /Global Prot Para /MStart /Start Control]
TBS Timer 	Time Between Starts Limit  Only available if: TBS Fc = active	1 - 240min	60min	[Protection Para /Global Prot Para /MStart /Start Control]
SPH Fc 	Starts Per Hour	inactive, active	inactive	[Protection Para /Global Prot Para /MStart /Start Control]
SPH 	SPH  Only available if: SPH Fc = active	1 - 10	1	[Protection Para /Global Prot Para /MStart /Start Control]
INSQReportFrom 	INcomplete SeQUENCE report time starting point	inactive, InSq Start2Run, InSq Stop2Start	inactive	[Protection Para /Global Prot Para /MStart /Start Control]

## Protective Elements

Parameter	Description	Setting range	Default	Menu path
 INSQReportTime	INSQ Report back time  Only available if: INSQReportFrom = active	1 - 240s	1s	[Protection Para /Global Prot Para /MStart /Start Control]
 LAT Fc	Long Time Acceleration Timer	inactive, active	inactive	[Protection Para /Global Prot Para /MStart /Start Control]
 LAT Timer	Large motors with a high inertia may experience starting currents that exceed the locked rotor current and time. The protective relay has logic and provisions for a zero speed switch input to differentiate between a stall and start condition. If the motor is spinning then the relay will not trip on the normal locked rotor time allowing the motor to start.  Only available if: LAT Fc = active	1 - 1200s	1200s	[Protection Para /Global Prot Para /MStart /Start Control]
 ABS Fc	For certain applications, such as pumping a fluid up a pipe, the motor may be driven backward for a period of time after it stops. The protective relay provides an anti-backspin timer to prevent starting the motor while it is spinning in the reverse direction. The timer begins counting from the moment a stop is declared by the relay.	inactive, active	inactive	[Protection Para /Global Prot Para /MStart /Start Control]
 ABS Timer	For certain applications, such as pumping a fluid up a pipe, the motor may be driven backward for a period of time after it stops. The protective relay provides an anti-backspin timer to prevent starting the motor while it is spinning in the reverse direction. The timer begins counting from the moment a stop is declared by the relay.  Only available if: ABS Fc = active	1 - 3600s	3600s	[Protection Para /Global Prot Para /MStart /Start Control]
 ZSS	Zero Speed Switch	inactive, active	inactive	[Protection Para /Global Prot Para /MStart /Start Control]
 EmgOvr	Emergency override options. Signal has to be active in order to release the thermal capacity of the motor. Please notice that by doing this you run the risk of damaging the motor. "EMGOVR" has to be set to "DI" or "DI or UI" for this input to take effect.	inactive, DI, HMI, DI or HMI	inactive	[Protection Para /Global Prot Para /MStart /Start Control]

Protective Elements

Parameter	Description	Setting range	Default	Menu path
RemStartBlock 	Remote Motor Start Blocking  Only available if: RemStartBlo Fc = active	1..n, Dig Inputs	.-.	[Protection Para /Global Prot Para /MStart /Motor Inputs]
EmgOvr 	Emergency Override. Signal has to be active in order to release the thermal capacity of the motor. Please notice that by doing this you run the risk of damaging the motor. "EMGOVR" has to be set to "DI" or "DI or UI" for this input to take effect	1..n, Dig Inputs	.-.	[Protection Para /Global Prot Para /MStart /Motor Inputs]
INSQ 	INcomplete SeQuence  Only available if: INSQReportFrom = active	1..n, Dig Inputs	.-.	[Protection Para /Global Prot Para /MStart /Motor Inputs]
ZSS 	Zero Speed Switch  Only available if: ZSS = active	1..n, Dig Inputs	.-.	[Protection Para /Global Prot Para /MStart /Motor Inputs]
STPC Blo 	With this setting a Digital Input keeps the Motor in the RUN mode, even when the motor current drops below STPC (motor stop current).	1..n, Dig Inputs	.-.	[Protection Para /Global Prot Para /MStart /Motor Inputs]
t-Blo-IOC 	Phase Overcurrent Start Delay. Phase Overcurrent elements are blocked for the time programmed under this parameter, while the motor is starting.	0.03 - 1.00s	0.05s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]
t-Blo-GOC 	Ground Overcurrent Start Delay. Ground Overcurrent elements are blocked for the time programmed under this parameter, while the motor is starting	0.03 - 1.00s	0.08s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]
t-Blo-I< 	Underload Start Delay. 37[x] elements are blocked for the time programmed under this parameter, while the motor is starting	0 - 1200s	60s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]
t-Blo-I2> 	Current Unbalance Start Delay. 46[x] elements are blocked for the time programmed under this parameter, while the motor is starting	0.03 - 1200.00s	10.00s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]



## Protective Elements

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
t-Blo-JAM 	Jam Start Delay. 50J[x] elements are blocked for the time programmed under this parameter, while the motor is starting	0.03 - 1200.00s	60.00s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]
t-Blo-Generic1 	t-Blo-Generic1	0 - 1200s	0s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]
t-Blo-Generic2 	t-Blo-Generic2	0 - 1200s	0s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]
t-Blo-Generic3 	t-Blo-Generic3	0 - 1200s	0s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]
t-Blo-Generic4 	t-Blo-Generic4	0 - 1200s	0s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]
t-Blo-Generic5 	t-Blo-Generic5	0 - 1200s	0s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]

## Motor Start Module Input States



<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
RemStartBlock-I	State of the module input: Remote Motor Start Blocking	[Protection Para /Global Prot Para /MStart /Motor Inputs]
EmgOvr-I	State of the module input: Emergency Override. Signal has to be active in order to release the thermal capacity of the motor. Please notice that by doing this you run the risk of damaging the motor. "EMGOVR" has to be set to "DI" or "DI or UI" for this input to take effect	[Protection Para /Global Prot Para /MStart /Motor Inputs]
INSQ-I	State of the module input: INcomplete SeQuence	[Protection Para /Global Prot Para /MStart /Motor Inputs]
ZSS-I	State of the module input: Zero Speed Switch	[Protection Para /Global Prot Para /MStart /Motor Inputs]
STPC Blo-I	State of the module input: With this setting a Digital Input keeps the Motor in the RUN mode, even when the motor current drops below STPC (motor stop current).	[Protection Para /Global Prot Para /MStart /Motor Inputs]

## Motor Start Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
active	Signal: active
Blo TripCmd	Signal: Trip Command blocked
Trip	Signal: Trip
TripCmd	Signal: Trip Command
Start	Signal: Motor is in start mode
Run	Signal: Motor is in run mode
Stop	Signal: Motor is in stop mode
Blo	Signal: Motor is blocked for starting or transition to Run mode
NOCSBlocked	Signal: Motor is prohibited to start due to number of cold start limits
SPHBlocked	Signal: Motor is prohibited to start due to starts per hour limits
SPHBlockAlarm	Signal: Motor is prohibited to start due to starts per hour limits, would come active in the next stop
TBSBlocked	Signal: Motor is prohibited to start due to time between starts limits
ThermalBlo	Signal: Thermal block
RemBlockStart	Signal: Motor is prohibited to start due to external blocking through digital input DI
TransitionTrip	Signal: Start transition fail trip
ZSSTrip	Signal: Zero speed trip (possible locked rotor)
INSQSP2STFail	Signal: Fail to transit from stop to start based on reported back time
INSQSt2RunFail	Signal: Fail to transit from start to run based on reported back time
LATBlock	Signal: Long acceleration timer enforced
ColdStartSeq	Signal: Motor cold start sequence flag
ForcedStart	Signal: Motor being forced to start
TripPhaseReverse	Signal: Relay tripped because of phase reverse detection
EmergOverrideDI	Signal: Emergency override start blocking through digital input DI
EmergOverrideUI	Signal: Emergency override start blocking through front panel
ABSActive	Signal: Anti-backspin is active. For certain applications, such as pumping a fluid up a pipe, the motor may be driven backward for a period of time after it stops. The anti-backspin timer prevents starting the motor while it is spinning in the reverse direction.
Blo-GOCStart	Signal: Ground Instantaneous Overcurrent Start Delay. GOC (Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
Blo-IOCStart	Signal: Phase Instantaneous Overcurrent Start Delay. IOC (Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
Blo-I<Start	Signal: Underload Start Delay. Underload(Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
Blo-JamStart	Signal: JAM Start Delay. JAM(Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
Blo-I2>Start	Signal: Motor start block current unbalance signal
Blo-Generic1	Generic Start Delay. This value can be used to block any protective element.1
Blo-Generic2	Generic Start Delay. This value can be used to block any protective element.2
Blo-Generic3	Generic Start Delay. This value can be used to block any protective element.3

<i>Signal</i>	<i>Description</i>
Blo-Generic4	Generic Start Delay. This value can be used to block any protective element.4
Blo-Generic5	Generic Start Delay. This value can be used to block any protective element.5
I_Transit	Signal: Current transition signal
T_Transit	Signal: Time transition signal
MotorStopBlo	Signal: Motor stop block other protection functions
Rotating forward	Signal: Rotation Direction forward
Rotating backward	Signal: Rotation Direction reverse

### Direct Commands of the Motor Start Module

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
 EmergOverHMI	Emergency override through front display  Only available if: EmgOvr = active	inactive, active	inactive	[Operation / Reset/Acknowledge /EmgOvr]
 RstForcedStart	Reset Forced Start flag	inactive, active	inactive	[Operation / Reset/Acknowledge /Reset]

## Motor Start Module Counter Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
WaitTimeStarts	Wait time between starts remained	0s	0 - 9999999999s	[Operation /Measured Values /Motor]
ColdStartPermit	Number of cold starts remaining	0	0 - 9999999999	[Operation /Measured Values /Motor]
StartPerHour	StartPerHour	0	0 - 9999999999	[Operation /Measured Values /Motor]
SPH Release	In case that the Motor is blocked by a SPH blocking, this timer needs to be expired before the blocking is released and the next motor start is permitted. The next Motor Start will increment the SPH counter again.	0min	0 - 9999999999min	[Operation /Measured Values /Motor]
AntiBackSpin	Anti-BackspinTimer	0s	0 - 9999999999s	[Operation /Measured Values /Motor]
IL1 lb	Measured value: Phase current as multiple of lb	0lb	0 - 1000lb	[Operation /Measured Values /Current RMS]
IL2 lb	Measured value: Phase current as multiple of lb	0lb	0 - 1000lb	[Operation /Measured Values /Current RMS]
IL3 lb	Measured value: Phase current as multiple of lb	0lb	0 - 1000lb	[Operation /Measured Values /Current RMS]
I3 P (%lb) avg	Average RMS current of all 3 phases as percentages of lb	0lb	0 - 1000lb	[Operation /Measured Values /Current RMS]
OCNT	Motor Operation count since last reset.	0	0 - 65535	[Operation /History /OperationsCr]
HighestStartI	Highest starting phase current. The time stamp indicates the point in time when the maximum current has occurred.	0A	0 - 99999999A	[Operation /History /OperationsCr]

## Protective Elements

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
HighestRunI	Highest running phase current. The time stamp indicates the point in time when the maximum current has occurred.	0A	0 - 999999A	[Operation /History /OperationsCr]
nEmrgOvr	Number of emergency overrides since last reset.	0	0 - 65535	[Operation /History /OperationsCr]
nISQT	Number of incomplete sequence trips since last reset.	0	0 - 65535	[Operation /History /TripCmdCr]
nSPHBlocks	Number of start per hour blocks since last reset.	0	0 - 65535	[Operation /History /TripCmdCr]
nTBSBlocks	Number of time between start blocks since last reset.	0	0 - 65535	[Operation /History /TripCmdCr]
nTRNTrips	Number of transition trips since last reset.	0	0 - 65535	[Operation /History /TripCmdCr]
nZSWTrips	Number of zero speed switch trips since last reset.	0	0 - 65535	[Operation /History /TripCmdCr]
nRevTrips	Number of reverse spinning trips since last reset.	0	0 - 65535	[Operation /History /TripCmdCr]
TOCS	Total Motor Operation count since last reset.	0	0 - 65535	[Operation /History /TotalCr]

### Motor Start Module Values

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
I3 PRMS avg	Average RMS current of all 3 phases	[Operation /Measured Values /Current RMS]
RunTime	Motor Operation time since last reset.	[Operation /History /OperationsCr]
Highest%I2/I1	Highest %I2/I1 value since last reset. The time stamp indicates the point in time when the maximum unbalanced load has occurred.	[Operation /History /OperationsCr]
TRunTime	Motor Operation (Motor run time) time since last reset.	[Operation /History /TotalCr]

### Motor Start Module Statistics

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
IL1 max Ib	IL1 maximum value as multiple of Ib	[Operation /Statistics /Max /Current]
IL1 avg Ib	IL1 average value as multiple of Ib	[Operation /Statistics /Demand /Current Demand]
IL1 min Ib	IL1 minimum value as multiple of Ib	[Operation /Statistics /Min /Current]
IL2 max Ib	IL2 maximum value as multiple of Ib	[Operation /Statistics /Max /Current]
IL2 avg Ib	IL2 average value as multiple of Ib	[Operation /Statistics /Demand /Current Demand]

## Protective Elements

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<i>Value</i>	<i>Description</i>	<i>Menu path</i>
IL2 min lb	IL2 minimum value as multiple of lb	[Operation /Statistics /Min /Current]
IL3 max lb	IL3 maximum value as multiple of lb	[Operation /Statistics /Max /Current]
IL3 avg lb	IL3 average value as multiple of lb	[Operation /Statistics /Demand /Current Demand]
IL3 min lb	IL3 minimum value as multiple of lb	[Operation /Statistics /Min /Current]
I3P Fla Demand	RMS current of all 3 phases calculated in a fixed demand window as percentages of lb	[Operation /Statistics /Demand /Current Demand]



## Protection elements that might be blocked by the Motor Start Module

*These protection elements can be blocked during the motor start.*

<i>Name</i>	<i>Description</i>
-.-	No assignment
MStart.Blo-GOCStart	Signal: Ground Instantaneous Overcurrent Start Delay. GOC (Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
MStart.Blo-IOCStart	Signal: Phase Instantaneous Overcurrent Start Delay. IOC (Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
MStart.Blo-I<Start	Signal: Underload Start Delay. Underload(Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
MStart.Blo-JamStart	Signal: JAM Start Delay. JAM(Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
MStart.Blo-I2>Start	Signal: Motor start block current unbalance signal
MStart.Blo-Generic1	Generic Start Delay. This value can be used to block any protective element.1
MStart.Blo-Generic2	Generic Start Delay. This value can be used to block any protective element.2
MStart.Blo-Generic3	Generic Start Delay. This value can be used to block any protective element.3
MStart.Blo-Generic4	Generic Start Delay. This value can be used to block any protective element.4
MStart.Blo-Generic5	Generic Start Delay. This value can be used to block any protective element.5
MStart.Blo-U2>	Signal: Motor start block voltage unbalance signal.
MStart.Blo-UnderV Start	Signal: Undervoltage Start Delay. Undervoltage elements are blocked for the time programmed under this parameter
MStart.Block-OverVStart	Signal: Overvoltage Start Delay. Overvoltage elements are blocked for the time programmed under this parameter
MStart.Blo-PowerStart	Signal: Power Start Delay. Power elements are blocked for the time programmed under this parameter
MStart.Blo-PFacStart	Signal: Power Factor Start Delay. Power Factor elements are blocked for the time programmed under this parameter
MStart.Blo-FrqStart	Signal: Frequency Start Delay. Frequency elements are blocked for the time programmed under this parameter

## I< - Undercurrent [37]

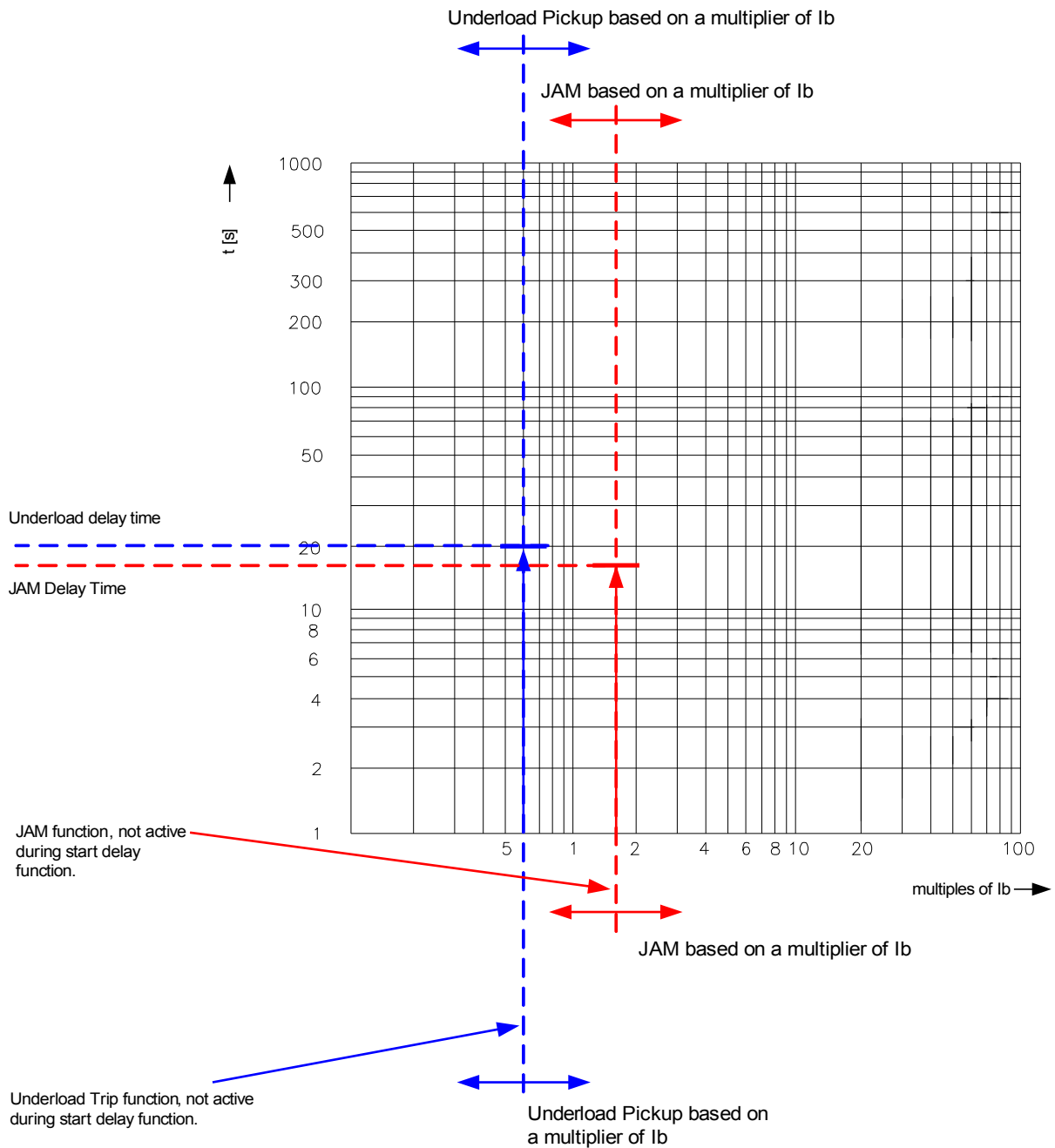
Available Elements:  
 I<[1], I<[2], I<[3]

### Functional Description

When the motor is running, a current reduction might indicate a malfunction in the load. *Underload* protection recognizes mechanical problems, such as a blocked flow or loss of back pressure in a pump, or a broken drive belt or drive shaft.

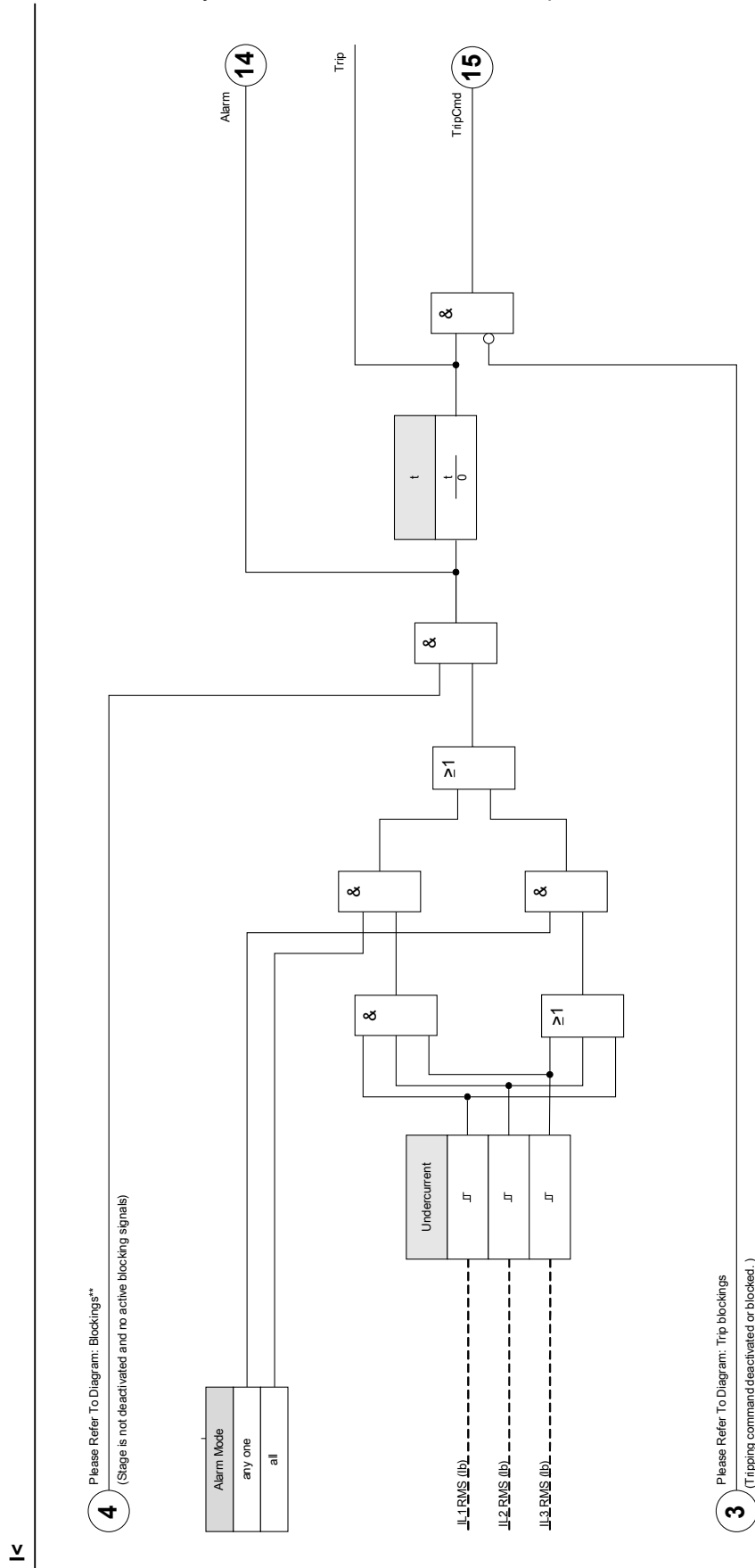
Refer to the underload protection limit - the left vertical line in the “Underload and Jam Trip Function example”. In the example, the underload trip is set at 60% of I<sub>b</sub> (FLA). The protective device can be configured for underload alarm (if the trip command is blocked) and underload trip .

### Underload and JAM Trip Function




These would be represented by two such vertical lines, both below the normal load current. Be sure to set the





alarm level **above** the trip level. Each element has its own delay timer. Use the start delay to block tripping until the load stabilizes after a start. Use run delays to avoid nuisance alarms or trips for load transients.



### Device Planning Parameters of the Underload Module

Parameter	Description	Options	Default	Menu path
Mode 	Mode	do not use, use	I<[1]: use I<[2]: do not use I<[3]: do not use	[Device planning]

### Global Protection Parameters of the Underload Module

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /Underload-Prot /I<[1]]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /Underload-Prot /I<[1]]
ExBlo3 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Trip Cmds	MStart.Blo- I<Start	[Protection Para /Global Prot Para /Underload-Prot /I<[1]]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the stage, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /Underload-Prot /I<[1]]

## Setting Group Parameters of the Underload Module

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Protection Para <1..4> /Underload-Prot /[<1]]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo Fc=active".	inactive, active	inactive	[Protection Para <1..4> /Underload-Prot /[<1]]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/stage.	inactive, active	inactive	[Protection Para <1..4> /Underload-Prot /[<1]]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo TripCmd Fc=active".	inactive, active	inactive	[Protection Para <1..4> /Underload-Prot /[<1]]
Undercurrent 	Underload Pickup based on a multiplier of Ib	0.05 - 0.90Ib	0.50Ib	[Protection Para <1..4> /Underload-Prot /[<1]]
Alarm Mode 	Indicates if one, two of three or all phases are required for operation	any one, all	any one	[Protection Para <1..4> /Underload-Prot /[<1]]
t 	Tripping delay	0.4 - 1200.0s	10.0s	[Protection Para <1..4> /Underload-Prot /[<1]]
MeasCircSv Curr 	Measuring Circuit Supervision Current	inactive, active	inactive	[Protection Para <1..4> /Underload-Prot /[<1]]

### Underload Module Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module input state: External blocking1	[Protection Para /Global Prot Para /Underload-Prot /I<[1]]
ExBlo2-I	Module input state: External blocking2	[Protection Para /Global Prot Para /Underload-Prot /I<[1]]
ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command	[Protection Para /Global Prot Para /Underload-Prot /I<[1]]

### Underload Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
active	Signal: active
ExBlo	Signal: External Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Alarm	Signal: Alarm
Trip	Signal: Trip
TripCmd	Signal: Trip Command

### Underload Module Counter Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NumberOfAlarms	Number of alarms since last reset.	0	0 - 999999999	[Operation /History /AlarmCr]
NumberOfTripCmds	Number of trip commands since last reset	0	0 - 999999999	[Operation /History /TripCmdCr]

## Commissioning: Undercurrent [ANSI 37]

### *Object to be tested*

- Testing the pick-up value for Undercurrent protection
- Testing the trip delay
- Testing the fallback ratio

### Necessary means

- 3-phase current source
- Ammemeter
- Timer for measuring of the tripping time

### *Procedure*

#### *Testing the threshold values( single-phase, three phase)*

Feed in a testing current significantly greater than the pick-up value.

For testing the threshold values and fallback values, the test current has to be decreased until the relay is energized. When comparing the displayed values with those of the ammeter, the deviation must be within the permissible tolerances.

#### *Testing the trip delay*

For testing the trip delay, a timer is to be connected to the contact of the associated trip relay. Feed in a testing current significantly greater than the pick-up value, the test current has to be decreased suddenly below the threshold value. The timer is started when the limiting value of the tripping current falls below the threshold and the operating time is elapsed and it is stopped when the relay trips.

#### *Testing the fallback ratio*

Enlarge the measuring quantity to more than 103% of the trip value. The relay must only fall back at 103% of the trip value at the earliest.

#### *Successful test result*

The measured tripping delays, threshold values and fallback ratio comply with those specified in the adjustment list. Permissible deviations/tolerances can be taken from Technical Data.

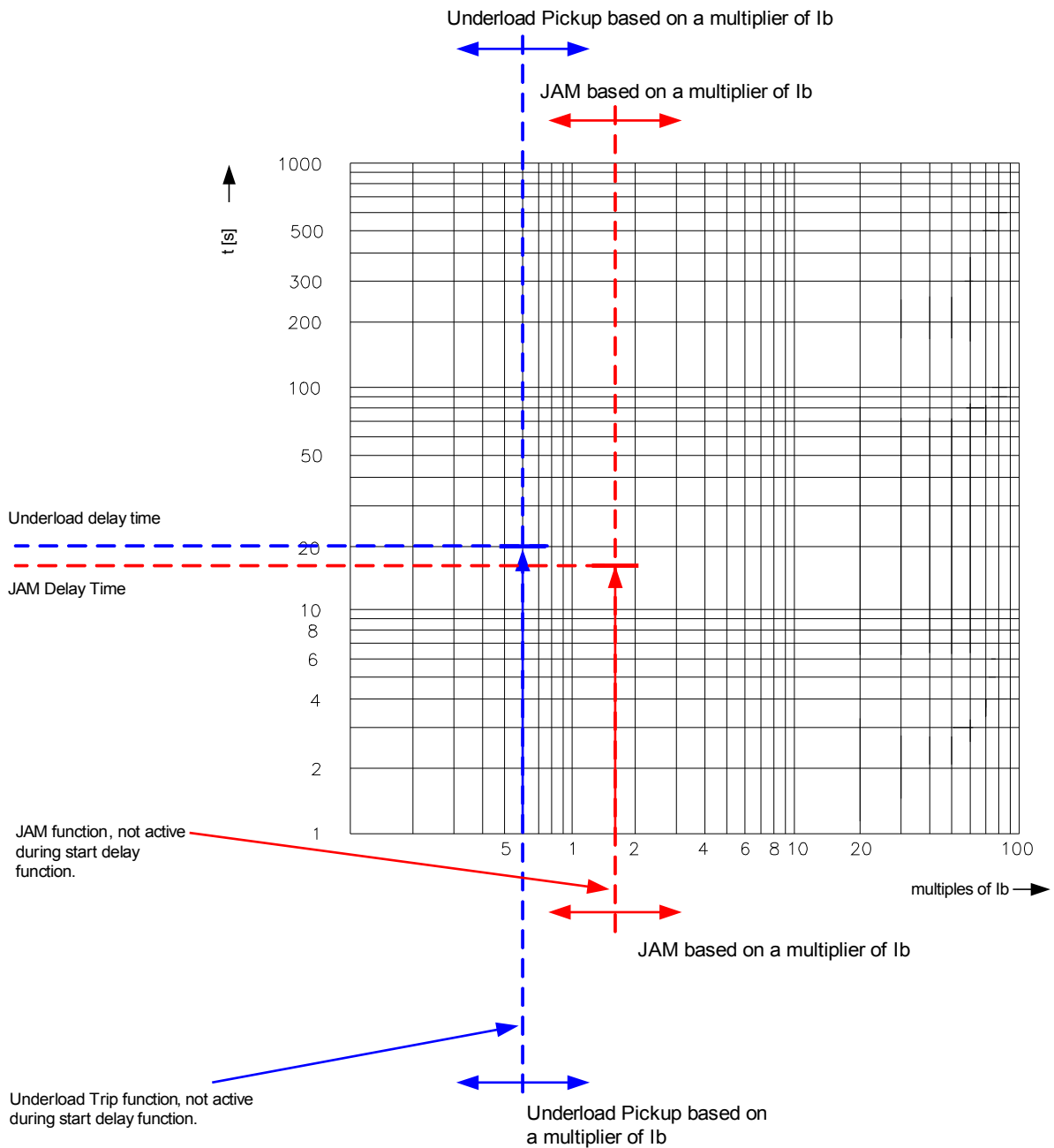
## JAM [51LR]

Elements  
 Jam[1], Jam[2]

### Functional Description

When the motor is running, a current increase above normal load may be an indication of a malfunction in the load. JAM protection recognizes mechanical problems, such as broken drive gears. Refer to the JAM protection limit (the right vertical line in the “Underload and JAM Trip Function” curve example). In this curve example, the JAM trip is set at 150% of  $I_b$  (FLA).

#### Underload and JAM Trip Function



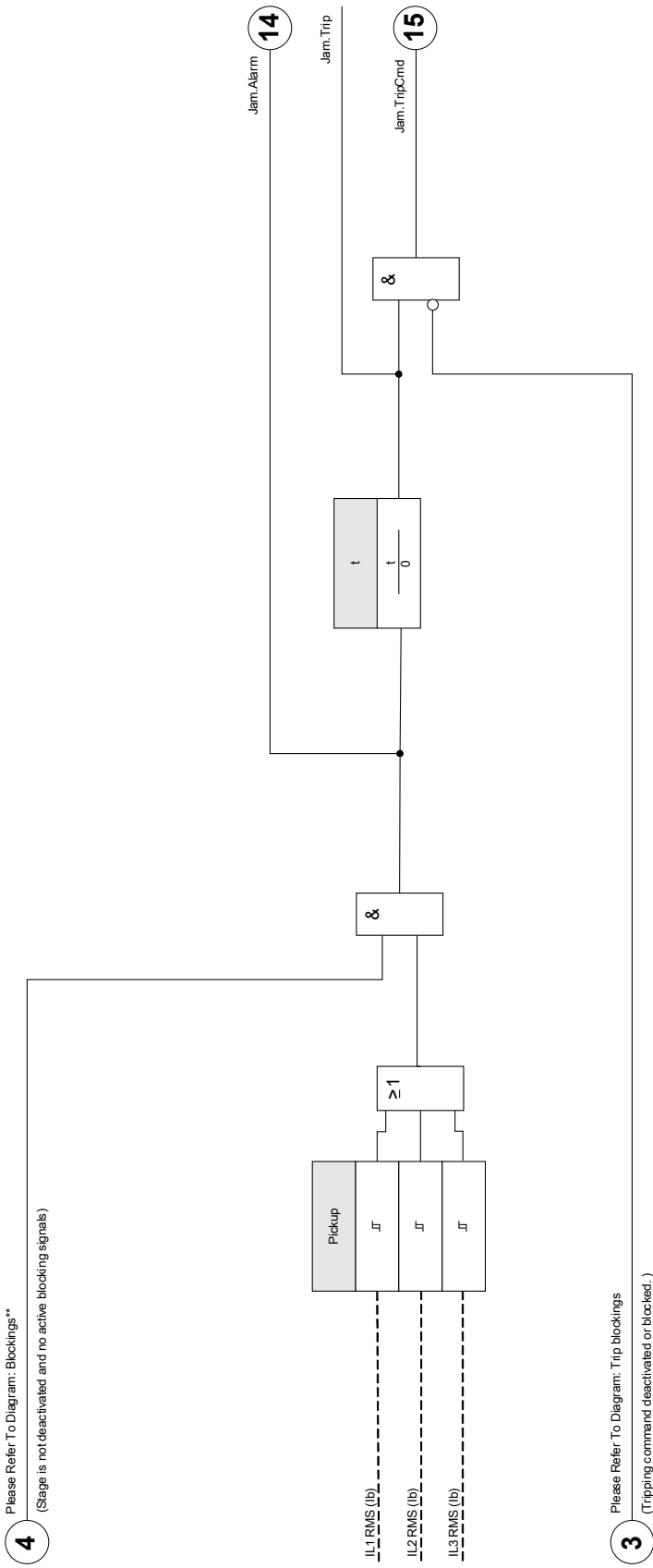
The protective device issues an alarm when the pickup is exceeded. If the timer has elapsed, a trip signal will be issued. In the “Underload and JAM Trip Function” curve, the »TRIP« settings are represented by vertical lines, well above the normal load current. This curve also applies to JAM setting configured as an alarm element (blocked trip)




command). The trips are held off by the delay timer »t«. Use the start delay to block tripping and alarming until the motor current drops to continuous load level. Use run delays to avoid nuisance alarms or trips for load transients.

Jam





name = Jam





## Device Planning Parameters for JAM Protection

Parameter	Description	Options	Default	Menu path
Mode 	Mode	do not use, use	Jam[1]: use Jam[2]: do not use	[Device planning]

## Global Protection Parameters for JAM Protection

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /JAM-Prot /Jam[1]]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /JAM-Prot /Jam[1]]
ExBlo3 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Trip Cmds	MStart.Blo-JamStart	[Protection Para /Global Prot Para /JAM-Prot /Jam[1]]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the stage, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /JAM-Prot /Jam[1]]

## Setting Group Parameters for JAM Protection

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Protection Para /<1..4> /JAM-Prot /Jam[1]]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo Fc=active".	inactive, active	inactive	[Protection Para /<1..4> /JAM-Prot /Jam[1]]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/stage.	inactive, active	inactive	[Protection Para /<1..4> /JAM-Prot /Jam[1]]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo TripCmd Fc=active".	inactive, active	inactive	[Protection Para /<1..4> /JAM-Prot /Jam[1]]
Pickup 	JAM based on a multiplier of Ib	1.00 - 12.00Ib	Jam[1]: 10Ib Jam[2]: 10.00Ib	[Protection Para /<1..4> /JAM-Prot /Jam[1]]
t 	Tripping delay	0.0 - 1200.0s	2.0s	[Protection Para /<1..4> /JAM-Prot /Jam[1]]

### JAM Protection Module Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module input state: External blocking1	[Protection Para /Global Prot Para /JAM-Prot /Jam[1]]
ExBlo2-I	Module input state: External blocking2	[Protection Para /Global Prot Para /JAM-Prot /Jam[1]]
ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command	[Protection Para /Global Prot Para /JAM-Prot /Jam[1]]

### JAM Protection Signals (Output States)

<i>Signal</i>	<i>Description</i>
active	Signal: active
ExBlo	Signal: External Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Alarm	Signal: Alarm
Trip	Signal: Trip
TripCmd	Signal: Trip Command

### JAM Protection Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NumberOfAlarms	Number of alarms since last reset.	0	0 - 999999999	[Operation /History /AlarmCr]
NumberOfTripCmds	Number of trip commands since last reset	0	0 - 999999999	[Operation /History /TripCmdCr]

## Commissioning: JAM [51LR]

### *Object to be tested*

- Testing the pick-up value for JAM protection
- Testing the trip delay
- Testing the fallback ratio

### Necessary means

- 3-phase current source
- Ammeter
- Timer for measuring of the tripping time

### *Procedure*

#### *Testing the threshold values(single-phase)*

Feed in a testing current significantly smaller than the pick-up value.

For testing the threshold values and fallback values, the test current has to be increased until the relay is energized. When comparing the displayed values with those of the ammeter, the deviation must be within the permissible tolerances.

#### *Testing the tripping delay*

For testing the trip delay, a timer is to be connected to the contact of the associated trip relay. Feed in a testing current significantly smaller than the pick-up value, the test current has to be increased suddenly above the threshold value. The timer is started when the limiting value of the tripping current exceeded the threshold and the operating time is elapsed and it is stopped when the relay trips.

#### *Testing the fallback ratio*

Enlarge the measuring quantity to less than 97% of the trip value. The relay must only fall back at 98% of the trip value at the earliest.

#### *Successful test result*

The measured tripping delays, threshold values and fallback ratio comply with those values, specified in the adjustment list. Permissible deviations/tolerances can be found under Technical data.

## LRC - Locked Rotor during Start

### Functional Description

The Locked-rotor protection function is an integral part of the thermal model and is used to protect the motor in the event that the motor fails to start or accelerate after being energized. The heating in the motor during this period of time can be higher significantly than the heating at rated current, ranging from 10 to 50 times the normal rated heating. The time that a motor can remain at a standstill after being energized varies with the applied voltage and has an  $I^2T$  limit.

When determining the heat in the motor during this period of time, both the negative and positive sequence currents are used in the equation that approximates the heat generated in a locked rotor condition. The heat can be approximated by the equation:

$$I^2_H = I_1^2 + K I_2^2$$

where :

- $I_1$  = the per unit stator positive sequence current;
- $K$  = weighting factor for the value of  $I_2$  resulting from the disproportionate heating caused by the negative sequence current component due to skin effect in the rotor bar; and
- $I_2$  = per unit stator negative sequence current.

Settings for the Locked Rotor Current can be found under the [Field Parameters]. The LRC value is a multiplier of  $I_b$  (FLA).

## MLS - Mechanical Load Shedding

Available elements:

MLS

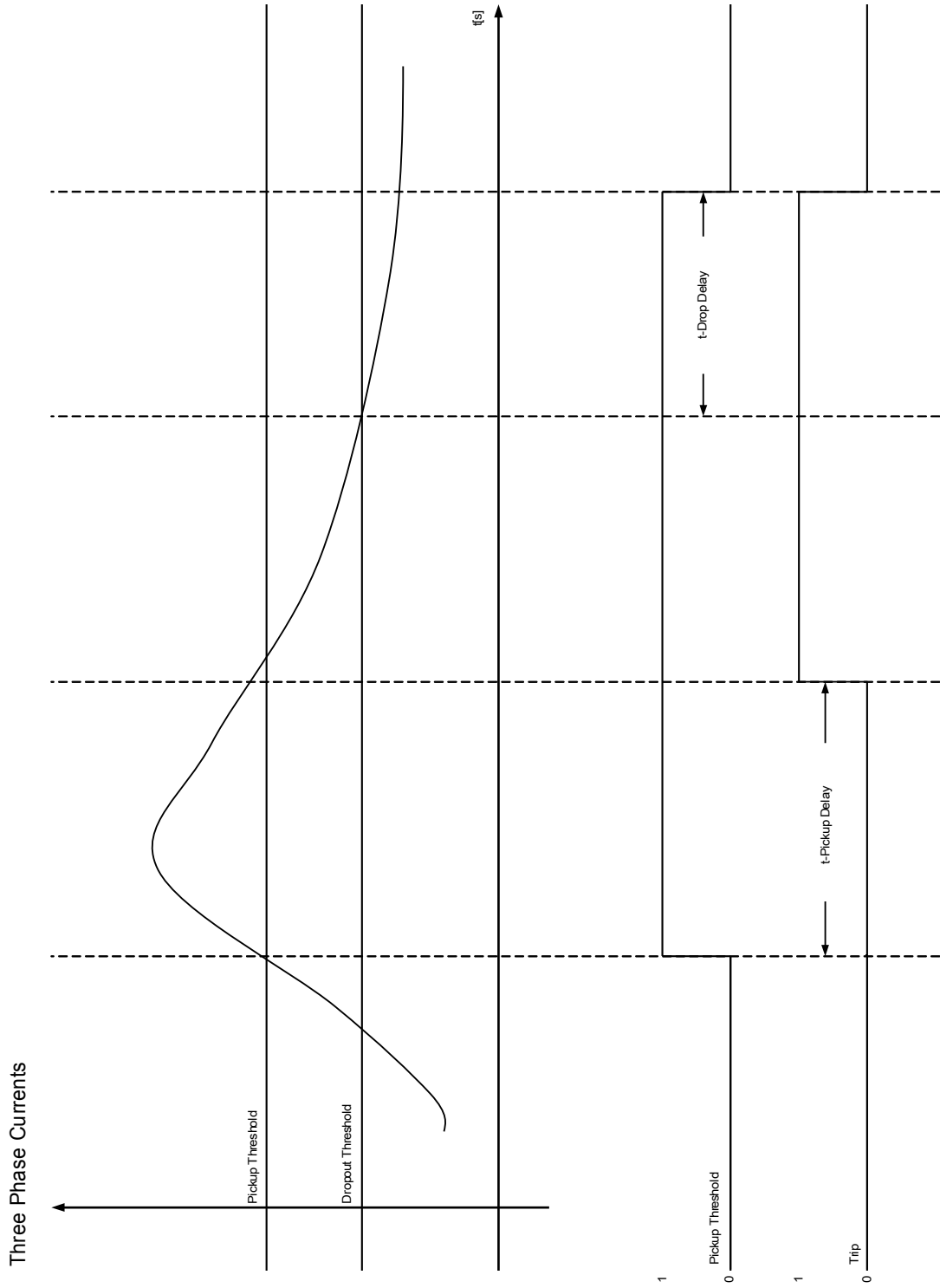
### Functional Description

In some applications, the protective device can forestall a JAM alarm or trip, or a thermal trip, by sending a signal to the process to reduce loading. The load-shedding function, if enabled, closes or opens a relay contact to shed process load when the motor load current goes above the Load-shed threshold, for a time exceeding the »*t-Pickup Delay*«. The pickup-delay can be used to stop or reduce the flow of material into the driven process until the load current falls below the threshold. The »*t-Drop Delay*« is the timer that has to elapse before the normal flow of material will be fed again into the process.

Set the load-shed drop current comfortably below the JAM trip level. It may be useful to set it below the Ultimate Trip Current, particularly if Remote Temperature Detection is not used.


The load shed function is only active during the »RUN« state of the motor.

Note : Load Shedding function is only active when motor is in RUN mode.













## Device Planning Parameters of the Load Shedding

<i>Parameter</i>	<i>Description</i>	<i>Options</i>	<i>Default</i>	<i>Menu path</i>
Mode 	Mode	do not use, use	use	[Device planning]

## Global Protection Parameters of the Load Shedding

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	-.-	[Protection Para /Global Prot Para /MLS]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	-.-	[Protection Para /Global Prot Para /MLS]

### Setting Group Parameters of the Load Shedding

Parameter	Description	Setting range	Default	Menu path
 Function	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Protection Para /<1..4> /MLS]
 ExBlo Fc	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo Fc=active".	inactive, active	inactive	[Protection Para /<1..4> /MLS]
 Pickup Threshold	Mechanical load shedding pickup current as multiplier of Ib	0.50 - 1.50Ib	0.90Ib	[Protection Para /<1..4> /MLS]
 t-Pickup Delay	Trip delay time	0.0 - 5.0s	1.0s	[Protection Para /<1..4> /MLS]
 Dropout Threshold	Mechanical load reclosure current (Dropout of Load shedding) as multiplier of Ib	0.50 - 1.50Ib	0.50Ib	[Protection Para /<1..4> /MLS]
 t-Drop Delay	Dropout delay time	0.0 - 5.0s	1.0s	[Protection Para /<1..4> /MLS]

**Load Shedding Input States**

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module input state: External blocking1	[Protection Para /Global Prot Para /MLS]
ExBlo2-I	Module input state: External blocking2	[Protection Para /Global Prot Para /MLS]

**Load Shedding Signals (Output States)**

<i>Signal</i>	<i>Description</i>
active	Signal: active
ExBlo	Signal: External Blocking
Alarm	Signal: Alarm
Trip	Signal: Trip

## Commissioning: Mechanical Load Shedding

### *Object to be tested*

- Testing the pick-up and drop-out thresholds
- Testing the delay times

### *Necessary means*

- 3-phase current source
- Ammemeter
- Timer for measuring of the tripping times

### *Procedure*

#### *Testing the threshold values (three-phase)*

This test is only possible, if the motor is in run mode.

##### *Testing pick-up threshold*

The drop-out delay time should be "0s" for this test.

Feed in a testing current significantly lower than the threshold of the mechanical load shedding. The test current has to be increased until the relay is energized. When comparing the measured values with those of the ammeter, the deviation must be within the permissible tolerances.

##### *Testing drop-out threshold*

For testing the drop-out threshold the testing current has to be significantly greater than the pick-up threshold value. The test current has to be decreased until the relay is falls back. When comparing the measured values with those of the ammeter, the deviation must be within the permissible tolerances.

#### *Testing the delay times*

This test is only possible, if the motor is in run mode.

##### *Testing the trip delay*

For testing the pick-up delay , a timer is to be connected to the contact of the associated trip relay. Feed in a testing current significantly lower than the pick-up value, the test current has to be increased suddenly above the threshold. The timer is started when the limiting value of the tripping current exceeded the threshold and it is stopped when the relay trips and the operating time is elapsed.

##### *Testing the drop-out delay*

For testing the drop-out threshold, the testing current has to be significantly greater than the pick-up threshold. A timer is to be connected to the contact of the associated trip relay. The test current has to be decreased suddenly below the drop-out threshold. The timer has to be started when the limiting value of the tripping current falls below the threshold and it has to be stopped when the relay falls back.

#### *Successful test result*

The measured tripping delays and threshold values comply with those values, specified in the adjustment list. Permissible deviations/tolerances can be found under Technical data.

## UTC - Ultimate Trip Current

### Functional Description

The Ultimate Trip Current (UTC) sets the current level at which a trip eventually occurs and is settable to a value as a multiples of »Ib« (Full Load Amps (FLA)). This value represents the vertical line on the upper portion of the non-RTD as shown in the protection trip curve labeled “Motor Protection Curve Example 2 (without RTD)”. The ultimate trip current setting in this example is at 1 times the of »Ib« (FLA).


The user has to set the k-Factor which can be calculated by the following formula:

$$k_{Factor} = \frac{UTC}{CT_{PRI}} = \frac{Overload_{factor} * I_b}{CT_{PRI}}$$

Please note that the settings for k-Factor and Ib have to be set within the *Field Parameter* menu.

For normal use, set »UTC« to the »k-Factor« times 100%. The »k-Factor« is found on the motor nameplate or in the manufacturer’s data. Note that the relay does not trip at the moment the current goes above »UTC« during motor running. Instead, it models the gradual stator heating for currents above »UTC« , and trips only after some time has passed. The trip time depends on a variety of setting and operating factors, including the motor nameplate data contained in other setting values.

Use a conservative value. In this case, a lower value of »UTC« than that dictated by the »k-Factor« if the motor ambient temperatures may rise above 40°C (104°F) and the optional *URTD* Module is not used, otherwise stator insulation damage or loss of motor life may occur. Also, consider lowering the »UTC« value if the motor is suitably rated, yet additional safety is critical for the application.

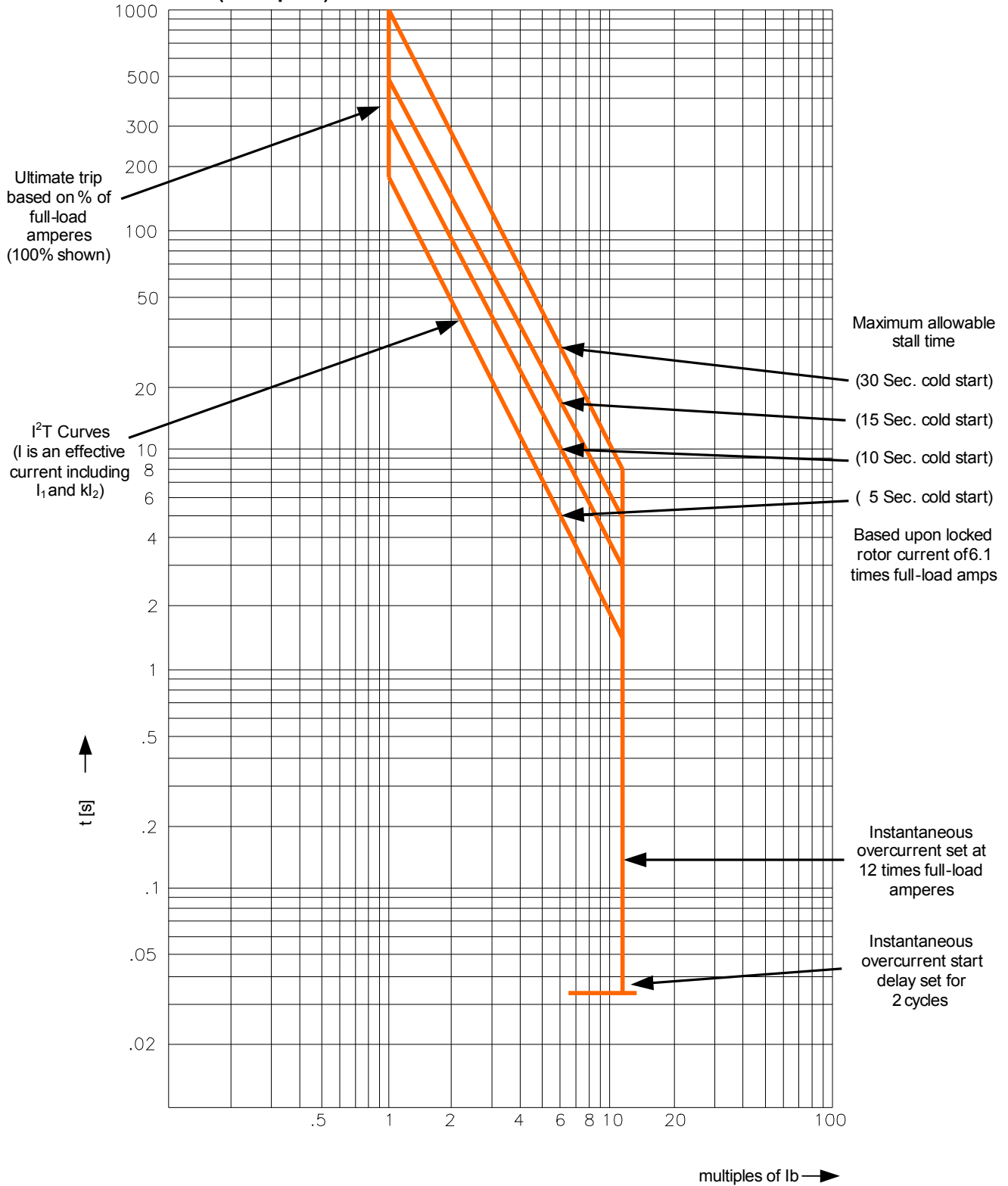
 **If UTC is set above 100% times the service factor, motor damage could result.**

In systems where an RTD is used the »UTC« pick-up point is biased by the measured temperature. This is shown in the example trip curve labeled “Motor Protection Curve Example 3” (with RTD) where you will see a shift in the »UTC« value to 2 times of »Ib« (FLA)

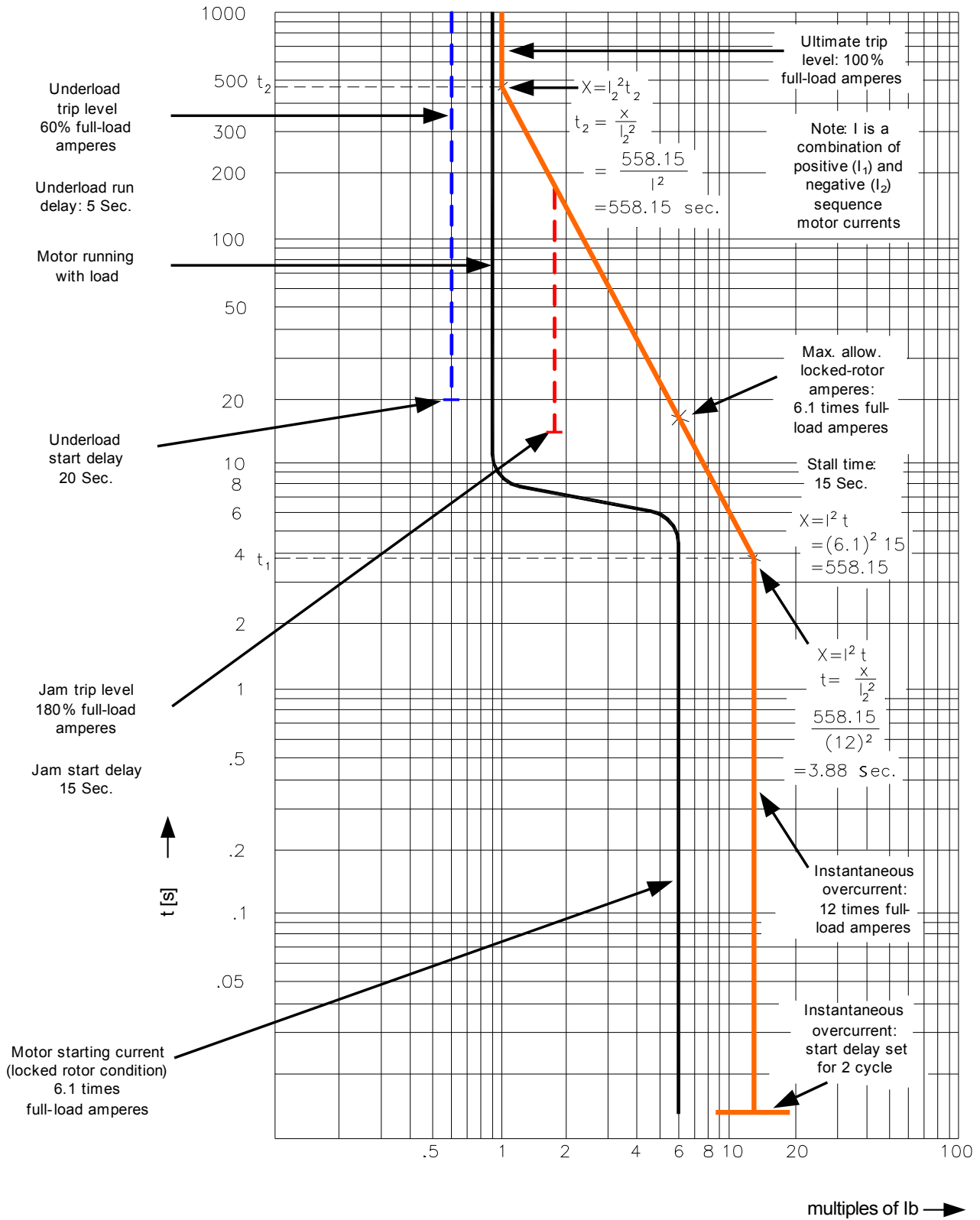
If stator temperature measurements are available, the algorithm may keep from tripping, even if the effective current is above the ultimate trip current setting, depending on stator temperature reports. It is still important to set a correct ultimate trip current so that the motor is well protected. If the RTDs, the module, or its communications to the relay fail, the algorithm falls back to use of »UTC«. Also, note that if all RTD channels are set to »OFF«, the algorithm reverts to the non-RTD calculation, which is based strictly on »UTC« .

### Motor Protection Curves

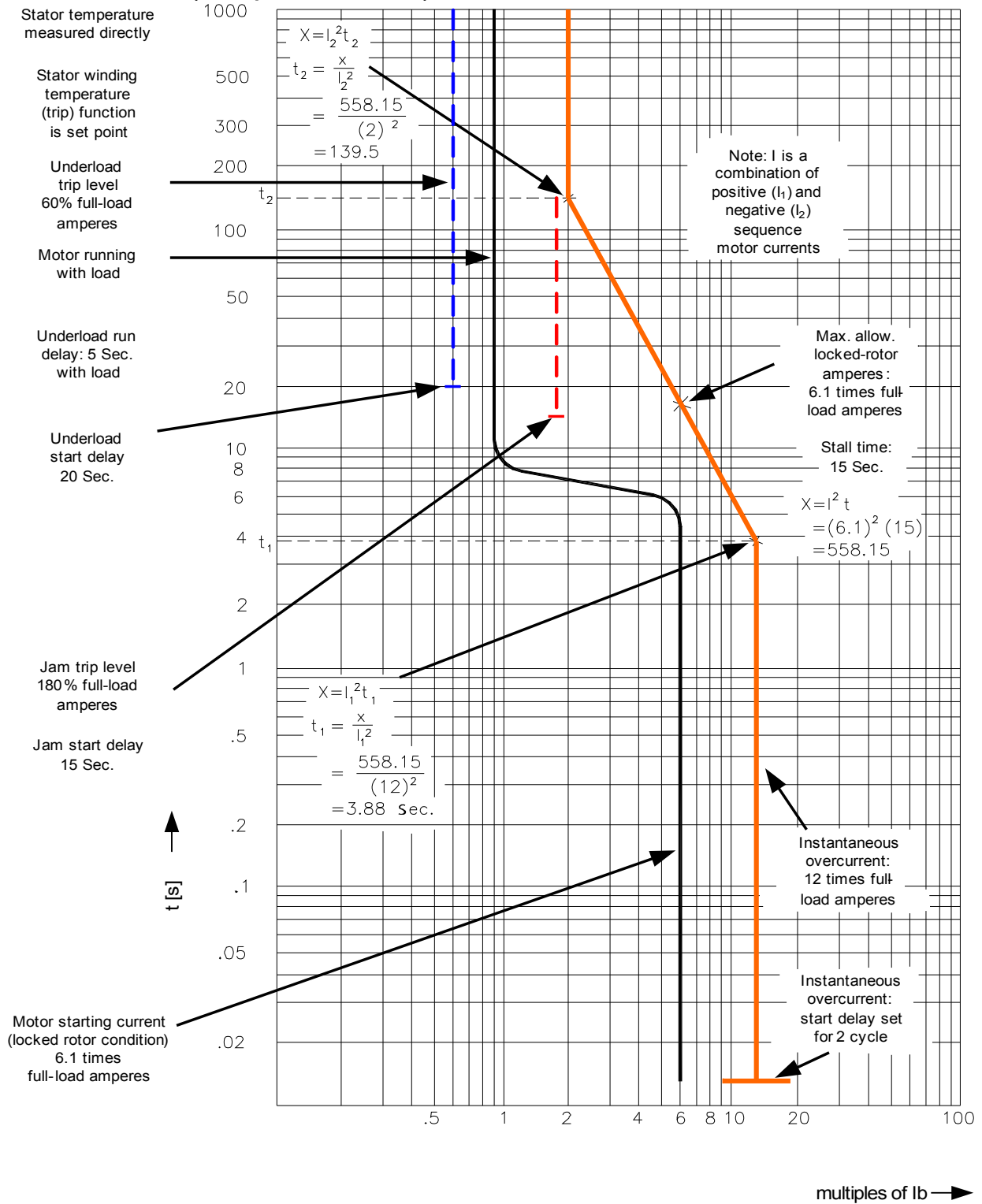
Motor Protection Curve (Example 1)



**Motor Protection Curve (Example 2 - without RTDs)**



**Motor Protection Curve (Example 3 - with RTDs)**





## I>> - IOC Function

The instantaneous overcurrent function (IOC) or 50P is intended to protect in the event of a high-current fault. The example IOC setting used in the Motor Protection Curve (see the Motor Protection Curve Examples in the Ultimate Trip Current Section) is 12 times (1,200%) of FLA. In general the instantaneous IOC should be at least 1.5 times LRC (Locked Rotor Current), well above the locked rotor current that is normally seen at the moment of a start.

IOC should trip fast and therefore no run or pickup delay is provided. A start delay is set at a minimum of 0.03 sec or more if needed to block IOC tripping on magnetizing inrush when the motor is first energized. An additional IOC tripping delay setting is set at a default of zero seconds.

## IOC Trip Level

The IOC sets the instantaneous overcurrent trip limit in percentage of »*I<sub>b</sub>*« (FLA) above at which the relay trips. This trip type can be set to inactive to deactivate this protective device element. For currents clearly above the setting, the IOC function picks up in 1.5 power cycles or less (at 50 Hz).

## IOC Start Delay (IOCSD)

This setting sets the number of power cycles after a start is recognized until the IOC trip and alarm functions are enabled. Use this delay to inhibit IOC tripping on a current peak caused by magnetic inrush when the motor is first energized (usually two to three cycles).

## I - Overcurrent Protection [50, 51,51Q, 51V\*]

Available stages:  
 I[1] .I[2] .I[3] .I[4] .I[5] .I[6]

**WARNING** If you are using inrush blockings the tripping delay of the current protection functions must be at least 30ms or more in order to prevent faulty trippings.

**NOTICE** All overcurrent protective elements are identically structured.

**NOTICE** This module offers Adaptive Parameter Sets. Parameters can be modified within parameter sets dynamically by means of Adaptive Parameter Sets. Please refer to chapter Parameter / Adaptive Parameter Sets.

The following table shows the application options of the Overcurrent Protection element

Applications of the I-Protection Module	Setting in	Option
ANSI 50 – Overcurrent protection, non-directional	Device Planning menu	Measuring Mode: Fundamental/TrueRMS/negative phase sequence current (I2)
ANSI 51 – Short circuit protection, non-directional	Device Planning menu	Measuring Mode: Fundamental/TrueRMS/negative phase sequence current (I2)
ANSI 51V – Voltage restraint overcurrent protection*	Parameter Set: VRestraint = active	Measuring Mode: Fundamental/TrueRMS/negative phase sequence current (I2)  Measuring Channel: Phase to Phase/Phase to Neutral
ANSI 51Q Negative Phase Sequence Overcurrent Protection	Parameter Set: Measuring Method =I2 (Negative Sequence Current)	
51C Voltage controlled overcurrent protection*  (Please refer to the chapter Parameter/Adaptive Parameter)	Adaptive Parameters	Measuring Mode: Fundamental/TrueRMS/negative phase sequence current (I2)  Measuring Channel: (in voltage protection module) Phase to Phase/Phase to Neutral

\*=available only for devices that offer voltage measurement.

### *Measuring Mode*

For all protection elements it can be determined, whether the measurement is done on basis of the »*Fundamental*« or if »*TrueRMS*« measurement is used.

Alternatively the »*Measuring Mode*« can be set to »*I2*«. In this case the negative phase sequence current will be measured. This is to detect unbalanced faults.

### *Voltage restraint overcurrent protection 51V\**

When the Parameter »*VRestraint*« is set to active the overcurrent protection element works voltage restraint. That means, the overcurrent pickup threshold will be lowered during voltage drops. This results in a more sensitive overcurrent protection. For the voltage threshold »*VRestraint max*« additionally the »*Measuring Channel*« can be determined.

\*=available only for devices that offer voltage measurement.

### *Measuring Channel*

With the parameter »*Measuring Channel*« it can be determined, whether the »*Phase to Phase*« voltage or the »*Phase to Neutral*« voltage is measured.

For each element the following characteristics are available:

- DEFT (UMZ)
- NINV (IEC/AMZ)
- VINV (IEC/AMZ)
- LINV (IEC/AMZ)
- EINV (IEC/AMZ)
- MINV (ANSI/AMZ)
- VINV (ANSI/AMZ)
- EINV (ANSI/AMZ)
- Thermal Flat
- IT
- I2T
- I4T

Explanation:

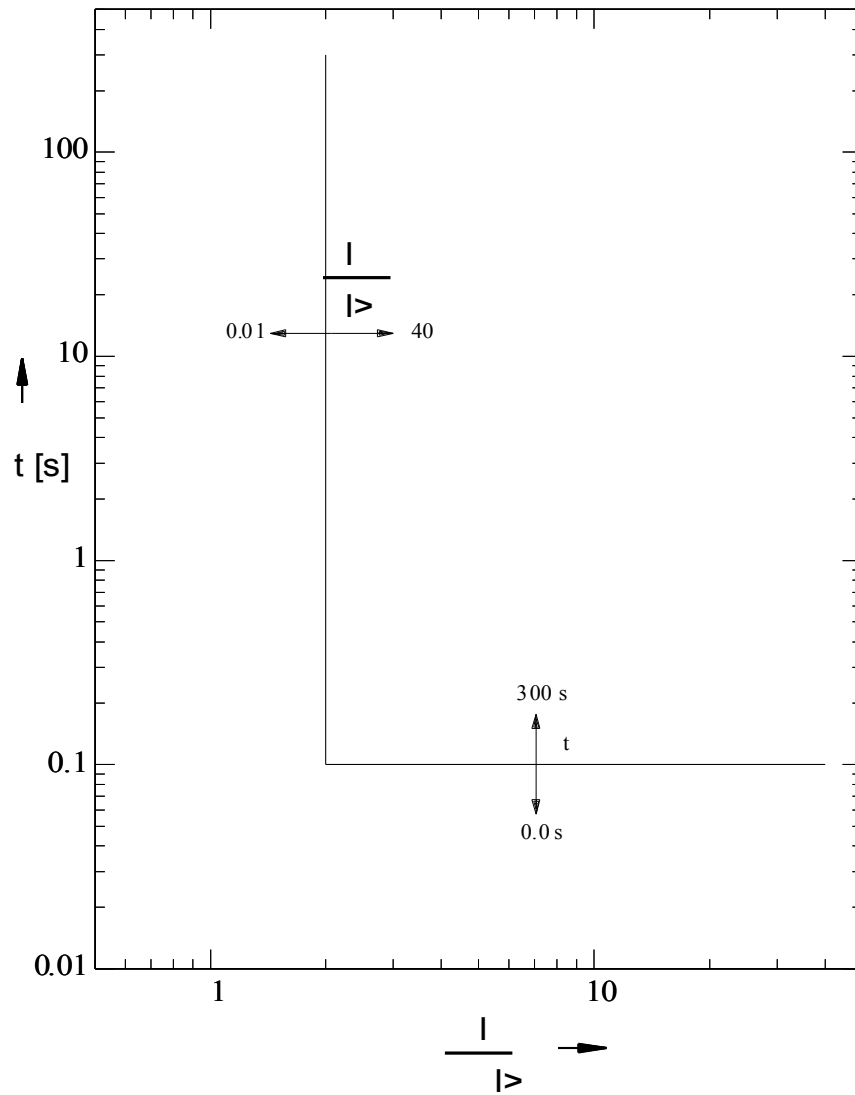
t = Tripping delay

t-char = Time multiplier/tripping characteristic factor. The setting range depends on the selected tripping curve.

I = Fault current

I> = If the pickup value is exceeded, the module/element starts to time out to trip.

### DEFT



**IEC NINV**



**Notice!**

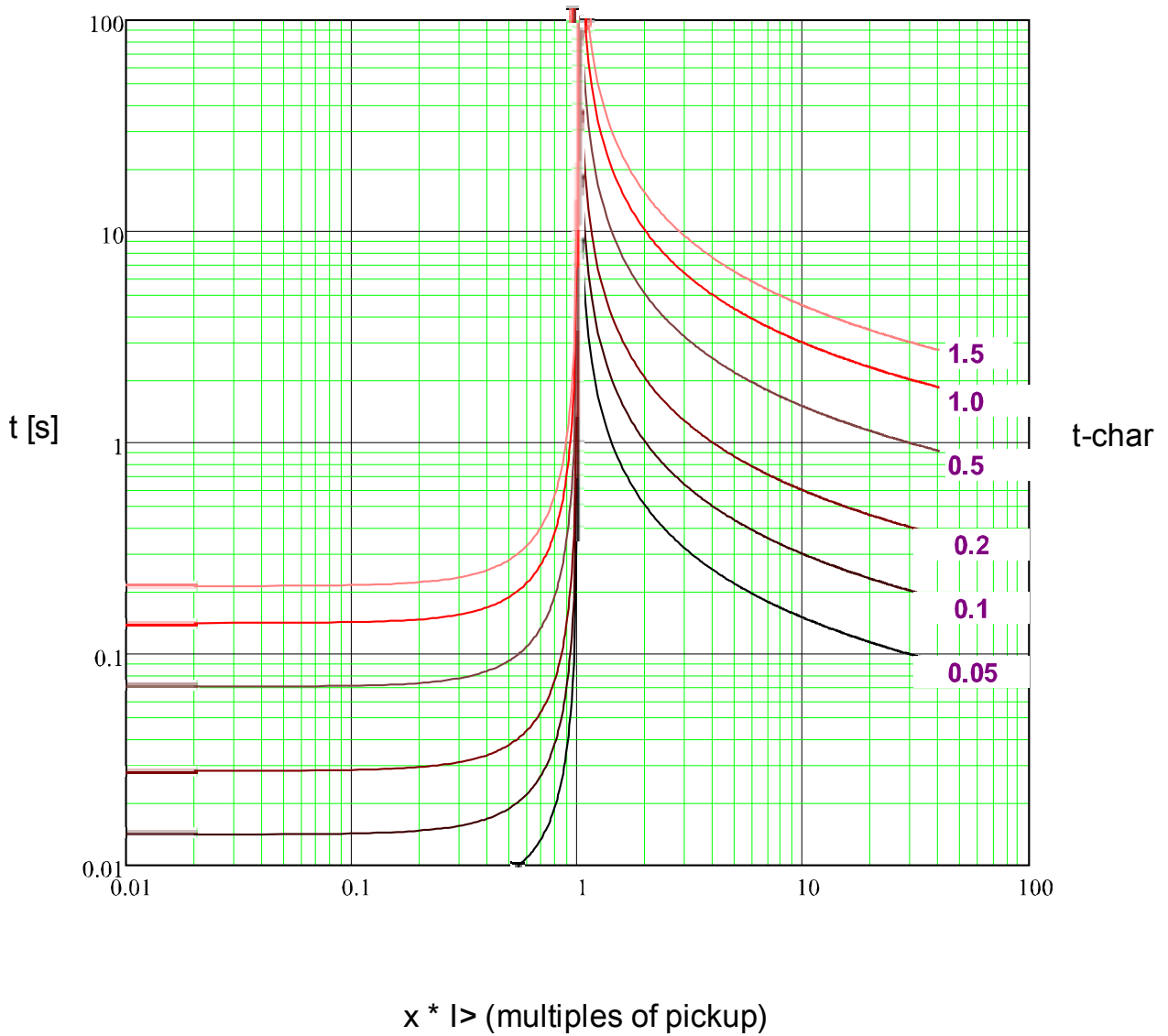
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

**Trip**

$$t = \left| \frac{0.14}{\left(\frac{1}{I>} \right)^2 - 1} \right| * t\text{-char [s]}$$

$$t = \frac{0.14}{\left(\frac{1}{I>} \right)^{0.02} - 1} * t\text{-char [s]}$$



### IEC VINV



**Notice!**

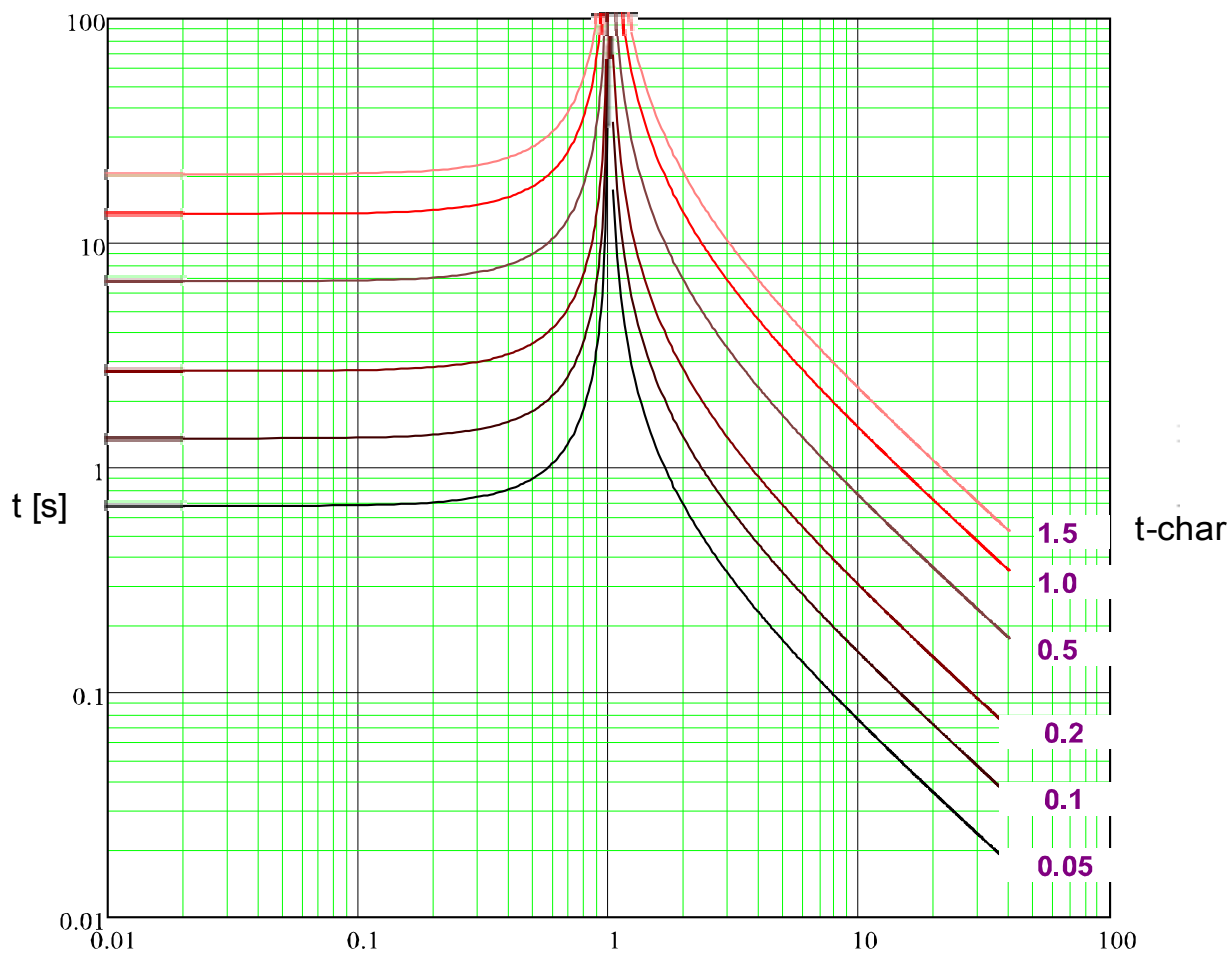
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

#### Reset

$$t = \left| \frac{13.5}{\left(\frac{1}{I>} \right)^2 - 1} \right| * t\text{-char [s]}$$

#### Trip

$$t = \frac{13.5}{\left(\frac{1}{I>} \right) - 1} * t\text{-char [s]}$$



x \* I> (multiples of pickup)

**IEC LINV**



**Notice!**

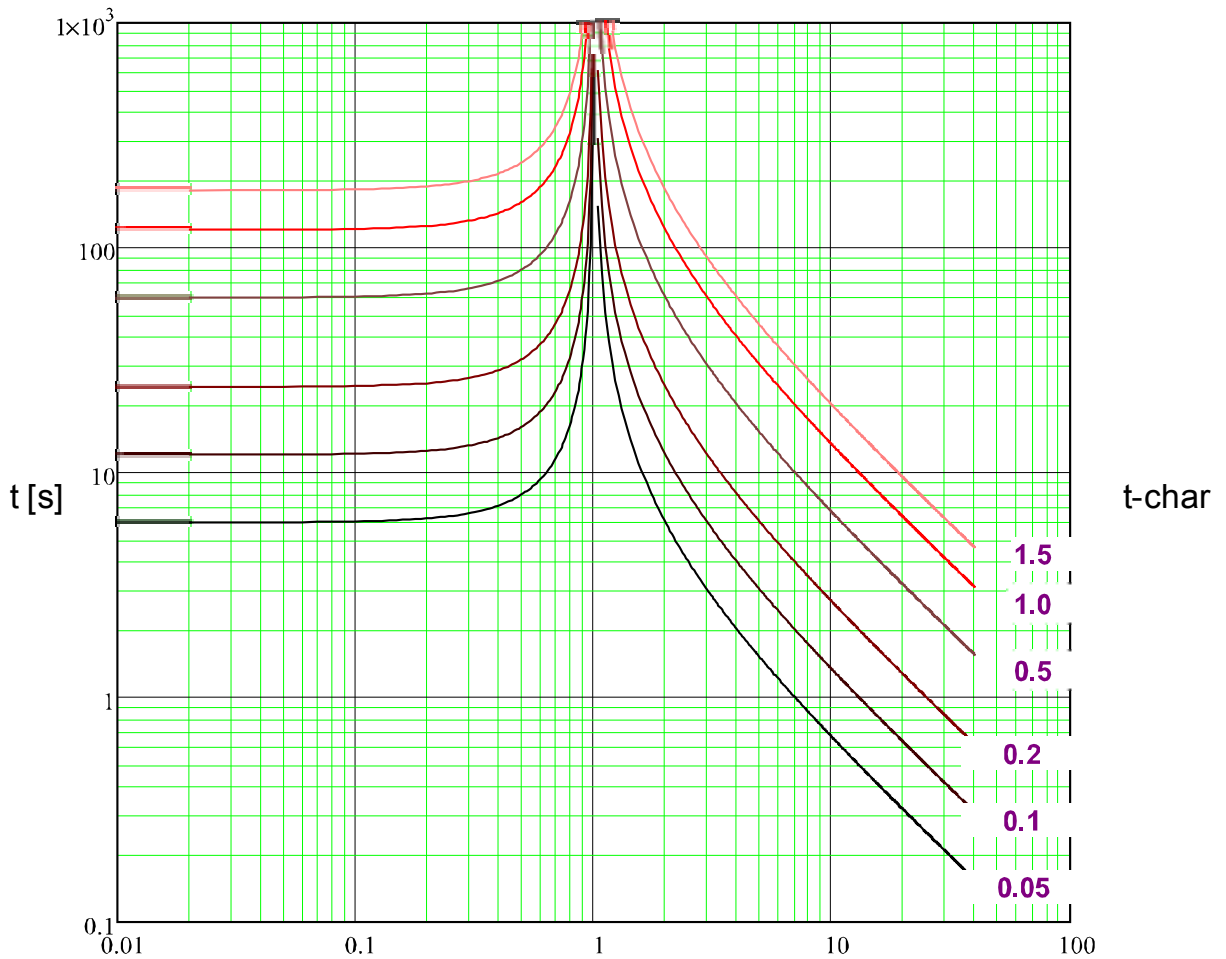
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

**Trip**

$$t = \left| \frac{120}{\left(\frac{I}{I_p}\right)^2 - 1} \right| * t\text{-char [s]}$$

$$t = \frac{120}{\left(\frac{I}{I_p}\right) - 1} * t\text{-char [s]}$$



$x * I_p$  (multiples of pickup)

**IEC EINV**



**Notice!**

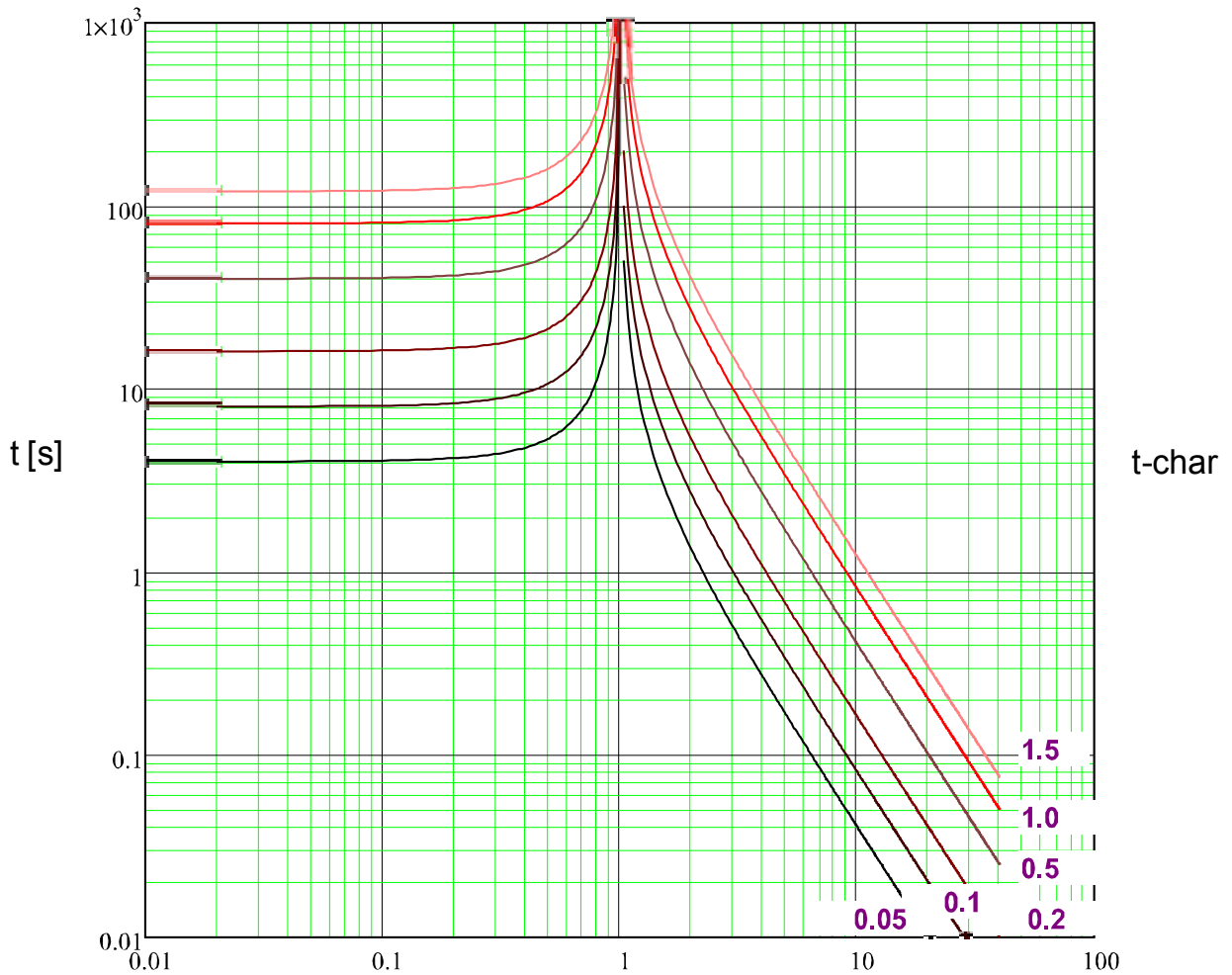
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

**Trip**

$$t = \left| \frac{80}{\left(\frac{1}{I>} \right)^2 - 1} \right| * t\text{-char [s]}$$

$$t = \frac{80}{\left(\frac{1}{I>} \right)^2 - 1} * t\text{-char [s]}$$



$x * I>$  (multiples of pickup)



**ANSI MINV**



**Notice!**

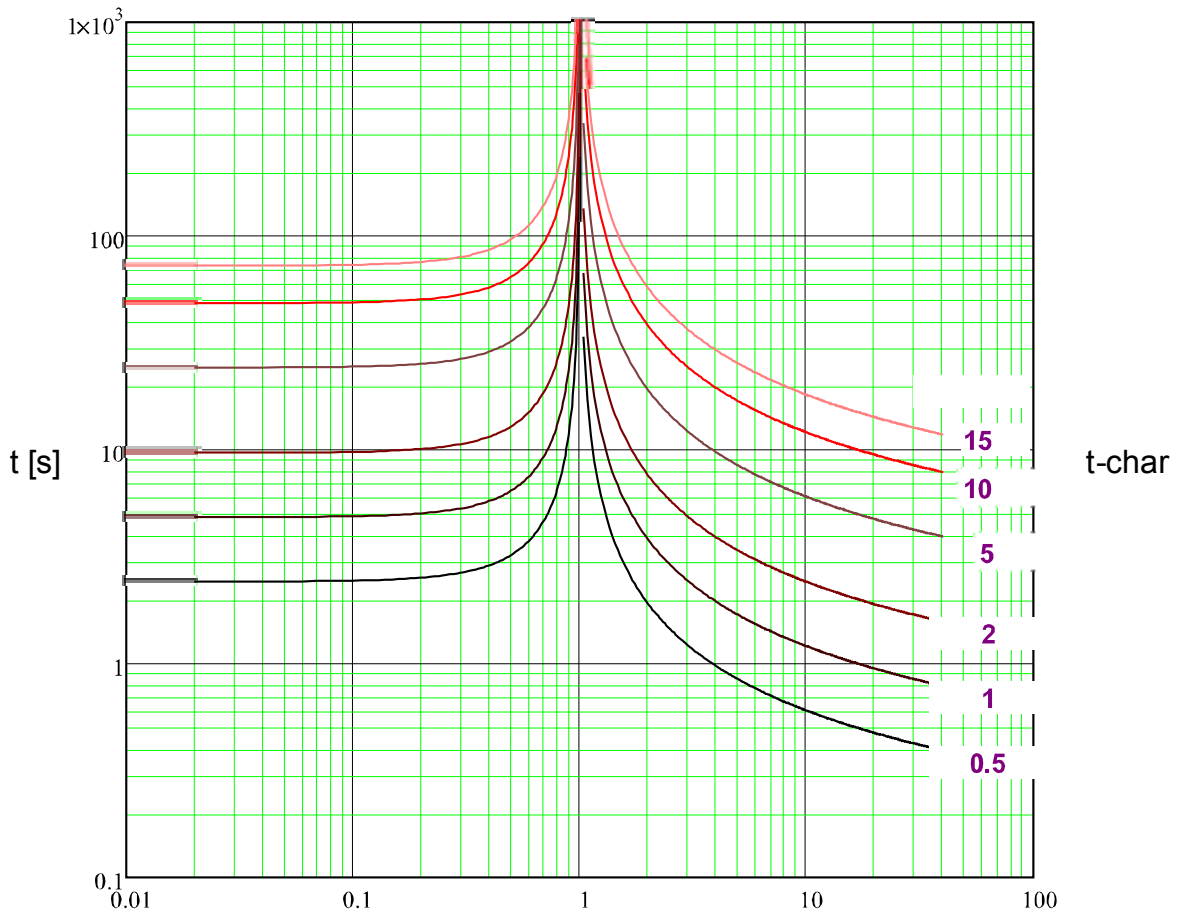
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

$$t = \left| \frac{4.85}{\left(\frac{1}{I>} \right)^2 - 1} \right| * t\text{-char [s]}$$

**Trip**

$$t = \left( \frac{0.0515}{\left(\frac{1}{I>} \right)^{0.02} + 0.1140} \right) * t\text{-char [s]}$$



$x * I>$  (multiples of pickup)

**ANSI VINV**



**Notice!**

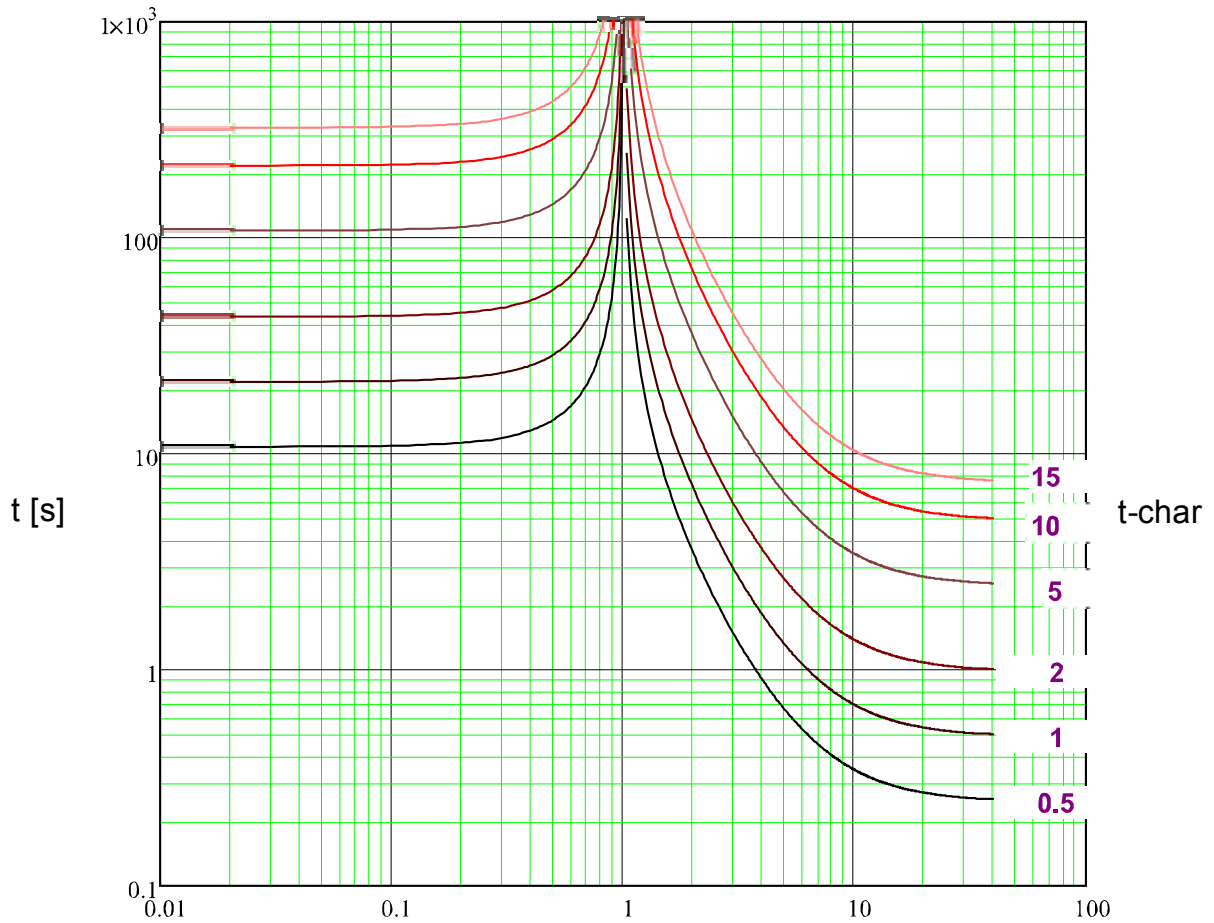
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

$$t = \left| \frac{21.6}{\left(\frac{1}{I>} \right)^2 - 1} \right| * t\text{-char [s]}$$

**Trip**

$$t = \left( \frac{19.61}{\left(\frac{1}{I>} \right)^2} + 0.491 \right) * t\text{-char [s]}$$



$x * I>$  (multiples of pickup)

**ANSI EINV**



**Notice!**

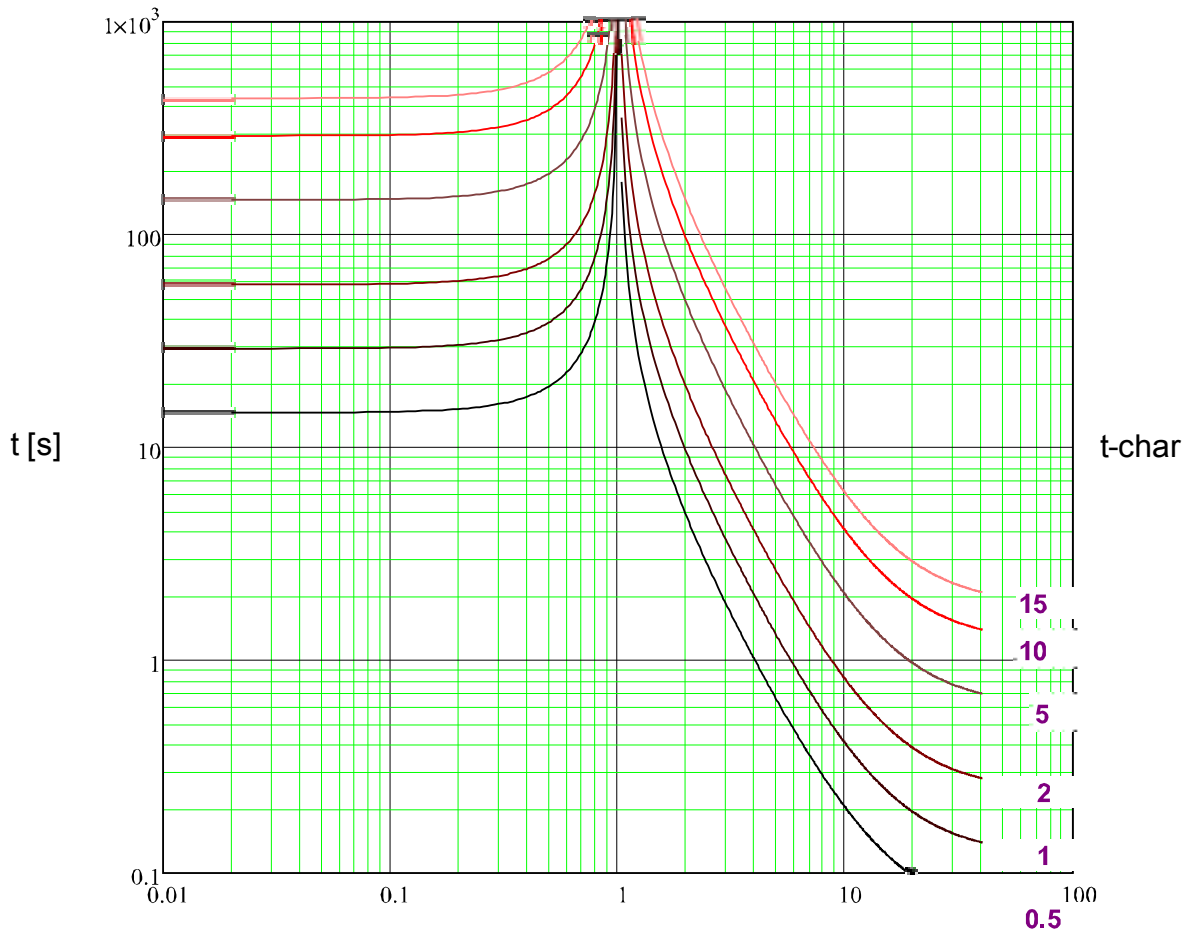
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

**Trip**

$$t = \left| \frac{29.1}{\left(\frac{1}{I>} \right)^2 - 1} \right| * t\text{-char [s]}$$

$$t = \left( \frac{28.2}{\left(\frac{1}{I>} \right)^2 - 1} + 0.1217 \right) * t\text{-char [s]}$$



$x * I>$  (multiples of pickup)

### Therm Flat



**Notice!**

Various reset modes are available . Resetting via characteristic , delayed and instantaneous .

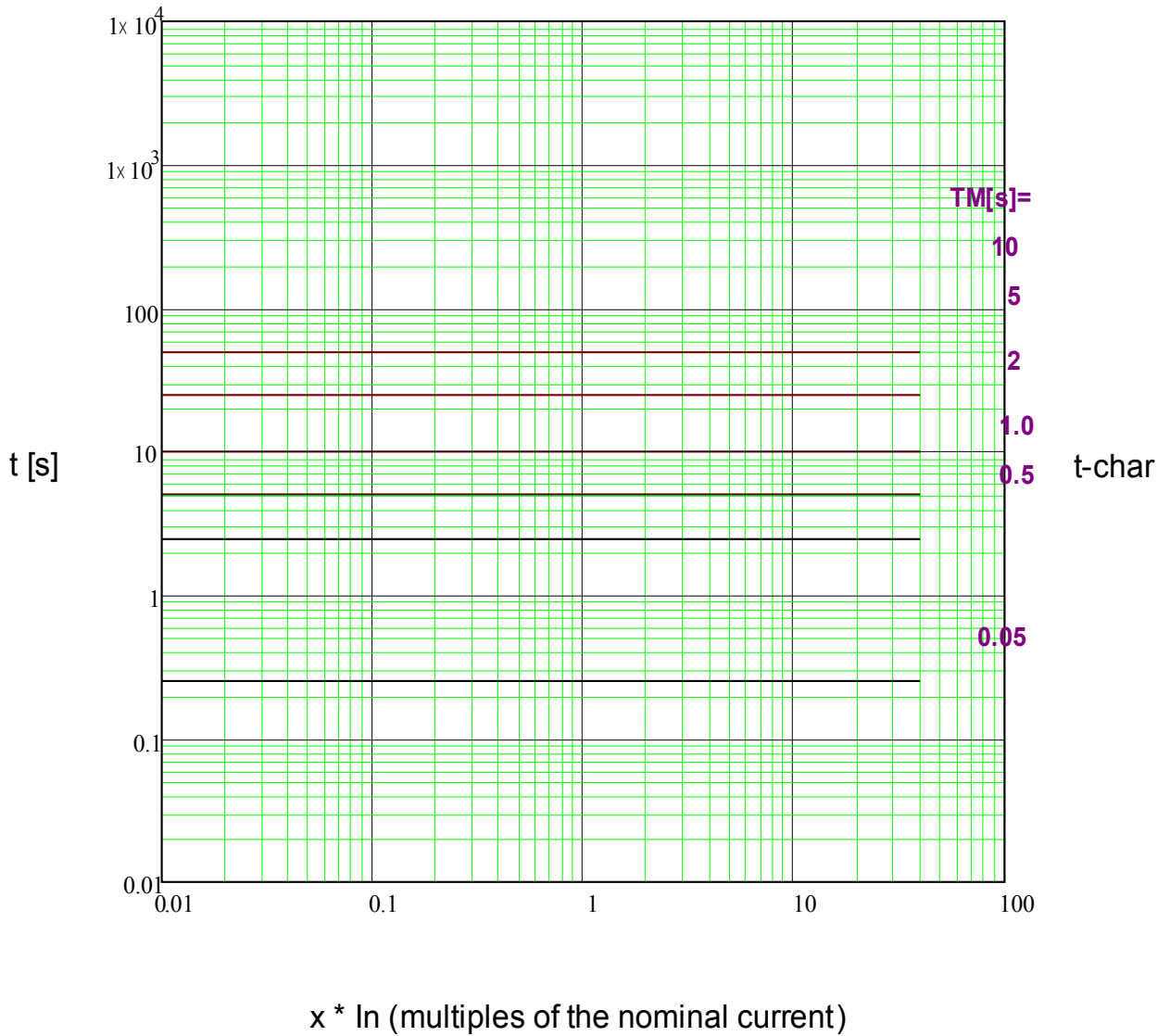
**Reset**

$$t = \left| \frac{5 \cdot 3^2}{\left(\frac{I}{I_n}\right)^0} \right| \cdot t\text{-char [s]}$$

**Trip**

$$t = \frac{5 \cdot 1^2}{\left(\frac{I}{I_n}\right)^0} \cdot t\text{-char [s]}$$

$$t = 45 \cdot t\text{-char [s]}$$



IT



**Notice!**

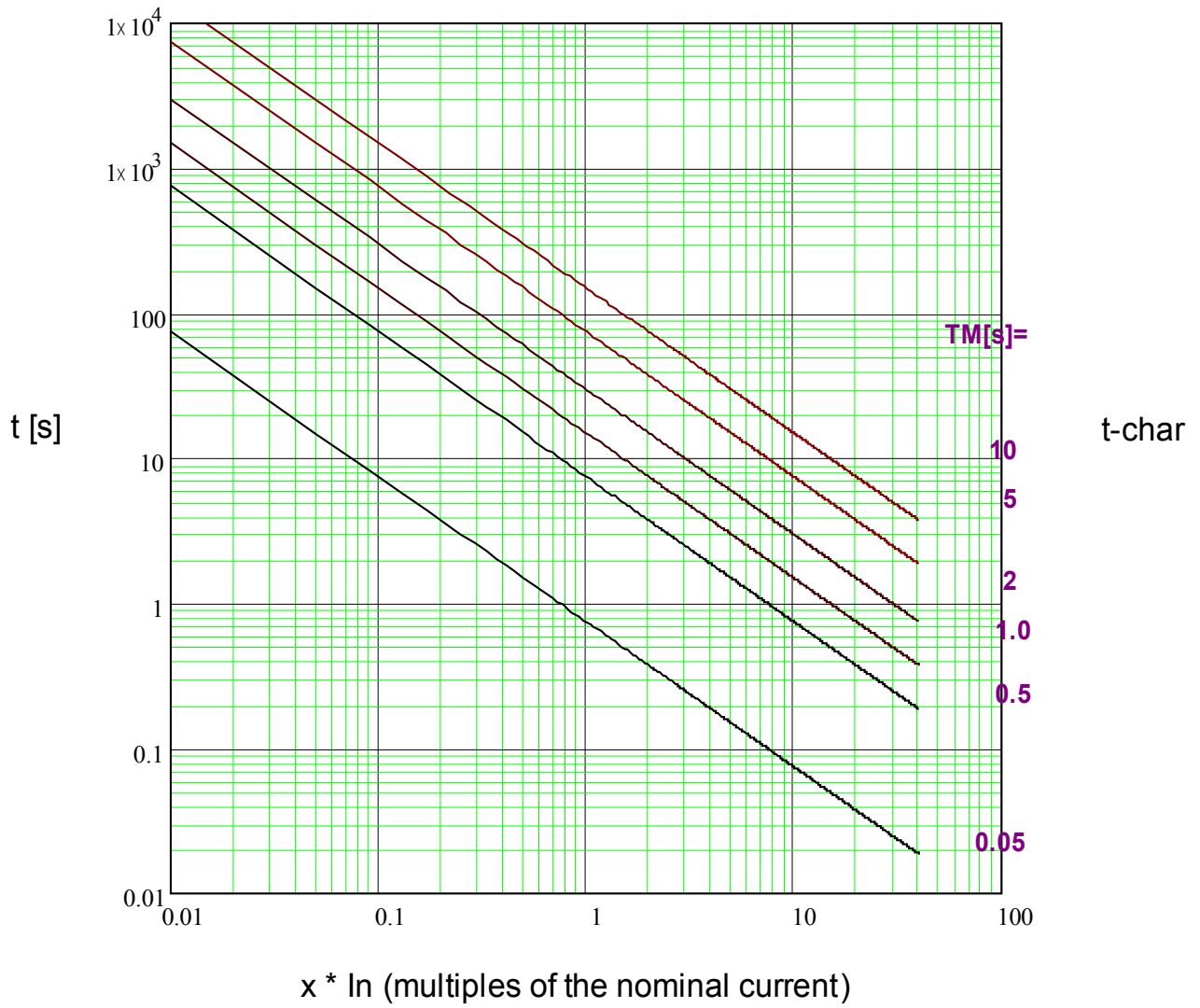
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

**Trip**

$$t = \left| \frac{5 \cdot 3^2}{\left(\frac{I}{I_n}\right)^0} \right| \cdot t_{\text{-char}} \text{ [s]}$$

$$t = \frac{5 \cdot 3^1}{\left(\frac{I}{I_n}\right)^1} \cdot t_{\text{-char}} \text{ [s]}$$



I<sup>2</sup>T



**Notice!**

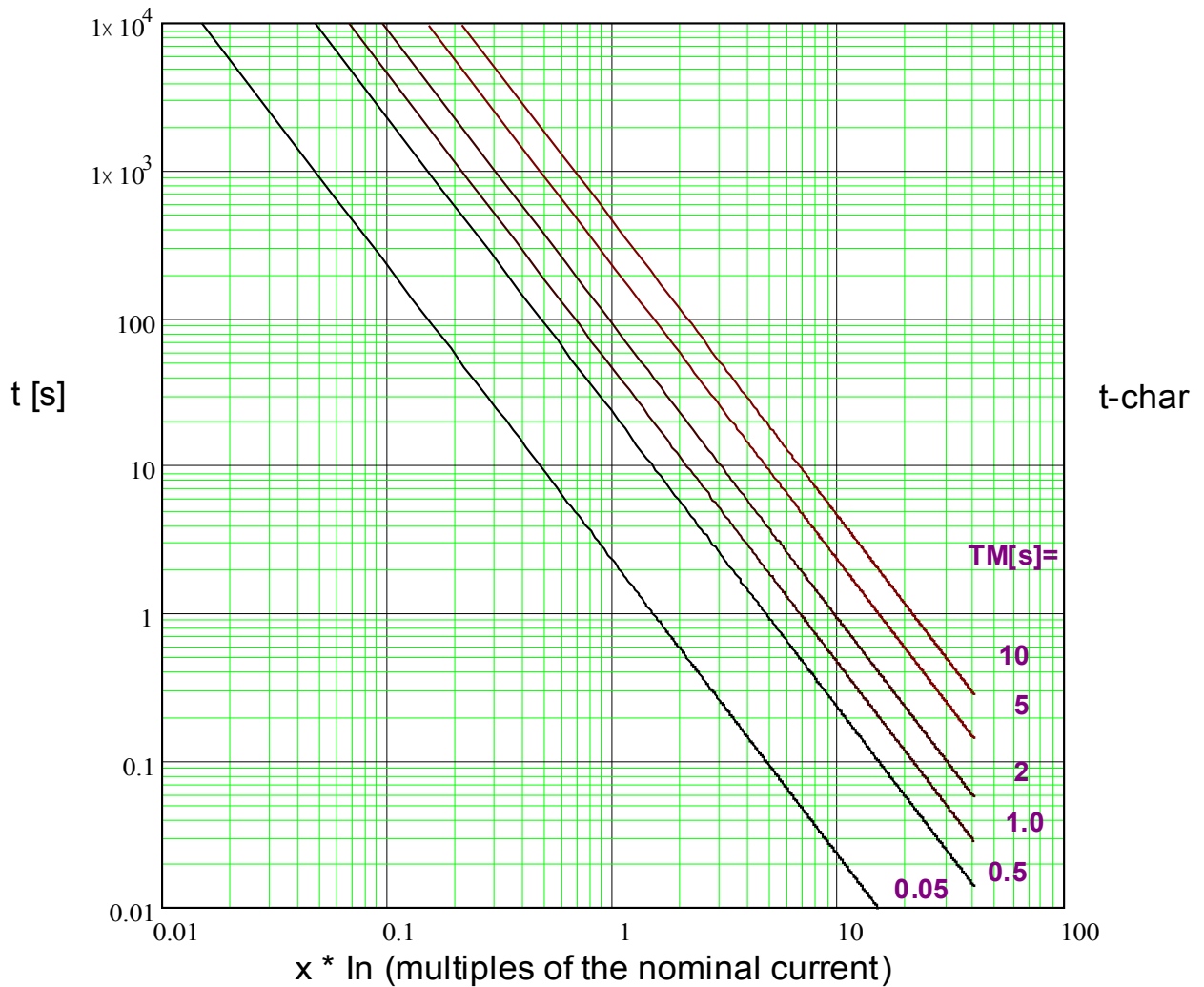
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

**Trip**

$$t = \left| \frac{5 \cdot 3^2}{\left(\frac{I}{I_n}\right)^0} \right| \cdot t\text{-char [s]}$$

$$t = \frac{5 \cdot 3^2}{\left(\frac{I}{I_n}\right)^2} \cdot t\text{-char [s]}$$



I4T



**Notice!**

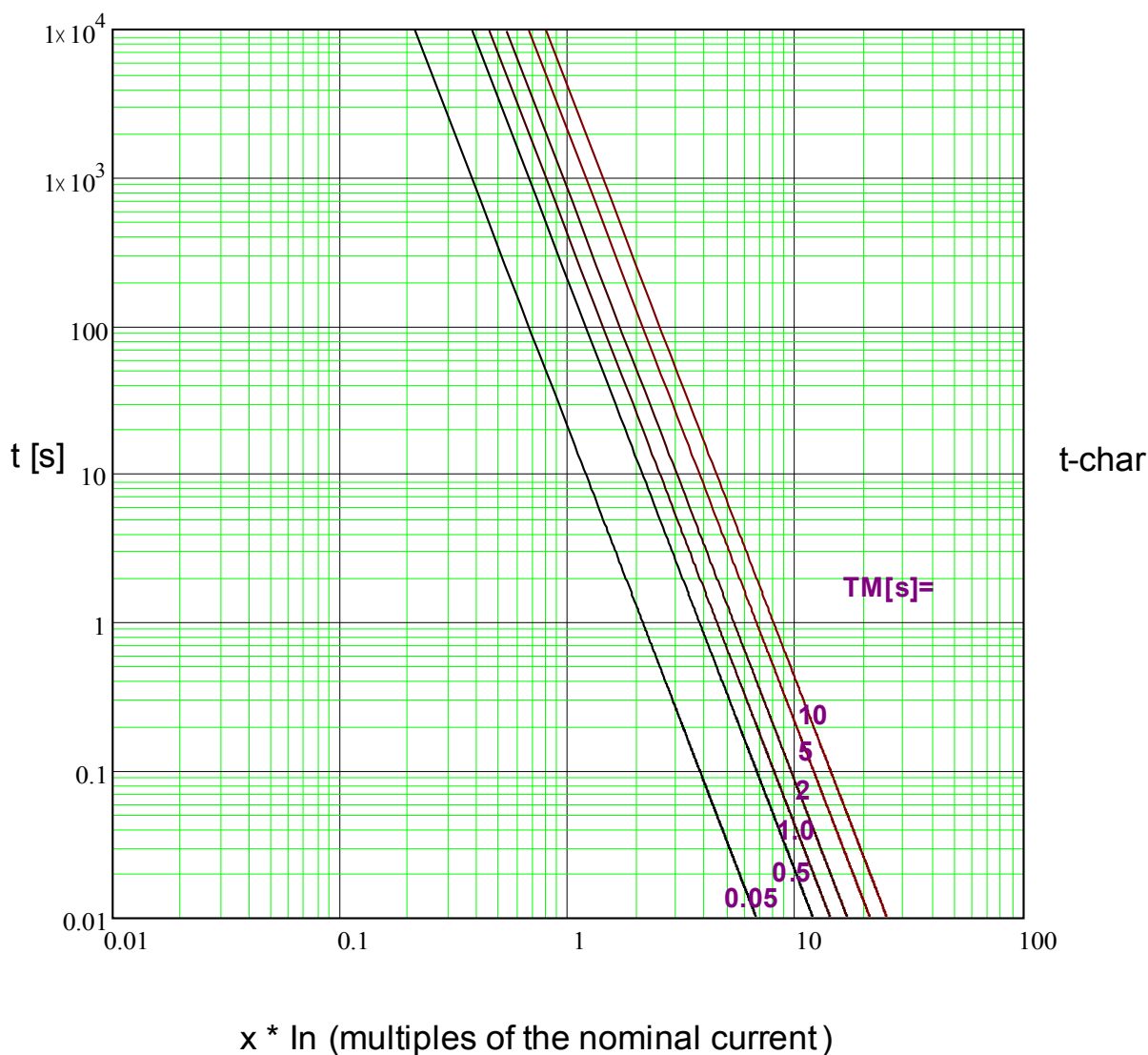
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

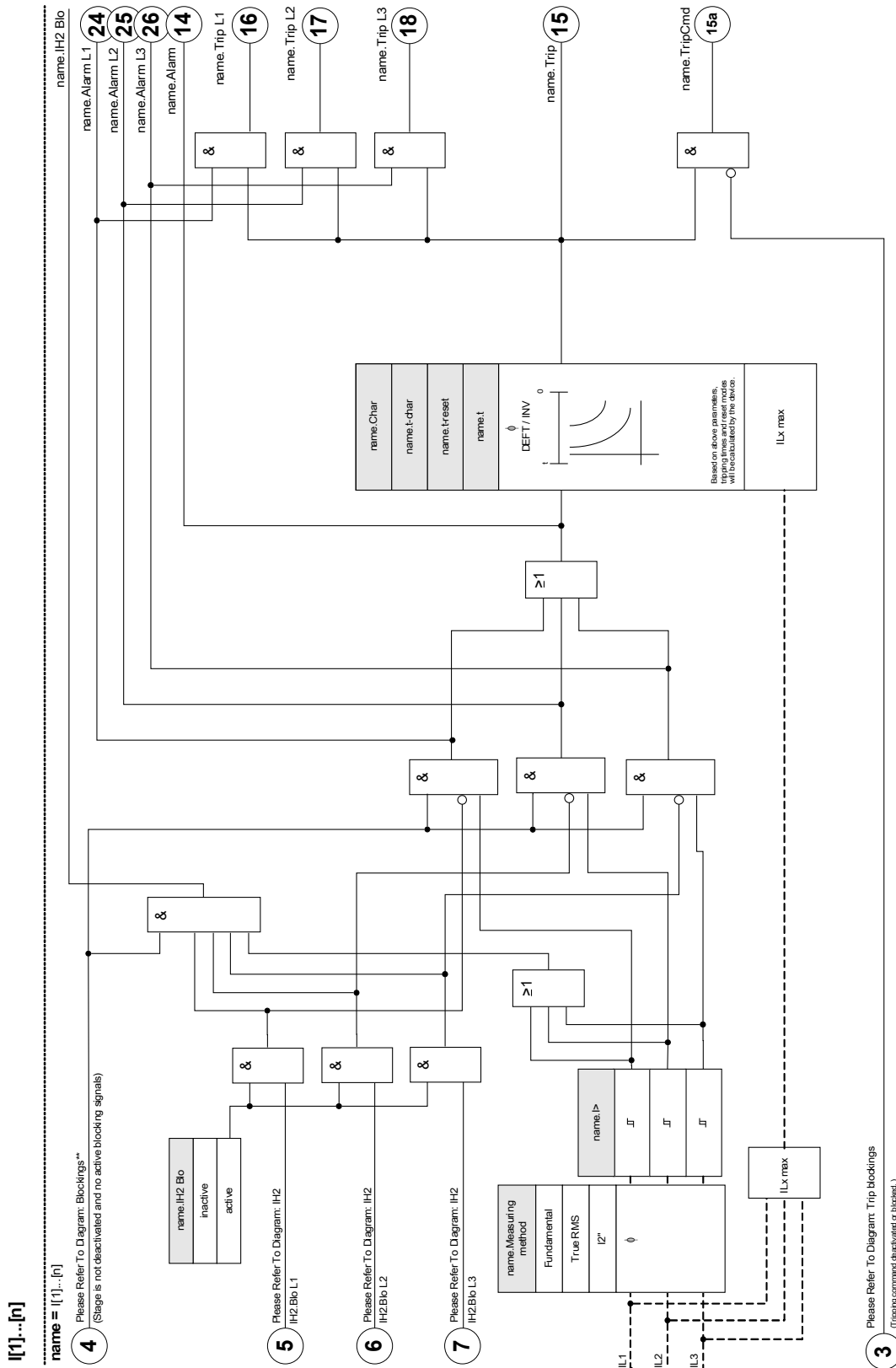
**Trip**

$$t = \left| \frac{5 \cdot 3^2}{\left(\frac{I}{I_n}\right)^0} \right| \cdot t_{\text{-char}} \text{ [s]}$$

$$t = \frac{5 \cdot 3^4}{\left(\frac{I}{I_n}\right)^4} \cdot t_{\text{-char}} \text{ [s]}$$

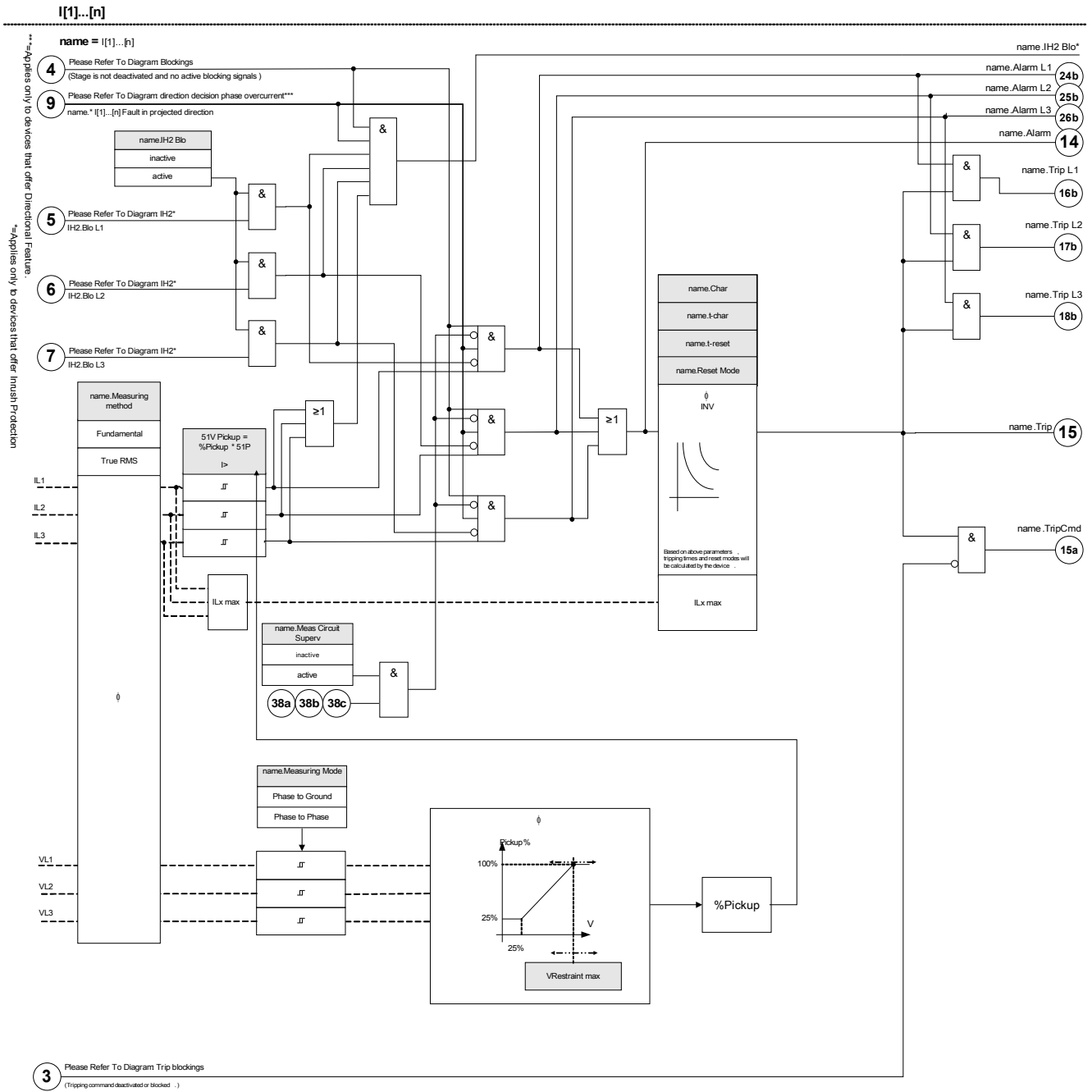


The following block diagram applies to devices without voltage measurement (without 51V)











The following block diagram applies to devices that offer a voltage measurement card (with 51V)







### Device Planning Parameters of the I Module

Parameter	Description	Options	Default	Menu path
Mode 	Mode	do not use, non directional	I[1]: non directional I[2]: non directional I[3]: do not use I[4]: do not use I[5]: do not use I[6]: do not use	[Device planning]







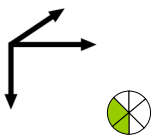
### Global Protection Parameters of the I Module

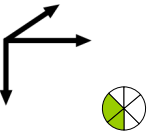
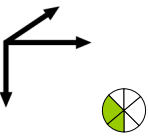
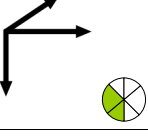
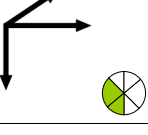
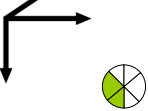
Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /I-Prot /I[1]]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /I-Prot /I[1]]
ExBlo3 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Trip Cmds	I[1]: MStart.Blo-IOCStart I[2]: MStart.Blo-IOCStart I[3]: -- I[4]: -- I[5]: -- I[6]: --	[Protection Para /Global Prot Para /I-Prot /I[1]]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the stage, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /I-Prot /I[1]]
Ex rev Interl 	External blocking of the module by external reverse interlocking, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /I-Prot /I[1]]

## Protective Elements

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
AdaptSet 1 	Assignment Adaptive Parameter 1	AdaptSet	-.-	[Protection Para /Global Prot Para /I-Prot /[1]]
AdaptSet 2 	Assignment Adaptive Parameter 2	AdaptSet	-.-	[Protection Para /Global Prot Para /I-Prot /[1]]
AdaptSet 3 	Assignment Adaptive Parameter 3	AdaptSet	-.-	[Protection Para /Global Prot Para /I-Prot /[1]]
AdaptSet 4 	Assignment Adaptive Parameter 4	AdaptSet	-.-	[Protection Para /Global Prot Para /I-Prot /[1]]

### Setting Group Parameters of the I Module

Parameter	Description	Setting range	Default	Menu path
 Function	Permanent activation or deactivation of module/stage.	inactive, active	I[1]: active I[2]: active I[3]: inactive I[4]: inactive I[5]: inactive I[6]: inactive	[Protection Para /<1..4> /I-Prot /I[1]]
 ExBlo Fc	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo Fc=active".	inactive, active	inactive	[Protection Para /<1..4> /I-Prot /I[1]]
 Ex rev Interl Fc	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "Ex rev Interl Fc = active".	inactive, active	inactive	[Protection Para /<1..4> /I-Prot /I[1]]
 Blo TripCmd	Permanent blocking of the Trip Command of the module/stage.	inactive, active	inactive	[Protection Para /<1..4> /I-Prot /I[1]]
 ExBlo TripCmd Fc	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo TripCmd Fc=active".	inactive, active	inactive	[Protection Para /<1..4> /I-Prot /I[1]]
 Measuring method	Measuring method: fundamental or rms or 3rd harmonic (only generator protection relays)	Fundamental, True RMS, I2	Fundamental	[Protection Para /<1..4> /I-Prot /I[1]]
 I>	If the pickup value is exceeded, the module/element starts to time out to trip.  Only available if: Characteristic = DEFT Or Characteristic = INV Minimum of the setting range If: VRestrained = active Minimum of the setting range If: VRestrained = inactive	0.02 - 40.00In	I[1]: 2.0In I[2]: 5.0In I[3]: 1.00In I[4]: 1.00In I[5]: 1.00In I[6]: 1.00In	[Protection Para /<1..4> /I-Prot /I[1]]

Parameter	Description	Setting range	Default	Menu path
Char 	Characteristic	DEFT, IEC NINV, IEC VINV, IEC EINV, IEC LINV, ANSI MINV, ANSI VINV, ANSI EINV, Therm Flat, IT, I2T, I4T	DEFT	[Protection Para /<1..4> /I-Prot /I[1]]
t 	Tripping delay  Only available if: Characteristic = DEFT	0.00 - 300.00s	I[1]: 0.5s I[2]: 0.5s I[3]: 1.00s I[4]: 1.00s I[5]: 1.00s I[6]: 1.00s	[Protection Para /<1..4> /I-Prot /I[1]]
t-char 	Time multiplier/tripping characteristic factor. The setting range depends on the selected tripping curve.  Only available if: Characteristic = INV Or Characteristic = Therm Flat Or Characteristic = IT Or Characteristic = I2T Or Characteristic = I4T	0.02 - 20.00	1	[Protection Para /<1..4> /I-Prot /I[1]]
Reset Mode 	Reset Mode  Only available if: Characteristic = INV Or Characteristic = Therm Flat Or Characteristic = IT Or Characteristic = I2T Or Characteristic = I4T	instantaneous, t-delay, calculated	instantaneous	[Protection Para /<1..4> /I-Prot /I[1]]
t-reset 	Reset time for intermittent phase failures (INV characteristics only)  Available if: Reset Mode = t-delay	0.00 - 60.00s	0s	[Protection Para /<1..4> /I-Prot /I[1]]

## I Module Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module input state: External blocking1	[Protection Para /Global Prot Para /I-Prot /[1]]
ExBlo2-I	Module input state: External blocking2	[Protection Para /Global Prot Para /I-Prot /[1]]
ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command	[Protection Para /Global Prot Para /I-Prot /[1]]
Ex rev Inter-I	Module input state: External reverse interlocking	[Protection Para /Global Prot Para /I-Prot /[1]]
AdaptSet1-I	Module input state: Adaptive Parameter1	[Protection Para /Global Prot Para /I-Prot /[1]]
AdaptSet2-I	Module input state: Adaptive Parameter2	[Protection Para /Global Prot Para /I-Prot /[1]]
AdaptSet3-I	Module input state: Adaptive Parameter3	[Protection Para /Global Prot Para /I-Prot /[1]]
AdaptSet4-I	Module input state: Adaptive Parameter4	[Protection Para /Global Prot Para /I-Prot /[1]]

## I Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
active	Signal: active
ExBlo	Signal: External Blocking
Ex rev Interl	Signal: External reverse Interlocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Alarm L1	Signal: Alarm L1
Alarm L2	Signal: Alarm L2
Alarm L3	Signal: Alarm L3
Alarm	Signal: Alarm
Trip L1	Signal: General Trip Phase L1
Trip L2	Signal: General Trip Phase L2
Trip L3	Signal: General Trip Phase L3
Trip	Signal: Trip
TripCmd	Signal: Trip Command
Active AdaptSet	Active Adaptive Parameter
DefaultSet	Signal: Default Parameter Set
AdaptSet 1	Signal: Adaptive Parameter 1
AdaptSet 2	Signal: Adaptive Parameter 2
AdaptSet 3	Signal: Adaptive Parameter 3
AdaptSet 4	Signal: Adaptive Parameter 4

## Counter Values of the I Module

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NumberOfAlarms	Number of alarms since last reset.	0	0 - 999999999	[Operation /History /AlarmCr]
NumberOfTripCmds	Number of trip commands since last reset	0	0 - 999999999	[Operation /History /TripCmdCr]

## Commissioning: Overcurrent Protection, non-directional [50, 51]

### Object to be tested

- Signals to be measured for each current protection element, the threshold values, total tripping time (recommended), or alternatively tripping delays and the fallback ratios; each time 3 x single-phase and 1 x three-phase.

### NOTICE

Especially in Holmgreen connections, wiring errors can easily happen, and these are then detected safely. Measuring the total tripping time can ensure that the secondary wiring is o.k. (from the terminal on, up to the trip coil of the CB).

### NOTICE

It is recommended to measure the total tripping time instead of the tripping delay. The tripping delay should be specified by the customer. The total tripping time is measured at the position signalling contact of the CB (not at the relay output!).

**Total tripping time = tripping delay (please refer to the tolerances of the protection stages) + CB operating time (about 50 ms)**

**Please take the CB operating times from the technical data specified in the relevant documentation provided by the CB manufacturer.**

### Necessary means

- Current source
- May be: ampere meters
- Timer

### Procedure

#### Testing the threshold values (3 x single-phase and 1 x three-phase)

Each time feed a current which is about 3-5% above the threshold value for activation/tripping. Then check the threshold values.

#### Testing the total tripping delay (recommendation)

Measure the total tripping times at the auxiliary contacts of the CB (CB tripping).

#### Testing the tripping delay (measuring at the relay output)

Measure the tripping times at the relay output.

#### Testing the fallback ratio

Reduce the current to 97% below the trip value and check the fallback ratio.

### Successful test result

The measured total tripping delays or individual tripping delays, threshold values and fallback ratios correspond with those values, specified in the adjustment list. Permissible deviations/tolerances can be found under Technical Data.

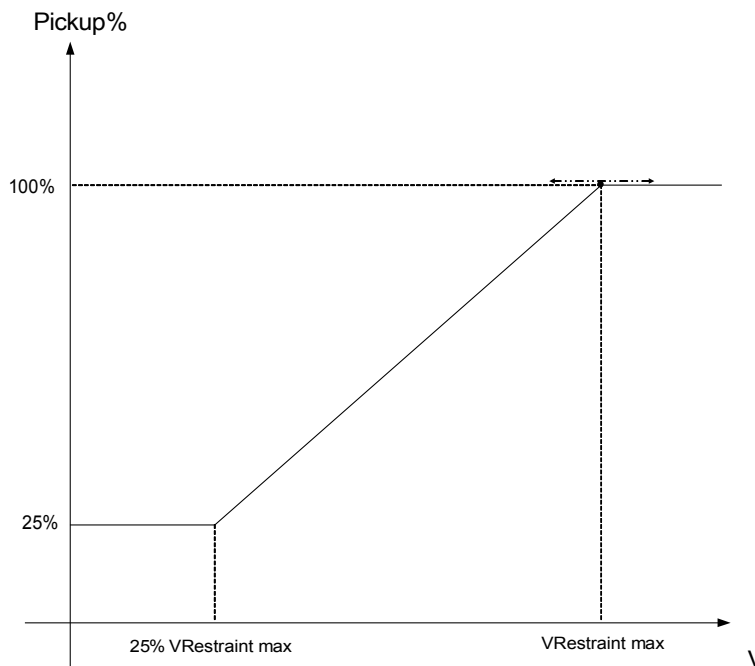


### 51V - Voltage Restraint Overcurrent\*

\*=available only for devices that offer voltage measurement.

For activating this function, the parameter »*VRestraint*« has to be set to *active* in the parameter set of the corresponding overcurrent element I[x]. The 51V protection function restrains operation which reduces pickup levels. This allows the User to lower the pickup value of the 51V protection function with the corresponding phase input voltage (phase-to-phase or phase-to-ground, depending on the setting of »*Measuring Channel*« within the current protection module). When the minimum fault phase current is close to the load current, it may make the phase time overcurrent protection coordination difficult. In this case, an undervoltage function may be used to alleviate this situation. When the voltage is low, the phase time overcurrent pickup threshold may be set low accordingly, so that the phase time overcurrent protection may achieve adequate sensitivity and better coordination. The device uses a simple linear model to determine the effective pickup by characterizing the relationship between the voltage and the phase time overcurrent pickup threshold.

Once the voltage restraint protection function is activated, the effective phase time overcurrent pickup threshold will be the calculated Pickup% times the phase time overcurrent pickup setting. The effective pickup threshold must be within the setting range allowed and, if it is less, the minimum pickup value will be used.



That means:

$$V_{min} = 0.25 \cdot V_{max};$$

- Pickup%<sub>min</sub> = 25%;

- Pickup% = 25%, if  $V \leq V_{min}$ ;

- Pickup% =  $1/V_{max} \cdot (V - V_{min}) + 25\%$ , if  $V_{min} < V < V_{max}$ ;

- Pickup% = 100%, if  $V \geq V_{max}$ ;

The tripping curves (characteristic) will not be influenced by the voltage restraint function.

If the voltage transformer supervision is activated, the voltage restraint overcurrent protection element is blocked in case of m.c.b. trip to avoid false trippings.

**NOTICE**

**Definition of  $V_n$ :**

$V_n$  is dependent on the »*Measuring Channel*« setting in the current protection modules.

In case that this parameter is set to "Phase to Phase":

$$V_n = \text{Main VT sec}$$

In case that this parameter is set to "Phase to Neutral":

$$V_n = \frac{\text{Main VT sec}}{\sqrt{3}}$$

If the parameter »*VT con*« within the field parameters is set to »*Phase to Phase*« the setting »*Phase to Neutral*« in the current modules is effectless.

## Commissioning: Overcurrent Protection, Non-directional [ANSI 51V]\*

\*=available only for devices that offer voltage measurement.

*Object to be tested:*

Signals to be measured for Voltage Restraint protection function: the threshold values, total tripping time (recommended), or alternatively tripping delays and the dropout ratios; each time 3 x single-phase and 1 x three-phase.

### NOTICE

**It is recommended to measure the total tripping time instead of the tripping time. The tripping delay should be specified by the customer. The total tripping time is measured at the position signaling contacts of the CBs (not at the relay output!).**

**Total tripping time: = tripping delay (please refer to the tolerances of the protection stages) + CB operating time (about 50 ms)**

**Please take the CB switching times from the technical data, specified in the relevant documentation, provided by the CB manufacturer.**

*Necessary means:*

- Current source;
- Voltage Source;
- Current and Voltage meters; and
- Timer.

*Procedure:*

*Testing the threshold values (3 x single-phase and 1 x three-phase)*

Feed %Pickup voltage. For each test performed, feed a current that is about 3-5% above the threshold value for activation/tripping. Then check if the pickup values are %Pickup of the value according to the standard overcurrent protection.

*Testing the total tripping delay (recommendation)*

Measure the total tripping times at the auxiliary contacts of the breakers (breaker tripping).

*Testing the tripping delay (measuring at the relay output contact)*

Measure the tripping times at the relay output contact.

*Testing the dropout ratio*

Reduce the current to 97% below the trip value and check the dropout ratio.

*Successful test result*

The measured total tripping delays or individual tripping delays, threshold values, and dropout ratios correspond with those values specified in the adjustment list. Permissible deviations/tolerances can be found under Technical Data.

## I2> - Negative-Sequence Overcurrent [51Q]

For activating this function, the parameter »Measuring Mode« has to be set to »I2« in the parameter set of the corresponding overcurrent element I[x].

The negative-sequence overcurrent protection function (I2>) is to be seen as an equivalent to the phase overcurrent protection with the exception that it uses negative-sequence current (I2>) as measured quantities instead of the three phase currents used by phase overcurrent protection function. The negative-sequence current used by I2> is derived from the following well-known symmetrical component transformation:

$$I_2 = \frac{1}{3}(I_{L1} + a^2 I_{L2} + a I_{L3})$$

The pickup set value of a I2> protection function should be set in accordance of the negative-sequence current occurrence in the protected object.

Besides that, the negative-sequence overcurrent protection function (I2>) uses the same setting parameters as the phase overcurrent protection function, like trip and reset characteristics from both IEC/ANSI standards, time multiplier, etc.

The negative-sequence overcurrent protection function (I2>) can be used for line, generator, transformer and motor protection to protect the system from unbalanced faults. Because the I2> protection function operates on the negative-sequence current component which is normally absent during load conditions, the I2> can, therefore, be set more sensitive than the phase overcurrent protection functions. On the other hand, coordination of negative-sequence overcurrent protection function in a radial system does not mean automatically very long fault clearing time for the furthest upstream protection devices, because the tripping time of concerned negative-sequence overcurrent protection function needs only be coordinate with the next downstream device with the negative-sequence overcurrent protection function. This makes the I2> in many cases as an advantageous protection concept in addition to the phase overcurrent protection function.



### WARNING

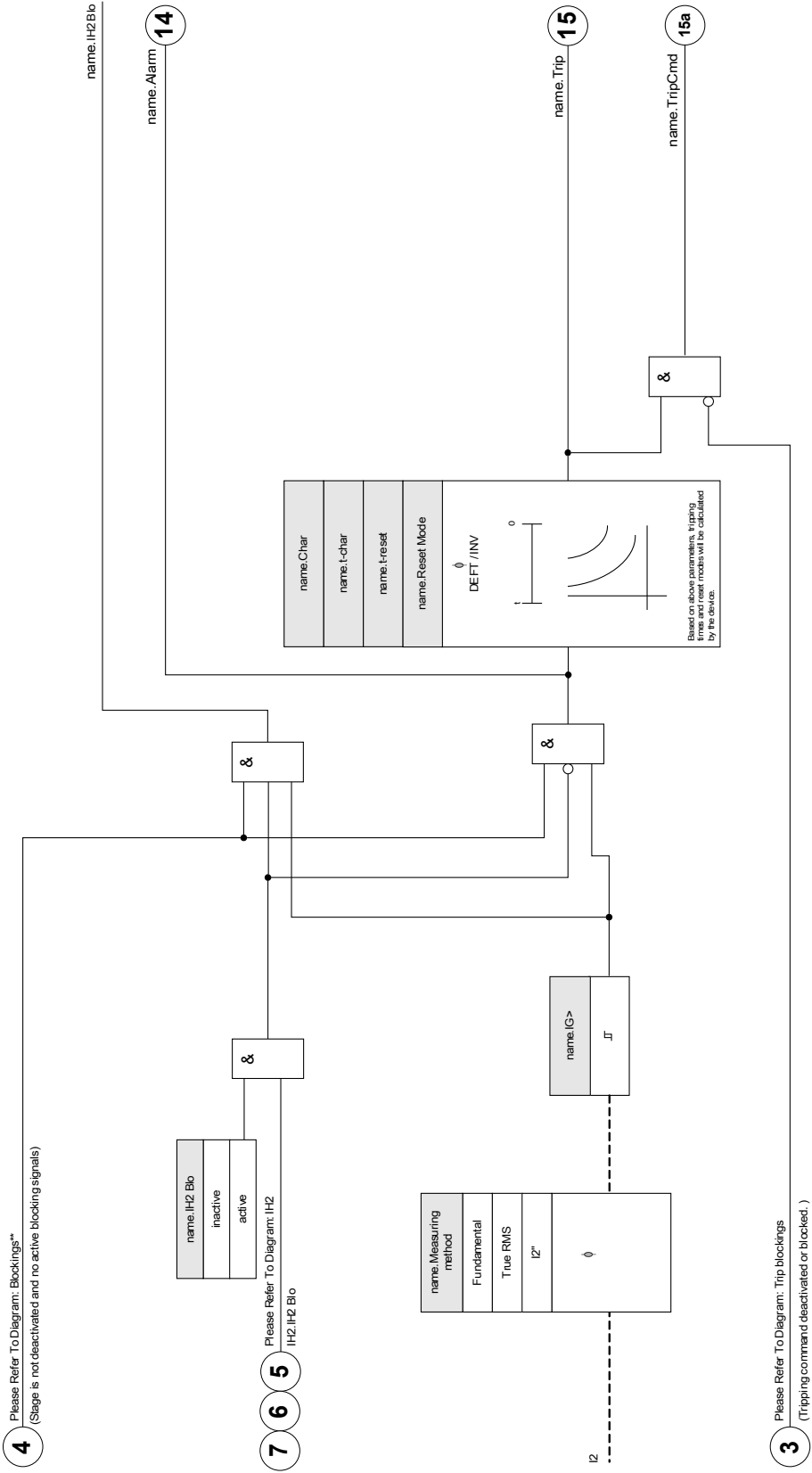
If you are using inrush blockings, the tripping delay of the current protection functions must be at least 30 ms or more in order to prevent faulty trippings.

### NOTICE

At the moment of breaker closure, negative-sequence current might be the result of transients.

I[?].[n]: Measuring method = (I2>

name = I[?].[n]



## Commissioning: Negative Sequence Overcurrent

*Object to be tested*

Signals to be measured for each current protection function: the threshold values, total tripping time (recommended), or alternatively tripping delays and the dropout ratios.

### **NOTICE**

**It is recommended to measure the total tripping time instead of the tripping time. The tripping delay should be specified by the customer. The total tripping time is measured at the position signalling contacts of the CBs (not at the relay output!).**

**Total tripping time: = tripping delay (please refer to the tolerances of the protection stages) + CB operating time (about 50 ms)**

**Please take the CB switching times from the technical data, specified in the relevant documentation, provided by the CB manufacturer.**

*Necessary means:*

- Current source
- Current meters
- Timer

*Procedure:*

*Testing the threshold values*

In order to get a negative-sequence current, please change the phase sequence at the terminals of the current source (in case of ABC sequence to ACB – in case of a ACB sequence to ABC).

For each test performed, feed a current that is about 3-5% above the threshold value for activation/tripping. Then check the threshold values.

*Testing the total tripping delay (recommendation)*

Measure the total tripping times at the auxiliary contacts of the breakers (breaker tripping).

*Testing the tripping delay (measuring at the relay output contact)*

Measure the tripping times at the relay output contact.

*Testing the dropout ratio*

Reduce the current to 97% below the trip value and check the dropout ratio.

*Successful test result*

The measured total tripping delays or individual tripping delays, threshold values, and dropout ratios correspond with those values specified in the adjustment list. Permissible deviations/tolerances can be found under Technical Data.

## Voltage Controlled Overcurrent Protection [51C]\*

\*=available only for devices that offer voltage measurement.

When a short circuit is near the generator, the voltage might drop down. By means of **Adaptive Parameters** (Please refer to chapter Parameter) the tripping times or tripping characteristics can be modified by the output signal of a voltage element (depending on a threshold). The device might change a load curve to a fault curve (taking influence on tripping time, trip curves and reset modes).

Please proceed as follows:

- Read and understand the section „Adaptive Parameters“ within the chapter Parameter.
- Do the device planning and set all required parameters for the Undervoltage element.
- Do the device planning and set all required parameters for the Overcurrent element.
- Set the **Adaptive Parameters** within the Overcurrent element in the relevant parameter sets (e.g. Curve multiplier, curve type...).
- Assign the Undervoltage alarm (pickup) within the **Global Parameters** as an activation signal for the corresponding **Adaptive Parameter set** of the overcurrent element that should be modified.
- Check the functionality by a commissioning test.

## Special Notes on Earth Fault Current Transformers

Elements:

Earth Fault Protection

### Functional Description

Earth current measurement is usually been done with a summation current transformer (core-balance transformer). This CT has a large primary window through which all three-phase conductors can pass.

Note that the earth fault current settings are based on the earth CT rated **primary current (In)**, not on FLA or the phase CT ratio. For example, a pick-up setting of 0.10 gives a trip or alarm for an actual earth leakage current of 5 A on the primary side of the sensor with a 50:5 CT.

This function is only useful for an earthed power system. The earth return is normally made from the neutral of the secondary wire winding of the supply power transformer. Resistance earthing is acceptable as long as the resulting fault current is at a level the protective device can be set to detect.

The earth CT, which provides sensitive protection for high-resistance earth faults, may saturate for a robust heavy-current earth fault in a solid-earthed system. Minimize the saturation problem by minimizing the burden. Use the shortest and heaviest leads possible between the earth CT and the relay. The relay itself has very low burden, usually much lower than the connecting wiring.

A residual connection – the wired summation of the phase CT circuits through the earth CT input – requires a much higher earth fault time setting to avoid false tripping. Thus sensitivity is not nearly as good as with a separate flux-canceling CT.

If the relay is installed where a residual connection is used, XCT should be set to the same value as CT Pri. The User must then set the earth fault trip level at a high value to avoid nuisance tripping from CT ratio errors, third harmonic and certain higher harmonics or other measurement errors producing false residual currents. Monitor the metered earth current during various loading conditions to ensure a good margin between these error currents and the earth fault trip current setting 50R [x]. Also watch out for phase CTs that saturate during motor starting. The saturation produces a large residual current and an earth fault trip.



## IG> - Earth Fault [50N/G, 51N/G]

Available elements:  
 IG[1] .IG[2] .IG[3] .IG[4]

**⚠ WARNING** If you are using inrush blockings the tripping delay of the earth current protection functions must be at least 30 ms or more in order to prevent faulty trippings.

**NOTICE** All earth current elements are identically structured.

**NOTICE** This module offers Adaptive Parameter Sets. Parameters can be modified within parameter sets dynamically by means of Adaptive Parameter Sets. Please refer to chapter Parameter / Adaptive Parameter Sets.

The following table shows the application options of the earth overcurrent protection element

Applications of the IE-Protection Module	Setting in	Option
ANSI 50N/G – Earth overcurrent protection, non directional	Device Planning menu Setting: non directional	Measuring Mode: Fundamental/TrueRMS
ANSI 51N/G – Earth short circuit protection, non directional	Device Planning menu Setting: non directional	Measuring Mode: Fundamental/TrueRMS

### Measuring Mode

For all protection elements it can be determined, whether the measurement is done on basis of the »*Fundamental*« or if »*TrueRMS*« measurement is used.

For each element the following characteristics are available:

- DEFT
- NINV (IEC)
- VINV (IEC)
- LINV (IEC)
- EINV (IEC)
- MINV (ANSI)
- VINV (ANSI)
- EINV (ANSI)
- RXIDG
- Thermal Flat
- IT
- I2T
- I4T

Explanation:

t = Tripping delay

t-char = Time multiplier/tripping characteristic factor. The setting range depends on the selected tripping curve.  
IG = Fault current

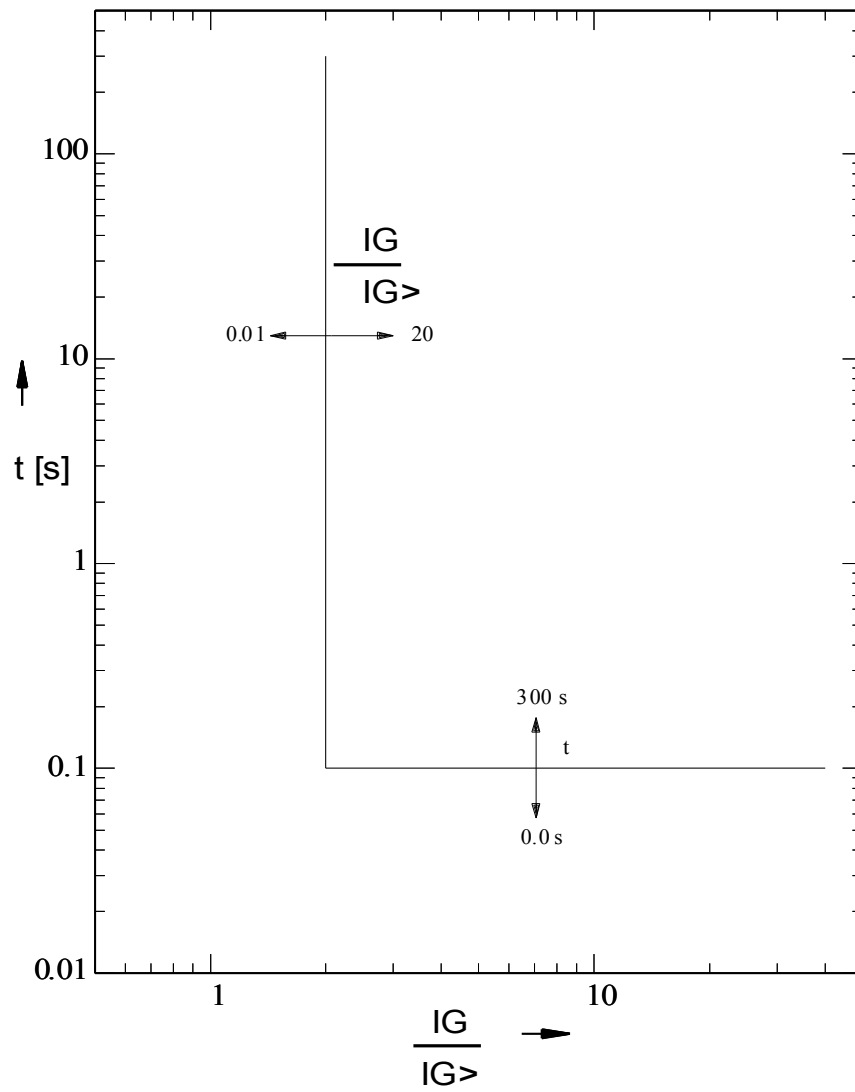
IG> = If the pickup value is exceeded, the module/element starts to time out to trip.

The directional decision depends on the layout of the mains star-point or the angle between residual voltage and ground current. The residual voltage can be measured via suitable transformers (da-dn winding – formerly: e-n) or can be calculated, provided the VTs are in star-connection.

The earth current can be measured either directly via a cable-type transformer or detected by a Holmgreen connection. The earth current can alternatively be calculated from the phase currents; but this is only possible if the phase currents are not ascertained by a V-connection.

The device can optionally be procured with a sensitive earth current measuring input (in preparation).

### DEFT



**IEC NINV**



**Notice!**

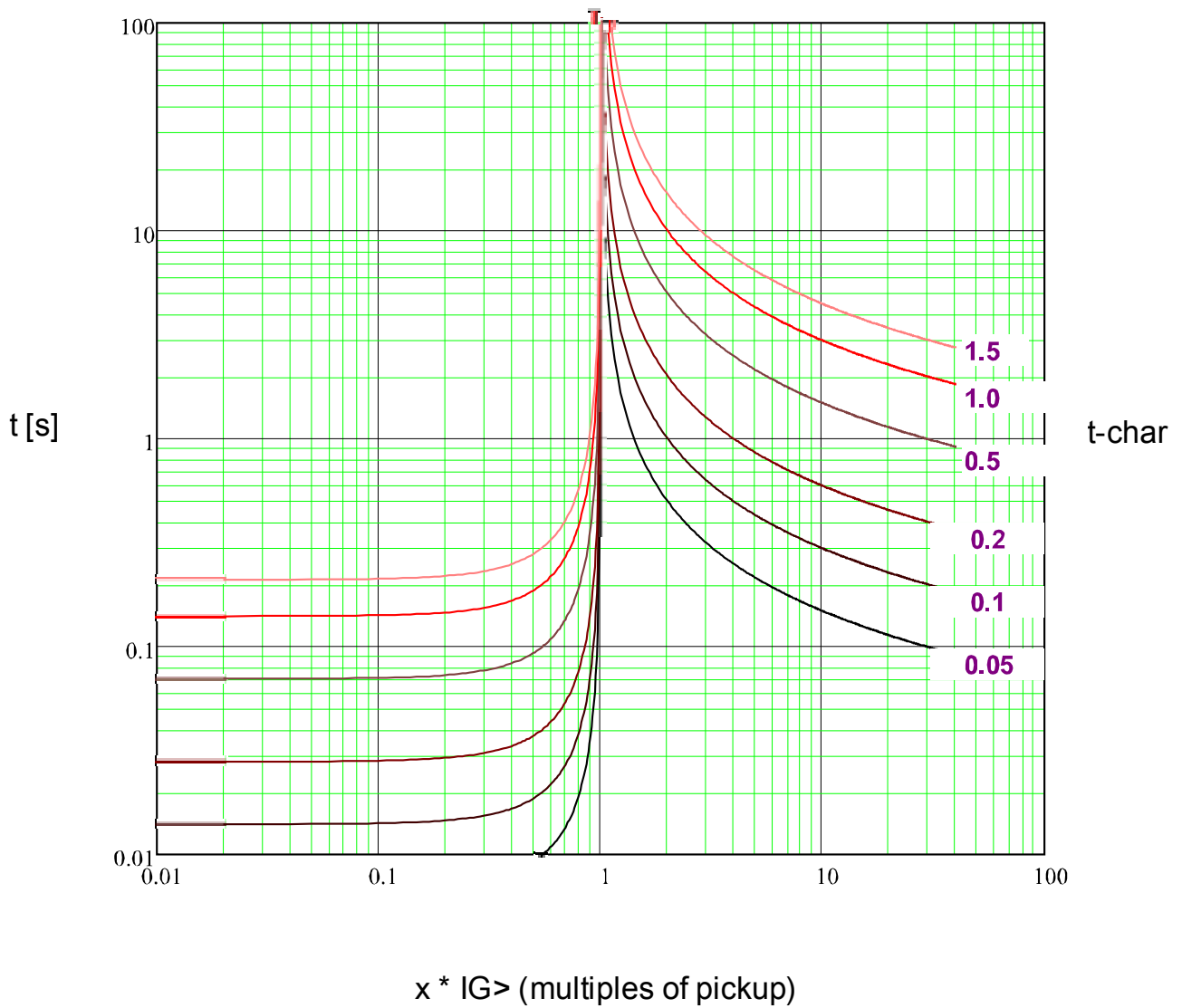
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

**Trip**

$$t = \left| \frac{0.14}{\left(\frac{IG}{IG>}\right)^2 - 1} \right| * t\text{-char [s]}$$

$$t = \frac{0.14}{\left(\frac{IG}{IG>}\right)^{0.02} - 1} * t\text{-char [s]}$$



**IEC VINV**



**Notice!**

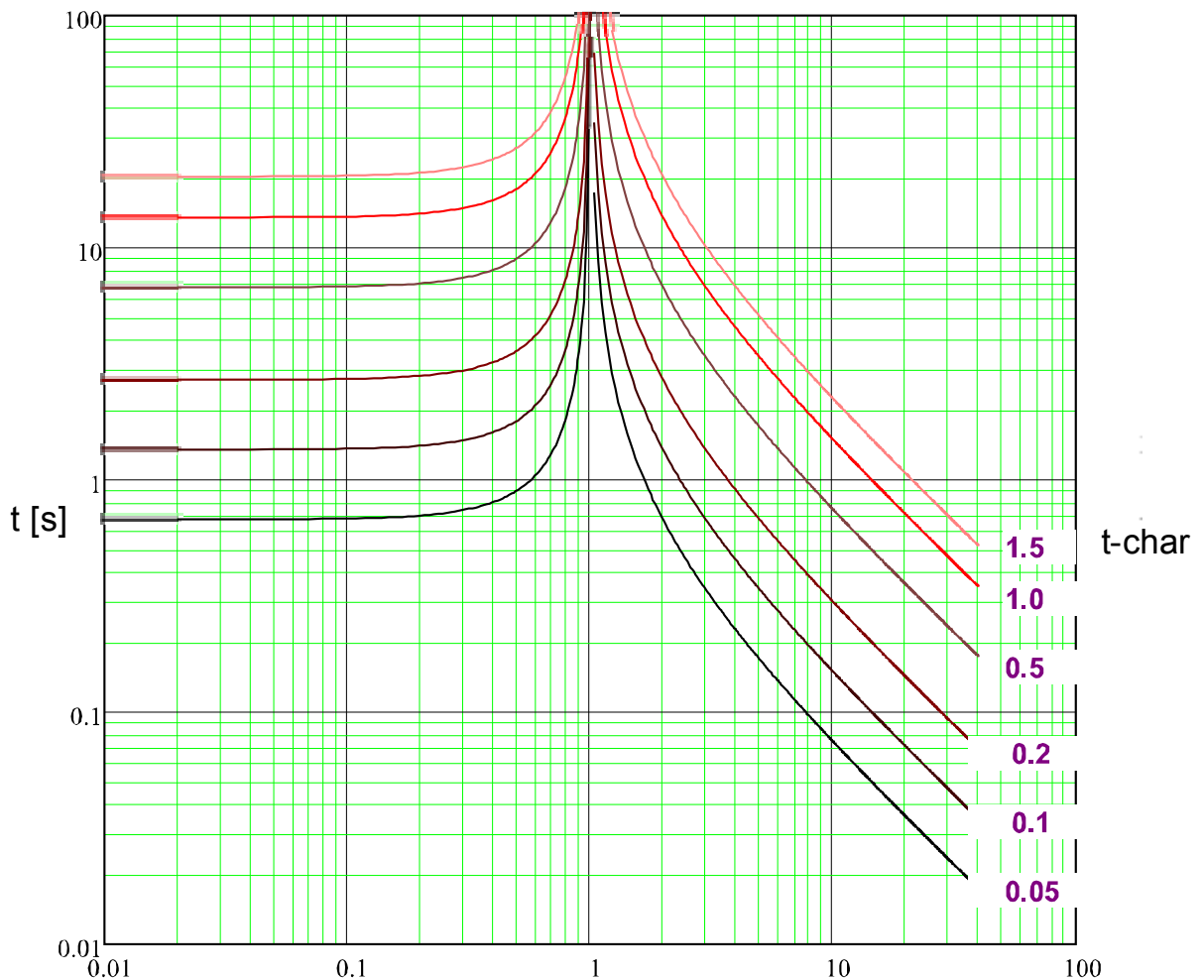
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

$$t = \left| \frac{13.5}{\left(\frac{IG}{IG>}\right)^2 - 1} \right| * t\text{-char [s]}$$

**Trip**

$$t = \frac{13.5}{\left(\frac{IG}{IG>}\right) - 1} * t\text{-char [s]}$$



x \* IG> (multiples of pickup)

**IEC LINV**



**Notice!**

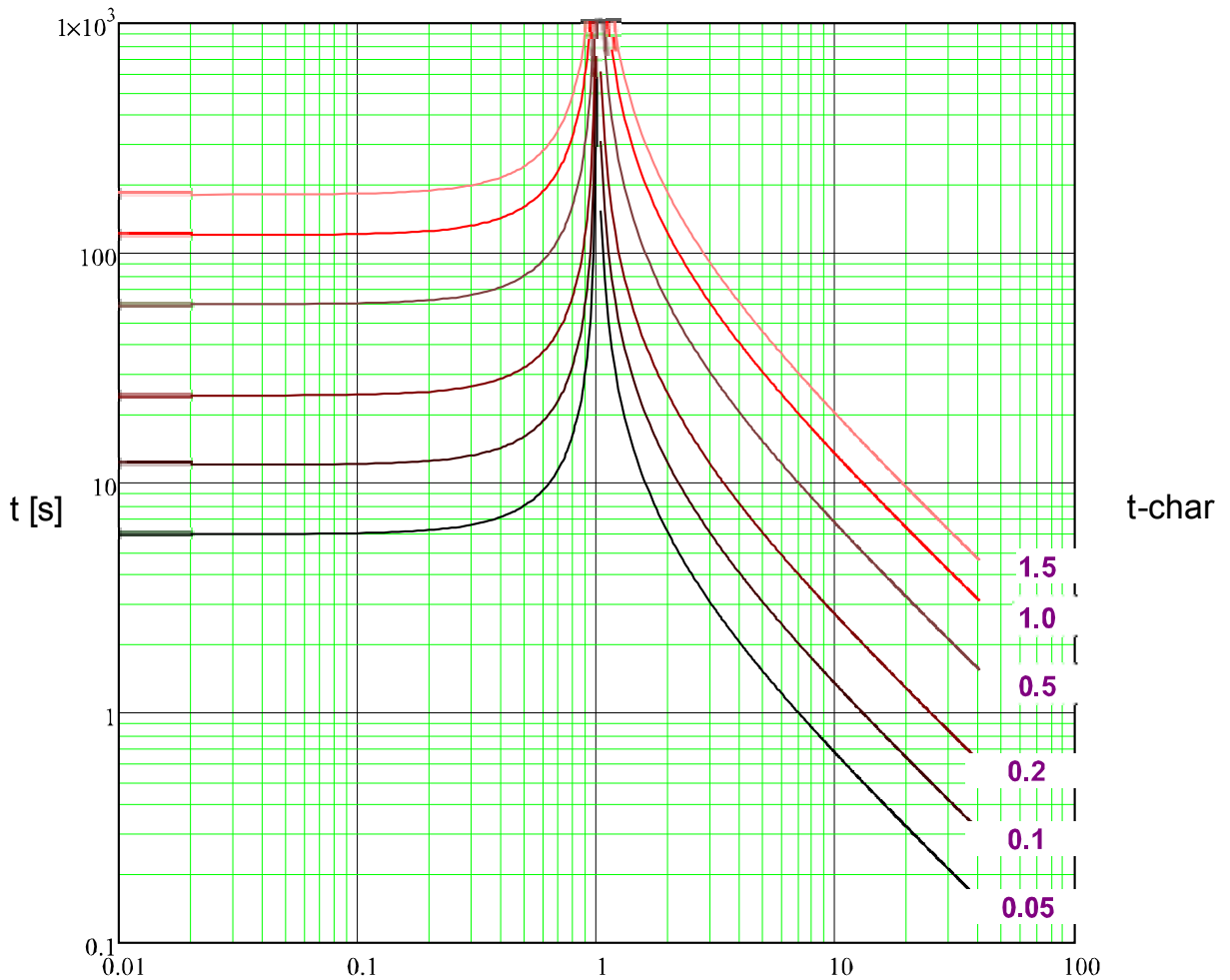
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

$$t = \left| \frac{120}{\left(\frac{IG}{IG>} \right)^2 - 1} \right| * t\text{-char [s]}$$

**Trip**

$$t = \frac{120}{\left(\frac{IG}{IG>} \right)^2 - 1} * t\text{-char [s]}$$



x \* IG> (multiples of pickup)

**IEC EINV**



**Notice!**

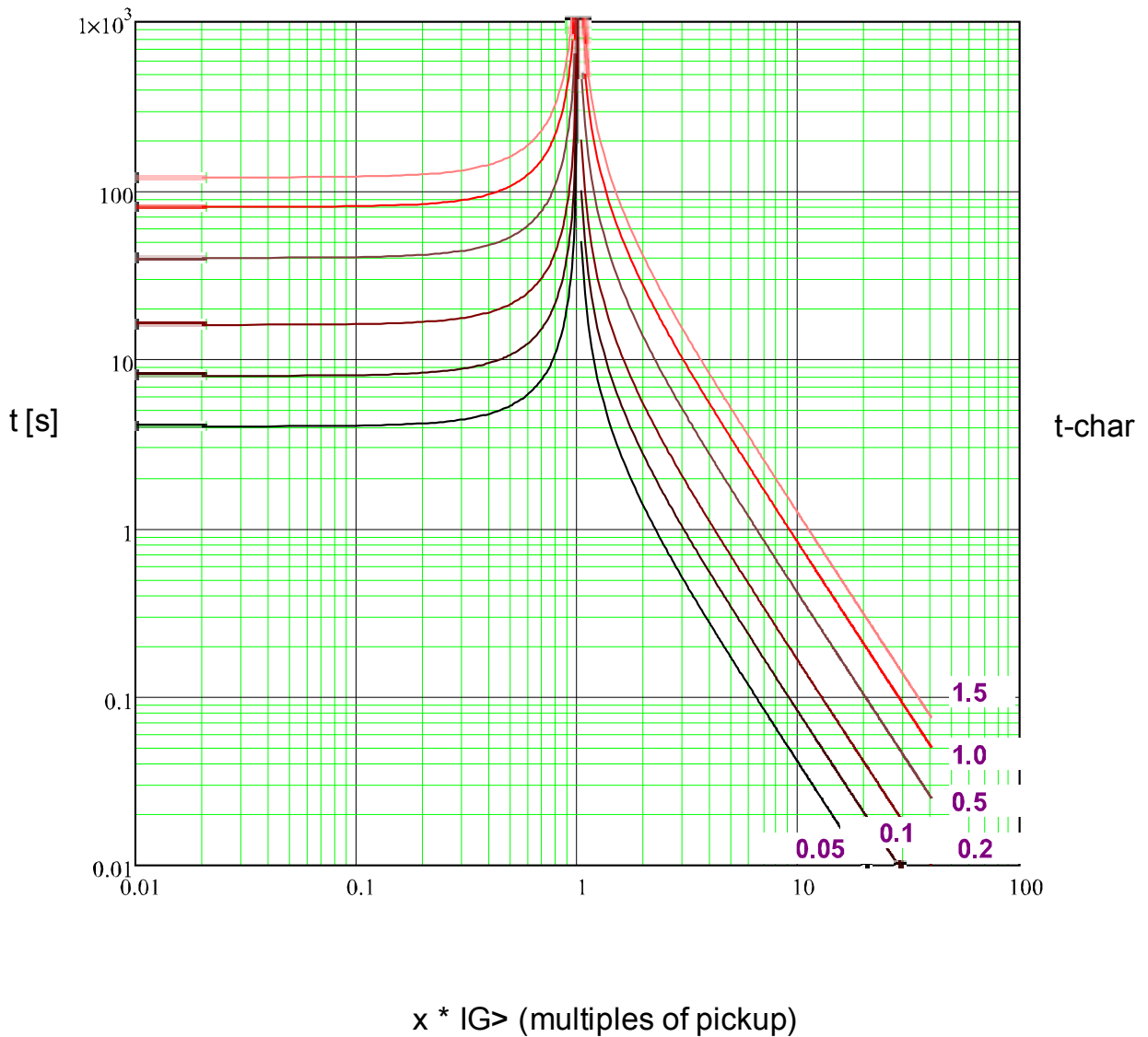
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

**Trip**

$$t = \left| \frac{80}{\left(\frac{IG}{IG>}\right)^2 - 1} \right| * t\text{-char [s]}$$

$$t = \frac{80}{\left(\frac{IG}{IG>}\right)^2 - 1} * t\text{-char [s]}$$



**ANSI MINV**



**Notice!**

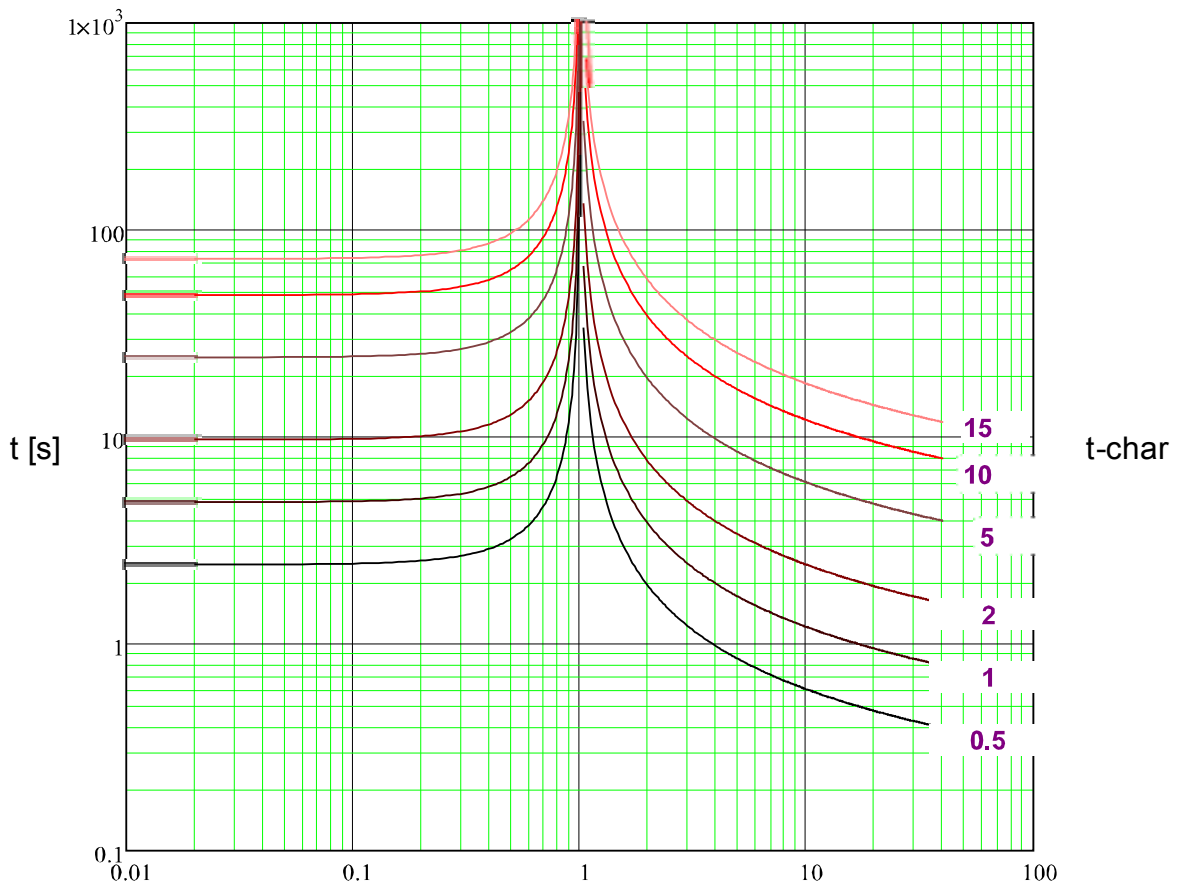
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

**Trip**

$$t = \left| \frac{4.85}{\left(\frac{IG}{I>} \right)^2 - 1} \right| * t\text{-char [s]}$$

$$t = \left( \frac{0.0515}{\left(\frac{IG}{IG>} \right)^{0.02} + 0.1140} \right) * t\text{-char [s]}$$



x \* IG> (multiples of pickup)



**ANSI VINV**



**Notice!**

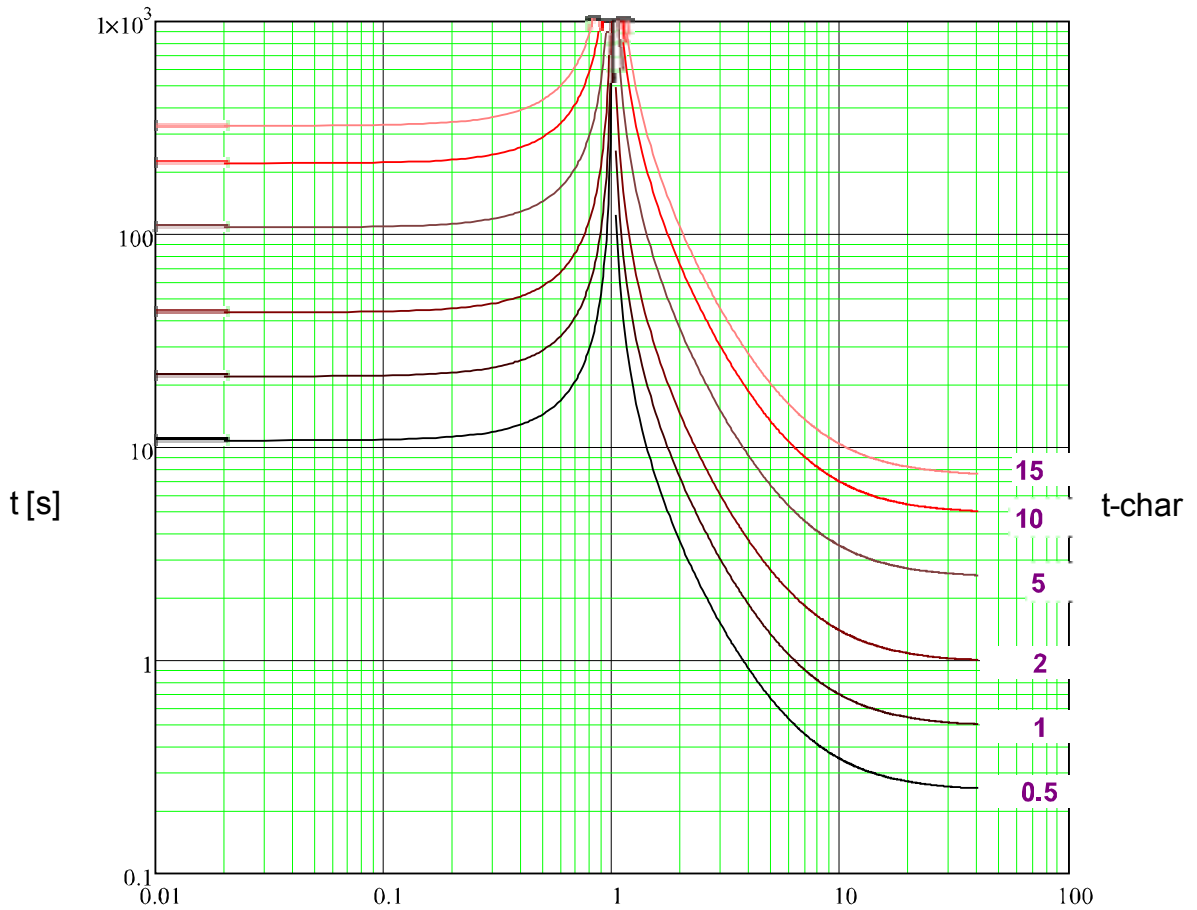
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

$$t = \left| \frac{21.6}{\left(\frac{IG}{IG>} \right)^2 - 1} \right| * t-char [s]$$

**Trip**

$$t = \left( \frac{19.61}{\left(\frac{IG}{IG>} \right)^2 - 1} + 0.491 \right) * t-char [s]$$



x \* IG> (multiples of pickup)

**ANSI EINV**



**Notice!**

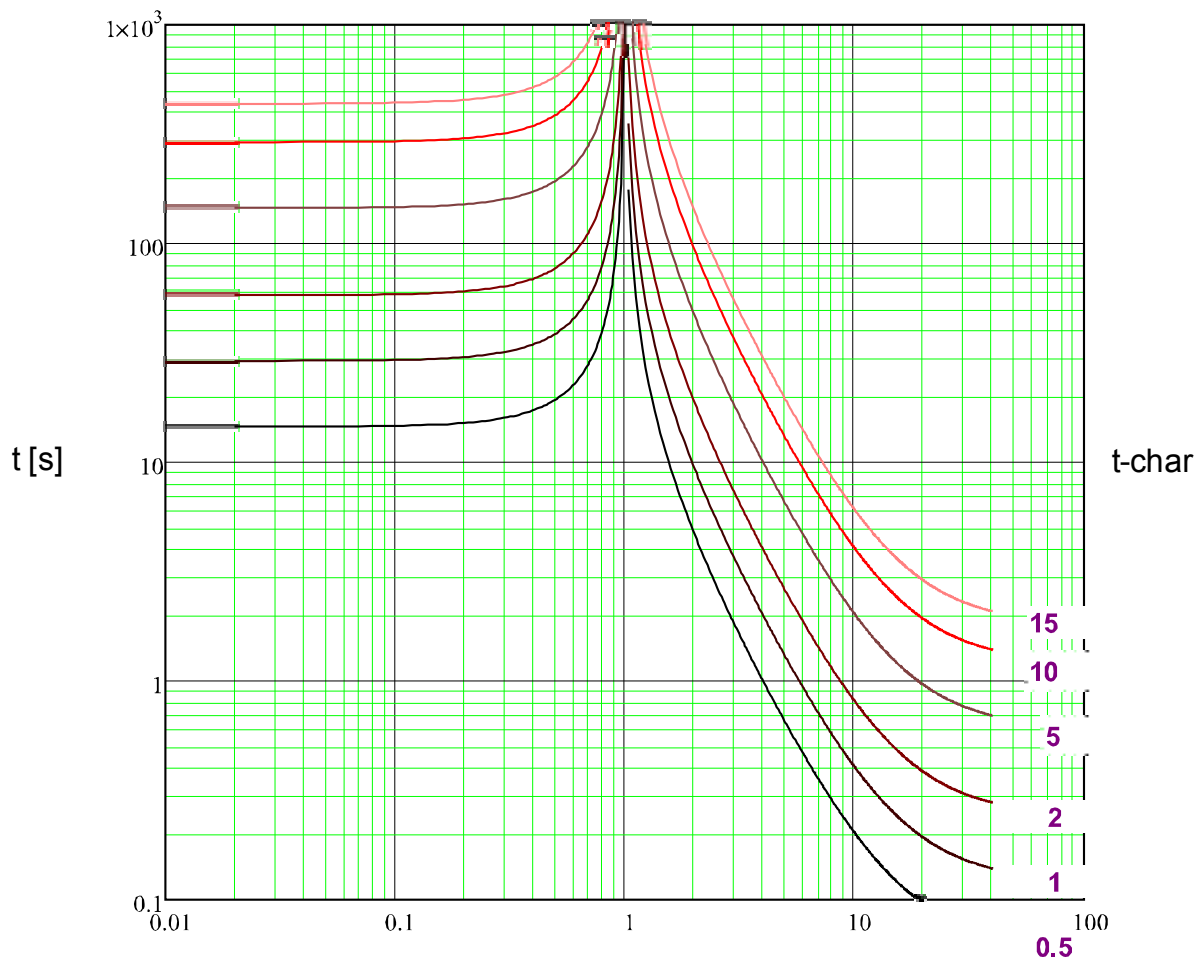
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

$$t = \left| \frac{29.1}{\left(\frac{IG}{IG>}\right)^2 - 1} \right| * t\text{-char [s]}$$

**Trip**

$$t = \left( \frac{28.2}{\left(\frac{IG}{IG>}\right)^2 - 1} + 0.1217 \right) * t\text{-char [s]}$$

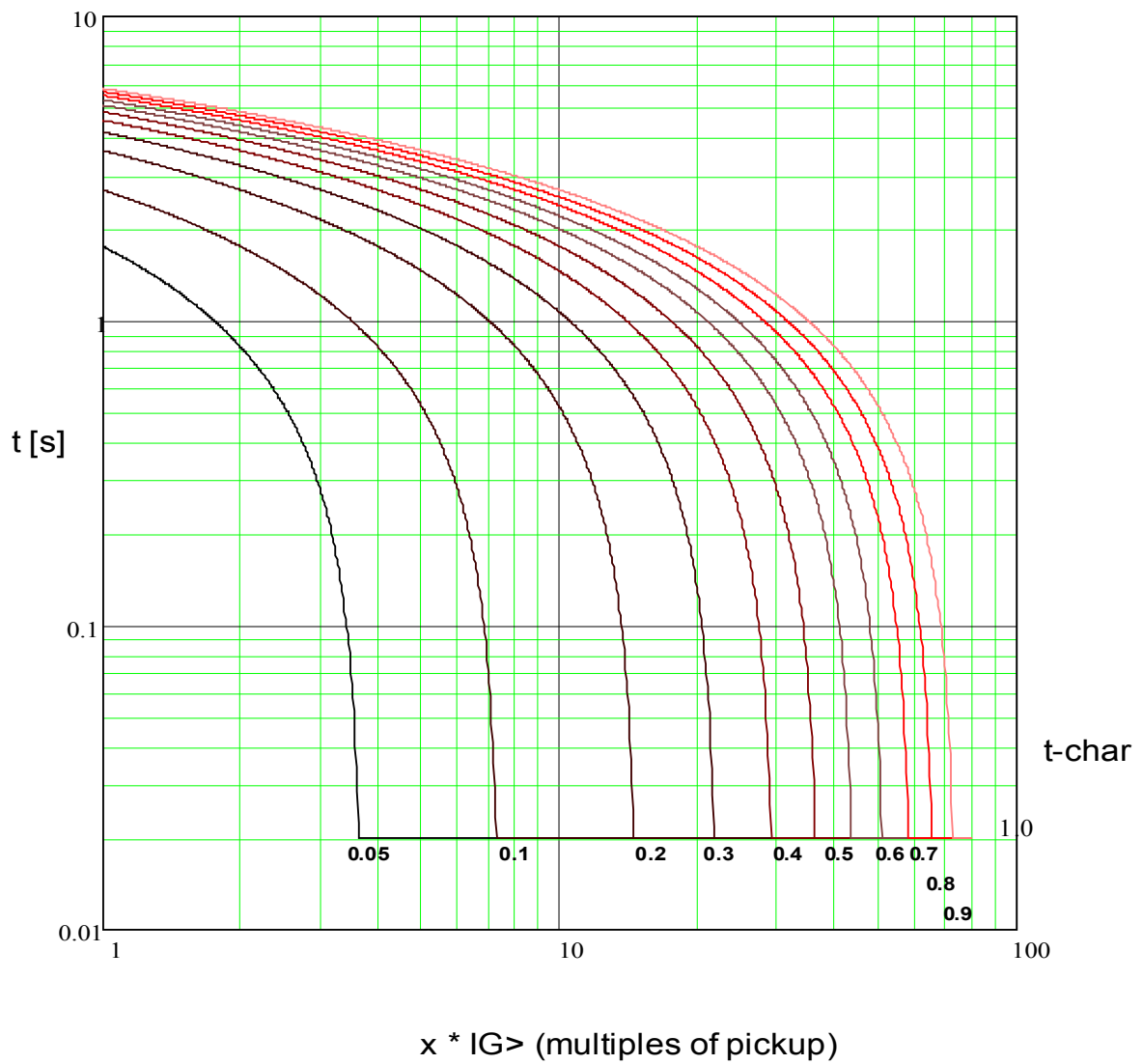


x \* IG> (multiples of pickup)

**RXIDG**

**Trip**

$$t = 5.8 - 1.35 * \ln \left( \frac{IG}{t\text{-char} * IG>} \right) \text{ [s]}$$



### Therm Flat



**Notice!**

Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

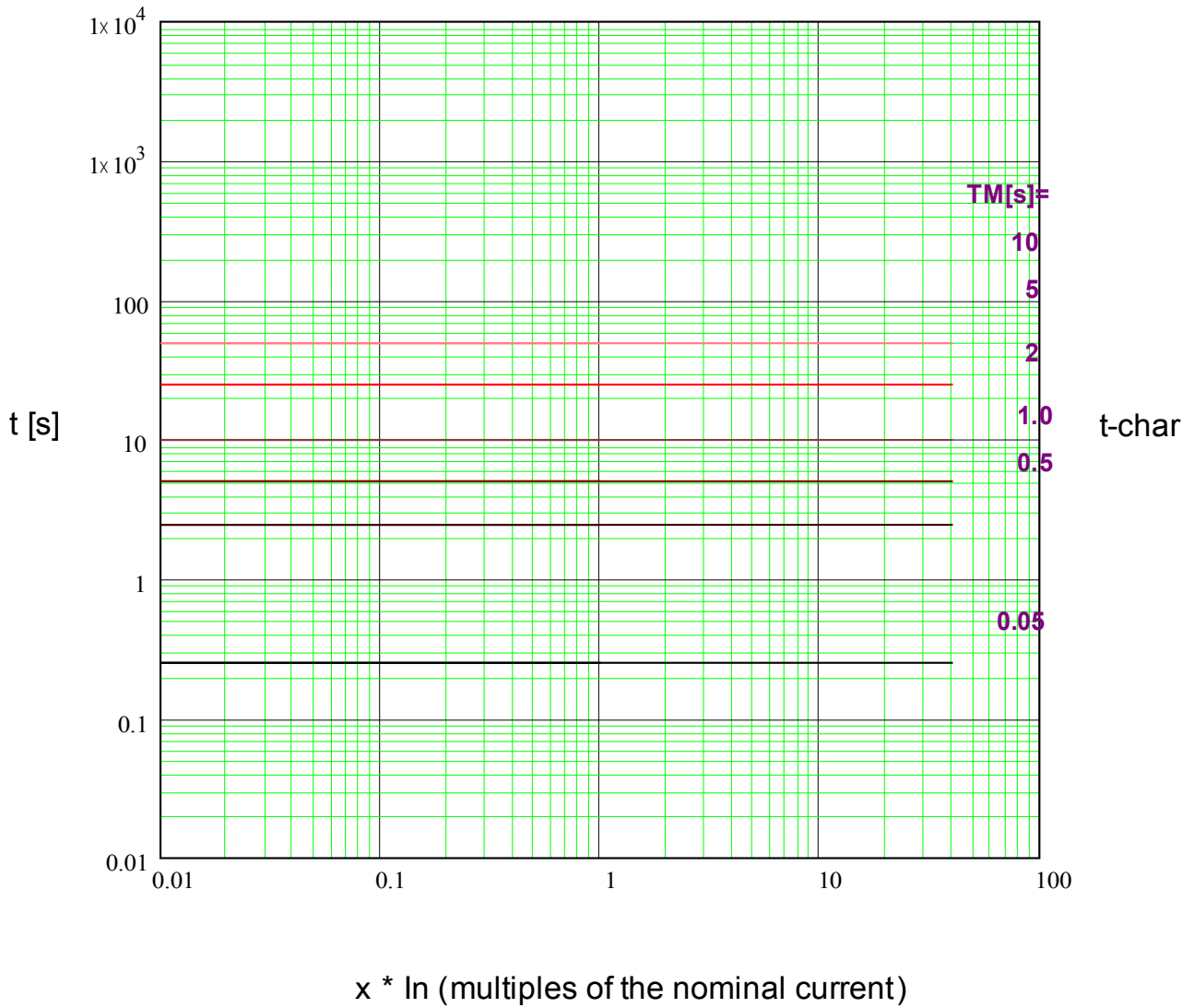
**Reset**

$$t = \left| \frac{5 \cdot 1^2}{\left(\frac{IG}{IGnom}\right)^0} \right| \cdot t\text{-char [s]}$$

**Trip**

$$t = \frac{5}{\left(\frac{IG}{IGnom}\right)^0} \cdot t\text{-char [s]}$$

$$t = 5 \cdot t\text{-char [s]}$$



IT



**Notice!**

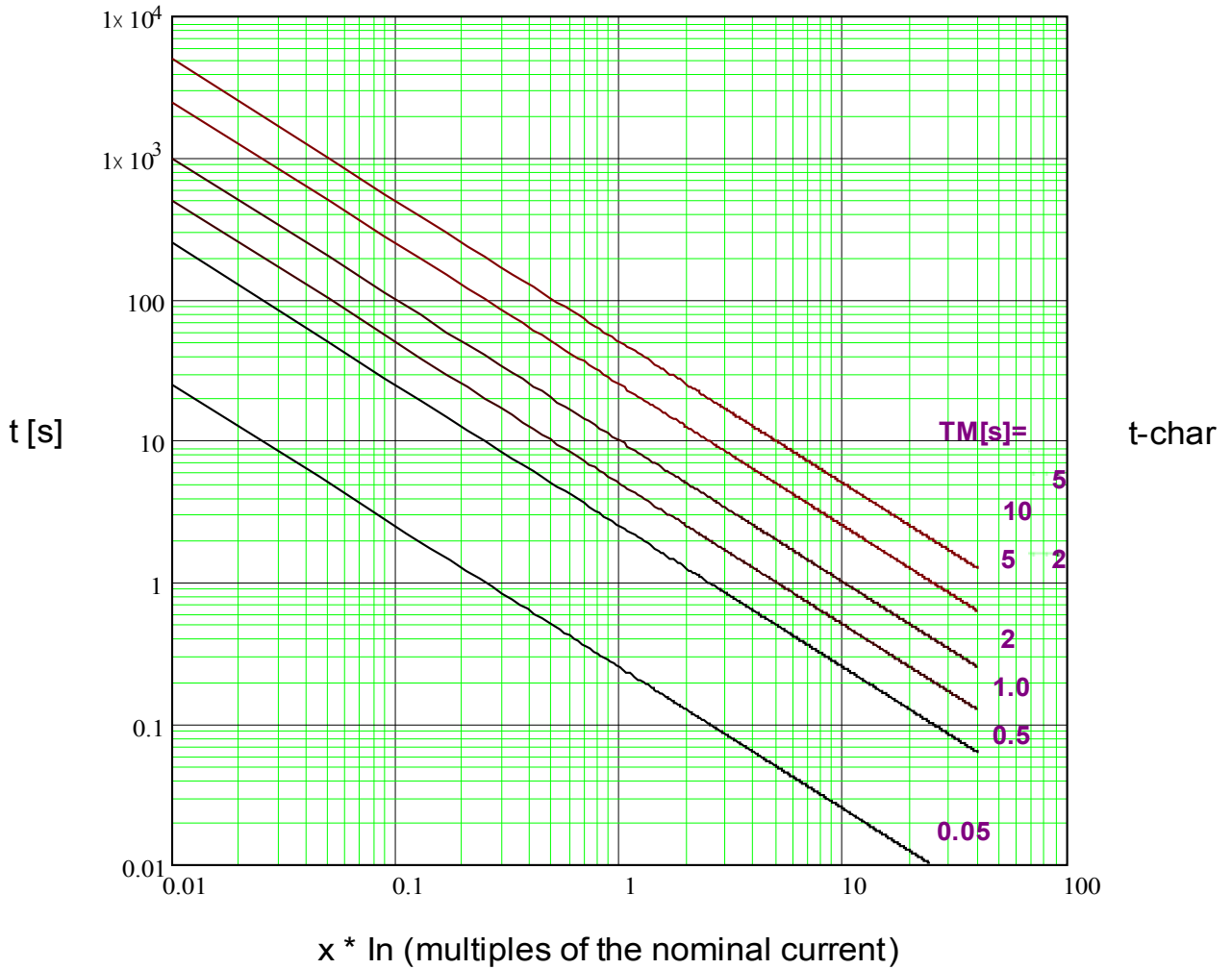
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

**Trip**

$$t = \left| \frac{5 \cdot 1^2}{\left(\frac{IG}{IGnom}\right)^0} \right| \cdot t\text{-char [s]}$$

$$t = \frac{5 \cdot 1^1}{\left(\frac{IG}{IGnom}\right)^1} \cdot t\text{-char [s]}$$



**I<sup>2</sup>T**



**Notice!**

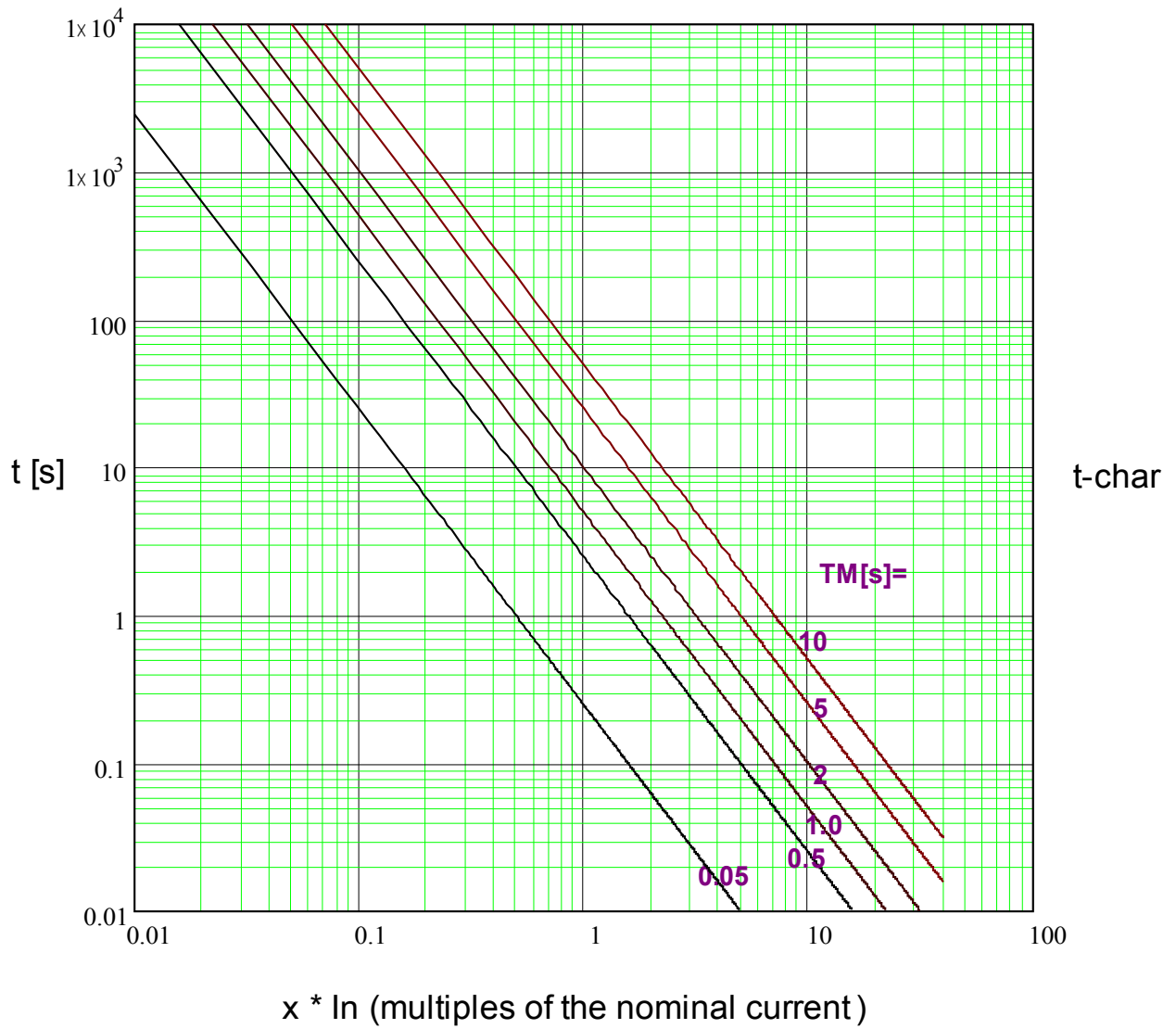
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

$$t = \left| \frac{5 \cdot 1^2}{\left(\frac{IG}{IG_{nom}}\right)^0} \right| \cdot t_{char} [s]$$

**Trip**

$$t = \frac{5 \cdot 1^2}{\left(\frac{IG}{IG_{nom}}\right)^2} \cdot t_{char} [s]$$



**I4T**



**Notice!**

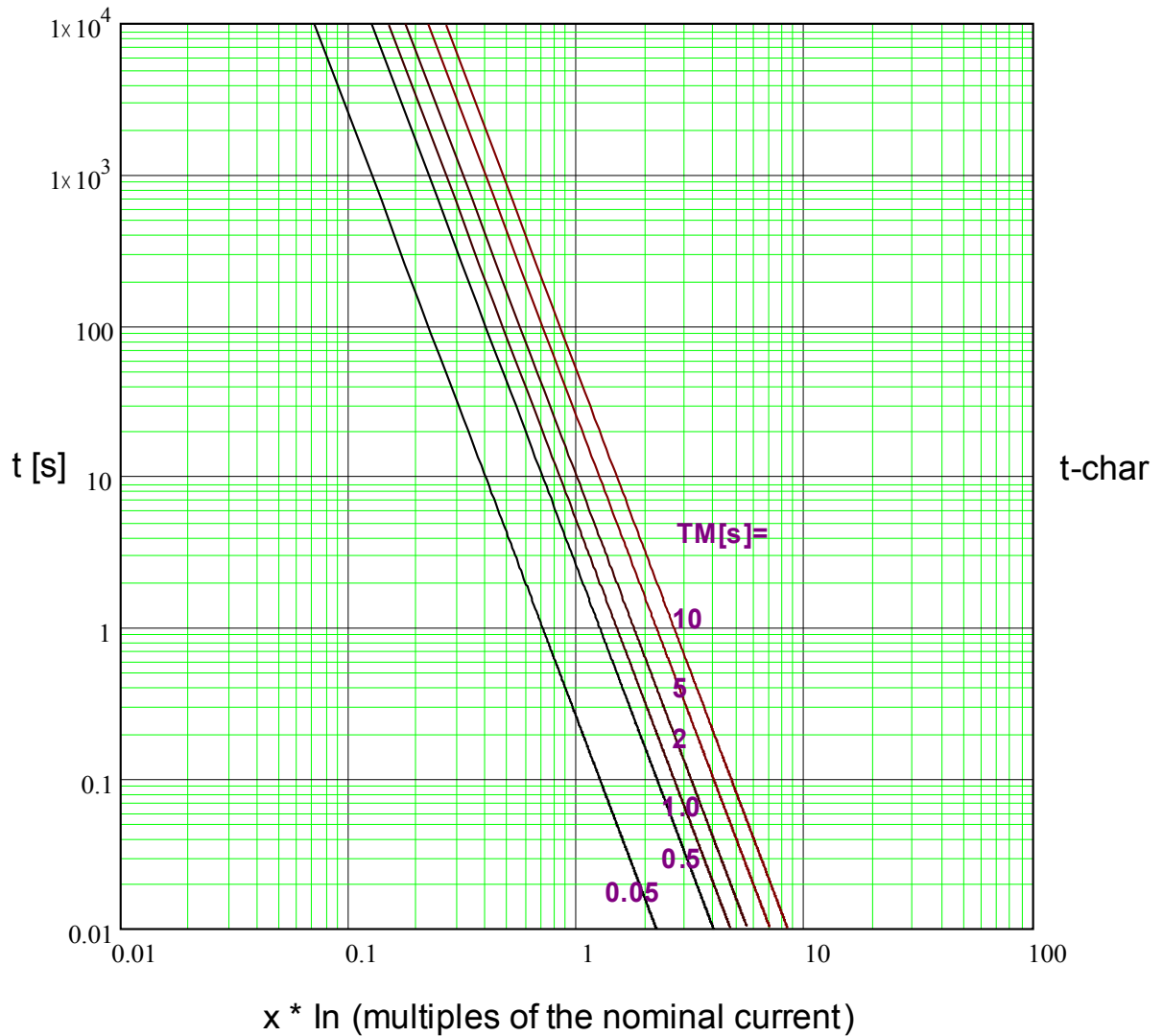
Various reset modes are available . Resetting via characteristic, delayed and instantaneous .

**Reset**

$$t = \left| \frac{5 \cdot 1^2}{\left(\frac{IG}{IGnom}\right)^0} \right| \cdot t\text{-char [s]}$$

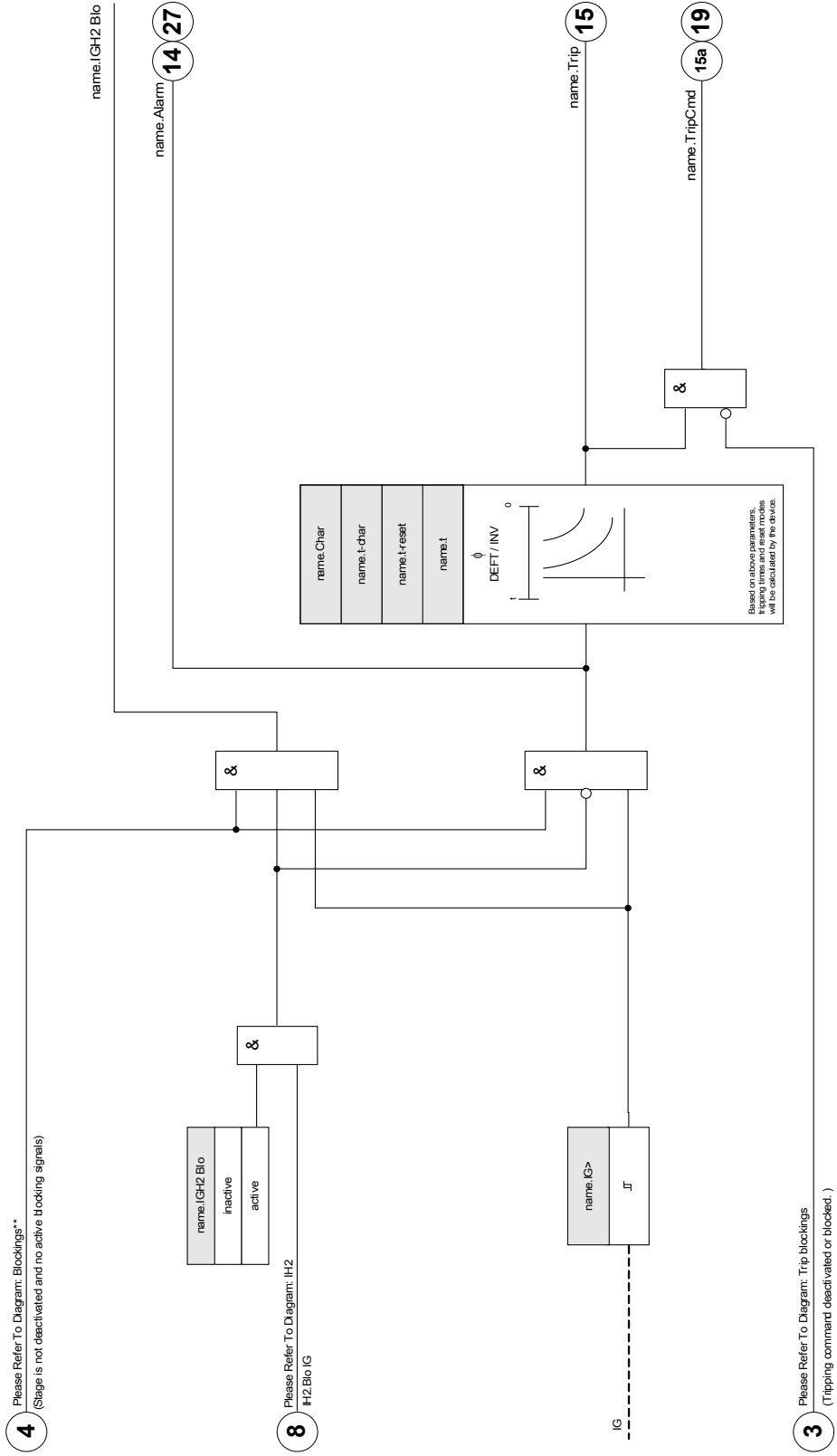
**Trip**

$$t = \frac{5 \cdot 1^4}{\left(\frac{IG}{IGnom}\right)^4} \cdot t\text{-char [s]}$$




**IG[1]...[n]**

**name =** IG[1]...[n]





### Device Planning Parameters of the Ground Fault Protection



Parameter	Description	Options	Default	Menu path
Mode 	Mode	do not use, non directional	do not use	[Device planning]

### Global Protection Parameters of the Ground Fault Protection



Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /I-Prot /IG[1]]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /I-Prot /IG[1]]
ExBlo3 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Trip Cmds	--	[Protection Para /Global Prot Para /I-Prot /IG[1]]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the stage, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /I-Prot /IG[1]]
Ex rev Interl 	External blocking of the module by external reverse interlocking, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /I-Prot /IG[1]]
AdaptSet 1 	Assignment Adaptive Parameter 1	AdaptSet	--	[Protection Para /Global Prot Para /I-Prot /IG[1]]
AdaptSet 2 	Assignment Adaptive Parameter 2	AdaptSet	--	[Protection Para /Global Prot Para /I-Prot /IG[1]]


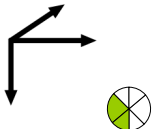
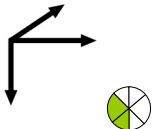
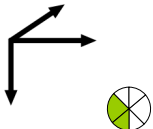
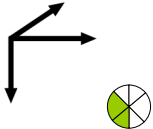
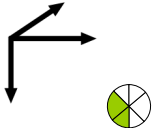
## Protective Elements

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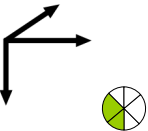
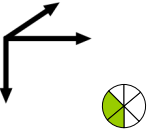
<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
AdaptSet 3 	Assignment Adaptive Parameter 3	AdaptSet	-.-	[Protection Para /Global Prot Para /I-Prot /IG[1]]
AdaptSet 4 	Assignment Adaptive Parameter 4	AdaptSet	-.-	[Protection Para /Global Prot Para /I-Prot /IG[1]]

### Setting Group Parameters of the Ground Fault Protection

Parameter	Description	Setting range	Default	Menu path
 Function	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Protection Para /<1..4> /I-Prot /IG[1]]
 ExBlo Fc	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo Fc=active".	inactive, active	inactive	[Protection Para /<1..4> /I-Prot /IG[1]]
 Ex rev Interl Fc	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "Ex rev Interl Fc = active".	inactive, active	inactive	[Protection Para /<1..4> /I-Prot /IG[1]]
 Blo TripCmd	Permanent blocking of the Trip Command of the module/stage.	inactive, active	inactive	[Protection Para /<1..4> /I-Prot /IG[1]]
 ExBlo TripCmd Fc	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo TripCmd Fc=active".	inactive, active	inactive	[Protection Para /<1..4> /I-Prot /IG[1]]
 IG Source	Selection if measured or calculated ground current should be used.	sensitive measure- ment, measured, calculated	calculated	[Protection Para /<1..4> /I-Prot /IG[1]]
 Measuring method	Measuring method: fundamental or rms or 3rd harmonic (only generator protection relays)	Fundamental, True RMS	Fundamental	[Protection Para /<1..4> /I-Prot /IG[1]]

Parameter	Description	Setting range	Default	Menu path
Meas Circuit Superv 	Activates the use of the measuring circuit supervision. In this case the module will be blocked if a measuring circuit supervision module (e.g. LOP, VTS) signals a disturbed measuring circuit (e.g. caused by a fuse failure).  Only available if "VX Source" ist set to "calculated".	inactive	inactive	[Protection Para <1..4> /I-Prot /IG[1]]
IG> 	If the pickup value is exceeded, the module/stage will be started.	0.02 - 20.00In	0.02In	[Protection Para <1..4> /I-Prot /IG[1]]
IGs> 	If the pickup value is exceeded, the module/stage will be started.	0.002 - 2.000In	0.02In	[Protection Para <1..4> /I-Prot /IG[1]]
Char 	Characteristic	DEFT, IEC NINV, IEC VINV, IEC EINV, IEC LINV, ANSI MINV, ANSI VINV, ANSI EINV, Therm Flat, IT, I2T, I4T, RXIDG	DEFT	[Protection Para <1..4> /I-Prot /IG[1]]
t 	Tripping delay  Only available if: Characteristic = DEFT	0.00 - 300.00s	0.00s	[Protection Para <1..4> /I-Prot /IG[1]]
t-char 	Time multiplier/tripping characteristic factor. The setting range depends on the selected tripping curve.  Only available if: Characteristic = INV Or Characteristic = Therm Flat Or Characteristic = IT Or Characteristic = I2T Or Characteristic = I4T Or Characteristic = RXIDG	0.02 - 20.00	1	[Protection Para <1..4> /I-Prot /IG[1]]

## Protective Elements

Parameter	Description	Setting range	Default	Menu path
Reset Mode 	Reset Mode  Only available if: Characteristic = INV Or Characteristic = Therm Flat Or Characteristic = IT Or Characteristic = I2T Or Characteristic = I4T Or Characteristic = RXIDG	instantaneous,  t-delay,  calculated	instantaneous	[Protection Para /<1..4> /I-Prot /IG[1]]
t-reset 	Reset time for intermittent phase failures (INV characteristics only)  Only available if: Characteristic = INV Or Characteristic = Therm Flat Or Characteristic = IT Or Characteristic = I2T Or Characteristic = I4T Or Characteristic = RXIDG Only available if: Reset Mode = t-delay	0.00 - 60.00s	0.00s	[Protection Para /<1..4> /I-Prot /IG[1]]

## Ground Fault Protection Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module input state: External blocking1	[Protection Para /Global Prot Para /I-Prot /IG[1]]
ExBlo2-I	Module input state: External blocking2	[Protection Para /Global Prot Para /I-Prot /IG[1]]
ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command	[Protection Para /Global Prot Para /I-Prot /IG[1]]
Ex rev Inter-I	Module input state: External reverse interlocking	[Protection Para /Global Prot Para /I-Prot /IG[1]]
AdaptSet1-I	Module input state: Adaptive Parameter1	[Protection Para /Global Prot Para /I-Prot /IG[1]]
AdaptSet2-I	Module input state: Adaptive Parameter2	[Protection Para /Global Prot Para /I-Prot /IG[1]]
AdaptSet3-I	Module input state: Adaptive Parameter3	[Protection Para /Global Prot Para /I-Prot /IG[1]]
AdaptSet4-I	Module input state: Adaptive Parameter4	[Protection Para /Global Prot Para /I-Prot /IG[1]]

### Ground Fault Protection Signals (Output States)

<i>Signal</i>	<i>Description</i>
active	Signal: active
ExBlo	Signal: External Blocking
Ex rev Interl	Signal: External reverse Interlocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Alarm	Signal: Alarm IG
Trip	Signal: Trip
TripCmd	Signal: Trip Command
Active AdaptSet	Active Adaptive Parameter
DefaultSet	Signal: Default Parameter Set
AdaptSet 1	Signal: Adaptive Parameter 1
AdaptSet 2	Signal: Adaptive Parameter 2
AdaptSet 3	Signal: Adaptive Parameter 3
AdaptSet 4	Signal: Adaptive Parameter 4

### Ground Fault Protection Counter Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NumberOfAlarms	Number of alarms since last reset.	0	0 - 999999999	[Operation /History /AlarmCr]
NumberOfTripCmds	Number of trip commands since last reset	0	0 - 999999999	[Operation /History /TripCmdCr]

## Commissioning: Ground Fault Protection – non-directional [50N/G, 51N/G]

Please test the non-directional earth overcurrent analog to the nondirectional phase overcurrent protection.

### I2> and %I2/I1> - Unbalanced Load [46]

Elements:

I2>[1], I2>[2]

The I2> Current Unbalance element works similar to the V012 Voltage Unbalance element. The positive and negative sequence currents are calculated from the 3-phase currents. The Threshold setting defines a minimum operating current magnitude of I2 for the 46 function to operate, which insures that the relay has a solid basis for initiating a current unbalance trip. The »%I2/I1« (option) setting is the unbalance trip pickup setting. It is defined by the ratio of negative sequence current to positive sequence current »%I2/I1«.

This function requires negative sequence current magnitude above the threshold setting and the percentage current unbalance above the »%I2/I1« setting before allowing a current unbalance trip. Therefore, both the threshold and percent settings must be met for the specified Delay time setting before the relay initiates a trip for current unbalance.

#### NOTICE

All elements are identically structured.

Rating value I2> is the permitted continuous unbalanced load current. For both steps trip characteristics are provided, namely a definite time characteristic (DEFT) and an inverse characteristic (INV).

The characteristic of the inverse curve is as follows:

$$t [s] \leq \frac{K * I_n^2}{I_2^2 - I_2>^2}$$

Legend:

I<sub>n</sub> [A] = Nominal current

t [s] = Tripping delay

K [s] = Indicates the thermal load capability of the engine while running with 100% unbalanced load current.

I2> [A] = The Threshold setting defines a minimum operating current magnitude of I2 for the 46 function to operate, which ensures that the relay has a solid basis for initiating a current unbalance trip. This is a supervisory function and not a trip level.

I2 [A] = Measured value (calculated): Unbalanced load current

In the equation shown above the heating-up process is assumed by integration of the counter system current I2. When I2> is undershoot, the built-up heat amount will be reduced in line with the adjusted cooling-down constant "tau-cool".



$$\Theta(t) = \Theta_0 * e^{-\frac{t}{\tau_{\text{cool}}}}$$

Legend:

t = Tripping delay

$\tau_{\text{cool}}$  = Cooling time constant

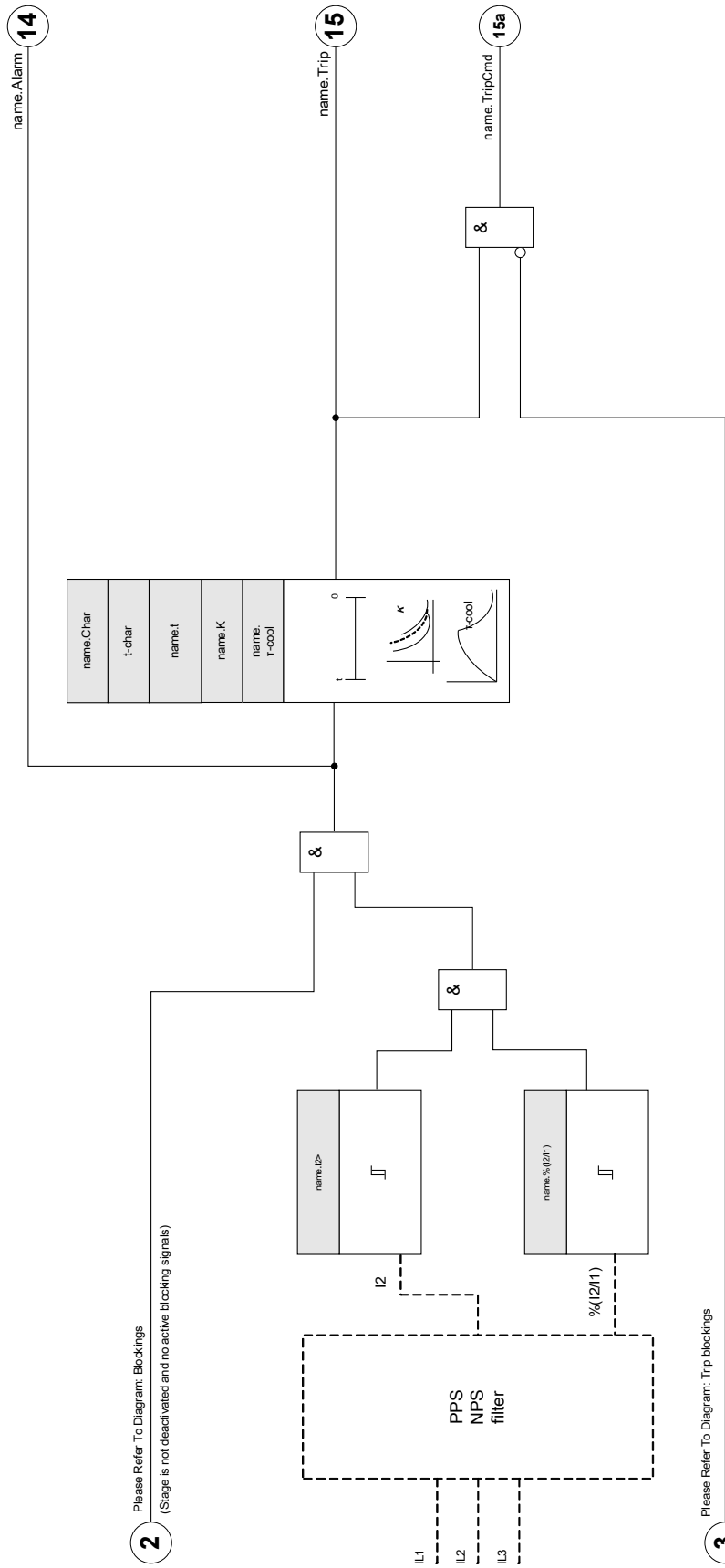
$\Theta(t)$  = Momentary heat (thermal) energy

$\Theta_0$  = Heat (thermal) energy before the cooling down has started


If the heat amount is not reduced when the permitted unbalanced load current is overshoot again, the remaining heat amount will cause an earlier tripping.

46[1]...[n]





name = 46[1]...[n]











## Device Planning Parameters of the Current Unbalance Module




Parameter	Description	Options	Default	Menu path
Mode 	Mode	do not use, use	I2>[1]: use I2>[2]: do not use	[Device planning]

## Global Protection Parameters of the Current Unbalance Module

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /I-Prot /I2>[1]]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /I-Prot /I2>[1]]
ExBlo3 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Trip Cmds	I2>[1]: MStart.Blo- I2>Start I2>[2]: --	[Protection Para /Global Prot Para /I-Prot /I2>[1]]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the stage, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /I-Prot /I2>[1]]

### Setting Group Parameters of the Current Unbalance Module

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Protection Para /<1..4> /I-Prot /I2>[1]]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo Fc=active".	inactive, active	inactive	[Protection Para /<1..4> /I-Prot /I2>[1]]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/stage.	inactive, active	inactive	[Protection Para /<1..4> /I-Prot /I2>[1]]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo TripCmd Fc=active".	inactive, active	inactive	[Protection Para /<1..4> /I-Prot /I2>[1]]
I2> 	The Threshold setting defines a minimum operating current magnitude of I2 for the 46 function to operate, which ensures that the relay has a solid basis for initiating a current unbalance trip. This is a supervisory function and not a trip level.  Only available if: Device planning: I2>.Mode = 46	0.01 - 4.00In	I2>[1]: 0.08In I2>[2]: 0.01In	[Protection Para /<1..4> /I-Prot /I2>[1]]
%(I2/I1) 	The %(I2/I1) setting is the unbalance trip pickup setting. It is defined by the ratio of negative sequence current to positive sequence current (% Unbalance=I2/I1). Phase sequence will be taken into account automatically.	inactive, active	inactive	[Protection Para /<1..4> /I-Prot /I2>[1]]
%(I2/I1) 	The %(I2/I1) setting is the unbalance trip pickup setting. It is defined by the ratio of negative sequence current to positive sequence current (% Unbalance=I2/I1). Phase sequence will be taken into account automatically.  Only available if: %(I2/I1) = use	2 - 40%	20%	[Protection Para /<1..4> /I-Prot /I2>[1]]
Char 	Characteristic	DEFT, INV, ANSI INV	DEFT	[Protection Para /<1..4> /I-Prot /I2>[1]]

Parameter	Description	Setting range	Default	Menu path
t 	Tripping delay  Only available if: Characteristic = DEFT	0.00 - 300.00s	0.00s	[Protection Para /<1..4> /I-Prot /I2>[1]]
K 	This setting is the negative sequence capability constant. This value is normally provided by the generator manufacturer.  Only available if: Characteristic = INV	1.00 - 200.00s	10.0s	[Protection Para /<1..4> /I-Prot /I2>[1]]
t-cool 	If the unbalanced load current falls below the pickup value, the cooling-off time is taken into account. If the unbalanced load exceeds the pickup value again, than the saved heat within the electrical equipment will lead to an accelerated trip.  Only available if: Characteristic = INV	0.0 - 60000.0s	0.0s	[Protection Para /<1..4> /I-Prot /I2>[1]]

### Current Unbalance Module Input States

Name	Description	Assignment via
ExBlo1-I	Module input state: External blocking1	[Protection Para /Global Prot Para /I-Prot /I2>[1]]
ExBlo2-I	Module input state: External blocking2	[Protection Para /Global Prot Para /I-Prot /I2>[1]]
ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command	[Protection Para /Global Prot Para /I-Prot /I2>[1]]

### Current Unbalance Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
active	Signal: active
ExBlo	Signal: External Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Alarm	Signal: Alarm Negative Sequence
Trip	Signal: Trip
TripCmd	Signal: Trip Command

### Current Unbalance Module Counter Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NumberOfAlarms	Number of alarms since last reset.	0	0 - 9999999999	[Operation /History /AlarmCr]
NumberOfTripCmds	Number of trip commands since last reset	0	0 - 9999999999	[Operation /History /TripCmdCr]

## Commissioning: Current Unbalance Module

### *Object to be tested:*

Test of the unbalanced load protection function.

### *Necessary means:*

- Three-phase current source with adjustable current unbalance; and
- Timer.

### *Procedure:*

#### *Check the phase sequence:*

- Ensure that the phase sequence is the same as that set in the field parameters.
- Feed-in a three-phase nominal current.
- Change to the »Measuring Values« menu.
- Check the measuring value for the unbalanced current »I2«. The measuring value displayed for »I2« should be zero (within the physical measuring accuracy).

### **NOTICE**

**If the displayed magnitude for I2 is the same as that for the symmetrical nominal currents fed to the relay, it implies that the phase sequence of the currents seen by the relay is reversed.**

- Now turn-off phase L1.
- Again check the measuring value of the unbalanced current »I2« in the »Measuring Values« menu. The measuring value of the asymmetrical current »I2« should now be 33%.
- Turn-on phase L1, but turn-off phase L2.
- Once again check the measuring value of the asymmetrical current I2 in the »Measuring Values« menu. The measuring value of the asymmetrical current »I2« should be again 33%.
- Turn-on phase L2, but turn-off phase L3.
- Again check the measuring value of asymmetrical current »I2« in the »Measuring Values« menu. The measuring value of the asymmetrical current »I2« should still be 33%.

#### *Testing the trip delay:*

- Apply a symmetrical three-phase current system (nominal currents).
- Switch off IL1 (the threshold value »Threshold« for »I2« must be below 33%).
- Measure the tripping time.

The present current unbalance »I2« corresponds with 1/3 of the existing phase current displayed.

### *Testing the threshold values*

- Configure minimum »  $I_{2/1}$  « setting (2%) and an arbitrary threshold value » *Threshold* « (I2).
- For testing the threshold value, a current has to be fed to phase A which is lower than three times the adjusted threshold value » *Threshold* « (I2).
- Feeding only phase A results in »  $I_{2/1} = 100\%$ «, so the first condition »  $I_{2/1} \geq 2\%$ « is always fulfilled.
- Now increase the phase L1 current until the relay is activated.

### *Testing the dropout ratio of the threshold values*

Having tripped the relay in the previous test, now decrease the phase A current. The dropout ratio must not be higher than 0.97 times the threshold value.

### *Testing $I_{2/1}$*

- Configure minimum threshold value » *Threshold* « (I2) ( $0.01 \times I_n$ ) and set »  $I_{2/1}$  « greater or equal to 10%.
- Apply a symmetrical three-phase current system (nominal currents). The measuring value of »  $I_{2/1}$  « should be 0%.
- Now increase the phase L1 current. With this configuration, the threshold value » *Threshold* « (I2) should be reached before the value »  $I_{2/1}$  « reaches the set »  $I_{2/1}$  « ratio threshold.
- Continue increasing the phase 1 current until the relay is activated.

### *Testing the dropout ratio of $I_{2/1}$*

Having tripped the relay in the previous test, now decrease the phase L1 current. The dropout of »  $I_{2/1}$  « has to be 1% below the »  $I_{2/1}$  « setting.

### *Successful test result:*

The measured trip delays, threshold values, and dropout ratios are within the permitted deviations/tolerances, specified under Technical Data.



## Theta - Thermal Model [49M, 49R]

Available Elements:

ThR

### General – Principle Use

#### Thermal Protection and Alarm

This protective device provides a thermal model. The thermal model can work with or without the URTD. The RTD-based direct temperature trips and alarms are independent of the thermal model. Without the URTD, meaning the URTD is not connected to the protective device or it is connected but not configured for the thermal protection trips, the thermal model protection will be solely based on the following settings:

1. lb Full Load Ampere (FLA);
2. Locked Rotor Current (LRC);
3. Maximum Allowable Stall Time (Tc);
4. UTC (Ultimate Trip Current) or k-Factor;
5. Thermal Model Trip Threshold if enabled;
6. Trip Delay;
7. Thermal Model Alarm Threshold if enabled; and
8. Alarm Delay.

The first four settings (1-4) dictate the maximum allowable thermal limit curve of the protected equipment, and the last four settings (5-8) define the thermal trip and alarm curves relative to the thermal limit curve.

Mathematically, the thermal limit curve can be expressed as the following:

$$Trip\ Time = \frac{I_{LR}^2 * T_{LR}}{I_{ef}^2} \quad \text{when} \quad I_{ef} > k_{Factor} * I_b$$

If the direct stator temperature measurements are available, the thermal replica model will be modified to include the heat loss between stator and rotor. As a result, the motor will be able to run longer under overload conditions. The heat loss serves as a cooling. At some point, the cooling effect will cancel the heat increment so that the thermal capacity used will reach some steady-state level that may be below the trip or alarm limit. This equivalently raises the »k-factor« and shifts the trip curve right.

If the thermal capacity used is held at a level that is below the trip threshold, the thermal model will not trip. To prevent the protected equipment from overheating, the direct temperature trip function must be enabled. Keep in mind that in order for the stator temperature to be effective in the thermal replica model, the following conditions must be met:

- Some RTD channels must be configured to measure the winding temperatures; and
- These RTD channels must be enabled for trip.

In addition, at least one of these winding temperatures must be valid.

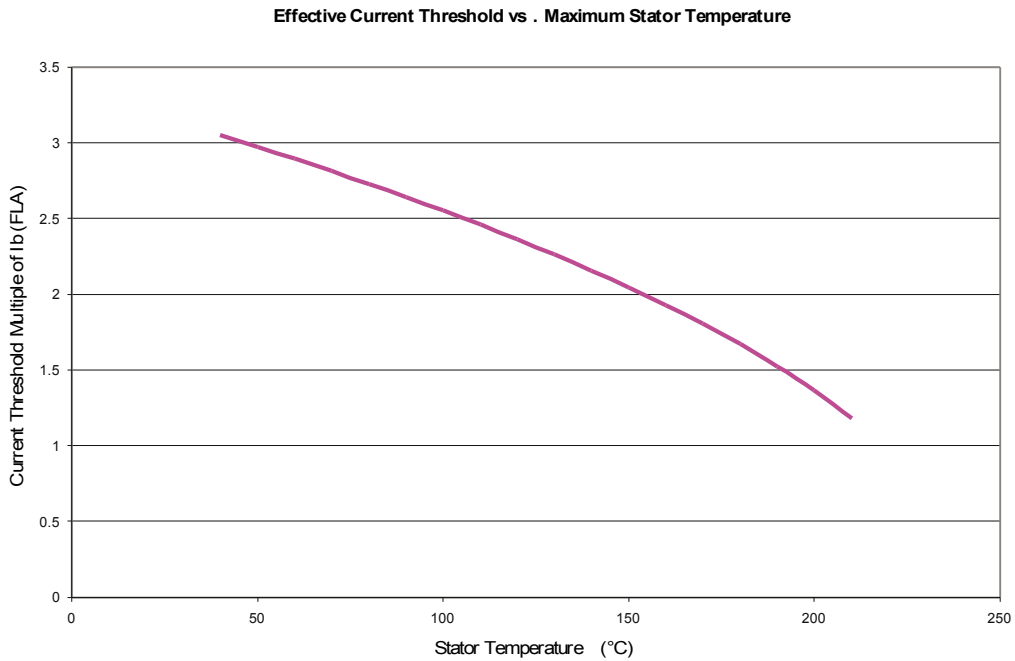
Knowing the maximum steady stator temperature  $\Theta_s$  (°C), the thermal capacity used can be estimated by the following formula.

$$TC_{Used} \% = \left( \frac{\Theta_s}{240} + \frac{I_{ef}^2 * 50}{I_{LR}^2 * T_{LR}} \right) \quad \text{when } I_{ef} > I_{th} * FLA$$

Take for example, ILR = 6 \* FLA, TLR = 15, and thermal trip level of 100%. The relationship between the effective current threshold and the stator temperature can be seen in the Stator Temperature Effect on Current Threshold Curve.

### Stator Temperature Effect on Current Threshold Curve

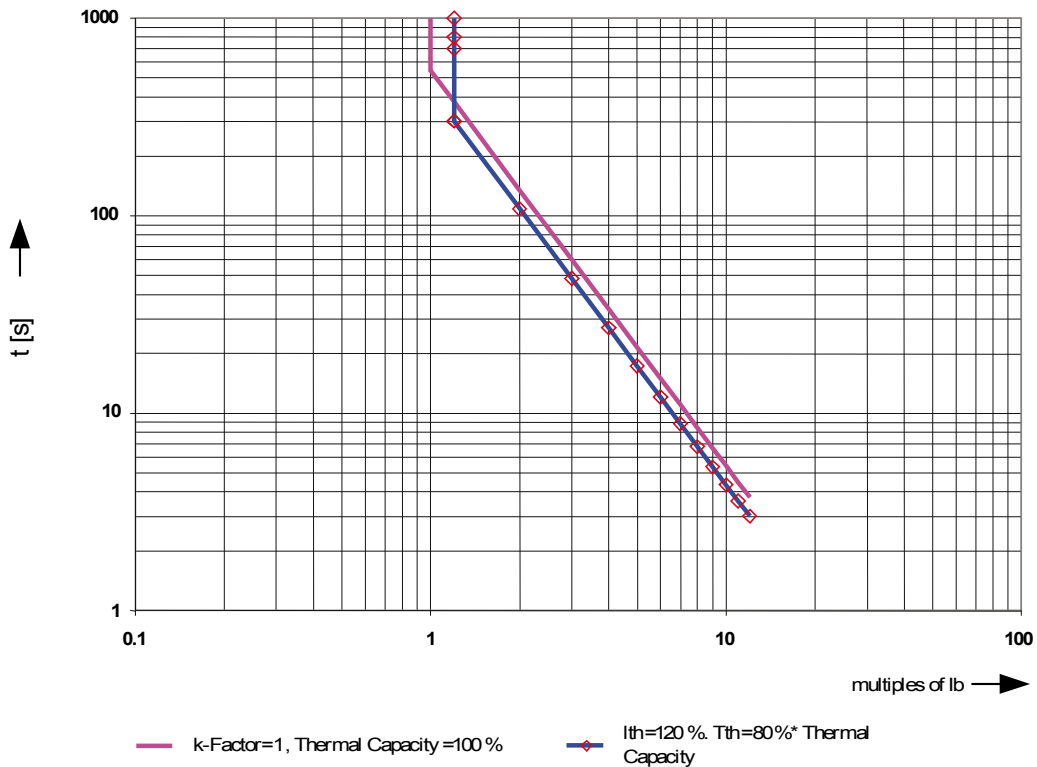
From the graph, it is seen that the lower the stator temperature, the higher the effective current threshold.



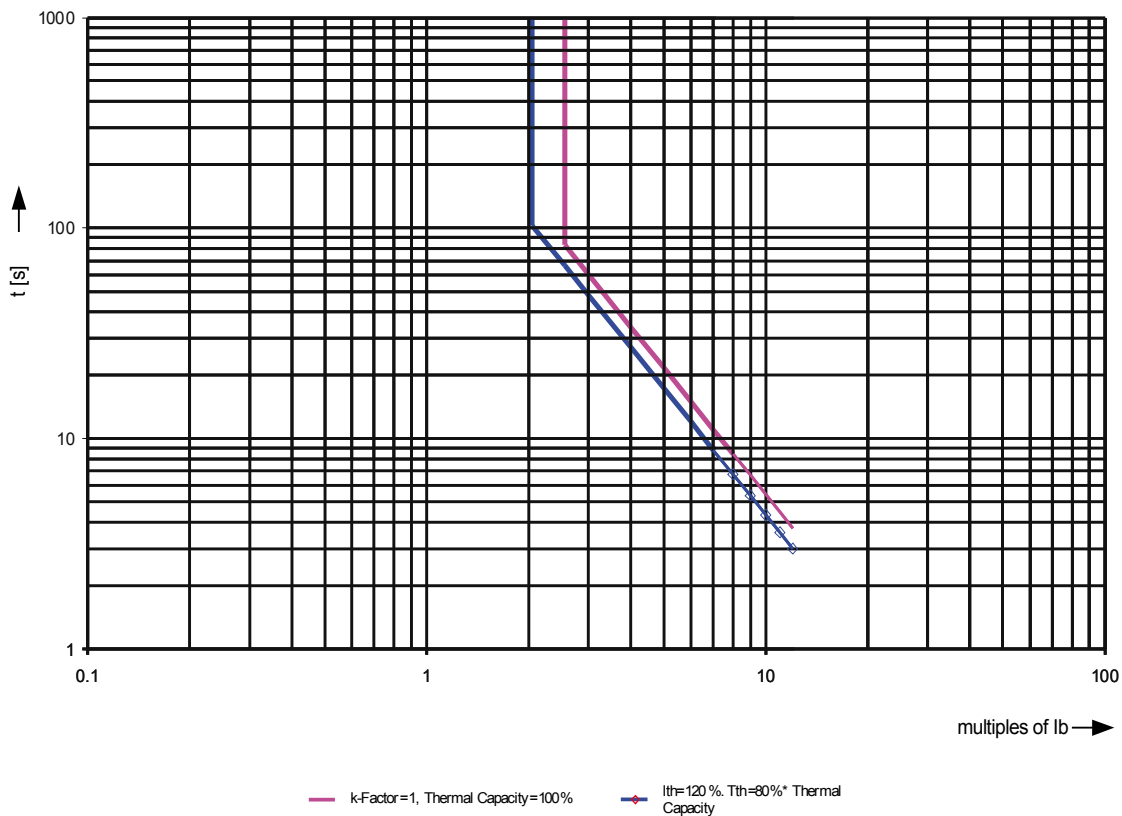
Without stator temperature, given the current threshold of 1.0 \* Ib (FLA) and 2.0 \* Ib (FLA) of the stator phase current, the thermal model will use the full thermal capacity in 139.54 seconds. However, if the stator temperature is known as 100°C (212°F), the effective ultimate trip current threshold is raised to 2.55 \* Ib (FLA) and the thermal capacity used will reach a steady state of 77.5%. As a result, the thermal model will never trip under this condition. From this example, it can be seen that the stator RTD could keep the motor running under overload condition. In this case, the appropriate direct stator temperature trip function must be enabled.

In the Thermal Replica Model Trip Curves with and without RTD, the unmarked lines are the thermal limit curves and the marked lines are the trip curves. From the curve without RTD, it can be seen that one can change the thermal current threshold to shift the upper portion of the trip curve right to allow the motor to run at a higher overload condition than is specified with the service factor. From the curve with RTD, it can be seen that the stator RTD pushes the effective thermal current threshold to 2.55 \* Ib (FLA) on the thermal limit curve (unmarked line). The marked line is the trip curve with 80% thermal capacity trip threshold, so actual effective thermal current threshold for the trip curve is about 2.05 \* Ib (FLA). Although in this case, the thermal current threshold is set to 1.50 \* Ib (FLA), it is effectively raised to a higher level with the stator RTD. Keep in mind that thermal limit and trip curves shown are based on the example above. They will vary with other sets of the settings.

Thermal Replica and Trip Curves without RTD




Thermal Replica Limit and Trip Curves with RTD =100°C



**NOTICE** The thermal model of the motor protection devices uses the hottest winding "WD" RTD value



## Global Protection Parameters of the Thermal Model

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /I-Prot /ThR]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /I-Prot /ThR]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the stage, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /I-Prot /ThR]
Use RTD values 	Take RTD values into account for the calculation of the Thermal Model.	inactive, active	inactive	[Protection Para /Global Prot Para /I-Prot /ThR]
K2 	This value represents the negative sequence current weighting factor of the motor.	0.10 - 10.00	6.01	[Protection Para /Global Prot Para /I-Prot /ThR]
t-cool 	Cooling time constant	5 - 240	60	[Protection Para /Global Prot Para /I-Prot /ThR]

## Setting Group Parameters of the Thermal Model

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/stage.	inactive, active	active	[Protection Para <1..4> /I-Prot /ThR]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo Fc=active".	inactive, active	inactive	[Protection Para <1..4> /I-Prot /ThR]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/stage.	inactive, active	inactive	[Protection Para <1..4> /I-Prot /ThR]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo TripCmd Fc=active".	inactive, active	inactive	[Protection Para <1..4> /I-Prot /ThR]
Trip Function 	Turn on or off the trip function	inactive, active	active	[Protection Para <1..4> /I-Prot /ThR]
Trip Threshold 	Trip threshold at which the thermal model will trip, based on percentage of thermal capacity used. This value should typically always be set at 0.99  Only available if: Trip Function = active	0.60 - 0.99	0.99	[Protection Para <1..4> /I-Prot /ThR]
t-Trip Delay 	Thermal capacity used trip delay  Only available if: Trip Function = active	0.0 - 3600.0s	0.0s	[Protection Para <1..4> /I-Prot /ThR]
Alarm Function 	Turn on or off the alarm function	inactive, active	active	[Protection Para <1..4> /I-Prot /ThR]

## Protective Elements

Parameter	Description	Setting range	Default	Menu path
Alarm Threshold 	Alarm threshold at which the thermal model will trip, based on percentage of thermal capacity used  Only available if: Alarm Function = active	0.60 - 0.99	0.70	[Protection Para /<1..4> /I-Prot /ThR]
t-Alarm Delay 	Thermal capacity used alarm delay  Only available if: Alarm Function = active	1 - 360min	1min	[Protection Para /<1..4> /I-Prot /ThR]


## Thermal Model Module Input States

Name	Description	Assignment via
ExBlo1	Module input state: External blocking	[Protection Para /Global Prot Para /I-Prot /ThR]
ExBlo2	Module input state: External blocking	[Protection Para /Global Prot Para /I-Prot /ThR]
ExBlo TripCmd	Module input state: External Blocking of the Trip Command	[Protection Para /Global Prot Para /I-Prot /ThR]

### Thermal Model Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
Alarm Pickup	Signal: Alarm Pickup
Alarm Timeout	Signal: Alarm Timeout
RTD effective	RTD effective
Load above SF	Load above Service Factor
active	Signal: active
ExBlo	Signal: External Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Alarm	Signal: Alarm
Trip	Signal: Trip
TripCmd	Signal: Trip Command

### Direct Commands of the Thermal Model Module

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
 Res I2T Used	Reset thermal capacity used.	inactive, active	inactive	[Operation / Reset/Acknowledge /Reset]

### Thermal Model Module Counter Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
I2T Used	Thermal capacity used.	0%	0 - 1000%	[Operation /Measured Values /ThR]
I2T Remained	Thermal capacity remained.	0%	0 - 1000%	[Operation /Measured Values /ThR]
NumberOfTripCmds	Number of trip commands since last reset	0	0 - 65535	[Operation /History /TripCmdCr]
nAlarms	nAlarms	0	0 - 65535	[Operation /History /AlarmCr]



## ExP - External Protection

Available stages:

ExP[1] , ExP[2] , ExP[3] , ExP[4]

### **NOTICE**

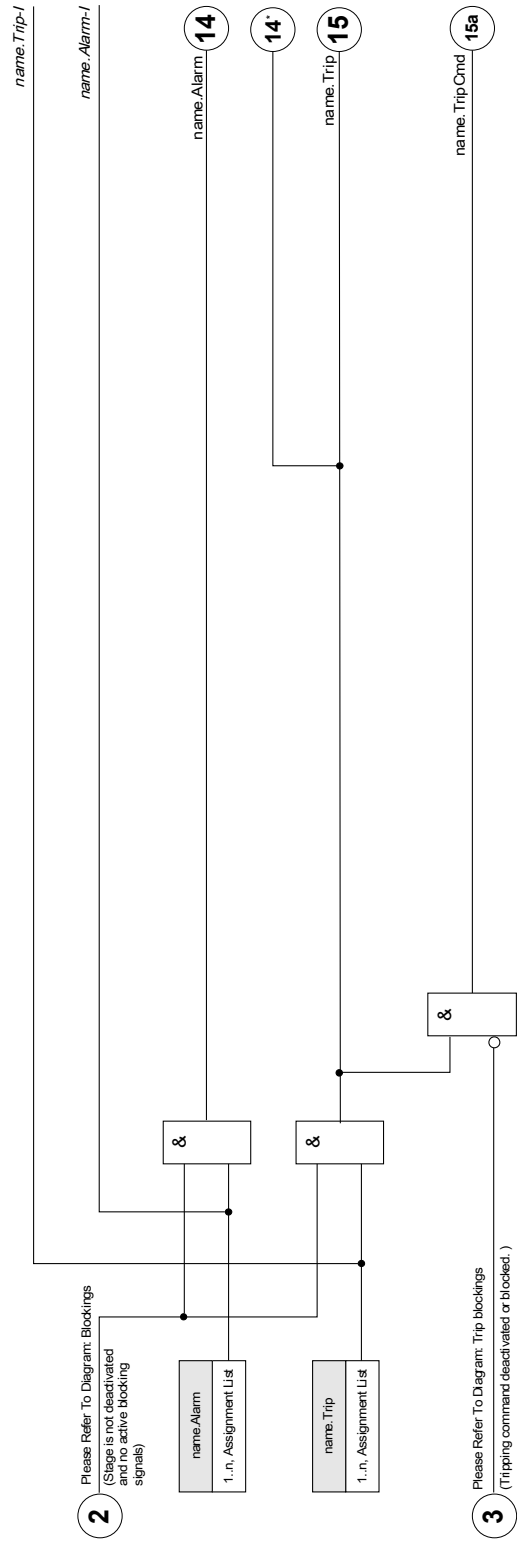
All 4 stages of the external protection ExP[1]...[4] are identically structured.

By using the module External Protection the following can be incorporated into the device function: trip commands, alarms and blockades of external protection facilities. Devices which are not provided with a communication interface can be connected to the control system as well.


**Exp[1]..[n]**

**name = Exp[1]..[n]**






\*=if no signal is assigned to the alarm input







## Device Planning Parameters of the Module External Protection

Parameter	Description	Options	Default	Menu path
Mode 	Mode	do not use, use	do not use	[Device planning]

## Global Protection Parameters of the Module External Protection

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /ExP /ExP[1]]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /ExP /ExP[1]]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the stage, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /ExP /ExP[1]]
Alarm 	Assignment for External Alarm	1..n, Assignment List	--	[Protection Para /Global Prot Para /ExP /ExP[1]]
Trip 	External trip of the CB if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /ExP /ExP[1]]

## Setting Group Parameters of the Module External Protection

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Function 	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Protection Para /<1..4> /ExP /ExP[1]]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo Fc=active".	inactive, active	inactive	[Protection Para /<1..4> /ExP /ExP[1]]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/stage.	inactive, active	inactive	[Protection Para /<1..4> /ExP /ExP[1]]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo TripCmd Fc=active".	inactive, active	inactive	[Protection Para /<1..4> /ExP /ExP[1]]

## Module External Protection Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module input state: External blocking1	[Protection Para /Global Prot Para /ExP /ExP[1]]
ExBlo2-I	Module input state: External blocking2	[Protection Para /Global Prot Para /ExP /ExP[1]]
ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command	[Protection Para /Global Prot Para /ExP /ExP[1]]
Alarm-I	Module input state: Alarm	[Protection Para /Global Prot Para /ExP /ExP[1]]
Trip-I	Module input state: Trip	[Protection Para /Global Prot Para /ExP /ExP[1]]

## Module External Protection Signals (Output States)

<i>Signal</i>	<i>Description</i>
active	Signal: active
ExBlo	Signal: External Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Alarm	Signal: Alarm
Trip	Signal: Trip
TripCmd	Signal: Trip Command

## **Commissioning: External Protection**

### *Object to be tested*

Test of the module External Protection

### *Necessary means*

- Depending on the application

### *Procedure*

Simulate the functionality of the External Protection (Alarm, Trip, Blockings...) by (de-)energizing of the digital inputs.

### *Successful test result*

All external alarms, external trips and external blockings are correctly recognized and processed by the device.

## RTD Protection Module

Elements:

RTD

### General – Principle Use

#### **NOTICE**

The Resistance-based Temperature Detector (RTD) Protection Module uses temperature data that are provided by a Universal Resistance-based Temperature Detector (URTD) module (please refer to the URTD Module section).

#### **NOTICE**

If voting trip is required, please map the output used for tripping purposes: "RTD.Voting Trip Grp 1" or "RTD.Voting Trip Grp 2"

The protective device provides tripping and alarming functions based on the direct temperature measurements read from the URTD device that has 11 temperature sensor channels. Each channel will have one trip function without an intended delay and one alarm function with a delay.

- The "trip" function has only a threshold setting.

- Each individual »Alarm Function« will have a threshold setting range, and can be individually enabled or disabled. Since the temperature cannot change instantaneously (which is a way that temperature differs from current), the "delay" is essentially built in to the function due to the fact that the temperature will take some time to increase from room temperature to the "trip threshold" level.

- The dropout ratio for both trip and alarm is 0.99.

- 

The temperature rise is limited by the RTD driver.

The entire function can be turned off or on, or individual channels can be turned off or on.

### *Voting*

Additionally, RTD voting schemes are available and User programmable. The Voting feature must be activated and configured within the following menu, [Protection Para\Set[x]\Temp-Prot/ RTD\Vote[x]]. Here, the setting »*Function*« has to be set to »*Active*«.

Once activated, the number of channels that will be used by the voting feature is selected. This is set by way of the parameter »*Voting[x]*«. This parameter defines how many of the selected channels must be over its threshold level in order to get a voting trip. Each individual channel must be selected or deselected by setting to either »*Yes*« or »*No*«. When selecting »*Yes*«, the channel will be used in the voting process. Note that in order to be selected, each channel must also be active and the RTD module itself has to be active.

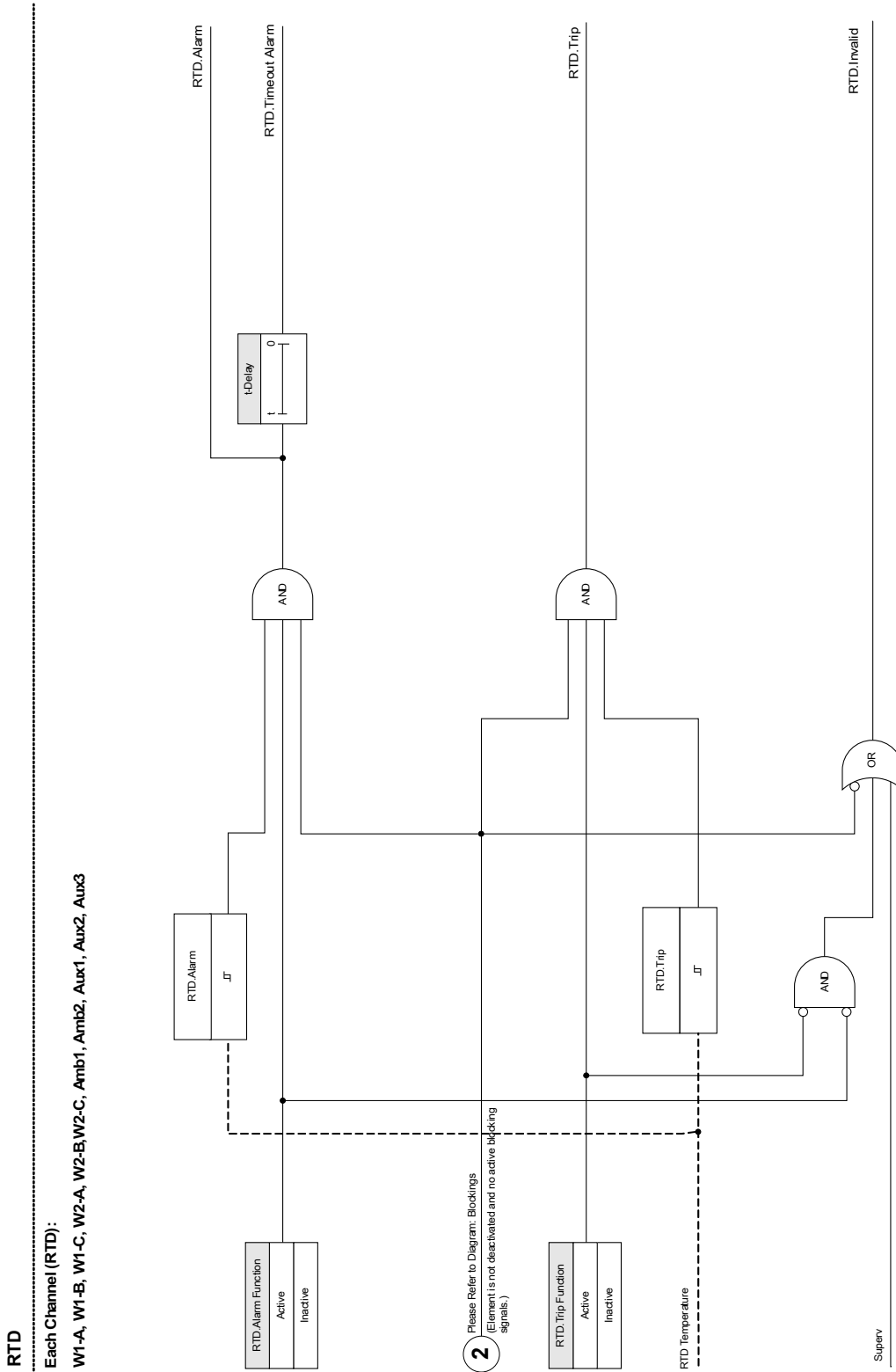
If for example, Vote[x] is set to »3«, and all channels are set to »*Yes*«, and if any three of the selected channels exceed their individual threshold settings, a Vote trip will occur.

Please note that the voting trip will be issued as a RTD trip only, if the parameter »*TripCmd Selection*« is set to »*Voting trip*« within the Global Protection Parameters of the RTD module. The Trip has to be assigned then within the trip manager to the Breaker.



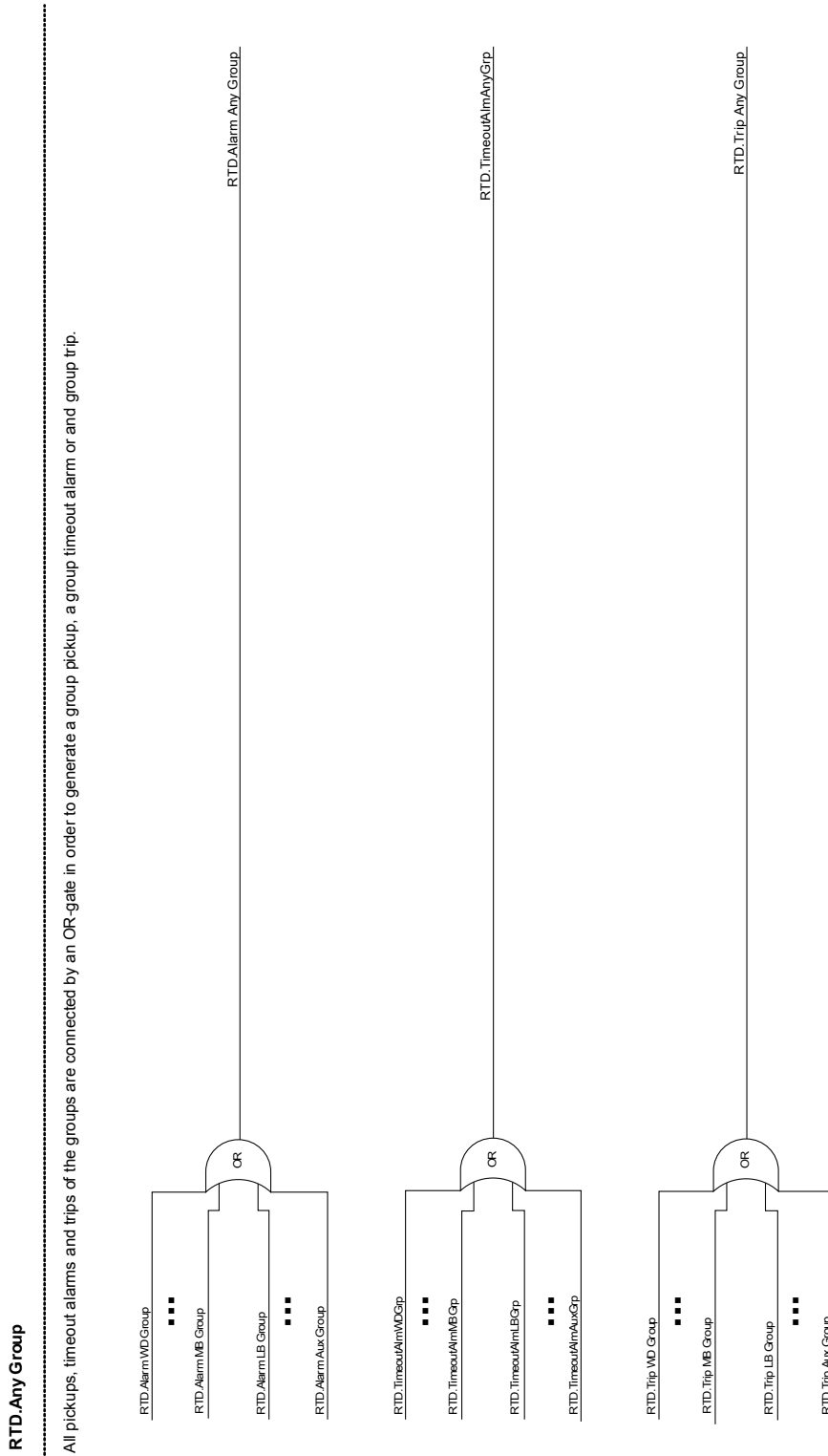
## Alarm, Timeout Alarm and Trip Principle for each RTD Sensor

The following diagram shows the general working principle (delayed alarm, undelayed trip) of each of the RTD sensors.



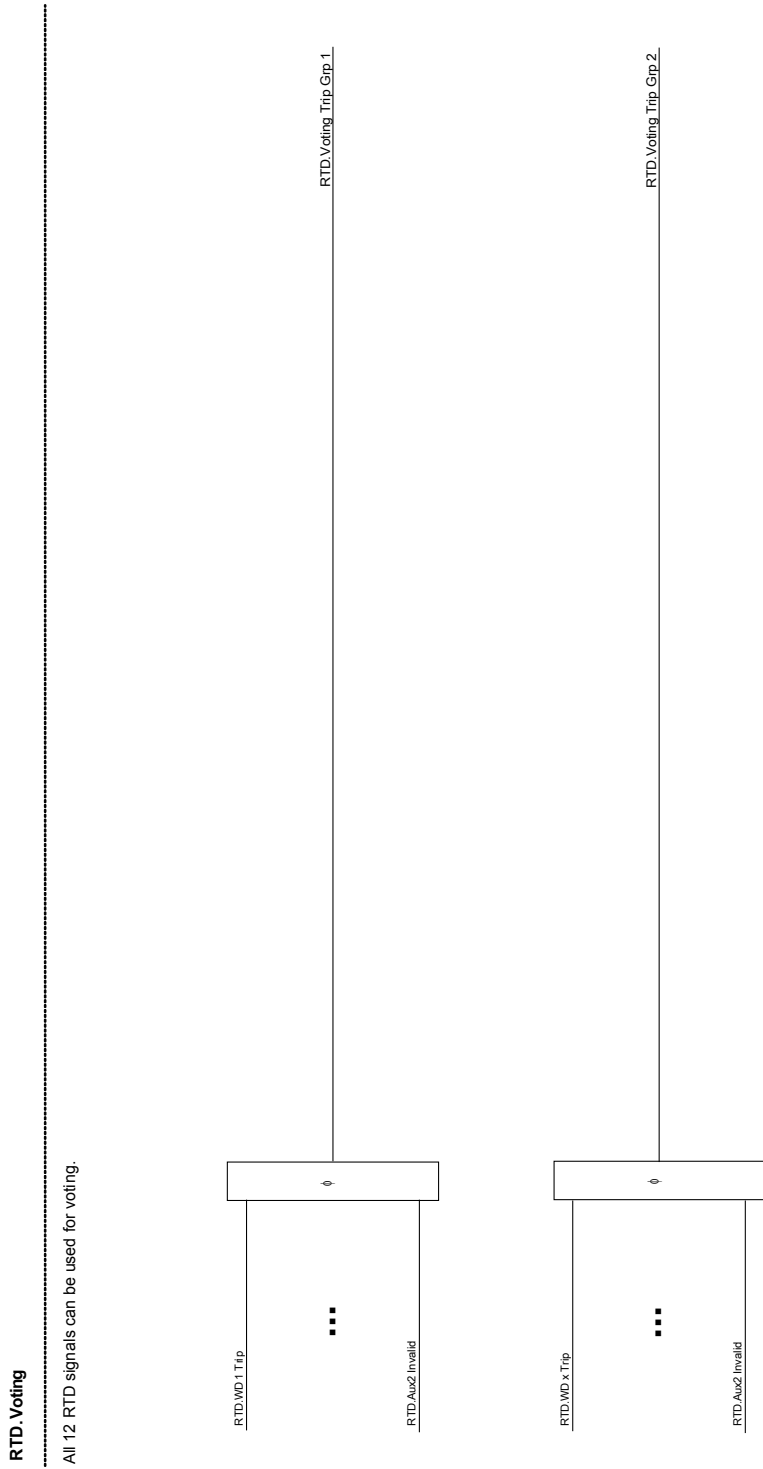
## Collective Alarm, Timeout Alarm and Trip Signals

The RTD sensors are assigned to four groups (depending on the ordered device). These four groups are OR-connected to the "AnyGroup". The AnyGroup generates an alarm, an timeout alarm and a trip signal if any of the sensors mounted into this issues the corresponding signal.



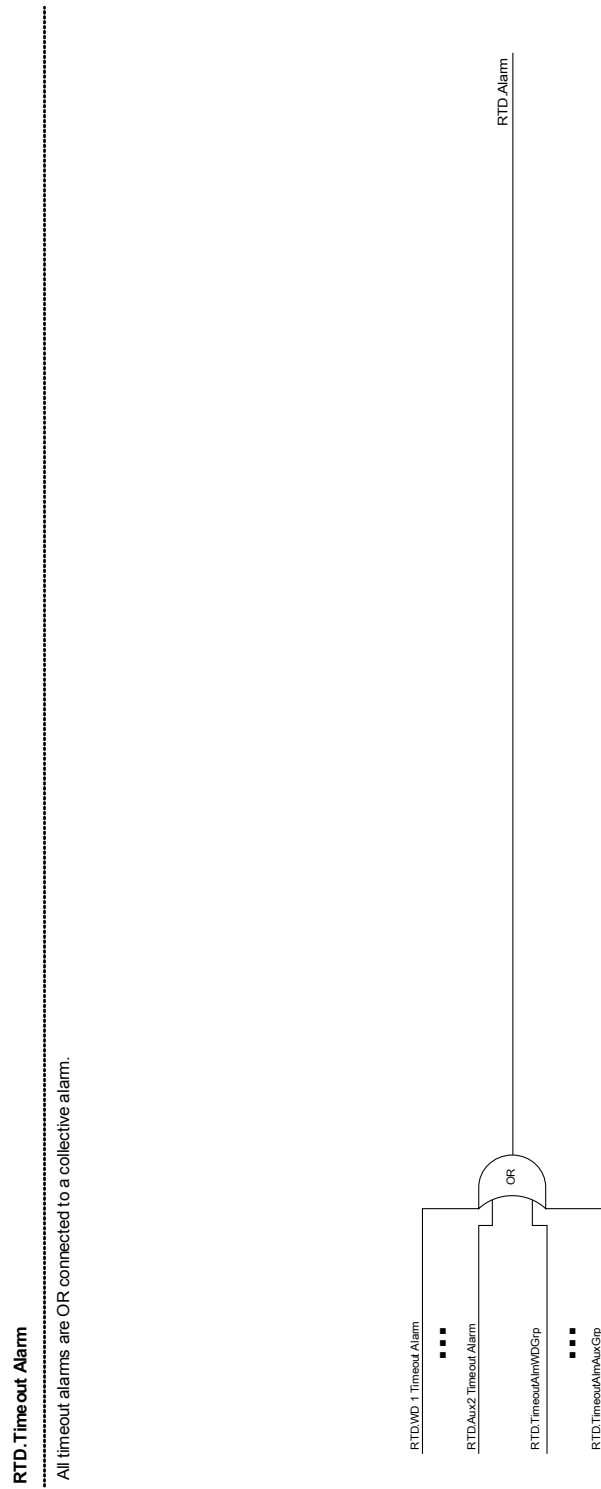
## Trips of the Voting Groups

In order to use voting groups the user has to determine the sensors that should belong to a voting group and how many of them have to trip in order to generate a voting trip of the corresponding group.



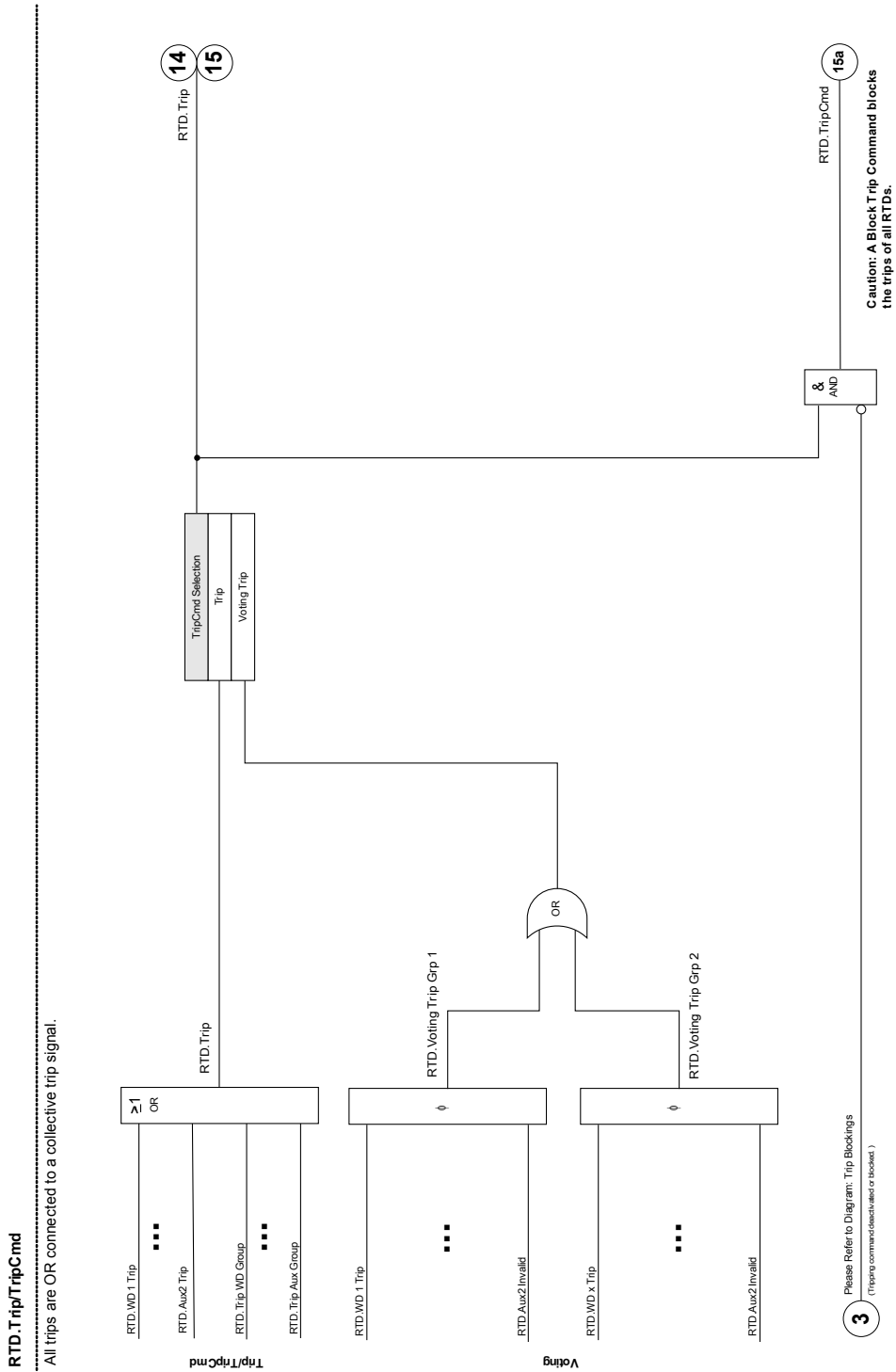
## Collective Timeout Alarm Signal

All RTD sensor timeout alarms and all group timeouts are OR-connected.




## Collective Trip Signal





By means of the trip command selection » *TripCmdSelection* « the user determines if the RTD element should use for the final trip signal the OR-connected default RTD trips or if the RTD element should use the OR-connected voting trips.




## Device Planning Parameters of the RTD Temperature Protection Module

Parameter	Description	Options	Default	Menu path
Mode 	Mode	do not use, use	do not use	[Device planning]

## Global Protection Parameters of the RTD Temperature Protection Module

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	-.-	[Protection Para /Global Prot Para /Temp-Prot /RTD]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	-.-	[Protection Para /Global Prot Para /Temp-Prot /RTD]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the stage, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	-.-	[Protection Para /Global Prot Para /Temp-Prot /RTD]
TripCmd Selection 	This parameter determines if the final trip of the RTD module is issued by the default way or by the voting groups.	Trip, Voting Trip	Trip	[Protection Para /Global Prot Para /Temp-Prot /RTD]

## Setting Group Parameters of the RTD Temperature Protection Module

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Protection Para <1..4> /Temp-Prot /RTD /General settings]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo Fc=active".	inactive, active	inactive	[Protection Para <1..4> /Temp-Prot /RTD /General settings]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/stage.	inactive, active	inactive	[Protection Para <1..4> /Temp-Prot /RTD /General settings]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo TripCmd Fc=active".	inactive, active	inactive	[Protection Para <1..4> /Temp-Prot /RTD /General settings]
Windg 1 Alarm Function 	Winding 1 Alarm Function	inactive, active	active	[Protection Para <1..4> /Temp-Prot /RTD /Windg 1]
Windg 1 Trip Function 	Winding 1 Trip Function	inactive, active	active	[Protection Para <1..4> /Temp-Prot /RTD /Windg 1]
Windg 1 Alarm 	Winding 1 Threshold for Temperature Alarm  Only available if: Device planning: Alarm Function = use	0 - 200°C	80°C	[Protection Para <1..4> /Temp-Prot /RTD /Windg 1]

## Protective Elements

Parameter	Description	Setting range	Default	Menu path
Windg 1 t-Delay 	Winding 1 If this time is expired a Temperature Alarm will be generated.  Only available if: Device planning: Alarm Function = use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /Windg 1]
Windg 1 Trip 	Winding 1 Threshold for Temperature Trip  Only available if: Device planning: Trip Function = use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /Windg 1]
Windg 2 Alarm Function 	Winding 2 Alarm Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /Windg 2]
Windg 2 Trip Function 	Winding 2 Trip Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /Windg 2]
Windg 2 Alarm 	Winding 2 Threshold for Temperature Alarm  Only available if: Device planning: Alarm Function = use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /Windg 2]
Windg 2 t-Delay 	Winding 2 If this time is expired a Temperature Alarm will be generated.  Only available if: Device planning: Alarm Function = use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /Windg 2]
Windg 2 Trip 	Winding 2 Threshold for Temperature Trip  Only available if: Device planning: Trip Function = use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /Windg 2]



## Protective Elements

Parameter	Description	Setting range	Default	Menu path
Windg 3 Alarm Function 	Winding 3 Alarm Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /Windg 3]
Windg 3 Trip Function 	Winding 3 Trip Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /Windg 3]
Windg 3 Alarm 	Winding 3 Threshold for Temperature Alarm  Only available if: Device planning: Alarm Function = use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /Windg 3]
Windg 3 t-Delay 	Winding 3 If this time is expired a Temperature Alarm will be generated.  Only available if: Device planning: Alarm Function = use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /Windg 3]
Windg 3 Trip 	Winding 3 Threshold for Temperature Trip  Only available if: Device planning: Trip Function = use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /Windg 3]
Windg 4 Alarm Function 	Winding 4 Alarm Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /Windg 4]
Windg 4 Trip Function 	Winding 4 Trip Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /Windg 4]

## Protective Elements

Parameter	Description	Setting range	Default	Menu path
Windg 4 Alarm 	Winding 4 Threshold for Temperature Alarm  Only available if: Device planning: Alarm Function = use	0 - 200°C	80°C	[Protection Para <1..4> /Temp-Prot /RTD /Windg 4]
Windg 4 t-Delay 	Winding 4 If this time is expired a Temperature Alarm will be generated.  Only available if: Device planning: Alarm Function = use	0 - 360min	1min	[Protection Para <1..4> /Temp-Prot /RTD /Windg 4]
Windg 4 Trip 	Winding 4 Threshold for Temperature Trip  Only available if: Device planning: Trip Function = use	0 - 200°C	100°C	[Protection Para <1..4> /Temp-Prot /RTD /Windg 4]
Windg 5 Alarm Function 	Winding 5 Alarm Function	inactive, active	active	[Protection Para <1..4> /Temp-Prot /RTD /Windg 5]
Windg 5 Trip Function 	Winding 5 Trip Function	inactive, active	active	[Protection Para <1..4> /Temp-Prot /RTD /Windg 5]
Windg 5 Alarm 	Winding 5 Threshold for Temperature Alarm  Only available if: Device planning: Alarm Function = use	0 - 200°C	80°C	[Protection Para <1..4> /Temp-Prot /RTD /Windg 5]
Windg 5 t-Delay 	Winding 5 If this time is expired a Temperature Alarm will be generated.  Only available if: Device planning: Alarm Function = use	0 - 360min	1min	[Protection Para <1..4> /Temp-Prot /RTD /Windg 5]

## Protective Elements

Parameter	Description	Setting range	Default	Menu path
Windg 5 Trip 	Winding 5 Threshold for Temperature Trip  Only available if: Device planning: Trip Function = use	0 - 200°C	100°C	[Protection Para <1..4> /Temp-Prot /RTD /Windg 5]
Windg 6 Alarm Function 	Winding 6 Alarm Function	inactive, active	active	[Protection Para <1..4> /Temp-Prot /RTD /Windg 6]
Windg 6 Trip Function 	Winding 6 Trip Function	inactive, active	active	[Protection Para <1..4> /Temp-Prot /RTD /Windg 6]
Windg 6 Alarm 	Winding 6 Threshold for Temperature Alarm  Only available if: Device planning: Alarm Function = use	0 - 200°C	80°C	[Protection Para <1..4> /Temp-Prot /RTD /Windg 6]
Windg 6 t-Delay 	Winding 6 If this time is expired a Temperature Alarm will be generated.  Only available if: Device planning: Alarm Function = use	0 - 360min	1min	[Protection Para <1..4> /Temp-Prot /RTD /Windg 6]
Windg 6 Trip 	Winding 6 Threshold for Temperature Trip  Only available if: Device planning: Trip Function = use	0 - 200°C	100°C	[Protection Para <1..4> /Temp-Prot /RTD /Windg 6]
MotBear 1 Alarm Function 	Motor Bearing 1 Alarm Function	inactive, active	active	[Protection Para <1..4> /Temp-Prot /RTD /MotBear 1]

## Protective Elements

Parameter	Description	Setting range	Default	Menu path
 MotBear 1 Trip Function	Motor Bearing 1 Trip Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /MotBear 1]
 MotBear 1 Alarm	Motor Bearing 1 Threshold for Temperature Alarm  Only available if: Device planning: Alarm Function = use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /MotBear 1]
 MotBear 1 t-Delay	Motor Bearing 1 If this time is expired a Temperature Alarm will be generated.  Only available if: Device planning: Alarm Function = use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /MotBear 1]
 MotBear 1 Trip	Motor Bearing 1 Threshold for Temperature Trip  Only available if: Device planning: Trip Function = use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /MotBear 1]
 MotBear 2 Alarm Function	Motor Bearing 2 Alarm Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /MotBear 2]
 MotBear 2 Trip Function	Motor Bearing 2 Trip Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /MotBear 2]
 MotBear 2 Alarm	Motor Bearing 2 Threshold for Temperature Alarm  Only available if: Device planning: Alarm Function = use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /MotBear 2]

## Protective Elements

Parameter	Description	Setting range	Default	Menu path
 MotBear 2 t-Delay	Motor Bearing 2 If this time is expired a Temperature Alarm will be generated.  Only available if: Device planning: Alarm Function = use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /MotBear 2]
 MotBear 2 Trip	Motor Bearing 2 Threshold for Temperature Trip  Only available if: Device planning: Trip Function = use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /MotBear 2]
 LoadBear 1 Alarm Function	Load Bearing 1 Alarm Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /LoadBear 1]
 LoadBear 1 Trip Function	Load Bearing 1 Trip Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /LoadBear 1]
 LoadBear 1 Alarm	Load Bearing 1 Threshold for Temperature Alarm  Only available if: Device planning: Alarm Function = use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /LoadBear 1]
 LoadBear 1 t-Delay	Load Bearing 1 If this time is expired a Temperature Alarm will be generated.  Only available if: Device planning: Alarm Function = use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /LoadBear 1]
 LoadBear 1 Trip	Load Bearing 1 Threshold for Temperature Trip  Only available if: Device planning: Trip Function = use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /LoadBear 1]

## Protective Elements

Parameter	Description	Setting range	Default	Menu path
 LoadBear 2 Alarm Function	Load Bearing 2 Alarm Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /LoadBear 2]
 LoadBear 2 Trip Function	Load Bearing 2 Trip Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /LoadBear 2]
 LoadBear 2 Alarm	Load Bearing 2 Threshold for Temperature Alarm  Only available if: Device planning: Alarm Function = use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /LoadBear 2]
 LoadBear 2 t-Delay	Load Bearing 2 If this time is expired a Temperature Alarm will be generated.  Only available if: Device planning: Alarm Function = use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /LoadBear 2]
 LoadBear 2 Trip	Load Bearing 2 Threshold for Temperature Trip  Only available if: Device planning: Trip Function = use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /LoadBear 2]
 Aux1 Alarm Function	Auxiliary 1 Alarm Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /Aux 1]
 Aux1 Trip Function	Auxiliary 1 Trip Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /Aux 1]

## Protective Elements

Parameter	Description	Setting range	Default	Menu path
 Aux1 Alarm	Auxiliary 1 Threshold for Temperature Alarm  Only available if: Device planning: Alarm Function1 = use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /Aux 1]
 Aux1 t-Delay	Auxiliary 1 If this time is expired a Temperature Alarm will be generated.  Only available if: Device planning: Alarm Function1 = use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /Aux 1]
 Aux1 Trip	Auxiliary 1 Threshold for Temperature Trip  Only available if: Device planning: Trip Function2 = use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /Aux 1]
 Aux2 Alarm Function	Auxiliary 2 Alarm Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /Aux 2]
 Aux2 Trip Function	Auxiliary 2 Trip Function	inactive, active	active	[Protection Para /<1..4> /Temp-Prot /RTD /Aux 2]
 Aux2 Alarm	Auxiliary 2 Threshold for Temperature Alarm  Only available if: Device planning: Alarm Function2 = use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /Aux 2]
 Aux2 t-Delay	Auxiliary 2 If this time is expired a Temperature Alarm will be generated.  Only available if: Device planning: Alarm Function2 = use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /Aux 2]

## Protective Elements

Parameter	Description	Setting range	Default	Menu path
 Aux2 Trip	Auxiliary 2 Threshold for Temperature Trip  Only available if: Device planning: Trip Function2 = use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /Aux 2]
 Windg Alarm Function	Winding Alarm Function	inactive, active	inactive	[Protection Para /<1..4> /Temp-Prot /RTD /Windg Group]
 Windg Trip Function	Winding Trip Function	inactive, active	inactive	[Protection Para /<1..4> /Temp-Prot /RTD /Windg Group]
 Windg Alarm	Winding Threshold for Temperature Alarm  Only available if: Device planning: Alarm Function = use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /Windg Group]
 Windg t-Delay	Winding If this time is expired a Temperature Alarm will be generated.  Only available if: Device planning: Alarm Function = use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /Windg Group]
 Windg Trip	Winding Threshold for Temperature Trip  Only available if: Device planning: Trip Function = use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /Windg Group]
 MotBear Alarm Function	Motor Bearing Alarm Function	inactive, active	inactive	[Protection Para /<1..4> /Temp-Prot /RTD /MotBear Group]










## Protective Elements

Parameter	Description	Setting range	Default	Menu path
 MotBear Trip Function	Motor Bearing Trip Function	inactive, active	inactive	[Protection Para /<1..4> /Temp-Prot /RTD /MotBear Group]
 MotBear Alarm	Motor Bearing Threshold for Temperature Alarm  Only available if: Device planning: Alarm Function = use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /MotBear Group]
 MotBear t-Delay	Motor Bearing If this time is expired a Temperature Alarm will be generated.  Only available if: Device planning: Alarm Function = use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /MotBear Group]
 MotBear Trip	Motor Bearing Threshold for Temperature Trip  Only available if: Device planning: Trip Function = use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /MotBear Group]
 LoadBear Alarm Function	Load Bearing Alarm Function	inactive, active	inactive	[Protection Para /<1..4> /Temp-Prot /RTD /LoadBear Group]
 LoadBear Trip Function	Load Bearing Trip Function	inactive, active	inactive	[Protection Para /<1..4> /Temp-Prot /RTD /LoadBear Group]
 LoadBear Alarm	Load Bearing Threshold for Temperature Alarm  Only available if: Device planning: Alarm Function = use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /LoadBear Group]

## Protective Elements

Parameter	Description	Setting range	Default	Menu path
 LoadBear t-Delay	Load Bearing If this time is expired a Temperature Alarm will be generated.  Only available if: Device planning: Alarm Function = use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /LoadBear Group]
 LoadBear Trip	Load Bearing Threshold for Temperature Trip  Only available if: Device planning: Trip Function = use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /LoadBear Group]
 Aux Alarm Function	Auxiliary Alarm Function	inactive, active	inactive	[Protection Para /<1..4> /Temp-Prot /RTD /Aux Group]
 Aux Trip Function	Auxiliary Trip Function	inactive, active	inactive	[Protection Para /<1..4> /Temp-Prot /RTD /Aux Group]
 Aux Alarm	Auxiliary Threshold for Temperature Alarm  Only available if: Device planning: Alarm Function = use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /Aux Group]
 Aux t-Delay	Auxiliary If this time is expired a Temperature Alarm will be generated.  Only available if: Device planning: Alarm Function = use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /Aux Group]
 Aux Trip	Auxiliary Threshold for Temperature Trip  Only available if: Device planning: Aux = use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /Aux Group]








Protective Elements

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
Voting 1 	Voting: This parameter defines how many of the selected channels must be over its threshold level for getting a voting trip	1 - 12	1	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
Windg 1 	Winding 1	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
Windg 2 	Winding 2	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
Windg 3 	Winding 3	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
Windg 4 	Winding 4	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
Windg 5 	Winding 5	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]








## Protective Elements

Parameter	Description	Setting range	Default	Menu path
Windg 6 	Winding 6	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
MotBear 1 	Motor Bearing 1	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
MotBear 2 	Motor Bearing 2	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
LoadBear 1 	Load Bearing 1	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
LoadBear 2 	Load Bearing 2	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
Aux1 	Auxiliary1	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
Aux2 	Auxiliary2	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]

Protective Elements

Parameter	Description	Setting range	Default	Menu path
 Function	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
 Voting 2	Voting: This parameter defines how many of the selected channels must be over its threshold level for getting a voting trip	1 - 12	1	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
 Windg 1	Winding 1	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
 Windg 2	Winding 2	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
 Windg 3	Winding 3	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
 Windg 4	Winding 4	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
 Windg 5	Winding 5	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]

Protective Elements

Parameter	Description	Setting range	Default	Menu path
Windg 6 	Winding 6	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
MotBear 1 	Motor Bearing 1	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
MotBear 2 	Motor Bearing 2	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
LoadBear 1 	Load Bearing 1	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
LoadBear 2 	Load Bearing 2	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
Aux1 	Auxiliary1	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
Aux2 	Auxiliary2	no, yes	no	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]

## RTD Temperature Protection Module Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module input state: External blocking1	[Protection Para /Global Prot Para /Temp-Prot /RTD]
ExBlo2-I	Module input state: External blocking2	[Protection Para /Global Prot Para /Temp-Prot /RTD]
ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command	[Protection Para /Global Prot Para /Temp-Prot /RTD]

## RTD Temperature Protection Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
active	Signal: active
ExBlo	Signal: External Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Alarm	Alarm RTD Temperature Protection
Trip	Signal: Trip
TripCmd	Signal: Trip Command
Windg 1 Trip	Winding 1 Signal: Trip
Windg 1 Alarm	Winding 1 Alarm RTD Temperature Protection
Windg 1 Timeout Alarm	Winding 1 Timeout Alarm
Windg 1 Invalid	Winding 1 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Windg 2 Trip	Winding 2 Signal: Trip
Windg 2 Alarm	Winding 2 Alarm RTD Temperature Protection
Windg 2 Timeout Alarm	Winding 2 Timeout Alarm
Windg 2 Invalid	Winding 2 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Windg 3 Trip	Winding 3 Signal: Trip
Windg 3 Alarm	Winding 3 Alarm RTD Temperature Protection
Windg 3 Timeout Alarm	Winding 3 Timeout Alarm

## Protective Elements

<i>Signal</i>	<i>Description</i>
Windg 3 Invalid	Winding 3 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Windg 4 Trip	Winding 4 Signal: Trip
Windg 4 Alarm	Winding 4 Alarm RTD Temperature Protection
Windg 4 Timeout Alarm	Winding 4 Timeout Alarm
Windg 4 Invalid	Winding 4 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Windg 5 Trip	Winding 5 Signal: Trip
Windg 5 Alarm	Winding 5 Alarm RTD Temperature Protection
Windg 5 Timeout Alarm	Winding 5 Timeout Alarm
Windg 5 Invalid	Winding 5 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Windg 6 Trip	Winding 6 Signal: Trip
Windg 6 Alarm	Winding 6 Alarm RTD Temperature Protection
Windg 6 Timeout Alarm	Winding 6 Timeout Alarm
Windg 6 Invalid	Winding 6 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
MotBear 1 Trip	Motor Bearing 1 Signal: Trip
MotBear 1 Alarm	Motor Bearing 1 Alarm RTD Temperature Protection
MotBear 1 Timeout Alarm	Motor Bearing 1 Timeout Alarm
MotBear 1 Invalid	Motor Bearing 1 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
MotBear 2 Trip	Motor Bearing 2 Signal: Trip
MotBear 2 Alarm	Motor Bearing 2 Alarm RTD Temperature Protection
MotBear 2 Timeout Alarm	Motor Bearing 2 Timeout Alarm
MotBear 2 Invalid	Motor Bearing 2 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
LoadBear 1 Trip	Load Bearing 1 Signal: Trip
LoadBear 1 Alarm	Load Bearing 1 Alarm RTD Temperature Protection
LoadBear 1 Timeout Alarm	Load Bearing 1 Timeout Alarm
LoadBear 1 Invalid	Load Bearing 1 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
LoadBear 2 Trip	Load Bearing 2 Signal: Trip
LoadBear 2 Alarm	Load Bearing 2 Alarm RTD Temperature Protection
LoadBear 2 Timeout Alarm	Load Bearing 2 Timeout Alarm
LoadBear 2 Invalid	Load Bearing 2 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Aux1 Trip	Auxiliary 1 Signal: Trip
Aux1 Alarm	Auxiliary 1 Alarm RTD Temperature Protection
Aux1 Timeout Alarm	Auxiliary 1 Timeout Alarm
Aux1 Invalid	Auxiliary 1 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Aux2 Trip	Auxiliary 2 Signal: Trip



## Protective Elements

<i>Signal</i>	<i>Description</i>
Aux2 Alarm	Auxiliary 2 Alarm RTD Temperature Protection
Aux2 Timeout Alarm	Auxiliary 2 Timeout Alarm
Aux2 Invalid	Auxiliary 2 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Trip WD Group	Trip all Windings
Alarm WD Group	Alarm all Windings
TimeoutAlmWDGrp	Timeout Alarm all Windings
Windg Group Invalid	Winding Group Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Trip MB Group	Trip all Motor Bearings
Alarm MB Group	Alarm all Motor Bearings
TimeoutAlmMBGrp	Timeout Alarm all Motor Bearings
MotBear Group Invalid	Motor Bearing Group Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Trip LB Group	Trip all Load Bearings
Alarm LB Group	Alarm all Load Bearings
TimeoutAlmLBGrp	Timeout Alarm all Load Bearings
LoadBear Group Invalid	Load Bearing Group Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Trip Any Group	Trip Any Group
Alarm Any Group	Alarm Any Group
TimeoutAlmAnyGrp	Timeout Alarm Any Group
Trip Group 1	Trip Group 1
Trip Group 2	Trip Group 2
Timeout Alarm	Alarm timeout expired
Trip Aux Group	Trip Auxiliary Group
Alarm Aux Group	Alarm Auxiliary Group
TimeoutAlmAuxGrp	Timeout Alarm Auxiliary Group
AuxGrpInvalid	Invalid Auxiliary Group

**RTD Temperature Protection Module Counter Values**

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
HottestWindingTemp	Hottest motor winding temperature in degrees C.	0°C	0 - 200°C	[Operation /Measured Values /URTD]
HottestMotBearTemp	Hottest motor bearing temperature in degrees C.	0°C	0 - 200°C	[Operation /Measured Values /URTD]
HottestLoadBearTemp	Hottest load bearing temperature in degrees C.	0°C	0 - 200°C	[Operation /Measured Values /URTD]
HottestAuxTemp	Hottest Auxiliary temperature in degrees C.	0°C	0 - 200°C	[Operation /Measured Values /URTD]
HighestWdTemp	Highest motor winding temperature in degrees.	0°C	0 - 250°C	[Operation /History /OperationsCr]
HighestMbTemp	Highest motor bearing temperature in degrees.	0°C	0 - 250°C	[Operation /History /OperationsCr]
HighestLbTemp	Highest load bearing temperature in degrees.	0°C	0 - 250°C	[Operation /History /OperationsCr]
HighestAuxTemp	Highest Auxiliary temperature in degrees.	0°C	0 - 250°C	[Operation /History /OperationsCr]
nWdAlarms	Number of winding temperature alarms since last reset.	0	0 - 65535	[Operation /History /AlarmCr]
nMbAlarms	Number of motor bearing temperature alarms since last reset.	0	0 - 65535	[Operation /History /AlarmCr]
nLbAlarms	Number of load bearing temperature alarms since last reset.	0	0 - 65535	[Operation /History /AlarmCr]
nAuxAlarms	Number of auxiliary temperature alarms since last reset.	0	0 - 65535	[Operation /History /AlarmCr]

## Protective Elements

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<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
nWdTrips	Number of winding temperature trips since last reset.	0	0 - 65535	[Operation /History /TripCmdCr]
nMbTrips	Number of motor bearing temperature trips since last reset.	0	0 - 65535	[Operation /History /TripCmdCr]
nLbTrips	Number of load bearing temperature trips since last reset.	0	0 - 65535	[Operation /History /TripCmdCr]
nAuxTrips	Number of auxiliary temperature trips since last reset.	0	0 - 65535	[Operation /History /TripCmdCr]
nChannelFails	Number of RTD channel failures.	0	0 - 65535	[Operation /History /AlarmCr]

## URTDII Module Interface\*

\*=Availability on request

### URTD

### Principle – General Use

The optional Universal Resistance-based Temperature Detector II (URTDII) Module provides temperature data to the protective device from up to 12 RTDs embedded in the motor, generator, transformer, or cable connector and driven equipment. The temperature data will be shown as measured values and statistics in the Operating Data menu. In addition, each channel will be monitored. The measured data provided by the URTDII Module can also be used for temperature protection (please refer to the Temperature Protection section).

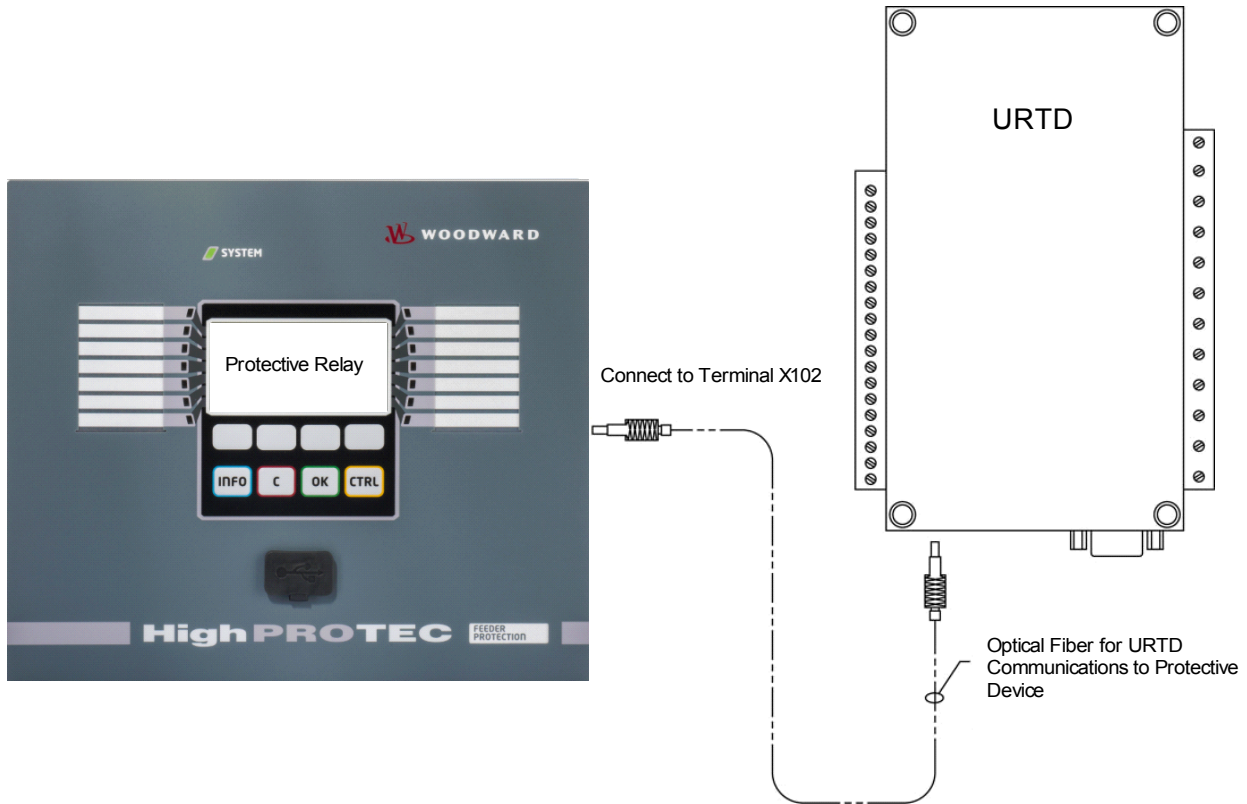
The URTDII conveys multiplexed temperature data back to the relay via a single optical fiber. The URTDII may be mounted remotely from the protective device. The fiber optic connector is located on the **X102** terminal of the protective device.

Consider the benefit of mounting the URTDII module away from the protective device and as close to the protected equipment as possible. The big bundle of RTD wires to the protected equipment becomes much shorter. The URTDII may be placed up to 400 ft (121.9 m) from the protective device with the optical fiber connection. Note that the URTDII will require a power supply connection at its remote location.

Connect a suitable source to the power terminals J10A-1 and J10A-2 on the URTDII module.

<u>Style</u>	<u>Power Supply</u>
URTDII-01	48-240 V AC 48-250 V DC
URTDII-02	24-48 V DC

## URTDII Module Fiber Optic Connection to the Protective Device



The figure above shows the fiber optic connections between the URTDII Module and the protective device. The protective device supports the optical fiber connection.

Preassembled plastic optical fibers with connectors can be ordered from any distributor of optical fiber products. In addition, these same distributors offer long rolls of cable with connectors that can be installed in the field. Some distributors will make custom lengths to order.

**NOTICE** Surplus length of a pre-cut fiber does not cause a problems. Simply coil and tie the excess fiber at a convenient point. Avoid high tie pressure. Bending radius of the fiber should be greater than 2 in. (50.8 mm).

The fiber termination at the URTDII simply snaps into or out of the connector. To connect the fiber termination at the protective device, push the plug of the fiber optic onto the device interface then turn it until it “snaps”.

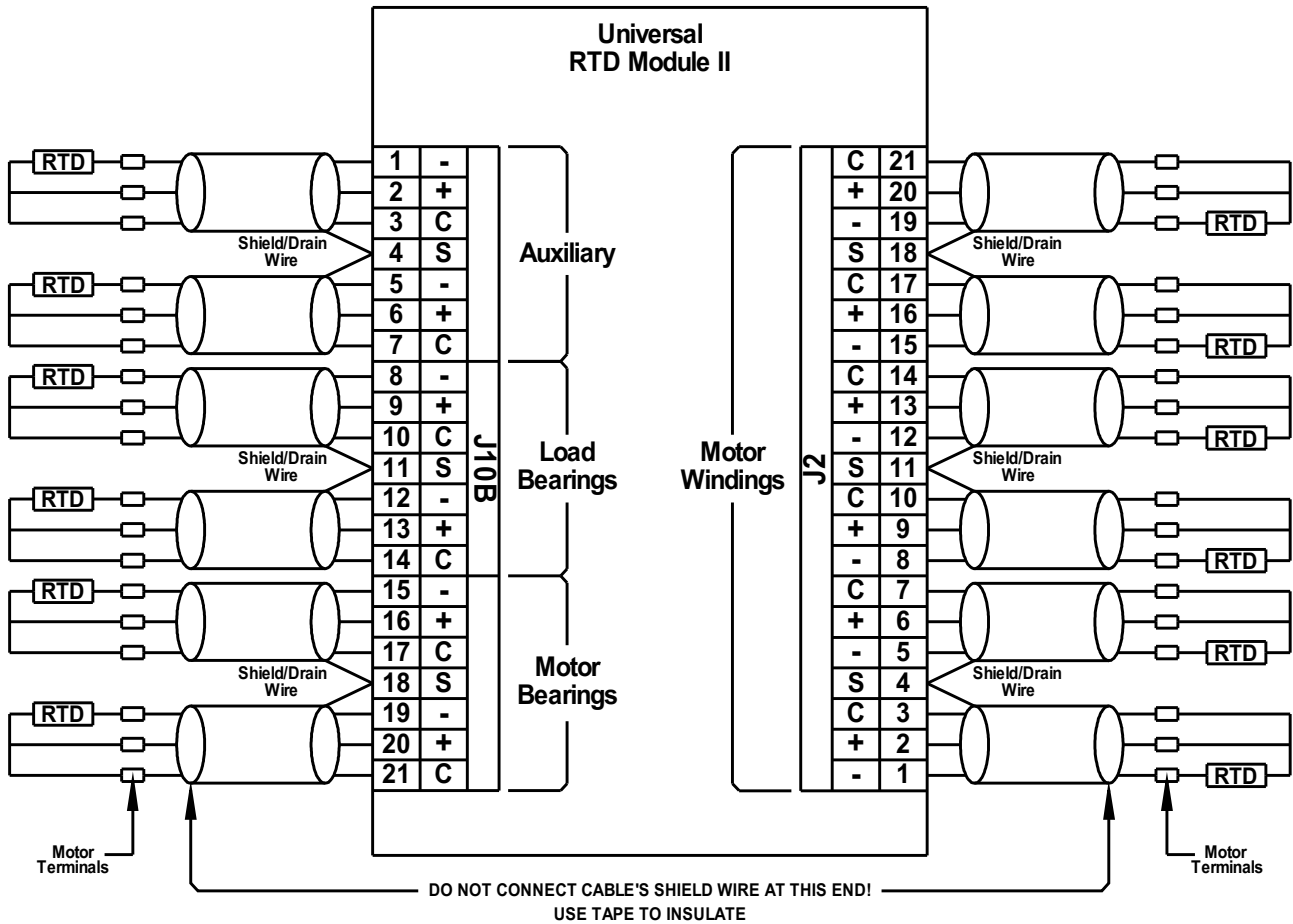
**CAUTION** The protective device as well as the URTDII have various power supply options. Make certain that the power supply is acceptable for both units before connecting the same power supply to both devices.

**NOTICE**

Consult the URTDII Module Instruction Leaflet for complete instructions.

Three URTD terminals are provided for each RTD input.

The three terminals for any unused RTD input channel should be wired together. For example, if MW5 and MW6 are unused, MW5 terminals J2-15, J2-16, and J2-17 should be wired together and MW6 terminals J2-19, J2-20, J2-21 should be separately wired together.







See the figure above for wiring of RTDs to the URTD inputs. Use three-conductor shielded cable. Note the connection rules in the figure. When making connections to a two-lead RTD, connect two of the cable conductors to one of the RTD leads as shown. Make this connection as close to the protected object as possible. Connect the third cable conductor to the remaining RTD lead.

Connect the shield / drain wire to the Shield terminal as shown in the figure. The RTD cable shield should be connected only at the URTD end, and insulated at the RTD end. The RTD's themselves must not be grounded at the object to be protected.




Remember to set the URTDII module DIP switches according to the types of RTDs in each of the channels.

## Direct Commands of the URTD Module

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Function 	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Service /Test (Prot inhibit) /URTD]
Force Windg1 	Force Winding 1	0 - 392	0	[Service /Test (Prot inhibit) /URTD]
Force Windg2 	Force Winding 2	0 - 392	0	[Service /Test (Prot inhibit) /URTD]
Force Windg3 	Force Winding 3	0 - 392	0	[Service /Test (Prot inhibit) /URTD]
Force Windg4 	Force Winding 4	0 - 392	0	[Service /Test (Prot inhibit) /URTD]
Force Windg5 	Force Winding 5	0 - 392	0	[Service /Test (Prot inhibit) /URTD]
Force Windg6 	Force Winding 6	0 - 392	0	[Service /Test (Prot inhibit) /URTD]
Force MotBear1 	Force Motor Bearing 1	0 - 392	0	[Service /Test (Prot inhibit) /URTD]
Force MotBear2 	Force Motor Bearing 2	0 - 392	0	[Service /Test (Prot inhibit) /URTD]
Force LoadBear1 	Force Load Bearing 1	0 - 392	0	[Service /Test (Prot inhibit) /URTD]
Force LoadBear2 	Force Load Bearing 2	0 - 392	0	[Service /Test (Prot inhibit) /URTD]

Parameter	Description	Setting range	Default	Menu path
Force Aux1 	Force Auxiliary1	0 - 392	0	[Service /Test (Prot inhibit) /URTD]
Force Aux2 	Force Auxiliary2	0 - 392	0	[Service /Test (Prot inhibit) /URTD]

**Global Protection Parameters of the URTD Module**

Parameter	Description	Setting range	Default	Menu path
Force Mode 	By means of this function the normal Output Relay States can be overwritten (forced) in case that the Relay is not in a disarmed state. The relays can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	permanent, timeout	permanent	[Service /Test (Prot inhibit) /URTD]
t-Timeout Force 	The Output State will be set by force for the duration of this time. That means for the duration of this time the Output Relay does not show the state of the signals that are assigned on it.  Only available if: Mode = Timeout DISARM	0.00 - 300.00s	0.03s	[Service /Test (Prot inhibit) /URTD]
Temperature Unit 	Temperature Unit	Celsius, Fahrenheit	Celsius	[Device Para /Measurem Display /General settings]



### URTD Signals (Output States)

<i>Signal</i>	<i>Description</i>
Windg1 Superv	Signal: Supervision Channel Windg1
Windg2 Superv	Signal: Supervision Channel Windg2
Windg3 Superv	Signal: Supervision Channel Windg3
Windg4 Superv	Signal: Supervision Channel Windg4
Windg5 Superv	Signal: Supervision Channel Windg5
Windg6 Superv	Signal: Supervision Channel Windg6
MotBear1 Superv	Signal: Supervision Channel MotBear1
MotBear2 Superv	Signal: Supervision Channel MotBear2
LoadBear1 Superv	Signal: Supervision Channel LoadBear1
LoadBear2 Superv	Signal: Supervision Channel LoadBear2
Aux1 Superv	Signal: Supervision Channel Aux1
Aux2 Superv	Signal: Supervision Channel Aux2
Superv	Signal: URTD Supervision Channel
active	Signal: URTD active
Outs forced	Signal: The State of at least one Relay Output has been set by force. That means that the state of at least one Relay is forced and hence does not show the state of the assigned signals.

### URTD Module Statistics

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
Windg1 max	Winding1 Maximum Value	[Operation /Statistics /Max /URTD]
Windg2 max	Winding2 Maximum Value	[Operation /Statistics /Max /URTD]
Windg3 max	Winding3 Maximum Value	[Operation /Statistics /Max /URTD]
Windg4 max	Winding4 Maximum Value	[Operation /Statistics /Max /URTD]

## Protective Elements

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<i>Value</i>	<i>Description</i>	<i>Menu path</i>
Windg5 max	Winding5 Maximum Value	[Operation /Statistics /Max /URTD]
Windg6 max	Winding6 Maximum Value	[Operation /Statistics /Max /URTD]
MotBear1 max	Motor Bearing1 Maximum Value	[Operation /Statistics /Max /URTD]
MotBear2 max	Motor Bearing2 Maximum Value	[Operation /Statistics /Max /URTD]
LoadBear1 max	Load Bearing1 Maximum Value	[Operation /Statistics /Max /URTD]
LoadBear2 max	Load Bearing2 Maximum Value	[Operation /Statistics /Max /URTD]
Aux1 max	Auxiliary1 Maximum Value	[Operation /Statistics /Max /URTD]
Aux2 max	Auxiliary2 Maximum Value	[Operation /Statistics /Max /URTD]

**URTD Measured Values**

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
Windg1	Winding 1	[Operation /Measured Values /URTD]
Windg2	Winding 2	[Operation /Measured Values /URTD]
Windg3	Winding 3	[Operation /Measured Values /URTD]
Windg4	Winding 4	[Operation /Measured Values /URTD]
Windg5	Winding 5	[Operation /Measured Values /URTD]
Windg6	Winding 6	[Operation /Measured Values /URTD]
MotBear1	Motor Bearing 1	[Operation /Measured Values /URTD]
MotBear2	Motor Bearing 2	[Operation /Measured Values /URTD]
LoadBear1	Load Bearing 1	[Operation /Measured Values /URTD]
LoadBear2	Load Bearing 2	[Operation /Measured Values /URTD]
Aux1	Auxiliary1	[Operation /Measured Values /URTD]
Aux2	Auxiliary2	[Operation /Measured Values /URTD]

## Protective Elements

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<i>Value</i>	<i>Description</i>	<i>Menu path</i>
RTD Max	Maximum temperature of all channels.	[Operation /Measured Values /URTD]

# Supervision

## CBF- Circuit Breaker Failure [50BF\*/62BF]

\*=only available in protective relays that offer current measurement.

Available elements:

CBF

### Principle – General Use

The breaker failure (BF) protection is used to provide backup protection in the event that a breaker fails to operate properly during fault clearing. This signal is to be used to trip the upstream breaker (e.g. infeed of a busbar) either via an output relay or via Communication (SCADA). Depending on the ordered device and type there are different/multiple schemes available to detect a breaker failure.

#### *Start/Trigger of the CBF Timer*

A supervision timer »*t-CBF*« will be started, once the CBF module is triggered. Even if the Trigger signal drops again, this timer will continue to run. If the timer runs down/elapses (is not stopped), the module will issue a trip afterwards. This trip signal is to be used to trip the upstream breaker (backup).

#### *Stopping the CBF*

The timer will be stopped if the opening of the breaker is detected. Depending on the supervision scheme the timer will be stopped if the current falls below the current threshold or if the position signals indicate the open position of the breaker or a combination of both. The CBF module will remain within the state rejected until the trigger signal drops (falls back).

#### *Detecting a Breaker Failure*

Depending on the supervision scheme, the Circuit Breaker Failure signal (Trip) will be set if either:

- the current doesn't fall below the threshold or
- the position signals indicate that the breaker is in the closed position or
- both.

#### *Reject state of the CBF module*

The CBF module will switch into the rejected state if the circuit breaker failure triggers are still active while the open position of the breaker has been detected successfully.

#### *Readiness for Operation*

The CBF module will switch back into the Stand-by if the trigger signals drop (fall back).

#### *Locking*

A locking signal will be issued simultaneously with the CBF-Signal (Trip). The locking signal is permanent. This signal has to be acknowledged at the HMI.

### NOTICE

**Note on devices that offer Wide Frequency Range measurement:**

**The supervision scheme 50BF will be blocked as soon as the frequency differs more than 5% from the nominal frequency. As long as the frequency differs more than 5% from the nominal frequency the supervision scheme "50BF and CB Pos" will work according to the "CB Pos" scheme.**

## Supervision Schemes

Up to three supervision schemes are available depending on the ordered device type and variant in order to detect a circuit breaker failure.

### *50BF\**

A supervision timer will be started as soon as the CBF module is triggered by a trip signal. A breaker failure will be detected and a signal will be issued if the measured current does not fall below a set threshold while this timer runs down.

This supervision scheme is available within protective relays that offer current measurement.

### *CB Pos*

A supervision timer will be started as soon as the CBF module is triggered by a trip signal. A breaker failure will be detected and a signal will be issued if the evaluation of the position indicators of the circuit breaker does not indicate that the breaker has been switched off successfully while this timer runs down.

This supervision scheme is available within all protective relays. This scheme is recommended if breaker failures have to be detected while there is no or not much load flow (small currents). This might e.g. be the case if overvoltage or overfrequency is supervised for a Gen-Set that is running in Stand-by.

### *50 BF and CB Pos\**

A supervision timer will be started as soon as the CBF module is triggered by a trip signal. A breaker failure will be detected and a signal will be issued if the measured current does not fall below a set threshold and if simultaneously the evaluation of the position indicators of the circuit breaker does not indicate that the breaker has been switched off successfully while this timer runs down.

This scheme is recommended if breaker failures have to be double checked. This scheme will issue a trip command to the upstream breaker even if position indicators indicate misleadingly (faulty) that the breaker has been opened or if the current measurement indicates misleadingly (faulty) that the breaker is now in the open position.

\*=only available in protective relays that offer current measurement.

## Trigger Modes

There are three trigger modes for the CBF module available. In addition to that, there are three assignable trigger inputs available that might trigger the CBF module even if they are not assigned within the breaker manager onto the breaker that is to be monitored.

• *All Trips*: All trip signals that are assigned to this breaker (within the trip manager) will start the CBF module (please refer also to section „Trigger signals of the Circuit Breaker Failure“).

• *Current Trips*: All current trips that are assigned to this breaker (within the trip manager) will start the CBF module (please refer also to section „Trigger signals of the Circuit Breaker Failure“).

• *External Trips*: All external trips that are assigned to this breaker (within the trip manager) will start the CBF module (please refer also to section „Trigger signals of the Circuit Breaker Failure“).

• In addition, the User can also select *none* (e.g.: if the User intends to use one of the three additional assignable trigger inputs).

### **NOTICE**

Those trips can exclusively start the breaker failures that are assigned within the trip manager to the breaker that is to be supervised. In contrast to that the additional three triggers 1-3 will trigger the CBF module even if they are not assigned onto the breaker within the corresponding breaker manager.

### **NOTICE**

Select the winding side (Breaker, Winding) from which the measured currents should be taken in case this protective device provides more than one current measurement card.

### **NOTICE**

This Notice applies to protective devices that offer control functionality only! This protective element requires, that a switchgear (circuit breaker) is assigned to it. It is allowed only to assign switchgears (circuit breaker) to this protective element, whose measuring transformers provide measuring data to the protective device.

## Breaker Failure Lockout

The signal of the Circuit Breaker Failure is latched. This signal can be used to block the breaker against a switching on attempt.

**Tabular Summary**

	<b>Supervision Schemes</b>		
	Where? Within [Protection Para\Global Prot Para\Supervision\CBF]		
	<b>CB Pos<sup>2)</sup></b>	<b>50BF<sup>3)</sup></b>	<b>CBPos und 50BF<sup>4)</sup></b>
<p><i>Which breaker is to be monitored?</i></p> <p>Where to select? Within [Protection Para\Global Prot Para\Supervision\CBF]</p>	<p>Selection of the breaker that is to be monitored.</p> <p>(In case that more than one breaker is available)</p>	<p>Selection of the breaker that is to be monitored.</p> <p>(In case that more than one breaker is available)</p>	<p>Selection of the breaker that is to be monitored.</p> <p>(In case that more than one breaker is available)</p>
<p><i>Trigger Modi</i></p> <p>(Who starts the CBF-timer ?)</p> <p>Where to set? Within [Protection Para\Global Prot Para\Supervision\CBF]</p>	<p>All Trips<sup>5)</sup></p> <p>or</p> <p>All Current Trips<sup>5)</sup></p> <p>or</p> <p>External Trips<sup>5)</sup></p> <p>...and the breaker is in the closed position and the CBF module is within the stand-by state.</p>	<p>All Trips<sup>5)</sup></p> <p>or</p> <p>All Current Trips<sup>5)</sup></p> <p>or</p> <p>External Trips<sup>5)</sup></p> <p>...and the CBF module is within the stand-by state.</p>	<p>All Trips<sup>5)</sup></p> <p>or</p> <p>All Current Trips<sup>5)</sup></p> <p>or</p> <p>External Trips<sup>5)</sup></p> <p>...and the breaker is in the closed position and the CBF module is within the stand-by state.</p>
<p><i>Who stops the CBF-Timer?</i></p> <p>Once the timer has been stopped the CBF module will switch into the state „Rejected“. The module will switch back into the state „Stand-by“ if the trigger signals are dropped.</p>	<p>Position indicators indicate that the switchgear (breaker) is in the open position.</p>	<p>Current is fallen below the I&lt;-threshold<sup>1)</sup>.</p>	<p>Position indicators indicate that the switchgear (breaker) is in the open position <b>and</b> current is fallen below the I&lt;-threshold<sup>1)</sup>.</p>
<p><i>A Breaker Failure will be detected</i></p> <p>...and a trip signal to the upstream breaker will be issued?</p>	<p>When the CBF-Timer has run down (elapsed).</p>	<p>When the CBF-Timer has run down (elapsed).</p>	<p>When the CBF-Timer has run down (elapsed).</p>
<p><i>When does the trip signal to the upstream breaker drops (falls back)?</i></p>	<p>If the position indicators indicate that the switchgear (breaker) is in the open position <b>and</b> if the trigger signals are dropped (fallen back)</p>	<p>If the current is fallen below the I&lt; <b>and</b> if the trigger signals are dropped (fallen back)</p>	<p>If the position indicators indicate that the switchgear (breaker) is in the open position <b>and</b> if the current is fallen below the I&lt; <b>and</b> if the trigger signals are dropped (fallen back)</p>



<sup>1)</sup> It is recommended to set the  $I <$  threshold to a value that is slightly below the fault current that is expectable. By means of that it is possible to shorten the CBF supervision timer and hence reduce thermal and mechanical damage of the electrical equipment in case of a breaker failure. The lower the threshold, the longer the time that is needed to detect, that the breaker is in the open position, especially if there are transients/harmonics.

Note: Tripping delay of the CBF module = Minimum delay time (tripping time) of the backup protection!

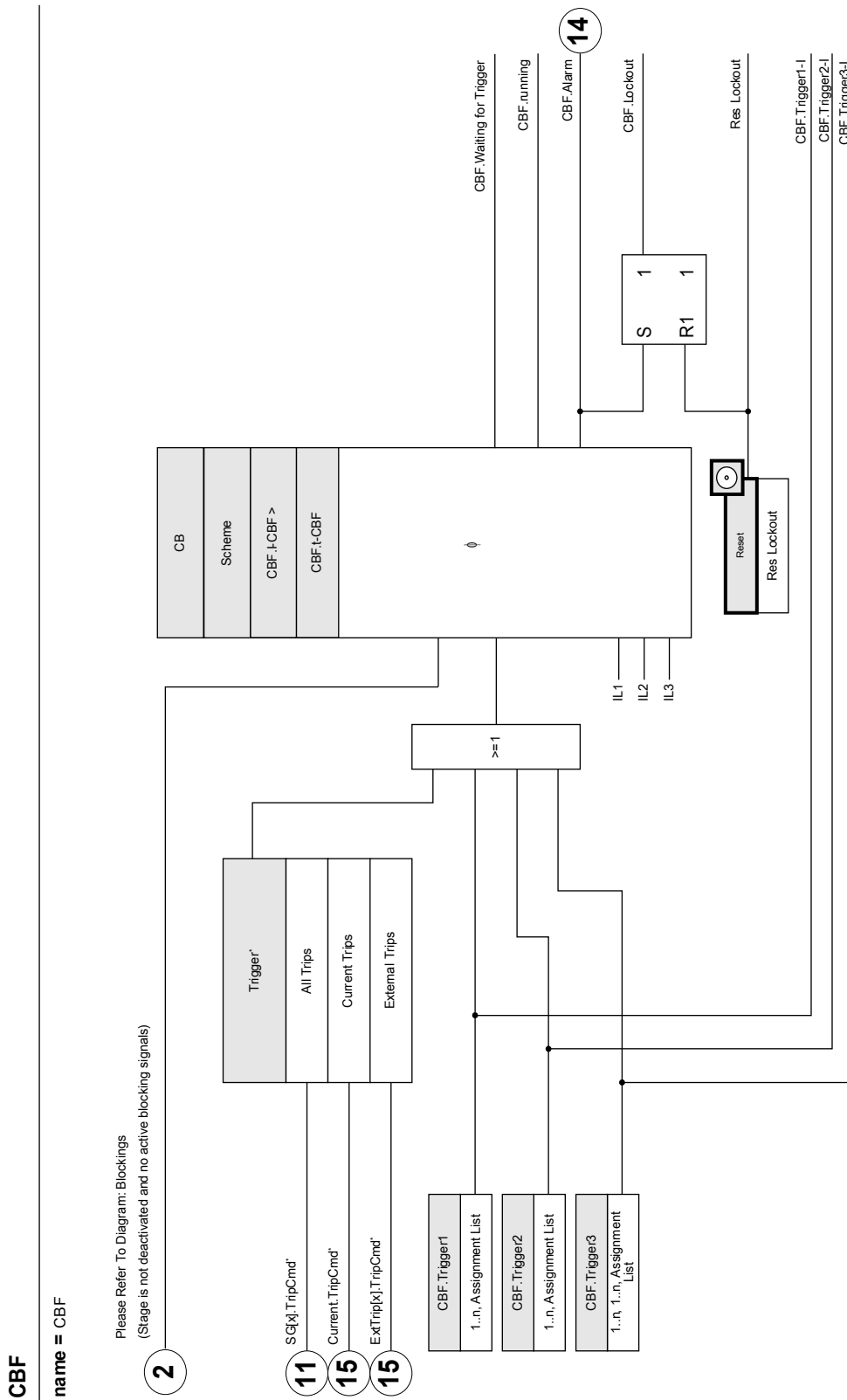
<sup>2), 3), 4)</sup>

Available in all devices with the corresponding software	Available in all devices that offer current measurement	Available in all devices that offer current measurement
--	---	---

<sup>5)</sup>

Only if the signals are assigned onto the breaker within the breaker manager.

Circuit Breaker Failure Protection for devices that offer current measurement



\*The Breaker Failure will be triggered only by those trip signals that are assigned onto the breaker within the Trip Manager.

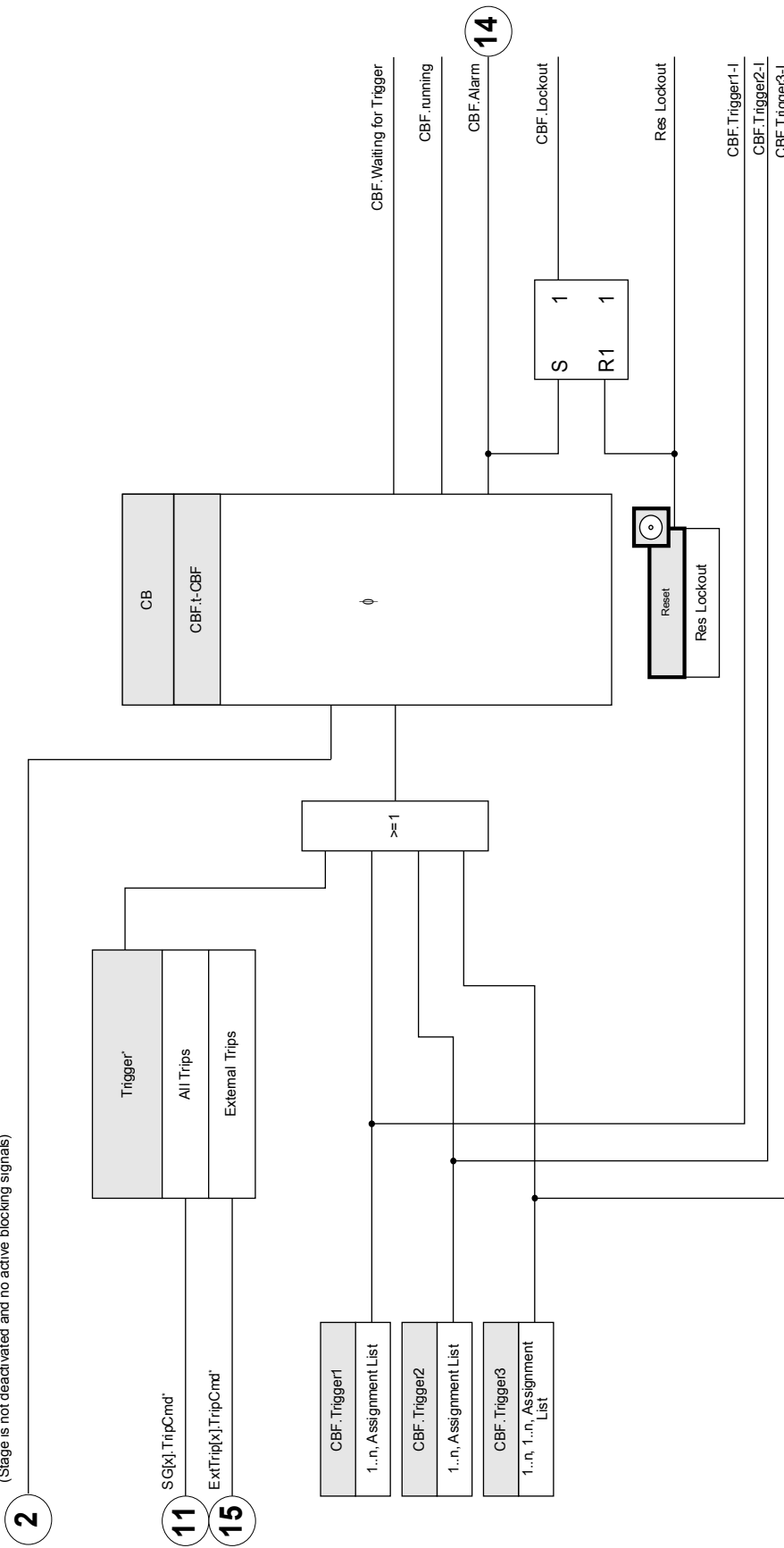
Circuit Breaker Failure Protection for devices that offer voltage measurement only

**CBF**

name = CBF


Please Refer To Diagram: Blockings

(Stage is not deactivated and no active blocking signals)




\*The Breaker Failure will be triggered only by those trip signals that are assigned onto the breaker within the Trip Manager.


## Device Planning Parameters of the CBF

Parameter	Description	Options	Default	Menu path
Mode 	Mode	do not use, use	do not use	[Device planning]

## Global Protection Parameters of the CBF

Parameter	Description	Setting range	Default	Menu path
Scheme 	Scheme	50BF, CB Pos, 50BF and CB Pos	50BF	[Protection Para /Global Prot Para /Supervision /CBF]
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /Supervision /CBF]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /Supervision /CBF]
Trigger 	Determining the trigger mode for the Breaker Failure.	- . -, All Trips, External Trips, Current Trips	All Trips	[Protection Para /Global Prot Para /Supervision /CBF]
Trigger1 	Trigger that will start the CBF	Trigger	--	[Protection Para /Global Prot Para /Supervision /CBF]
Trigger2 	Trigger that will start the CBF	Trigger	--	[Protection Para /Global Prot Para /Supervision /CBF]
Trigger3 	Trigger that will start the CBF	Trigger	--	[Protection Para /Global Prot Para /Supervision /CBF]

## Direct Commands of the CBF





Parameter	Description	Setting range	Default	Menu path
Res Lockout 	Reset Lockout	inactive, active	inactive	[Operation / Reset/Acknowledge /Reset]

## Setting Group Parameters of the CBF

### NOTICE

In order to prevent a faulty activation of the BF Module, the pickup (alarm) time must be greater than the sum of:

- Operating time of the protective relay
- +The close-open time of the breaker (please refer to the technical data of the manufacturer of the breaker);
- +Drop off time (current- or position indicators)
- +Security margin.

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Protection Para /<1..4> /Supervision /CBF]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo Fc=active".	inactive, active	inactive	[Protection Para /<1..4> /Supervision /CBF]
I-CBF > 	Breaker Failure Alarm will be initiated if this threshold is still exceeded after the timer has expired (50 BF).  Only available if: Scheme50BF = Or Scheme = 50BF and CB Pos	0.02 - 4.00In	0.02In	[Protection Para /<1..4> /Supervision /CBF]
t-CBF 	If the delay time is expired, an CBF alarm is given out.	0.00 - 10.00s	0.20s	[Protection Para /<1..4> /Supervision /CBF]

## CBF Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module input state: External blocking1	[Protection Para /Global Prot Para /Supervision /CBF]
ExBlo2-I	Module input state: External blocking2	[Protection Para /Global Prot Para /Supervision /CBF]
Trigger1-I	Module Input: Trigger that will start the CBF	[Protection Para /Global Prot Para /Supervision /CBF]
Trigger2-I	Module Input: Trigger that will start the CBF	[Protection Para /Global Prot Para /Supervision /CBF]
Trigger3-I	Module Input: Trigger that will start the CBF	[Protection Para /Global Prot Para /Supervision /CBF]

## CBF Signals (Output States)

<i>Signal</i>	<i>Description</i>
active	Signal: active
ExBlo	Signal: External Blocking
Waiting for Trigger	Waiting for Trigger
running	Signal: CBF-Module started
Alarm	Signal: Circuit Breaker Failure
Lockout	Signal: Lockout
Res Lockout	Signal: Reset Lockout

## Trigger signals of the Circuit Breaker Failure

*These trips will start the **CBF** module if »All trips« have been selected as the trigger event.*

Name	Description
--	No assignment
MStart.TripCmd	Signal: Trip Command
I[1].TripCmd	Signal: Trip Command
I[2].TripCmd	Signal: Trip Command
I[3].TripCmd	Signal: Trip Command
I[4].TripCmd	Signal: Trip Command
I[5].TripCmd	Signal: Trip Command
I[6].TripCmd	Signal: Trip Command
IG[1].TripCmd	Signal: Trip Command
IG[2].TripCmd	Signal: Trip Command
IG[3].TripCmd	Signal: Trip Command
IG[4].TripCmd	Signal: Trip Command
ThR.TripCmd	Signal: Trip Command
Jam[1].TripCmd	Signal: Trip Command
Jam[2].TripCmd	Signal: Trip Command
I<[1].TripCmd	Signal: Trip Command
I<[2].TripCmd	Signal: Trip Command
I<[3].TripCmd	Signal: Trip Command
I2>[1].TripCmd	Signal: Trip Command
I2>[2].TripCmd	Signal: Trip Command
ExP[1].TripCmd	Signal: Trip Command
ExP[2].TripCmd	Signal: Trip Command
ExP[3].TripCmd	Signal: Trip Command
ExP[4].TripCmd	Signal: Trip Command
RTD.TripCmd	Signal: Trip Command
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input
DI Slot X1.DI 5	Signal: Digital Input
DI Slot X1.DI 6	Signal: Digital Input
DI Slot X1.DI 7	Signal: Digital Input
DI Slot X1.DI 8	Signal: Digital Input
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input

<i>Name</i>	<i>Description</i>
DI Slot X1.DI 4	Signal: Digital Input
Logics.LE1.Gate Out	Signal: Output of the logic gate
Logics.LE1.Timer Out	Signal: Timer Output
Logics.LE1.Out	Signal: Latched Output (Q)
Logics.LE1.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE2.Gate Out	Signal: Output of the logic gate
Logics.LE2.Timer Out	Signal: Timer Output
Logics.LE2.Out	Signal: Latched Output (Q)
Logics.LE2.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE3.Gate Out	Signal: Output of the logic gate
Logics.LE3.Timer Out	Signal: Timer Output
Logics.LE3.Out	Signal: Latched Output (Q)
Logics.LE3.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE4.Gate Out	Signal: Output of the logic gate
Logics.LE4.Timer Out	Signal: Timer Output
Logics.LE4.Out	Signal: Latched Output (Q)
Logics.LE4.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE5.Gate Out	Signal: Output of the logic gate
Logics.LE5.Timer Out	Signal: Timer Output
Logics.LE5.Out	Signal: Latched Output (Q)
Logics.LE5.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE6.Gate Out	Signal: Output of the logic gate
Logics.LE6.Timer Out	Signal: Timer Output
Logics.LE6.Out	Signal: Latched Output (Q)
Logics.LE6.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE7.Gate Out	Signal: Output of the logic gate
Logics.LE7.Timer Out	Signal: Timer Output
Logics.LE7.Out	Signal: Latched Output (Q)
Logics.LE7.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE8.Gate Out	Signal: Output of the logic gate
Logics.LE8.Timer Out	Signal: Timer Output
Logics.LE8.Out	Signal: Latched Output (Q)
Logics.LE8.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE9.Gate Out	Signal: Output of the logic gate
Logics.LE9.Timer Out	Signal: Timer Output
Logics.LE9.Out	Signal: Latched Output (Q)
Logics.LE9.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE10.Gate Out	Signal: Output of the logic gate
Logics.LE10.Timer Out	Signal: Timer Output
Logics.LE10.Out	Signal: Latched Output (Q)



<i>Name</i>	<i>Description</i>
Logics.LE10.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE11.Gate Out	Signal: Output of the logic gate
Logics.LE11.Timer Out	Signal: Timer Output
Logics.LE11.Out	Signal: Latched Output (Q)
Logics.LE11.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE12.Gate Out	Signal: Output of the logic gate
Logics.LE12.Timer Out	Signal: Timer Output
Logics.LE12.Out	Signal: Latched Output (Q)
Logics.LE12.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE13.Gate Out	Signal: Output of the logic gate
Logics.LE13.Timer Out	Signal: Timer Output
Logics.LE13.Out	Signal: Latched Output (Q)
Logics.LE13.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE14.Gate Out	Signal: Output of the logic gate
Logics.LE14.Timer Out	Signal: Timer Output
Logics.LE14.Out	Signal: Latched Output (Q)
Logics.LE14.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE15.Gate Out	Signal: Output of the logic gate
Logics.LE15.Timer Out	Signal: Timer Output
Logics.LE15.Out	Signal: Latched Output (Q)
Logics.LE15.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE16.Gate Out	Signal: Output of the logic gate
Logics.LE16.Timer Out	Signal: Timer Output
Logics.LE16.Out	Signal: Latched Output (Q)
Logics.LE16.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE17.Gate Out	Signal: Output of the logic gate
Logics.LE17.Timer Out	Signal: Timer Output
Logics.LE17.Out	Signal: Latched Output (Q)
Logics.LE17.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE18.Gate Out	Signal: Output of the logic gate
Logics.LE18.Timer Out	Signal: Timer Output
Logics.LE18.Out	Signal: Latched Output (Q)
Logics.LE18.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE19.Gate Out	Signal: Output of the logic gate
Logics.LE19.Timer Out	Signal: Timer Output
Logics.LE19.Out	Signal: Latched Output (Q)
Logics.LE19.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE20.Gate Out	Signal: Output of the logic gate
Logics.LE20.Timer Out	Signal: Timer Output
Logics.LE20.Out	Signal: Latched Output (Q)

<i>Name</i>	<i>Description</i>
Logics.LE20.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE21.Gate Out	Signal: Output of the logic gate
Logics.LE21.Timer Out	Signal: Timer Output
Logics.LE21.Out	Signal: Latched Output (Q)
Logics.LE21.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE22.Gate Out	Signal: Output of the logic gate
Logics.LE22.Timer Out	Signal: Timer Output
Logics.LE22.Out	Signal: Latched Output (Q)
Logics.LE22.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE23.Gate Out	Signal: Output of the logic gate
Logics.LE23.Timer Out	Signal: Timer Output
Logics.LE23.Out	Signal: Latched Output (Q)
Logics.LE23.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE24.Gate Out	Signal: Output of the logic gate
Logics.LE24.Timer Out	Signal: Timer Output
Logics.LE24.Out	Signal: Latched Output (Q)
Logics.LE24.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE25.Gate Out	Signal: Output of the logic gate
Logics.LE25.Timer Out	Signal: Timer Output
Logics.LE25.Out	Signal: Latched Output (Q)
Logics.LE25.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE26.Gate Out	Signal: Output of the logic gate
Logics.LE26.Timer Out	Signal: Timer Output
Logics.LE26.Out	Signal: Latched Output (Q)
Logics.LE26.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE27.Gate Out	Signal: Output of the logic gate
Logics.LE27.Timer Out	Signal: Timer Output
Logics.LE27.Out	Signal: Latched Output (Q)
Logics.LE27.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE28.Gate Out	Signal: Output of the logic gate
Logics.LE28.Timer Out	Signal: Timer Output
Logics.LE28.Out	Signal: Latched Output (Q)
Logics.LE28.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE29.Gate Out	Signal: Output of the logic gate
Logics.LE29.Timer Out	Signal: Timer Output
Logics.LE29.Out	Signal: Latched Output (Q)
Logics.LE29.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE30.Gate Out	Signal: Output of the logic gate
Logics.LE30.Timer Out	Signal: Timer Output
Logics.LE30.Out	Signal: Latched Output (Q)

<i>Name</i>	<i>Description</i>
Logics.LE30.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE31.Gate Out	Signal: Output of the logic gate
Logics.LE31.Timer Out	Signal: Timer Output
Logics.LE31.Out	Signal: Latched Output (Q)
Logics.LE31.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE32.Gate Out	Signal: Output of the logic gate
Logics.LE32.Timer Out	Signal: Timer Output
Logics.LE32.Out	Signal: Latched Output (Q)
Logics.LE32.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE33.Gate Out	Signal: Output of the logic gate
Logics.LE33.Timer Out	Signal: Timer Output
Logics.LE33.Out	Signal: Latched Output (Q)
Logics.LE33.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE34.Gate Out	Signal: Output of the logic gate
Logics.LE34.Timer Out	Signal: Timer Output
Logics.LE34.Out	Signal: Latched Output (Q)
Logics.LE34.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE35.Gate Out	Signal: Output of the logic gate
Logics.LE35.Timer Out	Signal: Timer Output
Logics.LE35.Out	Signal: Latched Output (Q)
Logics.LE35.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE36.Gate Out	Signal: Output of the logic gate
Logics.LE36.Timer Out	Signal: Timer Output
Logics.LE36.Out	Signal: Latched Output (Q)
Logics.LE36.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE37.Gate Out	Signal: Output of the logic gate
Logics.LE37.Timer Out	Signal: Timer Output
Logics.LE37.Out	Signal: Latched Output (Q)
Logics.LE37.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE38.Gate Out	Signal: Output of the logic gate
Logics.LE38.Timer Out	Signal: Timer Output
Logics.LE38.Out	Signal: Latched Output (Q)
Logics.LE38.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE39.Gate Out	Signal: Output of the logic gate
Logics.LE39.Timer Out	Signal: Timer Output
Logics.LE39.Out	Signal: Latched Output (Q)
Logics.LE39.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE40.Gate Out	Signal: Output of the logic gate
Logics.LE40.Timer Out	Signal: Timer Output
Logics.LE40.Out	Signal: Latched Output (Q)

<i>Name</i>	<i>Description</i>
Logics.LE40.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE41.Gate Out	Signal: Output of the logic gate
Logics.LE41.Timer Out	Signal: Timer Output
Logics.LE41.Out	Signal: Latched Output (Q)
Logics.LE41.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE42.Gate Out	Signal: Output of the logic gate
Logics.LE42.Timer Out	Signal: Timer Output
Logics.LE42.Out	Signal: Latched Output (Q)
Logics.LE42.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE43.Gate Out	Signal: Output of the logic gate
Logics.LE43.Timer Out	Signal: Timer Output
Logics.LE43.Out	Signal: Latched Output (Q)
Logics.LE43.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE44.Gate Out	Signal: Output of the logic gate
Logics.LE44.Timer Out	Signal: Timer Output
Logics.LE44.Out	Signal: Latched Output (Q)
Logics.LE44.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE45.Gate Out	Signal: Output of the logic gate
Logics.LE45.Timer Out	Signal: Timer Output
Logics.LE45.Out	Signal: Latched Output (Q)
Logics.LE45.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE46.Gate Out	Signal: Output of the logic gate
Logics.LE46.Timer Out	Signal: Timer Output
Logics.LE46.Out	Signal: Latched Output (Q)
Logics.LE46.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE47.Gate Out	Signal: Output of the logic gate
Logics.LE47.Timer Out	Signal: Timer Output
Logics.LE47.Out	Signal: Latched Output (Q)
Logics.LE47.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE48.Gate Out	Signal: Output of the logic gate
Logics.LE48.Timer Out	Signal: Timer Output
Logics.LE48.Out	Signal: Latched Output (Q)
Logics.LE48.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE49.Gate Out	Signal: Output of the logic gate
Logics.LE49.Timer Out	Signal: Timer Output
Logics.LE49.Out	Signal: Latched Output (Q)
Logics.LE49.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE50.Gate Out	Signal: Output of the logic gate
Logics.LE50.Timer Out	Signal: Timer Output
Logics.LE50.Out	Signal: Latched Output (Q)

<i>Name</i>	<i>Description</i>
Logics.LE50.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE51.Gate Out	Signal: Output of the logic gate
Logics.LE51.Timer Out	Signal: Timer Output
Logics.LE51.Out	Signal: Latched Output (Q)
Logics.LE51.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE52.Gate Out	Signal: Output of the logic gate
Logics.LE52.Timer Out	Signal: Timer Output
Logics.LE52.Out	Signal: Latched Output (Q)
Logics.LE52.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE53.Gate Out	Signal: Output of the logic gate
Logics.LE53.Timer Out	Signal: Timer Output
Logics.LE53.Out	Signal: Latched Output (Q)
Logics.LE53.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE54.Gate Out	Signal: Output of the logic gate
Logics.LE54.Timer Out	Signal: Timer Output
Logics.LE54.Out	Signal: Latched Output (Q)
Logics.LE54.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE55.Gate Out	Signal: Output of the logic gate
Logics.LE55.Timer Out	Signal: Timer Output
Logics.LE55.Out	Signal: Latched Output (Q)
Logics.LE55.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE56.Gate Out	Signal: Output of the logic gate
Logics.LE56.Timer Out	Signal: Timer Output
Logics.LE56.Out	Signal: Latched Output (Q)
Logics.LE56.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE57.Gate Out	Signal: Output of the logic gate
Logics.LE57.Timer Out	Signal: Timer Output
Logics.LE57.Out	Signal: Latched Output (Q)
Logics.LE57.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE58.Gate Out	Signal: Output of the logic gate
Logics.LE58.Timer Out	Signal: Timer Output
Logics.LE58.Out	Signal: Latched Output (Q)
Logics.LE58.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE59.Gate Out	Signal: Output of the logic gate
Logics.LE59.Timer Out	Signal: Timer Output
Logics.LE59.Out	Signal: Latched Output (Q)
Logics.LE59.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE60.Gate Out	Signal: Output of the logic gate
Logics.LE60.Timer Out	Signal: Timer Output
Logics.LE60.Out	Signal: Latched Output (Q)

<i>Name</i>	<i>Description</i>
Logics.LE60.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE61.Gate Out	Signal: Output of the logic gate
Logics.LE61.Timer Out	Signal: Timer Output
Logics.LE61.Out	Signal: Latched Output (Q)
Logics.LE61.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE62.Gate Out	Signal: Output of the logic gate
Logics.LE62.Timer Out	Signal: Timer Output
Logics.LE62.Out	Signal: Latched Output (Q)
Logics.LE62.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE63.Gate Out	Signal: Output of the logic gate
Logics.LE63.Timer Out	Signal: Timer Output
Logics.LE63.Out	Signal: Latched Output (Q)
Logics.LE63.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE64.Gate Out	Signal: Output of the logic gate
Logics.LE64.Timer Out	Signal: Timer Output
Logics.LE64.Out	Signal: Latched Output (Q)
Logics.LE64.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE65.Gate Out	Signal: Output of the logic gate
Logics.LE65.Timer Out	Signal: Timer Output
Logics.LE65.Out	Signal: Latched Output (Q)
Logics.LE65.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE66.Gate Out	Signal: Output of the logic gate
Logics.LE66.Timer Out	Signal: Timer Output
Logics.LE66.Out	Signal: Latched Output (Q)
Logics.LE66.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE67.Gate Out	Signal: Output of the logic gate
Logics.LE67.Timer Out	Signal: Timer Output
Logics.LE67.Out	Signal: Latched Output (Q)
Logics.LE67.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE68.Gate Out	Signal: Output of the logic gate
Logics.LE68.Timer Out	Signal: Timer Output
Logics.LE68.Out	Signal: Latched Output (Q)
Logics.LE68.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE69.Gate Out	Signal: Output of the logic gate
Logics.LE69.Timer Out	Signal: Timer Output
Logics.LE69.Out	Signal: Latched Output (Q)
Logics.LE69.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE70.Gate Out	Signal: Output of the logic gate
Logics.LE70.Timer Out	Signal: Timer Output
Logics.LE70.Out	Signal: Latched Output (Q)

<i>Name</i>	<i>Description</i>
Logics.LE70.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE71.Gate Out	Signal: Output of the logic gate
Logics.LE71.Timer Out	Signal: Timer Output
Logics.LE71.Out	Signal: Latched Output (Q)
Logics.LE71.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE72.Gate Out	Signal: Output of the logic gate
Logics.LE72.Timer Out	Signal: Timer Output
Logics.LE72.Out	Signal: Latched Output (Q)
Logics.LE72.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE73.Gate Out	Signal: Output of the logic gate
Logics.LE73.Timer Out	Signal: Timer Output
Logics.LE73.Out	Signal: Latched Output (Q)
Logics.LE73.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE74.Gate Out	Signal: Output of the logic gate
Logics.LE74.Timer Out	Signal: Timer Output
Logics.LE74.Out	Signal: Latched Output (Q)
Logics.LE74.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE75.Gate Out	Signal: Output of the logic gate
Logics.LE75.Timer Out	Signal: Timer Output
Logics.LE75.Out	Signal: Latched Output (Q)
Logics.LE75.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE76.Gate Out	Signal: Output of the logic gate
Logics.LE76.Timer Out	Signal: Timer Output
Logics.LE76.Out	Signal: Latched Output (Q)
Logics.LE76.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE77.Gate Out	Signal: Output of the logic gate
Logics.LE77.Timer Out	Signal: Timer Output
Logics.LE77.Out	Signal: Latched Output (Q)
Logics.LE77.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE78.Gate Out	Signal: Output of the logic gate
Logics.LE78.Timer Out	Signal: Timer Output
Logics.LE78.Out	Signal: Latched Output (Q)
Logics.LE78.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE79.Gate Out	Signal: Output of the logic gate
Logics.LE79.Timer Out	Signal: Timer Output
Logics.LE79.Out	Signal: Latched Output (Q)
Logics.LE79.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE80.Gate Out	Signal: Output of the logic gate
Logics.LE80.Timer Out	Signal: Timer Output
Logics.LE80.Out	Signal: Latched Output (Q)

Supervision

Name	Description
Logics.LE80.Out inverted	Signal: Negated Latched Output (Q NOT)

*These trips will start the BF module if »All current« functions have been selected as the trigger event.*

Name	Description
--	No assignment
I[1].TripCmd	Signal: Trip Command
I[2].TripCmd	Signal: Trip Command
I[3].TripCmd	Signal: Trip Command
I[4].TripCmd	Signal: Trip Command
I[5].TripCmd	Signal: Trip Command
I[6].TripCmd	Signal: Trip Command
IG[1].TripCmd	Signal: Trip Command
IG[2].TripCmd	Signal: Trip Command
IG[3].TripCmd	Signal: Trip Command
IG[4].TripCmd	Signal: Trip Command
ThR.TripCmd	Signal: Trip Command
Jam[1].TripCmd	Signal: Trip Command
Jam[2].TripCmd	Signal: Trip Command
I<[1].TripCmd	Signal: Trip Command
I<[2].TripCmd	Signal: Trip Command
I<[3].TripCmd	Signal: Trip Command
I2>[1].TripCmd	Signal: Trip Command
I2>[2].TripCmd	Signal: Trip Command

*These trips will start the BF module if »External trips« have been selected as the trigger event.*

Name	Description
--	No assignment
ExP[1].TripCmd	Signal: Trip Command
ExP[2].TripCmd	Signal: Trip Command
ExP[3].TripCmd	Signal: Trip Command
ExP[4].TripCmd	Signal: Trip Command



## Commissioning Example: Supervision Scheme 50BF

### *Object to Be Tested:*

Test of the breaker failure protection (Supervision Scheme 50BF).

### *Necessary Means:*

- Current source;
- Ammeter; and
- Timer.

### **NOTICE**

**When testing, the applied test current must always be higher than the tripping threshold »I-CBF«. If the test current falls below the threshold while the breaker is in the “Off” position, no pickup will be generated.**

### *Procedure (Single-Phase):*

For testing the tripping time of the CBF protection, a test current has to be higher than the threshold value of one of the current protection modules that are assigned to trigger the CBF protection. The CBF trip delay can be measured from the time when one of the triggering inputs becomes active to the time when the CBF protection trip is asserted.

To avoid wiring errors, checked to make sure the breaker in the upstream system switches off.

The time, measured by the timer, should be in line with the specified tolerances.

### *Successful Test Result:*

The actual times measured comply with the setpoint times. The breaker in the higher-level section switches off.

### **⚠ WARNING**

**Re-connect the control cable to the breaker!**

## TCS - Trip Circuit Supervision [74TC]

Available elements:

TCS

The trip circuit monitoring is used for monitoring if the trip circuit is ready for operations. The monitoring can be fulfilled in two ways. The first assumes only »Aux On (52a)« is used in the trip circuit. The second assumes that, in addition to »Aux On (52a)«, »Aux Off(52b)« is also used for the circuit monitoring.

With »Aux On (52a)«, only in the trip circuit, the monitoring is only effective when the breaker is closed while if both »Aux On (52a)«, and »Aux Off(52b)« are used, the trip circuit will be monitored all time as long as the control power is on.

Note that the digital inputs used for this purpose must be configured properly based on the trip circuit control voltage. If the trip circuit is detected broken, an alarm will be issued with a specified delay, which must be longer than the time when a trip contact is closed to the time when the breaker status is clearly recognized by the relay.

### **NOTICE**

**In Slot 1 has 2 digital inputs, each of which has a separate root (contact separation) for the trip circuit supervision.**

### **NOTICE**

**This Notice applies to protective devices that offer control functionality only! This protective element requires, that a switchgear (circuit breaker is assigned to it.**

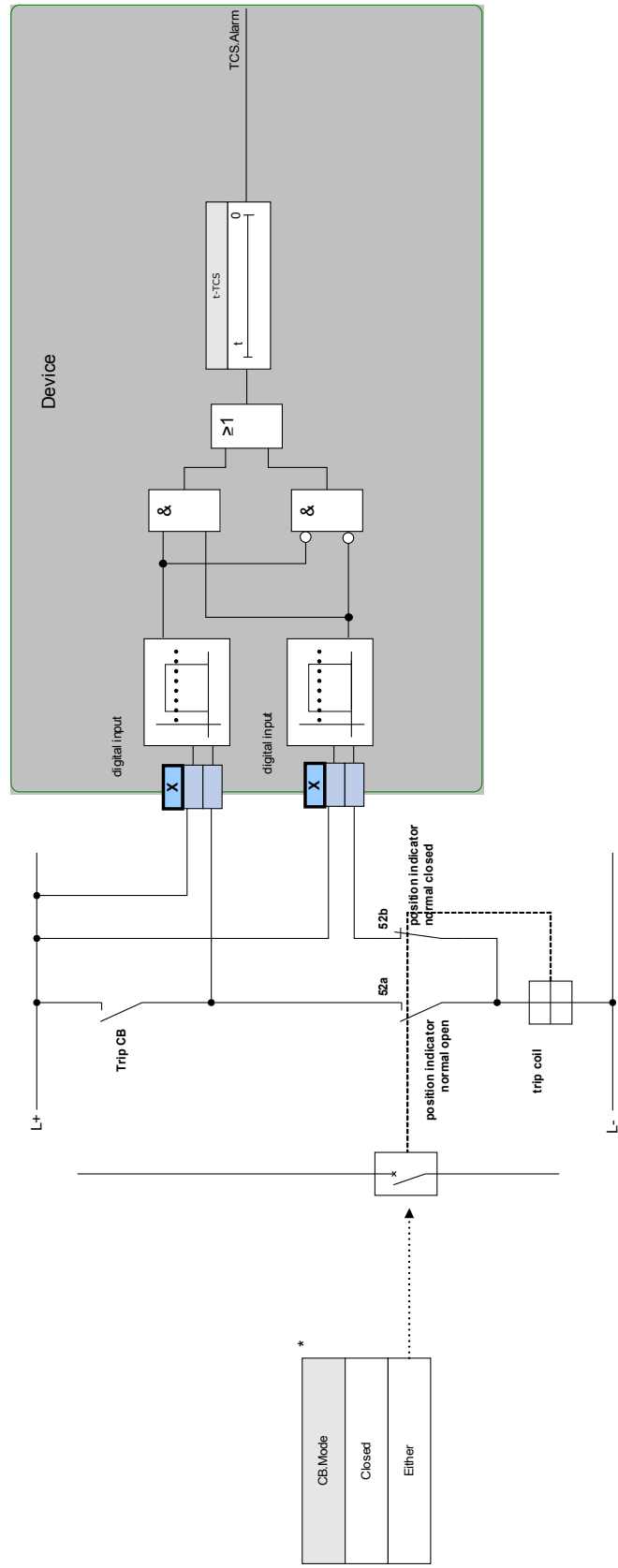
In this case, the trip circuit supply voltage serves also as supply voltage for the digital inputs and so the supply voltage failure of a trip circuit can be detected directly.

In order to identify a conductor failure in the trip circuit on the supply line or in the trip coil, the off-coil has to be looped-in to the supervision circuit.

The time delay is to be set in a way that switching actions cannot cause false trips in this module.

Connection example: Trip circuit supervision with two CB auxiliary contacts.

TCS



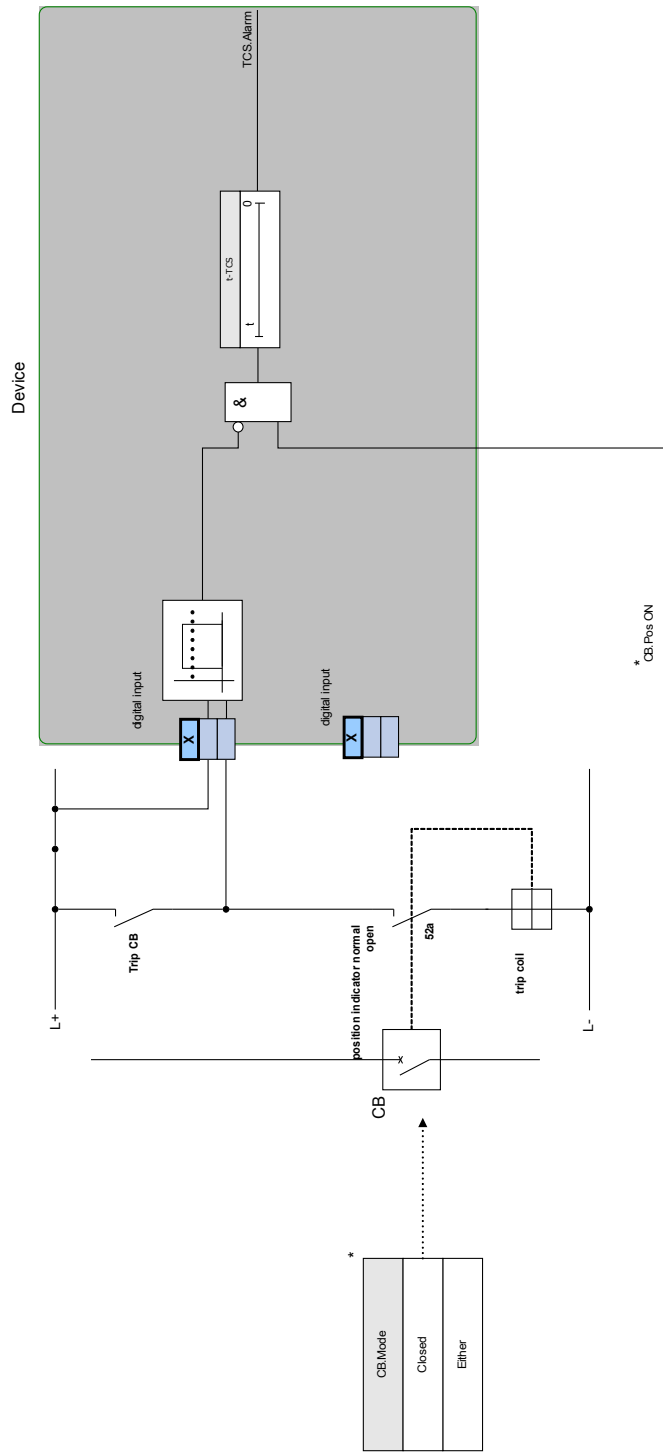
\*

CB.Mode
Closed
Either


\*This signal is the output of the switchgear that is assigned to this protective element. This applies to protective devices that offer control functionality.

Connection example: Trip circuit supervision with one CB auxiliary contact (Aux On (52a)) only.






TCS






## Device Planning Parameters of the Trip Circuit Supervision

Parameter	Description	Options	Default	Menu path
Mode 	Mode	do not use, use	do not use	[Device planning]

## Global Protection Parameters of the Trip Circuit Supervision

Parameter	Description	Setting range	Default	Menu path
Mode 	Select if trip circuit is going to be monitored when the breaker is closed or when the breaker is either open or close.	Closed, Either	Closed	[Protection Para /Global Prot Para /Supervision /TCS]
Input 1 	Select the input configured to monitor the trip coil when the breaker is closed.	1..n, Dig Inputs	--	[Protection Para /Global Prot Para /Supervision /TCS]
Input 2 	Select the input configured to monitor the trip coil when the breaker is open. Only available if Mode set to "Either".  Only available if: Mode = Either	1..n, Dig Inputs	--	[Protection Para /Global Prot Para /Supervision /TCS]
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /Supervision /TCS]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /Supervision /TCS]

## Setting Group Parameters of the Trip Circuit Supervision

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Function 	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Protection Para /<1..4> /Supervision /TCS]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo Fc=active".	inactive, active	inactive	[Protection Para /<1..4> /Supervision /TCS]
t-TCS 	Tripping delay time of the Trip Circuit Supervision	0.10 - 10.00s	0.2s	[Protection Para /<1..4> /Supervision /TCS]

## Trip Circuit Supervision Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Aux ON-I	Module Input State: Position indicator/check-back signal of the CB (52a)	[Protection Para /Global Prot Para /Supervision /TCS]
Aux OFF-I	Module input state: Position indicator/check-back signal of the CB (52b)	[Protection Para /Global Prot Para /Supervision /TCS]
ExBlo1-I	Module input state: External blocking1	[Protection Para /Global Prot Para /Supervision /TCS]
ExBlo2-I	Module input state: External blocking2	[Protection Para /Global Prot Para /Supervision /TCS]

## Trip Circuit Supervision Signals (Output States)

<i>Signal</i>	<i>Description</i>
active	Signal: active
ExBlo	Signal: External Blocking
Alarm	Signal: Alarm Trip Circuit Supervision
Not Possible	Not possible because no state indicator assigned to the breaker.

## Commissioning: Trip Circuit Supervision [74TC]

### **NOTICE**

For CBs that trip by means of little energy (e.g. via an optocoupler), it has to be ensured that the current applied by the digital inputs will not cause false tripping of the CB.

#### *Object to be tested*

Test of the trip circuit supervision.

#### *Procedure, part 1*

Simulate failure of the control voltage in the power circuits.

#### *Successful test result, part 1*

After expiry of »*t-TCS*« the trip circuit supervision TCS of the device should signal an alarm.

#### *Procedure, part 2*

Simulate a broken cable in the CB control circuit.

#### *Successful test result, part 2*

After expiry of »*t-TCS*« the trip circuit supervision TCS of the device should signal an alarm.



## CTS - Current Transformer Supervision [60L]

Available elements:

CTS

Wire breaks and failures within measuring circuits cause current transformer failures.

The module »CTS« can detect a failure of the CT if the calculated earth current does not match the measured one. If an adjustable threshold value (Difference of measured and calculated earth current) is exceeded, a CT failure can be assumed. This is signaled through a message/alarm.

The precondition is that the conductor currents are measured by the device and the earth current, for instance, by a ring core type current transformer.

The measuring principles of the circuit supervision are based on comparing the measured and the calculated residual currents:

In an ideal case these are:

$$(\vec{I}L1 + \vec{I}L2 + \vec{I}L3) + KI * \vec{I}G = 3 * I_0 + KI * \vec{I}G = 0$$

KI represents a correction factor which takes the different transformation ratio of the phase- and earth current transformers into account. The device automatically calculates this factor from the rated field parameters, i.e. the relation between the rated primary and secondary current values of the phase- and earth current transformers.

For compensating the current proportional ratio error of the measuring circuits, the dynamic correction factor Kd can be used. As a function of the measured max. current this factor is considering the linear rising measuring error.

The limiting value of the CT supervision is calculated as follows:

$\Delta I$  = deviation I (rated value)

Kd = correction factor

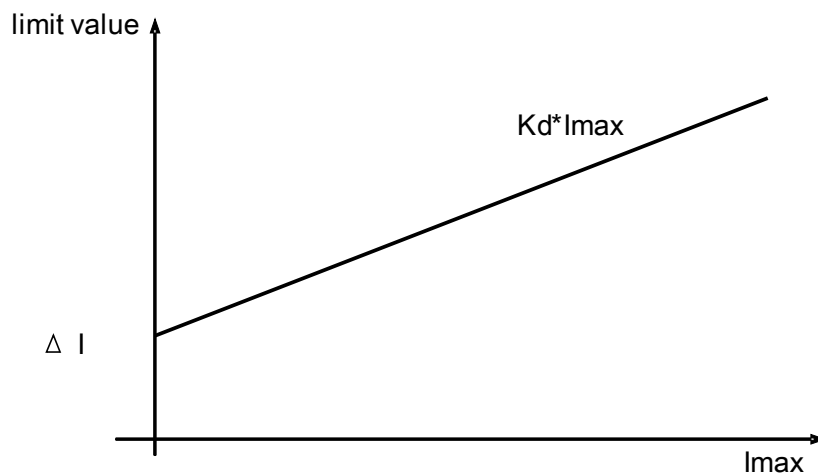
I<sub>max</sub> = current maximum

Limiting value =  $\Delta I + Kd \times I_{max}$

Precondition for identifying an error

$$3 * \vec{I}_0 + KI * \vec{I}G \geq \Delta I + Kd * I_{max}$$

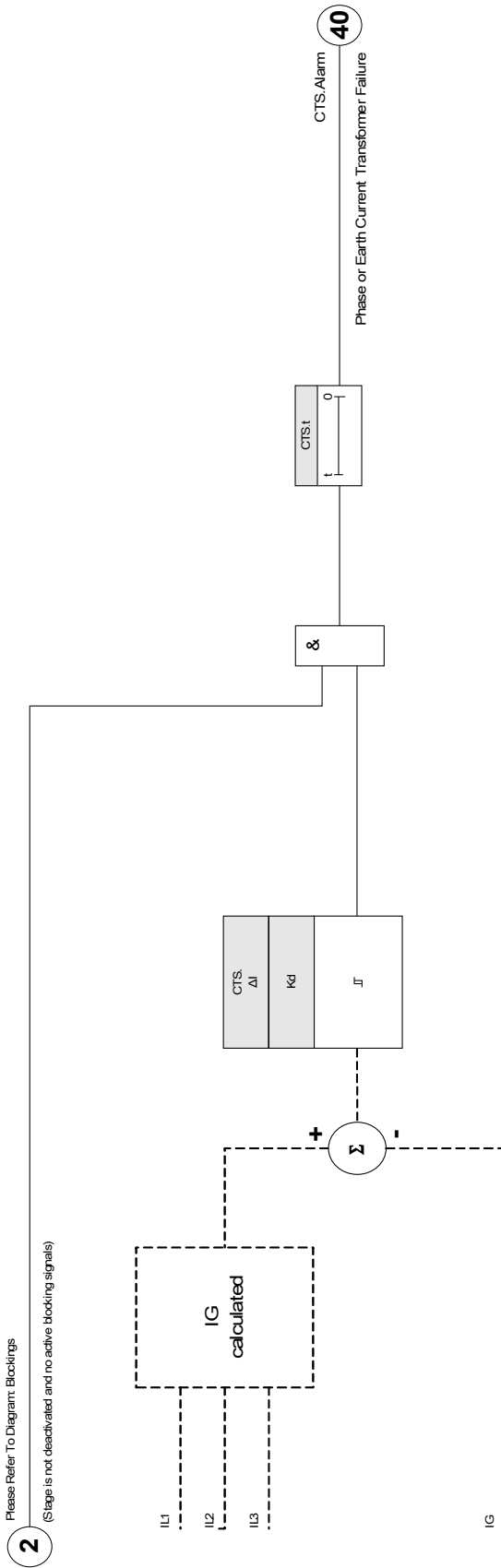
The evaluation method of the circuit supervision by using factor Kd can be graphically represented as follows:




**CAUTION**

If the current is measured in two phases only (for instant only IL1/IL3) or if there is no separate earth current measuring (e.g. normally via a cable-type CT), the supervision function should be deactivated.



CTS








## Device Planning Parameters of the Current Transformer Supervision

<i>Parameter</i>	<i>Description</i>	<i>Options</i>	<i>Default</i>	<i>Menu path</i>
Mode 	Mode	do not use, use	do not use	[Device planning]

## Global Protection Parameter of the Current Transformer Supervision

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /Supervision /CTS]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	--	[Protection Para /Global Prot Para /Supervision /CTS]

## Setting Group Parameters of the Current Transformer Supervision

Parameter	Description	Setting range	Default	Menu path
 Function	Permanent activation or deactivation of module/stage.	inactive, active	inactive	[Protection Para /<1..4> /Supervision /CTS]
 ExBlo Fc	Activate (allow) or inactivate (disallow) blocking of the module/stage. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/stages are blocked that are parameterized "ExBlo Fc=active".	inactive, active	inactive	[Protection Para /<1..4> /Supervision /CTS]
 $\Delta I$	In order to prevent faulty tripping of phase selective protection functions that use the current as tripping criterion. If the difference of the measured earth current and the calculated value $I_0$ is higher than the pick up value $\Delta I$ , an alarm event is generated after expiring of the excitation time. In such a case, a fuse failure, a broken wire or a faulty measuring circuit can be assumed.	0.10 - 1.00In	0.50In	[Protection Para /<1..4> /Supervision /CTS]
 Alarm delay	Alarm delay	0.1 - 9999.0s	1.0s	[Protection Para /<1..4> /Supervision /CTS]
 Kd	Dynamic correction factor for the evaluation of the difference between calculated and measured earth current. This correction factor allows transformer faults, caused by higher currents, to be compensated.	0.00 - 0.99	0.00	[Protection Para /<1..4> /Supervision /CTS]

## Current Transformer Supervision Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module input state: External blocking1	[Protection Para /Global Prot Para /Supervision /CTS]
ExBlo2-I	Module input state: External blocking2	[Protection Para /Global Prot Para /Supervision /CTS]

## Current Transformer Supervision Signals (Outputs States)

<i>Signal</i>	<i>Description</i>
active	Signal: active
ExBlo	Signal: External Blocking
Alarm	Signal: Alarm Current Transformer Measuring Circuit Supervision

## Commissioning: Current Transformer Failure Supervision

### NOTICE

#### Precondition:

1. Measurement of all three phase currents (are applied to the measuring inputs of the device).
2. The earth current is detected via a cable-type transformer (not in Holmgreen connection).

#### Object to be tested

Check of the CT supervision (by comparing the calculated with the measured earth current).

#### Necessary means

- Three-phase current source

#### Procedure, part 1

- Set the limiting value of the CTS to » $\Delta I = 0.1 \cdot I_n$ «.
- Feed a three-phase, symmetrical current system (approx. nominal current) to the secondary side.
- Disconnect the current of one phase from one of the measuring inputs (the symmetrical feeding at secondary side has to be maintained).
- Make sure that the signal »CTS.ALARM« is generated now.

#### Successful test result, part 1

- The signal »CTS.ALARM« is generated.

#### Procedure, part 2

- Feed a three-phase, symmetrical current system (approx. nominal current) to the secondary side.
- Feed a current that is higher than the threshold value for the measuring circuit supervision to the earth current measuring input.
- Ascertain that the signal »CTS.ALARM« is generated now.

#### Successful test result, part 2

The signal »CTS.ALARM« is generated.

## Self Supervision

### SSV

The protection devices are supervised by various check routines during normal operation and during the start-up phase on faulty operation.

The protection devices are carrying out various self supervision tests.

<i>Self Supervision within the devices</i>		
Supervision of...	Supervised by...	Action on detected issue...
Start phase	The duration (permitted time) of the boot phase is monitored.	The device will be rebooted. => The device will be taken out of service after three unsuccessful start attempts.
Supervision of the duration of a protection cycle (Software cycle)	The maximum permitted time for a protection cycle is monitored by a timing analysis.	The self-supervision contact will be deenergized if the permitted time for a protection cycle is exceeded (first threshold).  The protection device will be rebooted, if the protection cycle exceeds the second threshold.
Monitoring of the communication between Main and Digital Signal Processor (DSP)	The cyclic measured value processing of the DSP is monitored by the main processor.	The device will be rebooted, if a failure is detected. The self-supervision contact will be deenergized.
Analog-Digital-Converter	The DSP does a plausibility check on the digitalized data.	Protection will be blocked, if a failure is detected, in order to prevent faulty tripping.
Supervision of data consistency after an outage of the power supply. (e.g. outage of the power supply while changing the parameter settings).	An internal logic detects fragmentary saved data after an outage of the power supply.	If the new data is incomplete or corrupt, it will be deleted during the reboot phase of the device. The device will continue to work with the last valid data set.
Data consistency in general	Generation of check-sums.	The device will be taken out of service in case that inconsistent data is detected that is not caused by an outage of the power supply. (fatal internal error).

<b>Self Supervision within the devices</b>		
Parameter Setting (Device)	Protecting the parameter setting by plausibility checks.	Implausibilities within the parameter configuration can be detected by means of plausibility checks.  Detected implausibilities are highlighted by a question mark symbol. Please refer to chapter parameter setting for detailed information.
Quality of the power supply	A hardware circuit ensures that the device can only be used, if the power supply is in the range specified by the technical data.	If the supply voltage is too low, the device will not start up or it will be set out of service respectively.
Sags of the supply voltage	Short-term sags of the supply voltage are detected and can be bridged in most of the cases by means of the integrated buffer within the power supply hardware.  This buffer also allows the termination of ongoing data writing procedures.	The module for the supervision of the system utilization will detect repetitive short-term sags of the supply voltage.
Internal data of the device (memory load, internal resources, ...)	An internal module monitors the system utilization.	The module for the supervision of the system utilization initiates in case of a fatal error a reboot of the device. In case of minor faults the system led will flash alternating red and green (please refer to the trouble shooting guide). The issue will be recorded within an integrated fault memory.
Status of the device communication (SCADA)	The projected and activated SCADA module supervises its connection to the master communication system.	You can check if there is active communication with the master system within menu <Operation/ Status display/ Communication>. In order to monitor this state you can assign this status onto an LED and/or an output relay. For details on the status of the GOOSE communication please refer to chapter IEC61850.



## Device Start (Reboot)

The device starts up if:

- it is connected to the supply voltage,
- the User initiates (intentionally) a restart of the device,
- the device is set back to factory defaults,
- the internal self-supervision of the device detects a fatal error.

The reason for a device start/reboot is shown numerically within menu <Operation/ Status display/ Sys/ Restart> (please refer to the table below). The reason will also be logged within the event recorder (Event: Sys.Restart).

The table below explains the numbers indicating the reason of the restart.

<i>Device Start-up Codes</i>	
1.	<b>Normal Start-up</b> Start-up after clean disconnection of the supply voltage.
2.	<b>Reboot by the Operator</b> Device reboot triggered by the operator via HMI or Smart view.
3.	<b>Reboot by means of Super Reset</b> Automatic reboot when setting the device back to factory defaults.
4.	-- (outdated)
5.	-- (outdated)
6.	<b>Unknown Error Source</b> Reboot due to unknown error source.
7.	<b>Forced Reboot (initiated by the main processor)</b> The main processor identified invalid conditions or data.
8.	<b>Exceeded Time Limit of the Protection Cycle</b> Unexpected interruption of the Protection Cycle.
9.	<b>Forced Reboot (initiated by the digital signal processor)</b> The digital signal processor identified invalid conditions or data.
10.	<b>Exceeded Time Limit of the Measured Value Processing</b> Unexpected interruption of the cyclic measured value processing.
11.	<b>Sags of the Supply Voltage</b> Reboot after short-term sag or outage of the supply voltage.
12.	<b>Illegal Memory Access</b> Reboot after illegal memory access.

## Device taken out of Service „Device Stopped“

The protection device will be taken out of service, if there is an undefined state that cannot be escaped after three reboots.

In this state the system LED will be illuminated red or red flashing. The display will show the message „Device Stopped“ followed by a 6-digit error code, e.g. E01487.


In addition to the recorders, messages and display information that can be accessed by the user, there may exist additional error information accessible by the Service Staff. These offer further failure analysis and diagnosis opportunities to the Service Staff.

### **NOTICE**

**In such a case please contact the Woodward Service Staff and provide them the error code.**

**For further information on trouble shooting please refer to the separately provided „Trouble Shooting Guide“.**

## Direct Commands of the Self Supervision

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Ack System LED 	Ack System LED (red/green flashing LED)	False, True	False	[Operation / Reset/Acknowledge /Acknowledge]

## Signals (Output States) of the Self Supervision

<i>Signal</i>	<i>Description</i>
System Error	Signal: Device Failure
SelfSuperVision Contact	Signal: SelfSuperVision Contact

## Values of the Self Supervision

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
Last Failure	Last Failure	[Operation /Self Supervision /System Error]

## Counter Values of the Self Supervision

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
Resets by Device	Resets initiated by the device	[Operation /Self Supervision /System Error]
Cr No of free sockets	Counter for network diagnosis. Number of free sockets.	[Operation /Self Supervision /System State]

# Programmable Logic

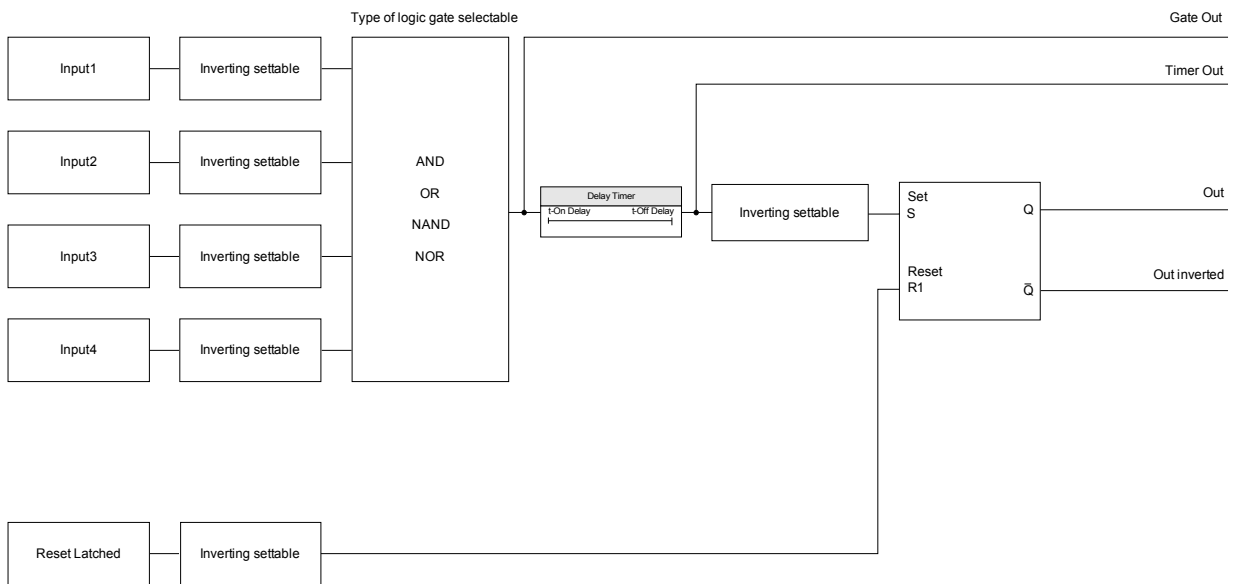
Available Elements (Equations):  
[Logics](#)

## General Description

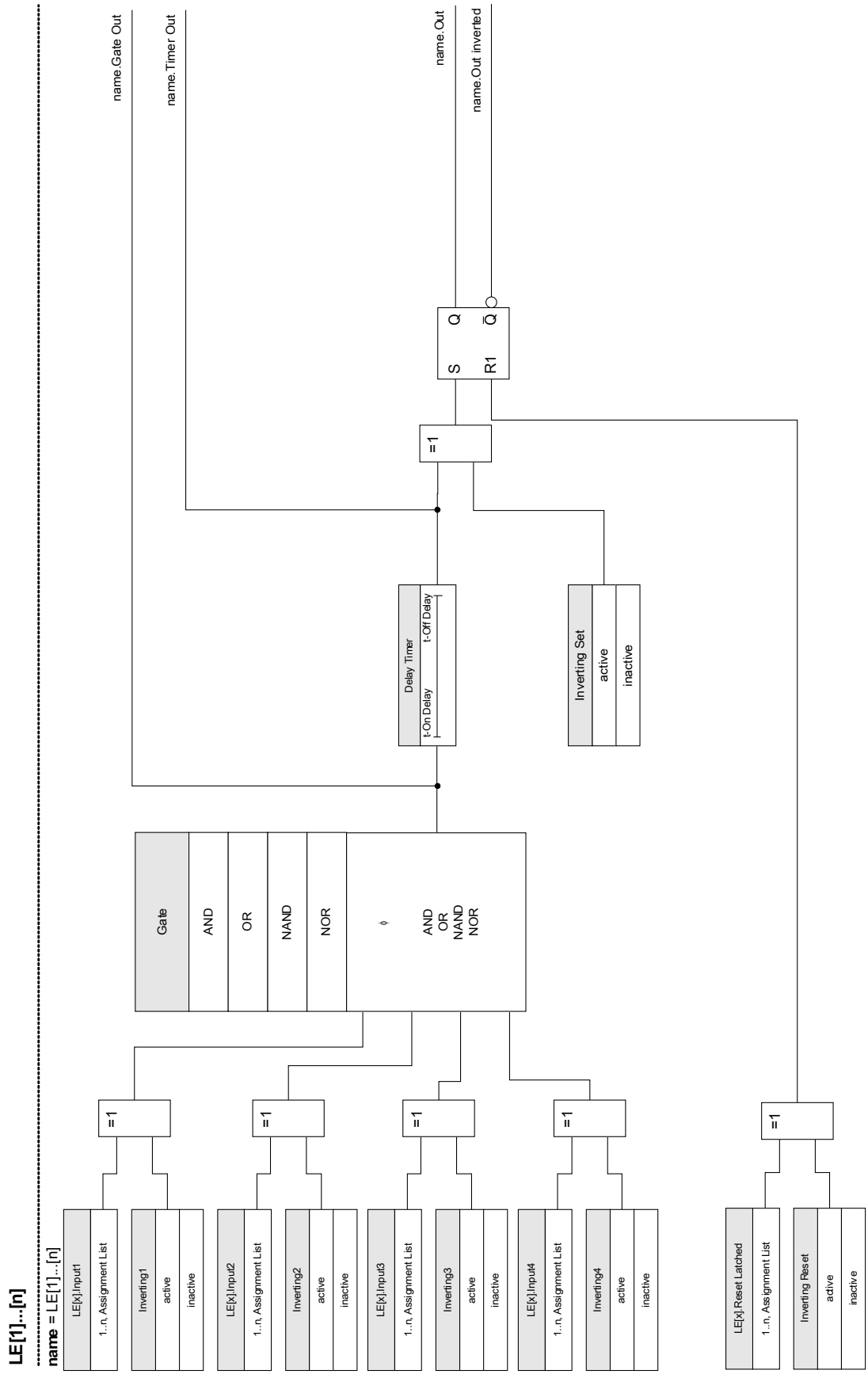
The Protective Relay includes programmable Logic Equations for programming output relays, blocking of protective functions and custom logic functions in the relay.

The logic provides control of the output relays based on the state of the inputs that can be chosen from the assignment list (protective function pickups, protective function states, breaker states, system alarms, and module inputs). The user can use the outputs signals of a Logic Equation as inputs in higher equations (e.g. the output signal of Logic Equation 10 might be used as an input of Logic Equation 11).

### Principle Overview



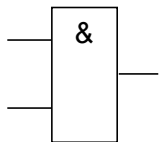
Detailed Overview – Overall Logic diagram



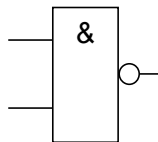
## Available Gates (Operators)

Within the Logic Equation, the following Gates can be used:

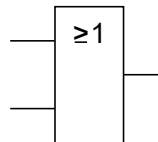
Gate



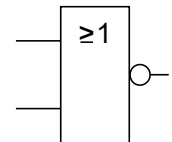
AND



NAND



OR



NOR

## Input Signals

The user can assign up to 4 Input signals (from the assignment list) to the inputs of the gate.

As an option, each of the 4 input signals can be inverted (negated)

## Timer Gate (On Delay and Off Delay)

The output of the gate can be delayed. The user has the option to set an On and an Off delay.

## Latching

The logic equations issues two signals. An unlatched and a latched signal. The latched output is also available as an inverted output.

In order to reset the latched signal the user has to assign a reset signal from the assignment list. The reset signal can also optionally be inverted. The latching works based on reset priority. That means, the reset input is dominant.

## Cascading Logical Outputs

The device will evaluate output states of the Logic Equations starting from Logic Equation 1 up to the Logic Equation with the highest number. This evaluation (device) cycle will be continuously repeated.

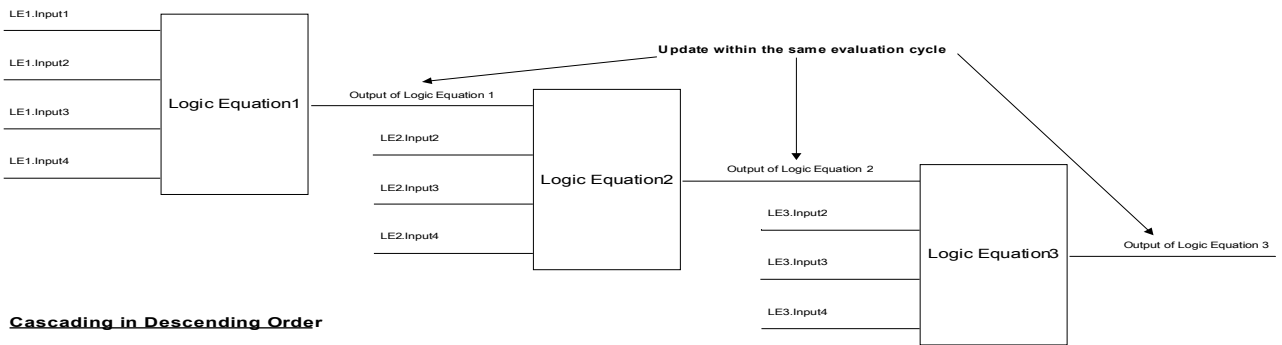
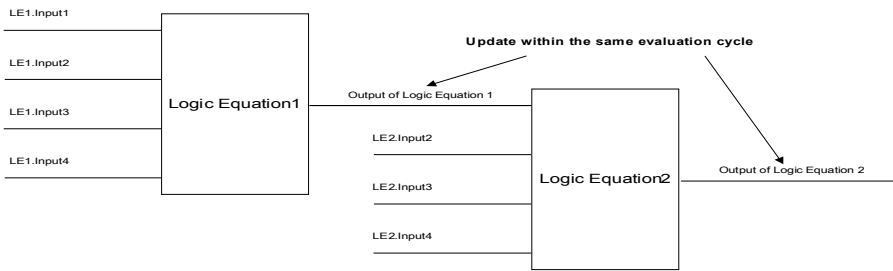
### *Cascading Logic Equations in an ascending sequence*

Cascading in an ascending sequence means that the user uses the output signal of “Logic Equation  $n$ ” as input of “Logic Equation  $n+1$ ”. If the state of “Logic Equation  $n$ ” changes, the state of the output of “Logic Equation  $n+1$ ” will be updated within the same cycle.

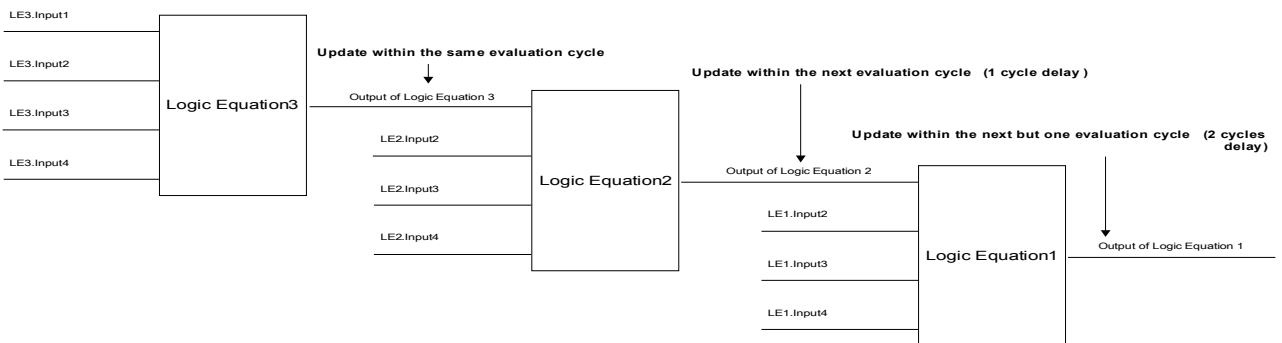
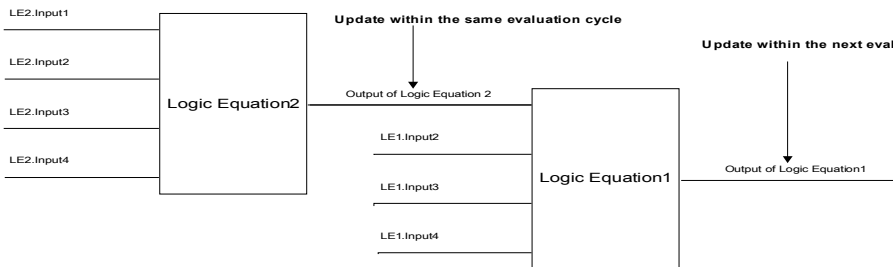
### *Cascading Logic Equations in a descending sequence*

Cascading in a descending sequence means that the user uses the output signal of “Logic Equation  $n+1$ ” as input of “Logic Equation  $n$ ”. If the output of “Logic Equation  $n+1$ ” changes, this change of the feed back signal at the input of “Logic Equation  $n$ ” will be delayed for one cycle.

**Cascading in Ascending Order**



**Cascading in Descending Order**





## Programmable Logic at the Panel



**WARNING** improper use of Logic Equations might result in personal injury or damage the electrical equipment.

**Don't use Logic Equations unless that you can ensure the safe functionality.**


*How to configure a Logic Equation?*

- Call up menu [Logics/LE [x]]:
- Set the Input Signals (where necessary, invert them).
- If required, configure the timer («*On delay*» and «*Off delay*»).
- If the latched output signal is used assign a reset signal to the reset input.
- Within the «status display», the user can check the status of the logical inputs and outputs of the Logic Equation.









In case that Logic Equations should be cascaded the user has to be aware of timing delays (cycles) in case of descending sequences (Please refer to section: Cascading Logical Outputs).





By means the Status Display [Operation/Status Display] the logical states can be verified.]

## Device Planning Parameters of the Programmable Logic

Parameter	Description	Options	Default	Menu path
No of Equations: 	Number of required Logic Equations:	0, 5, 10, 20, 40, 80	20	[Device planning]

## Global Protection Parameter of the Programmable Logic

Parameter	Description	Setting range	Default	Menu path
LE1.Gate 	Logic gate	AND, OR, NAND, NOR	AND	[Logics /LE 1]
LE1.Input1 	Assignment of the Input Signal	1..n, Assignment List	.-	[Logics /LE 1]
LE1.Inverting1 	Inverting the input signals.  Only available if an input signal has been assigned.	inactive, active	inactive	[Logics /LE 1]
LE1.Input2 	Assignment of the Input Signal	1..n, Assignment List	.-	[Logics /LE 1]
LE1.Inverting2 	Inverting the input signals.  Only available if an input signal has been assigned.	inactive, active	inactive	[Logics /LE 1]
LE1.Input3 	Assignment of the Input Signal	1..n, Assignment List	.-	[Logics /LE 1]
LE1.Inverting3 	Inverting the input signals.  Only available if an input signal has been assigned.	inactive, active	inactive	[Logics /LE 1]
LE1.Input4 	Assignment of the Input Signal	1..n, Assignment List	.-	[Logics /LE 1]
LE1.Inverting4 	Inverting the input signals.  Only available if an input signal has been assigned.	inactive, active	inactive	[Logics /LE 1]
LE1.t-On Delay 	Switch On Delay	0.00 - 36000.00s	0.00s	[Logics /LE 1]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
LE1.t-Off Delay 	Switch Off Delay	0.00 - 36000.00s	0.00s	[Logics /LE 1]
LE1.Reset Latched 	Reset Signal for the Latching	1..n, Assignment List	--	[Logics /LE 1]
LE1.Inverting Reset 	Inverting Reset Signal for the Latching	inactive, active	inactive	[Logics /LE 1]
LE1.Inverting Set 	Inverting the Setting Signal for the Latching	inactive, active	inactive	[Logics /LE 1]

### Programmable Logic Inputs

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
LE1.Gate In1-I	State of the module input: Assignment of the Input Signal	[Logics /LE 1]
LE1.Gate In2-I	State of the module input: Assignment of the Input Signal	[Logics /LE 1]
LE1.Gate In3-I	State of the module input: Assignment of the Input Signal	[Logics /LE 1]
LE1.Gate In4-I	State of the module input: Assignment of the Input Signal	[Logics /LE 1]
LE1.Reset Latch-I	State of the module input: Reset Signal for the Latching	[Logics /LE 1]

### Programmable Logic Outputs

<i>Signal</i>	<i>Description</i>
LE1.Gate Out	Signal: Output of the logic gate
LE1.Timer Out	Signal: Timer Output
LE1.Out	Signal: Latched Output (Q)
LE1.Out inverted	Signal: Negated Latched Output (Q NOT)

## Commissioning

Before starting work on an opened switchboard it is imperative that the complete switchboard is dead and the following 5 safety regulations are always met: ,

### DANGER

Safety precautions:

- Disconnect from the power supply
- Secure against reconnection
- Verify if the equipment is dead
- Connect to ground and short-circuit all phases
- Cover or safeguard all live adjacent parts

### DANGER

The secondary circuit of a current transformer must never be opened during operation. The prevailing high voltages are dangerous to life.

### WARNING

Even when the auxiliary voltage is switched off, it is likely that there are still hazardous voltages at the component connections.

All locally applicable national and international installation and safety regulations for working at electrical power installations must always be followed (e.g. VDE, EN, DIN, IEC).

### WARNING

Prior to the initial voltage connection, the following must be guaranteed:

- Correct grounding of the device
- That all signal circuits are tested
- That all control circuits are tested
- Transformer wiring is checked
- Correct rating of the CTs
- Correct burden of the CTs
- That the operational conditions are in line with the Technical Data
- Correct rating of the transformer protection
- Function of the transformer fuses
- Correct wiring of all digital inputs
- Polarity and capacity of the supply voltage
- Correct wiring of the analogue inputs and outputs

### NOTICE

The permissible deviations of measuring values and device adjustment are dependent on the technical data/tolerances.

## Commissioning/Protection Test

### **WARNING**

Putting into operation/Protection test must be carried out by authorized and qualified personnel. Before the device is put into operation the related documentation has to be read and understood.

### **WARNING**

With any test of the protection functions the following has to be checked:

- Is activation/tripping saved in the event recorder?
- Is tripping saved in the fault recorder?
- Is tripping saved in the disturbance recorder?
- Are all signals/messages correctly generated?
- Do all general parameterized blocking functions work properly?
- Do all temporary parameterized (via DI) blocking functions work properly?
- To enable checks on all LEDs and relay functions, these have to be provided with the relevant alarm and tripping functions of the respective protection functions/elements. This has to be tested in practical operation.

### **WARNING**

Check of all temporary blockings (via digital inputs):

- In order to avoid malfunctions, all blockings related to tripping/non-tripping of protection function have to be tested. The test can be very complex and should therefore be performed by the same people who set up the protection concept.

### **CAUTION**

Check of all general trip blockings:

- All general trip blockings have to be tested.

### **NOTICE**

Prior to the initial operation of the protection device all tripping times and values shown in the adjustment list have to be confirmed by a secondary test

### **NOTICE**

Any description of functions, parameters, inputs or outputs that does not match the device in hand, can be ignored.

## Putting out of Operation – Plug out the Relay



**Warning!** Dismounting the relay will lead to a loss of the protection functionality. Ensure that there is a back-up protection. If you are not aware of the consequences of dismounting the device – stop! Don't start.



Inform SCADA before you start.

Switch-off the power supply.

Ensure, that the cabinet is dead and that there are no voltages that could lead to personal injury.

Plug-out the terminals at the rear-side of the device. Do not pull any cable – pull on the plugs! If it is stuck use for example a screw driver.

Fasten the cables and terminals in the cabinet by means of cable clips to ensure that no accidental electrical connections are caused.

Hold the device at the front-side while opening the mounting nuts.

Remove the device carefully out of the cabinet.

In case no other device is to be mounted or replaced cover/close the cut-out in the front-door.

Close the cabinet.

## Service and Commissioning Support

Within the service menu various functions support maintenance and commissioning of the device.

### General

Within the menu [Service/General], the user can initiate a reboot of the device.

## Forcing the Relay Output Contacts

### NOTICE

The parameters, their defaults and setting ranges have to be taken from Relay Output Contacts section.

### Principle – General Use

### ⚠ DANGER

The User **MUST ENSURE** that the relay output contacts operate normally after the maintenance is completed. If the relay output contacts do not operate normally, the protective device **WILL NOT** provide protection.

For commissioning purposes or for maintenance, relay output contacts can be set by force.

Within this mode [Service/Test Mode/Force OR/BO Slot X(2/5)], relay output contacts can be set by force:

- Permanent; or
- Via timeout.

If they are set with a timeout, they will only keep their “Force Position” as long as this timer runs. If the timer expires, the relay will operate normally. If they are set as Permanent, they will keep the “Force Position” continuously.

There are two options available:

- Forcing a single relay »*Force ORx*«; and
- Forcing an entire group of relay output contacts »*Force all Outs*«.

Forcing an entire group takes precedence over forcing a single relay output contact!

### NOTICE

A relay output contact will NOT follow a force command as long as it is disarmed at the same time.

### NOTICE

A relay output contact will follow a force command:

- If it is not disarmed; and
- If the Direct Command is applied to the relay(s).

Keep in mind, that the forcing of all relay output contacts (of the same assembly group) takes precedence over the force command of a single relay output contact.



## Disarming the Relay Output Contacts

### NOTICE

The parameters, their defaults, and setting ranges have to be taken from the Relay Output Contacts section.

### Principle – General Use

Within this mode [Service/Test Mode/DISARMED], entire groups of relay output contacts can be disabled. By means of this test mode, contact outputs switching actions of the relay output contacts are prevented. If the relay output contacts are disarmed, maintenance actions can be carried out without the risk of taking entire processes off-line.

### ⚠ DANGER

The User **MUST ENSURE** that the relay output contacts are **ARMED AGAIN** after the maintenance is complete. If they are not armed, the protective device **WILL NOT** provide protection.

### NOTICE

Zone Interlocking Output and the Supervision Contact cannot be disarmed.

Within this mode [Service/Test Mode/DISARMED] entire groups of relay output contacts can be disarmed:

- Permanent; or
- Via timeout.

If they are set with a timeout, they will only keep their “Disarm Position” as long as this timer runs. If the timer expires, the relay output contacts will operate normally. If they are set Permanent, they will keep the “Disarm State” continuously.

### NOTICE

A relay output contact will NOT be disarmed as long as:

- It's latched (and not yet reset).
- As long as a running t-OFF-delay timer is not yet expired (hold time of a relay output contact).
- The Disarm Control is not set to active.
- The Direct Command is not applied.

### NOTICE

A relay output contact will be disarmed if it's not latched and

- There is no running t-OFF-delay timer (hold time of a relay output contact) and
- The DISARM Control is set to active and
- The Direct Command Disarm is applied.

## Forcing RTDs\*

\* = Availability depends on ordered device.

### NOTICE

The parameters, their defaults, and setting ranges have to be taken from RTD/UTRD section.

## Principle – General Use

### ⚠ DANGER

The User **MUST ENSURE** that the RTDs operate normally after the maintenance is completed. If the RTDs do not operate normally, the protective device **WILL NOT** provide protection.

For commissioning purposes or for maintenance, RTD temperatures can be set by force.

Within this mode [Service/Test Mode/URTD], RTD temperatures can be set by force:

- Permanent; or
- Via timeout.

If they are set with a timeout, they will keep their “Forced Temperature” only as long as this timer runs. If the timer expires, the RTD will operate normally. If they are set as »*Permanent*«, they will keep the “Forced Temperature” continuously. This menu will show the measured values of the RTDs until the User activates the force mode by calling up the »*Function*«. As soon as the force mode is activated, the shown values will be frozen as long as this mode is active. Now the User can force RTD values. As soon as the force mode is deactivated, measured values will be shown again.

## Forcing Analog Outputs\*

\* = Availability depends on ordered device.

### NOTICE

The parameters, their defaults, and setting ranges have to be taken from Analog Output section.

## Principle – General Use

### ⚠ DANGER

The User **MUST ENSURE** that the Analog Outputs operate normally after maintenance is completed. Do not use this mode if forced Analog Outputs cause issues in external processes.

For commissioning purposes or for maintenance, Analog Outputs can be set by force.

Within this mode [Service/Test Mode/Analog Output(x)], Analog Outputs can be set by force:

- Permanent; or
- Via timeout.

If they are set with a timeout, they will only keep their “Forced Value” as long as this timer runs. If the timer expires, the Analog Output will operate normally. If they are set as »*Permanent*«, they will keep the “Forced Value” continuously. This menu will show the current value that is assigned onto the Analog Output until the User activates the force mode by calling up the »*Function*«. As soon as the force mode is activated, the shown values will be frozen as long as this mode is active. Now the User can force Analog Output values. As soon as the force mode is deactivated, measured values will be shown again.

## Forcing Analog Inputs\*

\* = Availability depends on ordered device.

### NOTICE

The parameters, their defaults, and setting ranges have to be taken from Analog Inputs section.

## Principle – General Use

### ⚠ DANGER

The User **MUST ENSURE** that the Analog Inputs operate normally after maintenance is completed.

For commissioning purposes or for maintenance, Analog Inputs can be set by force.

Within this mode [Service/Test Mode (Prot inhibit)/WARNING! Cont?/Analog Inputs], Analog Inputs can be set by force:

- Permanent; or
- Via timeout.

If they are set with a timeout, they will only keep their “Forced Value” as long as this timer runs. If the timer expires, the Analog Input will operate normally. If they are set as »*Permanent*«, they will keep the “Forced Value” continuously. This menu will show the current value that is fed to the Analog Input until the User activates the force mode by calling up the »*Function*«. As soon as the force mode is activated, the shown value will be frozen as long as this mode is active. Now the User can force the Analog Input value. As soon as the force mode is deactivated, measured value will be shown again.

## Failure Simulator (Sequencer)\*

Available Elements:

Sgen

\* = Availability depends on ordered device.

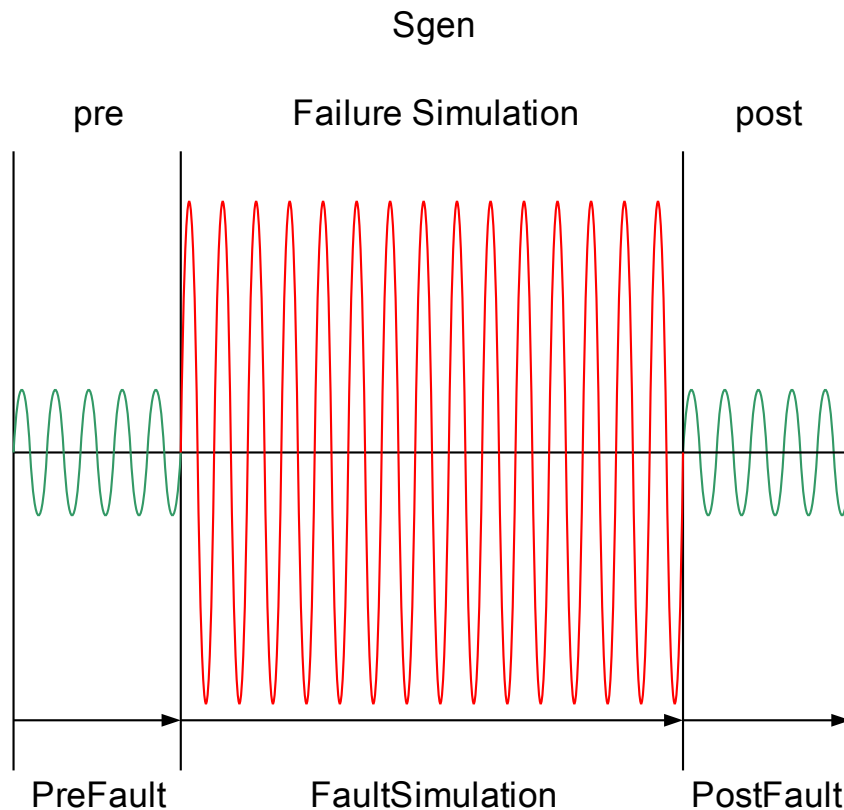
For commissioning support and in order to analyze failures, the protective device offers the option to simulate measuring quantities. The simulation menu can be found within the [Service/Test Mode/Sgen] menu.

The simulation cycle consists of three states:

- Pre-failure;
- Failure; and
- Post-failure State (Phase).

Within the [Service/Test Mode/Sgen/Configuration/Times] sub-menu, the duration of each phase can be set. In addition; the measuring quantities to be simulated can be determined (e.g.: voltages, currents, and the corresponding angles) for each phase (and ground). The simulation will be terminated, if a phase current exceeds 0.1 times  $I_n$ . A simulation can be restarted, five seconds after the current has fallen below 0.1 times  $I_n$ .

**⚠ DANGER** Setting the device into the simulation mode means taking the protective device out of operation for the duration of the simulation. Do not use this feature during operation of the device if the User cannot guarantee that there is a running and properly working backup protection.



The energy counters will be stopped while the failure simulator is running.

**NOTICE**


The simulation voltages are always phase to neutral voltages, irrespectively of the mains voltage transformers' connection method (Phase-to-phase / Wey / Open Delta).

Application Options of the Fault Simulator\*\*:

<b>Stop Options</b>	<b>Cold Simulation (Option 1)</b>	<b>Hot Simulation (Option 2)</b>
<p><b>Do not stop</b></p> <p>Run complete: Pre Failure, Failure, Post Failure.</p> <p>How To?: Call up [Service/Test Mode/Sgen /Process] Ex Force Post = no assignment</p> <p>Press/Call up Start Simulation.</p>	<p><b>Simulation without tripping the breaker:</b></p> <p>Blocking protective Trips to the Breaker. That means verifying if the protective device generates a trip without energizing the trip coil of the breaker (similar to disarm the output relay).</p> <p>How To?: Call up [Service/Test Mode/Sgen /Process]</p> <p>TripCmd Mode = No TripCmd</p>	<p><b>Simulation is authorized to trip the breaker:</b></p> <p>How To?: Call up [Service/Test Mode/Sgen /Process] TripCmd Mode = With TripCmd</p>
<p><b>Stop by external signal</b></p> <p>Force Post: As soon as this signal becomes true, the Fault Simulation will be forced to switch into the Post Failure mode.</p> <p>How To?: Call up [Service/Test Mode/Sgen /Process] Ex Force Post = Assigned Signal</p>		
<p><b>Manual stop</b></p> <p>As soon as this signal becomes true, the Fault Simulation will be terminated and the device changes back to normal operation.</p> <p>How To?: Call up [Service/Test Mode/Sgen /Process] Press/Call up Stop Simulation.</p>		

\*\*Please note: Due to internal dependencies, the frequency of the simulation module is 0.16% greater than the rated one.


## Device Planning Parameters of the Failure Simulator

Parameter	Description	Options	Default	Menu path
Mode 	Mode	do not use, use	use	[Device planning]


## Global Protection Parameter of the Failure Simulator

Parameter	Description	Setting range	Default	Menu path
PreFault 	Pre Fault Duration	0.00 - 300.00s	0.0s	[Service /Test (Prot inhibit) /Sgen /Configuration /Times]
FaultSimulation 	Duration of Fault Simulation	0.00 - 10800.00s	0.0s	[Service /Test (Prot inhibit) /Sgen /Configuration /Times]
PostFault 	PostFault	0.00 - 300.00s	0.0s	[Service /Test (Prot inhibit) /Sgen /Configuration /Times]
TripCmd Mode 	Trip Command Mode	No TripCmd, With TripCmd	No TripCmd	[Service /Test (Prot inhibit) /Sgen /Process]
Ex Start Simulation 	External Start of Fault Simulation (Using the test parameters)	1..n, Assignment List	--	[Service /Test (Prot inhibit) /Sgen /Process]
ExBlo 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	SG[1].Pos ON	[Service /Test (Prot inhibit) /Sgen /Process]



Parameter	Description	Setting range	Default	Menu path
Ex ForcePost 	Force Post state. Abort simulation.	1..n, Assignment List	.-	[Service /Test (Prot inhibit) /Sgen /Process]


### Current Parameter of the Failure Simulator

Parameter	Description	Setting range	Default	Menu path
IL1 	Current Fundamental Magnitude in Pre State: phase L1	0.00 - 40.00In	0.0In	[Service /Test (Prot inhibit) /Sgen /Configuration /PreFault /CT]
IL2 	Current Fundamental Magnitude in Pre State: phase L2	0.00 - 40.00In	0.0In	[Service /Test (Prot inhibit) /Sgen /Configuration /PreFault /CT]
IL3 	Current Fundamental Magnitude in Pre State: phase L3	0.00 - 40.00In	0.0In	[Service /Test (Prot inhibit) /Sgen /Configuration /PreFault /CT]
IG meas 	Current Fundamental Magnitude in Pre State: IG	0.00 - 25.00In	0.0In	[Service /Test (Prot inhibit) /Sgen /Configuration /PreFault /CT]
phi IL1 	Start Position respectively Start Angle of the Current Phasor during Pre-Phase:phase L1	-360 - 360°	0°	[Service /Test (Prot inhibit) /Sgen /Configuration /PreFault /CT]

Parameter	Description	Setting range	Default	Menu path
phi IL2 	Start Position respectively Start Angle of the Current Phasor during Pre-Phase:phase L2	-360 - 360°	240°	[Service /Test (Prot inhibit) /Sgen /Configuration /PreFault /CT]
phi IL3 	Start Position respectively Start Angle of the Current Phasor during Pre-Phase:phase L3	-360 - 360°	120°	[Service /Test (Prot inhibit) /Sgen /Configuration /PreFault /CT]
phi IG meas 	Start Position respectively Start Angle of the Current Phasor during Pre-Phase: IG	-360 - 360°	0°	[Service /Test (Prot inhibit) /Sgen /Configuration /PreFault /CT]
IL1 	Current Fundamental Magnitude in Fault State: phase L1	0.00 - 40.00In	0.0In	[Service /Test (Prot inhibit) /Sgen /Configuration /FaultSimulation /CT]
IL2 	Current Fundamental Magnitude in Fault State: phase L2	0.00 - 40.00In	0.0In	[Service /Test (Prot inhibit) /Sgen /Configuration /FaultSimulation /CT]
IL3 	Current Fundamental Magnitude in Fault State: phase L3	0.00 - 40.00In	0.0In	[Service /Test (Prot inhibit) /Sgen /Configuration /FaultSimulation /CT]

Parameter	Description	Setting range	Default	Menu path
IG meas 	Current Fundamental Magnitude in Fault State: IG	0.00 - 25.00In	0.0In	[Service /Test (Prot inhibit) /Sgen /Configuration /FaultSimulation /CT]
phi IL1 	Start Position respectively Start Angle of the Current Phasor during Fault-Phase:phase L1	-360 - 360°	0°	[Service /Test (Prot inhibit) /Sgen /Configuration /FaultSimulation /CT]
phi IL2 	Start Position respectively Start Angle of the Current Phasor during Fault-Phase:phase L2	-360 - 360°	240°	[Service /Test (Prot inhibit) /Sgen /Configuration /FaultSimulation /CT]
phi IL3 	Start Position respectively Start Angle of the Current Phasor during Fault-Phase:phase L3	-360 - 360°	120°	[Service /Test (Prot inhibit) /Sgen /Configuration /FaultSimulation /CT]
phi IG meas 	Start Position respectively Start Angle of the Current Phasor during Fault-Phase: IG	-360 - 360°	0°	[Service /Test (Prot inhibit) /Sgen /Configuration /FaultSimulation /CT]
IL1 	Current Fundamental Magnitude during Post phase: phase L1	0.00 - 40.00In	0.0In	[Service /Test (Prot inhibit) /Sgen /Configuration /PostFault /CT]

Parameter	Description	Setting range	Default	Menu path
IL2 	Current Fundamental Magnitude during Post phase: phase L2	0.00 - 40.00In	0.0In	[Service /Test (Prot inhibit) /Sgen /Configuration /PostFault /CT]
IL3 	Current Fundamental Magnitude during Post phase: phase L3	0.00 - 40.00In	0.0In	[Service /Test (Prot inhibit) /Sgen /Configuration /PostFault /CT]
IG meas 	Current Fundamental Magnitude during Post phase: IG	0.00 - 25.00In	0.0In	[Service /Test (Prot inhibit) /Sgen /Configuration /PostFault /CT]
phi IL1 	Start Position respectively Start Angle of the Current Phasor during Post phase: phase L1	-360 - 360°	0°	[Service /Test (Prot inhibit) /Sgen /Configuration /PostFault /CT]
phi IL2 	Start Position respectively Start Angle of the Current Phasor during Post phase: phase L2	-360 - 360°	240°	[Service /Test (Prot inhibit) /Sgen /Configuration /PostFault /CT]
phi IL3 	Start Position respectively Start Angle of the Current Phasor during Post phase: phase L3	-360 - 360°	120°	[Service /Test (Prot inhibit) /Sgen /Configuration /PostFault /CT]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
phi IG meas 	Start Position respectively Start Angle of the Current Phasor during Post phase: IG	-360 - 360°	0°	[Service /Test (Prot inhibit) /Sgen /Configuration /PostFault /CT]



### States of the Inputs of the Failure Simulator

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Ex Start Simulation-I	State of the module input: External Start of Fault Simulation (Using the test parameters)	[Service /Test (Prot inhibit) /Sgen /Process]
ExBlo	Module input state: External blocking	[Service /Test (Prot inhibit) /Sgen /Process]
Ex ForcePost-I	State of the module input: Force Post state. Abort simulation.	[Service /Test (Prot inhibit) /Sgen /Process]

### Signals of the Failure Simulator (States of the Outputs)

<i>Signal</i>	<i>Description</i>
Running	Signal; Measuring value simulation is running
State	Signal: Wave generation states: 0=Off, 1=PreFault, 2=Fault, 3=PostFault, 4=InitReset

### Direct Commands of the Failure Simulator

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
 Start Simulation	Start Fault Simulation (Using the test parameters)	inactive, active	inactive	[Service /Test (Prot inhibit) /Sgen /Process]
 Stop Simulation	Stopp Fault Simulation (Using the test parameters)	inactive, active	inactive	[Service /Test (Prot inhibit) /Sgen /Process]

### Failure Simulator Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
State	Wave generation states: 0=Off, 1=PreFault, 2=Fault, 3=PostFault, 4=InitReset	Off	Off, PreFault, FaultSimulation, PostFault, Init Res	[Service /Test (Prot inhibit) /Sgen /State]

## Technical Data

### NOTICE

Use Copper conductors only, 75°C.  
Conductor size AWG 14 [2.5 mm<sup>2</sup>].

## Climatic Environmental Conditions

Storage Temperature:	Operating Temperature:
-30°C up to +70°C (-22°F to 158°F)	-20°C up to +60°C (-4°F to 140°F)

Permissible Humidity at Ann. Average: <75% rel. (on 56d up to 95% rel.)  
 Permissible Installation Altitude: <2000 m (6561.67 ft) above sea level  
 If 4000 m (13123.35 ft) altitude apply a changed classification of the operating and test voltages may be necessary.

## Degree of Protection EN 60529

HMI front panel with seal	IP54
HMI front panel without seal	IP50
Rear side terminals	IP20

## Routine Test

Insulation test acc. to IEC60255-5: All tests to be carried out against earth and other input- and output circuits  
 Aux. voltage supply, digital inputs, 2.5 kV (eff) / 50 Hz  
 current measuring inputs, signal relay outputs:  
 Voltage measuring inputs: 3.0 kV (eff) / 50 Hz  
 All wire-bound communication interfaces: 1.5 kV DC

## Housing

Housing B1: height/-width (7 Pushbottons/Door Mounting)	173 mm (6.811")/ 141.5 mm (5.570")
Housing B1: height/-width (8 Pushbottons/Door Mounting)	183 mm (7.205")/ 141.5 mm (5.570")
Housing B1: height/-width (7 and 8 Pushbottons/19")	173 mm (6.811" / 4U)/ 141.5 mm (5.570" / 28 HP)
Housing depth (incl. terminals):	208 mm (8.189")
Material, housing:	Aluminum extruded section
Material, front panel:	Aluminum/Foil front
Mounting position:	Horizontal ( $\pm 45^\circ$ around the X-axis are allowed)
Weight:	Approx. 2.4 kg



## Current and Earth Current Measurement

### Plug-in Connectors with Integrated Short-Circuiter

(Conventional Current Inputs)

Nominal currents:	1 A / 5 A	
Max. measuring range:	up to 40 x I <sub>n</sub> (phase currents) up to 25 x I <sub>n</sub> (earth current standard)	up to 2.5 x I <sub>n</sub> (earth current sensitive) <sup>1)</sup>
Continuous loading capacity:	Phase current/Earth current 4 x I <sub>n</sub> /continuously	Earth current sensitive <sup>1)</sup> 2 x I <sub>n</sub> /continuously
Overcurrent proof:	Phase current/Earth current 30 x I <sub>n</sub> /10 s 100 x I <sub>n</sub> /1 s 250 x I <sub>n</sub> /10 ms (1 half-wave)	Earth current sensitive <sup>1)</sup> 10 x I <sub>n</sub> /10 s 25 x I <sub>n</sub> /1 s 100 x I <sub>n</sub> /10 ms (1 half-wave)
Power consumption:	Phase current inputs: at I <sub>n</sub> = 1 A S = 25 mVA at I <sub>n</sub> = 5 A S = 90 mVA  Earth current input: at I <sub>n</sub> = 1 A S = 25 mVA at I <sub>n</sub> = 5 A S = 90 mVA	Sensitive earth <sup>1)</sup> current input: at 0,1 A (1A) S = 7 mVA (550 mVA) at 0,5 A (5A) S = 10 mVA (870 mVA)
Frequency range:	50 Hz / 60 Hz ±10%	
Terminals:	Screw-type terminals with integrated short-circuiters (contacts)	
Screws:	M4, captive type acc. to VDEW	
Connection Cross Sections:	1 x or 2 x 2.5 mm <sup>2</sup> (2 x AWG 14) with wire end ferrule 1 x or 2 x 4.0 mm <sup>2</sup> (2 x AWG 12) with ring cable sleeve or cable sleeve 1 x or 2 x 6 mm <sup>2</sup> (2 x AWG 10) with ring cable sleeve or cable sleeve Only The current measuring board's terminal blocks may be used as with 2 (double) conductors AWG 10,12,14 otherwise with single conductors only.	

<sup>1)</sup> only in completion with sensitive earth measuring (see ordering information)

## Voltage Supply

Aux. Voltage: 24V - 270 V DC/48 - 230 V AC (-20/+10%)  $\approx$

Buffer time in case of supply failure:  $\geq 50$  ms at minimal aux. voltage. The device will shut down if the buffer time is expired  
Note: communication could be interrupted

Max. permissible making current: 18 A peak value for  $<0.25$  ms  
12 A peak value for  $<1$  ms

The voltage supply must be protected by a fuse of:

- 2,5 A time-lag miniature fuse 5x20 mm (approx. 1/5" x 0.8") according to IEC 60127
- 3,5 A time-lag miniature fuse 6,3x32 mm (approx. 1/4" x 1 1/4") according to UL 248-14

## Power Consumption

Power supply range:	Power consumption in idle mode	Max. power consumption
24-270 V DC:	7 W	10 W
48-230 V AC (for frequencies of 50-60 Hz):	7 W / 13 VA	10 W / 17 VA

## Display

Display type: LCD with LED background illumination  
Resolution graphics display: 128 x 64 pixel

LED-Type: Two colored: red/green  
Number of LEDs, Housing B1: 8

## Front Interface RS232

Baud rates: 115200 Baud  
Handshake: RTS and CTS  
Connection: 9-pole D-Sub plug

## Real Time Clock

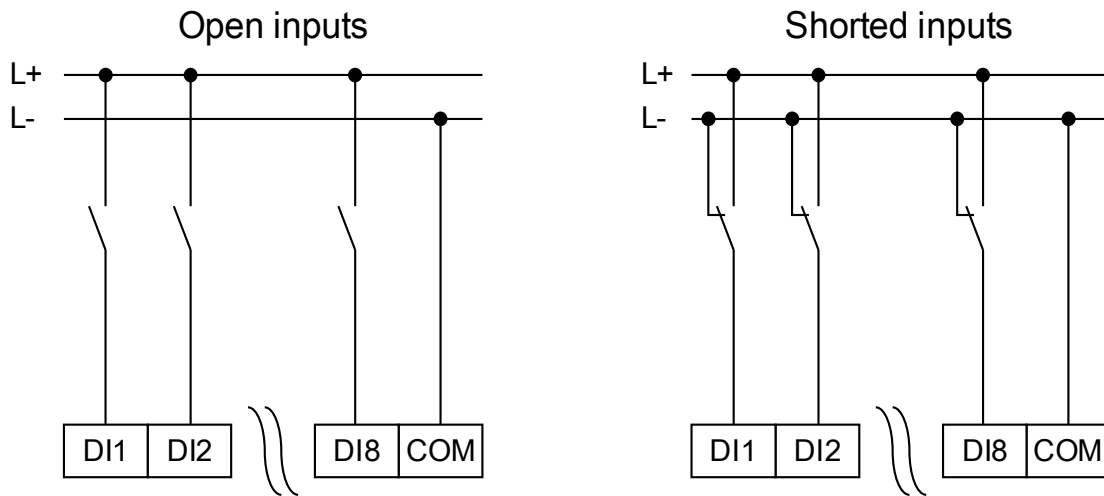
Running reserve of the real time clock: 1 year min.

## Digital Inputs

Max. input voltage: 300 V DC/259 V AC  
 Input current: DC <4 mA  
 AC <16 mA

Reaction time: <20 ms

Fallback Time:  
 Shorted inputs <30 ms  
 Open inputs <90 ms



(Safe state of the digital inputs)

4 Switching thresholds:  $U_n = 24 \text{ V DC}, 48 \text{ V DC}, 60 \text{ V DC}, 110 \text{ V AC/DC}, 230 \text{ V AC/DC}$

$U_n = 24 \text{ V DC}$ :  
 Switching threshold 1 ON: min. 19.2 V DC  
 Switching threshold 1 OFF: max. 9.6 V DC

$U_n = 48 \text{ V}/60 \text{ V DC}$ :  
 Switching threshold 2 ON: Min. 42.6 V DC  
 Switching threshold 2 OFF: max. 21.3 V DC

$U_n = 110 \text{ V AC/DC}$ :  
 Switching threshold 3 ON: min. 88.0 V DC/88.0 V AC  
 Switching threshold 3 OFF: max. 44.0 V DC/44.0 V AC

$U_n = 230 \text{ V AC/DC}$ :  
 Switching threshold 4 ON: min. 184 V DC/184 V AC  
 Switching threshold 4 OFF: max. 92 V DC/92 V AC

Terminals: Screw-type terminals

## Binary Output Relays

Continuous current:	5 A AC/DC
Max. Switch-on current:	25 A AC/DC for 4 s 48W (VA) at L/R = 40ms 30 A / 230 Vac according to ANSI IEEE Std C37.90-2005 30 A / 250 Vdc according to ANSI IEEE Std C37.90-2005
Max. breaking current:	5 A AC up to 240 V AC 4 A AC at 230V and $\cos \phi = 0,4$ 5 A DC up to 30 V (resistive) 0.3 A DC at 250 V (resistive) 0,1 A DC at 220 V and L/R = 40ms
Max. switching voltage:	250 V AC/250 V DC
Switching capacity:	3000 VA
Contact type:	1 changeover contact or normally open or normally closed
Terminals:	Screw-type terminals

## Time Synchronization IRIG

Nominal input voltage: 5 V  
Connection: Screw-type terminals (twisted pair)

## RS485\*

Master/Slave: Slave  
Connection: 9-pole D-Sub socket  
(external terminating resistors/in D-Sub)  
or 6 screw-clamping terminals RM 3.5 mm (138 MIL)  
(terminating resistors internal)

### CAUTION

In case that the RS485 interface is realized via terminals, the communication cable has to be shielded.

## Fibre Optic\*

Master/Slave: Slave  
Connection: ST-Plug  
Wavelength: 820 nm

## Optical Fast Ethernet\*

Connection: LC-Plug  
Wavelength: 1300 nm  
Fiber: 62.5/125 or 50/125  $\mu\text{m}$  multimode

## URTD-Interface\*

Connection: Versatile Link

\*availability depends on device

## Boot phase

After switching on the power supply the protection will be available in approximately 9 seconds. After approximately 1 min 5 seconds the boot phase is completed (HMI and Communication initialized).

## Servicing and Maintenance

Within the scope of servicing and maintenance following checks of the unit hardware have to be conducted:

<b>Component</b>	<b>Step</b>	<b>Interval/How often?</b>
Output Relays	Please check the Output Relays via Test menu Force/Disarm (please see chapter Service)	Each 1-4 years, according to ambience conditions.
Digital Inputs	Please supply a voltage to the Digital Inputs and control if the appropriate status signal appears.	Each 1-4 years, according to ambience conditions.
Current plugs and Current measurements	Please supply testing current to the Current measurement inputs and control the displayed measure values from the unit.	Each 1-4 years, according to ambience conditions.
Voltage plugs and Voltage measurements	Please supply testing current to the Voltage measurement inputs and control the displayed measure values from the unit.	Each 1-4 years, according to ambience conditions.
Analog Inputs	Please feed analog signals into the measurement inputs and check if the displayed measure values match.	Each 1-4 years, according to ambience conditions.
Analog Outputs	Please check the Analog Outputs via Test menu Force/Disarm (please see chapter Service)	Each 1-4 years, according to ambience conditions.
Battery	Readout the clock of the unit. Switch of the unit de-energized for a short moment (>20s). Reset the unit. Please check if the clock ran onwards correctly.	Generally after 10 years at the earliest. Exchange by manufacturer. Advice, the battery serves as buffering of the clock (real time clock). There's no impact of the functionality of the unit if the battery breaks down in addition to the buffering of the clock while the unit is in de-energized condition.
Self-monitoring contact	Switch of the auxiliary supply of the unit. The Self-monitoring contact has to dropout now. Please switch on the auxiliary supply again.	Each 1-4 years, according to ambience conditions.
Mechanical mounting of the unit of the cabinet door	Check the torque related to the specification of the Installation chapter.	With each maintenance or yearly.
Torque of all cable connections	Check the torque related to the specification of the Installation chapter which describes the hardware modules.	With each maintenance or yearly.

## Servicing and Maintenance

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We recommend to execute a protection test after each 4 years period. This period can be extended to 6 years if a function test is executed latest each 3 years.



## Standards

### Approvals

- UL- File No.: E217753
- CSA File No.: 251990\*\*
- CEI 0-16\* (Tested by EuroTest Laboratori S.r.l, Italy)\*
- BDEW Certified ( FGW TR3/ FGW TR8/ Q-U-Schutz)\*\*
- KEMA\*\*\*
- EAC

\* = applies to MRU4

\*\* = applies to MCA4

\*\*\* = applies to (MRDT4, MCA4, MRA4, MRI4, MRU4)

### Design Standards

Generic standard	EN 61000-6-2 , 2005 EN 61000-6-3 , 2006
Product standard	IEC 60255-1; 2009 IEC 60255-27, 2013 EN 50178, 1998 UL 508 (Industrial Control Equipment), 2005 CSA C22.2 No. 14-95 (Industrial Control Equipment), 1995 ANSI C37.90, 2005

## High Voltage Tests

### *High frequency interference test*

IEC 60255-22-1	Within one circuit	1 kV , 2 s
IEEE C37.90.1		
IEC 61000-4-18	Circuit to earth	2.5 kV , 2 s
class 3	Circuit to circuit	2.5 kV , 2 s

### *Insulation voltage test*

IEC 60255-27 (10.5.3.2)	All circuits to other circuits and exposed conductive parts	2.5 kV (eff.)/50Hz , 1 min.
IEC 60255-5	Except interfaces	1,5 kV DC , 1 min.
EN 50178	and Voltage measuring input	3 kV (eff.)/50 Hz , 1 min.

### *Impulse voltage test*

IEC 60255-27 (10.5.3.1)		5 kV/0.5J, 1.2/50 $\mu$ s
IEC 60255-5		

### *Insulation resistance test*

IEC 60255-27 (10.5.3.3)	Within one circuit	500V DC , 5s
EN 50178	Circuit to circuit	500V DC , 5s

## EMC Immunity Tests

### *Fast transient disturbance immunity test (Burst)*

IEC 60255-22-4	Power supply, mains inputs	±4 kV, 2.5 kHz
IEC 61000-4-4 class 4	Other in- and outputs	±2 kV, 5 kHz

### *Surge immunity test (Surge)*

IEC 60255-22-5	Within one circuit	2 kV
IEC 61000-4-5 class 4	Circuit to earth	4 kV
class 3	Communication cables to earth	2 kV

### *Electrical discharge immunity test (ESD)*

IEC 60255-22-2	Air discharge	8 kV
IEC 61000-4-2 class 3	Contact discharge	6 kV

### *Radiated radio-frequency electromagnetic field immunity test*

IEC 60255-22-3	26 MHz – 80 MHz	10 V/m
IEC 61000-4-3	80 MHz – 1 GHz	35 V/m
	1 GHz – 3 GHz	10 V/m

### *Immunity to conducted disturbances induced by radio frequency fields*

IEC 61000-4-6 class 3	150kHz - 80MHz	10 V
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### *Power frequency magnetic field immunity test*

IEC 61000-4-8 class 4	continues 3 sec	30 A/m 300 A/m
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## EMC Emission Tests

*Radio interference suppression test*

IEC/CISPR22                      150kHz - 30MHz  
IEC60255-26  
DIN EN 55022

Limit value class B

*Radio interference radiation test*

IEC/CISPR22                      30MHz - 1GHz  
IEC60255-25  
DIN EN 55022

Limit value class B

## Environmental Tests

### *Classification:*

IEC 60068-1	Climatic classification	20/060/56
IEC 60721-3-1	Classification of ambient conditions (Storage)	1K5/1B1/1C1L/1S1/1M2 but min. -30°C
IEC 60721-3-2	Classification of ambient conditions (Transportation)	2K2/2B1/2C1/2S1/2M2 but min. -30°C
IEC 60721-3-3	Classification of ambient conditions (Stationary use at weather protected locations)	3K6/3B1/3C1/3S1/3M2 but min. -20°C/max +60°C

### *Test Ad: Cold*

IEC 60068-2-1	Temperature test duration	-20°C 16 h
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### *Test Bd: Dry Heat*

IEC 60068-2-2	Temperature Relative humidity test duration	60°C <50% 72 h
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### *Test Db: Damp Heat (cyclic)*

IEC 60068-2-30	Temperature Relative humidity Cycles (12 + 12-hour)	60°C 95% 2
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## Environmental Tests

### *Test Cab: Damp Heat (permanent)*

IEC 60255 (6.12.3.6)	Temperature	60°C
IEC 60068-2-78	Relative humidity	95%
	test duration	56 days

### *Test Nb: Temperature Change*

IEC 60255 (6.12.3.5)	Temperature	60°C/-20°C
IEC 60068-2-14	cycle	5
	test duration	1°C/5min

### *Test BD: Dry Heat Transport and storage test*

IEC 60255 (6.12.3.3)	Temperature	70°C
IEC 60068-2-2	test duration	16 h

### *Test AB: Cold Transport and storage test*

IEC 60255-1 (6.12.3.4)	Temperature	-30°C
IEC 60068-2-1	test duration	16 h

## Mechanical Tests

### *Test Fc: Vibration response test*

IEC 60068-2-6	(10 Hz – 59 Hz)	0.035 mm
IEC 60255-21-1	Displacement	
class 1	(59Hz – 150Hz)	0,5 gn
	Acceleration	
	Number of cycles in each axis	1

### *Test Fc: Vibration endurance test*

IEC 60068-2-6	(10 Hz – 150 Hz)	1.0 gn
IEC 60255-21-1	Acceleration	
class 1	Number of cycles in each axis	20

### *Test Ea: Shock tests*

IEC 60068-2-27	Shock response test	5 gn, 11 ms, 3 impulses in each direction
IEC 60255-21-2		
class 1	Shock resistance test	15 gn, 11 ms, 3 impulses in each direction

### *Test Eb: Shockendurance test*

IEC 60068-2-29	Shock endurance test	10 gn, 16 ms, 1000 impulses in each direction
IEC 60255-21-2		
class 1		

### *Test Fe: Earthquake test*

IEC 60068-3-3	Single axis earthquake vibration test	1 – 9 Hz horizontal: 7.5 mm,
IEC 60255-21-3		1 – 9 Hz vertical :3.5 mm,
		1 sweep per axis
class 2		9 – 35 Hz horizontal: 2 gn,
		9 – 35 Hz vertical : 1 gn,
		1 sweep per axis

## General Lists

### Assignment List

The »ASSIGNMENT LIST« [below](#) summarizes all module outputs (signals) and inputs (e.g. states of the assignments).

<i>Name</i>	<i>Description</i>
--	No assignment
Prot.available	Signal: Protection is available
Prot.active	Signal: active
Prot.ExBlo	Signal: External Blocking
Prot.Blo TripCmd	Signal: Trip Command blocked
Prot.ExBlo TripCmd	Signal: External Blocking of the Trip Command
Prot.Alarm L1	Signal: General-Alarm L1
Prot.Alarm L2	Signal: General-Alarm L2
Prot.Alarm L3	Signal: General-Alarm L3
Prot.Alarm G	Signal: General-Alarm - Earth fault
Prot.Alarm	Signal: General Alarm
Prot.Trip L1	Signal: General Trip L1
Prot.Trip L2	Signal: General Trip L2
Prot.Trip L3	Signal: General Trip L3
Prot.Trip G	Signal: General Trip Ground fault
Prot.Trip	Signal: General Trip
Prot.Res Fault a Mains No	Signal: Resetting of fault number and number of grid faults.
Prot.ExBlo1-I	Module input state: External blocking1
Prot.ExBlo2-I	Module input state: External blocking2
Prot.ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
Ctrl.Local	Switching Authority: Local
Ctrl.Remote	Switching Authority: Remote
Ctrl.NonInterl	Non-Interlocking is active
Ctrl.SG Indeterm	Minimum one Switchgear is moving (Position cannot be determined).
Ctrl.SG Disturb	Minimum one Switchgear is disturbed.
Ctrl.NonInterl-I	Non-Interlocking
SG[1].SI SingleContactInd	Signal: The Position of the Switchgear is detected by one auxiliary contact (pole) only. Thus indeterminate and disturbed Positions cannot be detected.
SG[1].Pos not ON	Signal: Pos not ON
SG[1].Pos ON	Signal: Circuit Breaker is in ON-Position
SG[1].Pos OFF	Signal: Circuit Breaker is in OFF-Position
SG[1].Pos Indeterm	Signal: Circuit Breaker is in Indeterminate Position
SG[1].Pos Disturb	Signal: Circuit Breaker Disturbed - Undefined Breaker Position. The Position Indicators contradict themselves. After expiring of a supervision timer this signal becomes true.
SG[1].Ready	Signal: Circuit breaker is ready for operation.



General Lists

<i>Name</i>	<i>Description</i>
SG[1].t-Dwell	Signal: Dwell time
SG[1].Removed	Signal: The withdrawable circuit breaker is Removed
SG[1].Interl ON	Signal: One or more IL_On inputs are active.
SG[1].Interl OFF	Signal: One or more IL_Off inputs are active.
SG[1].CES succesf	Signal: Command Execution Supervision: Switching command executed successfully.
SG[1].CES Disturbed	Signal: Command Execution Supervision: Switching Command unsuccessful. Switchgear in disturbed position.
SG[1].CES Fail TripCmd	Signal: Command Execution Supervision: Command execution failed because trip command is pending.
SG[1].CES SwitchDir	Signal: Command Execution Supervision respectively Switching Direction Control: This signal becomes true, if a switch command is issued even though the switchgear is already in the requested position. Example: A switchgear that is already OFF should be switched OFF again (doubly). The same applies to CLOSE commands.
SG[1].CES ON d OFF	Signal: Command Execution Supervision: On Command during a pending OFF Command.
SG[1].CES SG not ready	Signal: Command Execution Supervision: Switchgear not ready
SG[1].CES Fiel Interl	Signal: Command Execution Supervision: Switching Command not executed because of field interlocking.
SG[1].CES SG removed	Signal: Command Execution Supervision: Switching Command unsuccessful, Switchgear removed.
SG[1].TripCmd	Signal: Trip Command
SG[1].Ack TripCmd	Signal: Acknowledge Trip Command
SG[1].OFF incl TripCmd	Signal: The OFF Command includes the OFF Command issued by the Protection module.
SG[1].Position Ind manipul	Signal: Position Indicators faked
SG[1].SGwear Slow SG	Signal: Alarm, the circuit breaker (load-break switch) becomes slower
SG[1].Res SGwear SI SG	Signal: Resetting the slow Switchgear Alarm
SG[1].ON Cmd	Signal: ON Command issued to the switchgear. Depending on the setting the signal may include the ON command of the Prot module.
SG[1].OFF Cmd	Signal: OFF Command issued to the switchgear. Depending on the setting the signal may include the OFF command of the Prot module.
SG[1].ON Cmd manual	Signal: ON Cmd manual
SG[1].OFF Cmd manual	Signal: OFF Cmd manual
SG[1].Aux ON-I	Module Input State: Position indicator/check-back signal of the CB (52a)
SG[1].Aux OFF-I	Module input state: Position indicator/check-back signal of the CB (52b)
SG[1].Ready-I	Module input state: CB ready
SG[1].Removed-I	State of the module input: The withdrawable circuit breaker is Removed
SG[1].Ack TripCmd-I	State of the module input: Acknowledgement Signal (only for automatic acknowledgement) Module input signal
SG[1].Interl ON1-I	State of the module input: Interlocking of the ON command
SG[1].Interl ON2-I	State of the module input: Interlocking of the ON command
SG[1].Interl ON3-I	State of the module input: Interlocking of the ON command
SG[1].Interl OFF1-I	State of the module input: Interlocking of the OFF command
SG[1].Interl OFF2-I	State of the module input: Interlocking of the OFF command
SG[1].Interl OFF3-I	State of the module input: Interlocking of the OFF command
SG[1].SCmd ON-I	State of the module input: Switching ON Command, e.g. the state of the Logics or the state of the digital input

General Lists

<i>Name</i>	<i>Description</i>
SG[1].SCmd OFF-I	State of the module input: Switching OFF Command, e.g. the state of the Logics or the state of the digital input
SG[1].Operations Alarm	Signal: Service Alarm, too many Operations
SG[1].Isum Intr trip: IL1	Signal: Maximum permissible Summation of the interrupting (tripping) currents exceeded: IL1
SG[1].Isum Intr trip: IL2	Signal: Maximum permissible Summation of the interrupting (tripping) currents exceeded: IL2
SG[1].Isum Intr trip: IL3	Signal: Maximum permissible Summation of the interrupting (tripping) currents exceeded: IL3
SG[1].Isum Intr trip	Signal: Maximum permissible Summation of the interrupting (tripping) currents exceeded in at least one phase.
SG[1].Res TripCmd Cr	Signal: Resetting of the Counter: total number of trip commands
SG[1].Res Sum trip	Signal: Reset summation of the tripping currents
SG[1].WearLevel Alarm	Signal: Threshold for the Alarm
SG[1].WearLevel Lockout	Signal: Threshold for the Lockout Level
SG[1].Res SGwear Curve	Signal: Reset of the Circuit Breaker (load-break switch) Wear maintenance curve.
SG[1].Isum Intr ph Alm	Signal: Alarm, the per hour Sum (Limit) of interrupting currents has been exceeded.
SG[1].Res Isum Intr ph Alm	Signal: Reset of the Alarm, "the per hour Sum (Limit) of interrupting currents has been exceeded".
MStart.active	Signal: active
MStart.Blo TripCmd	Signal: Trip Command blocked
MStart.Trip	Signal: Trip
MStart.TripCmd	Signal: Trip Command
MStart.Start	Signal: Motor is in start mode
MStart.Run	Signal: Motor is in run mode
MStart.Stop	Signal: Motor is in stop mode
MStart.Blo	Signal: Motor is blocked for starting or transition to Run mode
MStart.NOCSBlocked	Signal: Motor is prohibited to start due to number of cold start limits
MStart.SPHBlocked	Signal: Motor is prohibited to start due to starts per hour limits
MStart.SPHBlockAlarm	Signal: Motor is prohibited to start due to starts per hour limits, would come active in the next stop
MStart.TSBBlocked	Signal: Motor is prohibited to start due to time between starts limits
MStart.ThermalBlo	Signal: Thermal block
MStart.RemBlockStart	Signal: Motor is prohibited to start due to external blocking through digital input DI
MStart.TransitionTrip	Signal: Start transition fail trip
MStart.ZSSTrip	Signal: Zero speed trip (possible locked rotor)
MStart.INSQSP2STFail	Signal: Fail to transit from stop to start based on reported back time
MStart.INSQSt2RunFail	Signal: Fail to transit from start to run based on reported back time
MStart.LATBlock	Signal: Long acceleration timer enforced
MStart.ColdStartSeq	Signal: Motor cold start sequence flag
MStart.ForcedStart	Signal: Motor being forced to start
MStart.TripPhaseReverse	Signal: Relay tripped because of phase reverse detection
MStart.EmergOverrideDI	Signal: Emergency override start blocking through digital input DI
MStart.EmergOverrideUI	Signal: Emergency override start blocking through front panel

General Lists

Name	Description
MStart.ABSActive	Signal: Anti-backspin is active. For certain applications, such as pumping a fluid up a pipe, the motor may be driven backward for a period of time after it stops. The anti-backspin timer prevents starting the motor while it is spinning in the reverse direction.
MStart.Blo-GOCStart	Signal: Ground Instantaneous Overcurrent Start Delay. GOC (Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
MStart.Blo-IOCTest	Signal: Phase Instantaneous Overcurrent Start Delay. IOC (Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
MStart.Blo-I<Start	Signal: Underload Start Delay. Underload(Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
MStart.Blo-JamStart	Signal: JAM Start Delay. JAM(Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
MStart.Blo-I2>Start	Signal: Motor start block current unbalance signal
MStart.Blo-Generic1	Generic Start Delay. This value can be used to block any protective element.1
MStart.Blo-Generic2	Generic Start Delay. This value can be used to block any protective element.2
MStart.Blo-Generic3	Generic Start Delay. This value can be used to block any protective element.3
MStart.Blo-Generic4	Generic Start Delay. This value can be used to block any protective element.4
MStart.Blo-Generic5	Generic Start Delay. This value can be used to block any protective element.5
MStart.I_Transit	Signal: Current transition signal
MStart.T_Transit	Signal: Time transition signal
MStart.MotorStopBlo	Signal: Motor stop block other protection functions
MStart.Rotating forward	Signal: Rotation Direction forward
MStart.Rotating backward	Signal: Rotation Direction reverse
MStart.RemStartBlock-I	State of the module input: Remote Motor Start Blocking
MStart.EmgOvr-I	State of the module input: Emergency Override. Signal has to be active in order to release the thermal capacity of the motor. Please notice that by doing this you run the risk of damaging the motor. "EMGOVR" has to be set to "DI" or "DI or UI" for this input to take effect
MStart.INSQ-I	State of the module input: INcomplete SeQuence
MStart.ZSS-I	State of the module input: Zero Speed Switch
MStart.STPC Blo-I	State of the module input: With this setting a Digital Input keeps the Motor in the RUN mode, even when the motor current drops below STPC (motor stop current).
I[1].active	Signal: active
I[1].ExBlo	Signal: External Blocking
I[1].Ex rev Interl	Signal: External reverse Interlocking
I[1].Blo TripCmd	Signal: Trip Command blocked
I[1].ExBlo TripCmd	Signal: External Blocking of the Trip Command
I[1].Alarm L1	Signal: Alarm L1
I[1].Alarm L2	Signal: Alarm L2
I[1].Alarm L3	Signal: Alarm L3
I[1].Alarm	Signal: Alarm
I[1].Trip L1	Signal: General Trip Phase L1
I[1].Trip L2	Signal: General Trip Phase L2
I[1].Trip L3	Signal: General Trip Phase L3
I[1].Trip	Signal: Trip

General Lists

<i>Name</i>	<i>Description</i>
I[1].TripCmd	Signal: Trip Command
I[1].DefaultSet	Signal: Default Parameter Set
I[1].AdaptSet 1	Signal: Adaptive Parameter 1
I[1].AdaptSet 2	Signal: Adaptive Parameter 2
I[1].AdaptSet 3	Signal: Adaptive Parameter 3
I[1].AdaptSet 4	Signal: Adaptive Parameter 4
I[1].ExBlo1-I	Module input state: External blocking1
I[1].ExBlo2-I	Module input state: External blocking2
I[1].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
I[1].Ex rev Inter-I	Module input state: External reverse interlocking
I[1].AdaptSet1-I	Module input state: Adaptive Parameter1
I[1].AdaptSet2-I	Module input state: Adaptive Parameter2
I[1].AdaptSet3-I	Module input state: Adaptive Parameter3
I[1].AdaptSet4-I	Module input state: Adaptive Parameter4
I[2].active	Signal: active
I[2].ExBlo	Signal: External Blocking
I[2].Ex rev Interl	Signal: External reverse Interlocking
I[2].Blo TripCmd	Signal: Trip Command blocked
I[2].ExBlo TripCmd	Signal: External Blocking of the Trip Command
I[2].Alarm L1	Signal: Alarm L1
I[2].Alarm L2	Signal: Alarm L2
I[2].Alarm L3	Signal: Alarm L3
I[2].Alarm	Signal: Alarm
I[2].Trip L1	Signal: General Trip Phase L1
I[2].Trip L2	Signal: General Trip Phase L2
I[2].Trip L3	Signal: General Trip Phase L3
I[2].Trip	Signal: Trip
I[2].TripCmd	Signal: Trip Command
I[2].DefaultSet	Signal: Default Parameter Set
I[2].AdaptSet 1	Signal: Adaptive Parameter 1
I[2].AdaptSet 2	Signal: Adaptive Parameter 2
I[2].AdaptSet 3	Signal: Adaptive Parameter 3
I[2].AdaptSet 4	Signal: Adaptive Parameter 4
I[2].ExBlo1-I	Module input state: External blocking1
I[2].ExBlo2-I	Module input state: External blocking2
I[2].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
I[2].Ex rev Inter-I	Module input state: External reverse interlocking
I[2].AdaptSet1-I	Module input state: Adaptive Parameter1
I[2].AdaptSet2-I	Module input state: Adaptive Parameter2
I[2].AdaptSet3-I	Module input state: Adaptive Parameter3

General Lists

<i>Name</i>	<i>Description</i>
I[2].AdaptSet4-I	Module input state: Adaptive Parameter4
I[3].active	Signal: active
I[3].ExBlo	Signal: External Blocking
I[3].Ex rev Interl	Signal: External reverse Interlocking
I[3].Blo TripCmd	Signal: Trip Command blocked
I[3].ExBlo TripCmd	Signal: External Blocking of the Trip Command
I[3].Alarm L1	Signal: Alarm L1
I[3].Alarm L2	Signal: Alarm L2
I[3].Alarm L3	Signal: Alarm L3
I[3].Alarm	Signal: Alarm
I[3].Trip L1	Signal: General Trip Phase L1
I[3].Trip L2	Signal: General Trip Phase L2
I[3].Trip L3	Signal: General Trip Phase L3
I[3].Trip	Signal: Trip
I[3].TripCmd	Signal: Trip Command
I[3].DefaultSet	Signal: Default Parameter Set
I[3].AdaptSet 1	Signal: Adaptive Parameter 1
I[3].AdaptSet 2	Signal: Adaptive Parameter 2
I[3].AdaptSet 3	Signal: Adaptive Parameter 3
I[3].AdaptSet 4	Signal: Adaptive Parameter 4
I[3].ExBlo1-I	Module input state: External blocking1
I[3].ExBlo2-I	Module input state: External blocking2
I[3].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
I[3].Ex rev Interl-I	Module input state: External reverse interlocking
I[3].AdaptSet1-I	Module input state: Adaptive Parameter1
I[3].AdaptSet2-I	Module input state: Adaptive Parameter2
I[3].AdaptSet3-I	Module input state: Adaptive Parameter3
I[3].AdaptSet4-I	Module input state: Adaptive Parameter4
I[4].active	Signal: active
I[4].ExBlo	Signal: External Blocking
I[4].Ex rev Interl	Signal: External reverse Interlocking
I[4].Blo TripCmd	Signal: Trip Command blocked
I[4].ExBlo TripCmd	Signal: External Blocking of the Trip Command
I[4].Alarm L1	Signal: Alarm L1
I[4].Alarm L2	Signal: Alarm L2
I[4].Alarm L3	Signal: Alarm L3
I[4].Alarm	Signal: Alarm
I[4].Trip L1	Signal: General Trip Phase L1
I[4].Trip L2	Signal: General Trip Phase L2
I[4].Trip L3	Signal: General Trip Phase L3

## General Lists

<i>Name</i>	<i>Description</i>
I[4].Trip	Signal: Trip
I[4].TripCmd	Signal: Trip Command
I[4].DefaultSet	Signal: Default Parameter Set
I[4].AdaptSet 1	Signal: Adaptive Parameter 1
I[4].AdaptSet 2	Signal: Adaptive Parameter 2
I[4].AdaptSet 3	Signal: Adaptive Parameter 3
I[4].AdaptSet 4	Signal: Adaptive Parameter 4
I[4].ExBlo1-I	Module input state: External blocking1
I[4].ExBlo2-I	Module input state: External blocking2
I[4].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
I[4].Ex rev Interl-I	Module input state: External reverse interlocking
I[4].AdaptSet1-I	Module input state: Adaptive Parameter1
I[4].AdaptSet2-I	Module input state: Adaptive Parameter2
I[4].AdaptSet3-I	Module input state: Adaptive Parameter3
I[4].AdaptSet4-I	Module input state: Adaptive Parameter4
I[5].active	Signal: active
I[5].ExBlo	Signal: External Blocking
I[5].Ex rev Interl	Signal: External reverse Interlocking
I[5].Blo TripCmd	Signal: Trip Command blocked
I[5].ExBlo TripCmd	Signal: External Blocking of the Trip Command
I[5].Alarm L1	Signal: Alarm L1
I[5].Alarm L2	Signal: Alarm L2
I[5].Alarm L3	Signal: Alarm L3
I[5].Alarm	Signal: Alarm
I[5].Trip L1	Signal: General Trip Phase L1
I[5].Trip L2	Signal: General Trip Phase L2
I[5].Trip L3	Signal: General Trip Phase L3
I[5].Trip	Signal: Trip
I[5].TripCmd	Signal: Trip Command
I[5].DefaultSet	Signal: Default Parameter Set
I[5].AdaptSet 1	Signal: Adaptive Parameter 1
I[5].AdaptSet 2	Signal: Adaptive Parameter 2
I[5].AdaptSet 3	Signal: Adaptive Parameter 3
I[5].AdaptSet 4	Signal: Adaptive Parameter 4
I[5].ExBlo1-I	Module input state: External blocking1
I[5].ExBlo2-I	Module input state: External blocking2
I[5].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
I[5].Ex rev Interl-I	Module input state: External reverse interlocking
I[5].AdaptSet1-I	Module input state: Adaptive Parameter1
I[5].AdaptSet2-I	Module input state: Adaptive Parameter2

## General Lists

<i>Name</i>	<i>Description</i>
I[5].AdaptSet3-I	Module input state: Adaptive Parameter3
I[5].AdaptSet4-I	Module input state: Adaptive Parameter4
I[6].active	Signal: active
I[6].ExBlo	Signal: External Blocking
I[6].Ex rev Interl	Signal: External reverse Interlocking
I[6].Blo TripCmd	Signal: Trip Command blocked
I[6].ExBlo TripCmd	Signal: External Blocking of the Trip Command
I[6].Alarm L1	Signal: Alarm L1
I[6].Alarm L2	Signal: Alarm L2
I[6].Alarm L3	Signal: Alarm L3
I[6].Alarm	Signal: Alarm
I[6].Trip L1	Signal: General Trip Phase L1
I[6].Trip L2	Signal: General Trip Phase L2
I[6].Trip L3	Signal: General Trip Phase L3
I[6].Trip	Signal: Trip
I[6].TripCmd	Signal: Trip Command
I[6].DefaultSet	Signal: Default Parameter Set
I[6].AdaptSet 1	Signal: Adaptive Parameter 1
I[6].AdaptSet 2	Signal: Adaptive Parameter 2
I[6].AdaptSet 3	Signal: Adaptive Parameter 3
I[6].AdaptSet 4	Signal: Adaptive Parameter 4
I[6].ExBlo1-I	Module input state: External blocking1
I[6].ExBlo2-I	Module input state: External blocking2
I[6].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
I[6].Ex rev Interl-I	Module input state: External reverse interlocking
I[6].AdaptSet1-I	Module input state: Adaptive Parameter1
I[6].AdaptSet2-I	Module input state: Adaptive Parameter2
I[6].AdaptSet3-I	Module input state: Adaptive Parameter3
I[6].AdaptSet4-I	Module input state: Adaptive Parameter4
IG[1].active	Signal: active
IG[1].ExBlo	Signal: External Blocking
IG[1].Ex rev Interl	Signal: External reverse Interlocking
IG[1].Blo TripCmd	Signal: Trip Command blocked
IG[1].ExBlo TripCmd	Signal: External Blocking of the Trip Command
IG[1].Alarm	Signal: Alarm IG
IG[1].Trip	Signal: Trip
IG[1].TripCmd	Signal: Trip Command
IG[1].DefaultSet	Signal: Default Parameter Set
IG[1].AdaptSet 1	Signal: Adaptive Parameter 1
IG[1].AdaptSet 2	Signal: Adaptive Parameter 2

## General Lists

<i>Name</i>	<i>Description</i>
IG[1].AdaptSet 3	Signal: Adaptive Parameter 3
IG[1].AdaptSet 4	Signal: Adaptive Parameter 4
IG[1].ExBlo1-I	Module input state: External blocking1
IG[1].ExBlo2-I	Module input state: External blocking2
IG[1].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
IG[1].Ex rev Inter-I	Module input state: External reverse interlocking
IG[1].AdaptSet1-I	Module input state: Adaptive Parameter1
IG[1].AdaptSet2-I	Module input state: Adaptive Parameter2
IG[1].AdaptSet3-I	Module input state: Adaptive Parameter3
IG[1].AdaptSet4-I	Module input state: Adaptive Parameter4
IG[2].active	Signal: active
IG[2].ExBlo	Signal: External Blocking
IG[2].Ex rev Interl	Signal: External reverse Interlocking
IG[2].Blo TripCmd	Signal: Trip Command blocked
IG[2].ExBlo TripCmd	Signal: External Blocking of the Trip Command
IG[2].Alarm	Signal: Alarm IG
IG[2].Trip	Signal: Trip
IG[2].TripCmd	Signal: Trip Command
IG[2].DefaultSet	Signal: Default Parameter Set
IG[2].AdaptSet 1	Signal: Adaptive Parameter 1
IG[2].AdaptSet 2	Signal: Adaptive Parameter 2
IG[2].AdaptSet 3	Signal: Adaptive Parameter 3
IG[2].AdaptSet 4	Signal: Adaptive Parameter 4
IG[2].ExBlo1-I	Module input state: External blocking1
IG[2].ExBlo2-I	Module input state: External blocking2
IG[2].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
IG[2].Ex rev Interl-I	Module input state: External reverse interlocking
IG[2].AdaptSet1-I	Module input state: Adaptive Parameter1
IG[2].AdaptSet2-I	Module input state: Adaptive Parameter2
IG[2].AdaptSet3-I	Module input state: Adaptive Parameter3
IG[2].AdaptSet4-I	Module input state: Adaptive Parameter4
IG[3].active	Signal: active
IG[3].ExBlo	Signal: External Blocking
IG[3].Ex rev Interl	Signal: External reverse Interlocking
IG[3].Blo TripCmd	Signal: Trip Command blocked
IG[3].ExBlo TripCmd	Signal: External Blocking of the Trip Command
IG[3].Alarm	Signal: Alarm IG
IG[3].Trip	Signal: Trip
IG[3].TripCmd	Signal: Trip Command
IG[3].DefaultSet	Signal: Default Parameter Set



## General Lists

<i>Name</i>	<i>Description</i>
IG[3].AdaptSet 1	Signal: Adaptive Parameter 1
IG[3].AdaptSet 2	Signal: Adaptive Parameter 2
IG[3].AdaptSet 3	Signal: Adaptive Parameter 3
IG[3].AdaptSet 4	Signal: Adaptive Parameter 4
IG[3].ExBlo1-I	Module input state: External blocking1
IG[3].ExBlo2-I	Module input state: External blocking2
IG[3].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
IG[3].Ex rev Inter-I	Module input state: External reverse interlocking
IG[3].AdaptSet1-I	Module input state: Adaptive Parameter1
IG[3].AdaptSet2-I	Module input state: Adaptive Parameter2
IG[3].AdaptSet3-I	Module input state: Adaptive Parameter3
IG[3].AdaptSet4-I	Module input state: Adaptive Parameter4
IG[4].active	Signal: active
IG[4].ExBlo	Signal: External Blocking
IG[4].Ex rev Interl	Signal: External reverse Interlocking
IG[4].Blo TripCmd	Signal: Trip Command blocked
IG[4].ExBlo TripCmd	Signal: External Blocking of the Trip Command
IG[4].Alarm	Signal: Alarm IG
IG[4].Trip	Signal: Trip
IG[4].TripCmd	Signal: Trip Command
IG[4].DefaultSet	Signal: Default Parameter Set
IG[4].AdaptSet 1	Signal: Adaptive Parameter 1
IG[4].AdaptSet 2	Signal: Adaptive Parameter 2
IG[4].AdaptSet 3	Signal: Adaptive Parameter 3
IG[4].AdaptSet 4	Signal: Adaptive Parameter 4
IG[4].ExBlo1-I	Module input state: External blocking1
IG[4].ExBlo2-I	Module input state: External blocking2
IG[4].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
IG[4].Ex rev Interl-I	Module input state: External reverse interlocking
IG[4].AdaptSet1-I	Module input state: Adaptive Parameter1
IG[4].AdaptSet2-I	Module input state: Adaptive Parameter2
IG[4].AdaptSet3-I	Module input state: Adaptive Parameter3
IG[4].AdaptSet4-I	Module input state: Adaptive Parameter4
ThR.Alarm Pickup	Signal: Alarm Pickup
ThR.Alarm Timeout	Signal: Alarm Timeout
ThR.RTD effective	RTD effective
ThR.Load above SF	Load above Service Factor
ThR.active	Signal: active
ThR.ExBlo	Signal: External Blocking
ThR.Blo TripCmd	Signal: Trip Command blocked

## General Lists

<i>Name</i>	<i>Description</i>
ThR.ExBlo TripCmd	Signal: External Blocking of the Trip Command
ThR.Alarm	Signal: Alarm
ThR.Trip	Signal: Trip
ThR.TripCmd	Signal: Trip Command
ThR.ExBlo1	Module input state: External blocking
ThR.ExBlo2	Module input state: External blocking
ThR.ExBlo TripCmd	Module input state: External Blocking of the Trip Command
Jam[1].active	Signal: active
Jam[1].ExBlo	Signal: External Blocking
Jam[1].Blo TripCmd	Signal: Trip Command blocked
Jam[1].ExBlo TripCmd	Signal: External Blocking of the Trip Command
Jam[1].Alarm	Signal: Alarm
Jam[1].Trip	Signal: Trip
Jam[1].TripCmd	Signal: Trip Command
Jam[1].ExBlo1-I	Module input state: External blocking1
Jam[1].ExBlo2-I	Module input state: External blocking2
Jam[1].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
Jam[2].active	Signal: active
Jam[2].ExBlo	Signal: External Blocking
Jam[2].Blo TripCmd	Signal: Trip Command blocked
Jam[2].ExBlo TripCmd	Signal: External Blocking of the Trip Command
Jam[2].Alarm	Signal: Alarm
Jam[2].Trip	Signal: Trip
Jam[2].TripCmd	Signal: Trip Command
Jam[2].ExBlo1-I	Module input state: External blocking1
Jam[2].ExBlo2-I	Module input state: External blocking2
Jam[2].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
I<[1].active	Signal: active
I<[1].ExBlo	Signal: External Blocking
I<[1].Blo TripCmd	Signal: Trip Command blocked
I<[1].ExBlo TripCmd	Signal: External Blocking of the Trip Command
I<[1].Alarm	Signal: Alarm
I<[1].Trip	Signal: Trip
I<[1].TripCmd	Signal: Trip Command
I<[1].ExBlo1-I	Module input state: External blocking1
I<[1].ExBlo2-I	Module input state: External blocking2
I<[1].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
I<[2].active	Signal: active
I<[2].ExBlo	Signal: External Blocking
I<[2].Blo TripCmd	Signal: Trip Command blocked

General Lists

<i>Name</i>	<i>Description</i>
I<[2].ExBlo TripCmd	Signal: External Blocking of the Trip Command
I<[2].Alarm	Signal: Alarm
I<[2].Trip	Signal: Trip
I<[2].TripCmd	Signal: Trip Command
I<[2].ExBlo1-I	Module input state: External blocking1
I<[2].ExBlo2-I	Module input state: External blocking2
I<[2].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
I<[3].active	Signal: active
I<[3].ExBlo	Signal: External Blocking
I<[3].Blo TripCmd	Signal: Trip Command blocked
I<[3].ExBlo TripCmd	Signal: External Blocking of the Trip Command
I<[3].Alarm	Signal: Alarm
I<[3].Trip	Signal: Trip
I<[3].TripCmd	Signal: Trip Command
I<[3].ExBlo1-I	Module input state: External blocking1
I<[3].ExBlo2-I	Module input state: External blocking2
I<[3].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
MLS.active	Signal: active
MLS.ExBlo	Signal: External Blocking
MLS.Alarm	Signal: Alarm
MLS.Trip	Signal: Trip
MLS.ExBlo1-I	Module input state: External blocking1
MLS.ExBlo2-I	Module input state: External blocking2
I2>[1].active	Signal: active
I2>[1].ExBlo	Signal: External Blocking
I2>[1].Blo TripCmd	Signal: Trip Command blocked
I2>[1].ExBlo TripCmd	Signal: External Blocking of the Trip Command
I2>[1].Alarm	Signal: Alarm Negative Sequence
I2>[1].Trip	Signal: Trip
I2>[1].TripCmd	Signal: Trip Command
I2>[1].ExBlo1-I	Module input state: External blocking1
I2>[1].ExBlo2-I	Module input state: External blocking2
I2>[1].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
I2>[2].active	Signal: active
I2>[2].ExBlo	Signal: External Blocking
I2>[2].Blo TripCmd	Signal: Trip Command blocked
I2>[2].ExBlo TripCmd	Signal: External Blocking of the Trip Command
I2>[2].Alarm	Signal: Alarm Negative Sequence
I2>[2].Trip	Signal: Trip
I2>[2].TripCmd	Signal: Trip Command

General Lists

<i>Name</i>	<i>Description</i>
I2>[2].ExBlo1-I	Module input state: External blocking1
I2>[2].ExBlo2-I	Module input state: External blocking2
I2>[2].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
ExP[1].active	Signal: active
ExP[1].ExBlo	Signal: External Blocking
ExP[1].Blo TripCmd	Signal: Trip Command blocked
ExP[1].ExBlo TripCmd	Signal: External Blocking of the Trip Command
ExP[1].Alarm	Signal: Alarm
ExP[1].Trip	Signal: Trip
ExP[1].TripCmd	Signal: Trip Command
ExP[1].ExBlo1-I	Module input state: External blocking1
ExP[1].ExBlo2-I	Module input state: External blocking2
ExP[1].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
ExP[1].Alarm-I	Module input state: Alarm
ExP[1].Trip-I	Module input state: Trip
ExP[2].active	Signal: active
ExP[2].ExBlo	Signal: External Blocking
ExP[2].Blo TripCmd	Signal: Trip Command blocked
ExP[2].ExBlo TripCmd	Signal: External Blocking of the Trip Command
ExP[2].Alarm	Signal: Alarm
ExP[2].Trip	Signal: Trip
ExP[2].TripCmd	Signal: Trip Command
ExP[2].ExBlo1-I	Module input state: External blocking1
ExP[2].ExBlo2-I	Module input state: External blocking2
ExP[2].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
ExP[2].Alarm-I	Module input state: Alarm
ExP[2].Trip-I	Module input state: Trip
ExP[3].active	Signal: active
ExP[3].ExBlo	Signal: External Blocking
ExP[3].Blo TripCmd	Signal: Trip Command blocked
ExP[3].ExBlo TripCmd	Signal: External Blocking of the Trip Command
ExP[3].Alarm	Signal: Alarm
ExP[3].Trip	Signal: Trip
ExP[3].TripCmd	Signal: Trip Command
ExP[3].ExBlo1-I	Module input state: External blocking1
ExP[3].ExBlo2-I	Module input state: External blocking2
ExP[3].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
ExP[3].Alarm-I	Module input state: Alarm
ExP[3].Trip-I	Module input state: Trip
ExP[4].active	Signal: active

## General Lists

<i>Name</i>	<i>Description</i>
Exp[4].ExBlo	Signal: External Blocking
Exp[4].Blo TripCmd	Signal: Trip Command blocked
Exp[4].ExBlo TripCmd	Signal: External Blocking of the Trip Command
Exp[4].Alarm	Signal: Alarm
Exp[4].Trip	Signal: Trip
Exp[4].TripCmd	Signal: Trip Command
Exp[4].ExBlo1-I	Module input state: External blocking1
Exp[4].ExBlo2-I	Module input state: External blocking2
Exp[4].ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command
Exp[4].Alarm-I	Module input state: Alarm
Exp[4].Trip-I	Module input state: Trip
URTD.Windg1 Superv	Signal: Supervision Channel Windg1
URTD.Windg2 Superv	Signal: Supervision Channel Windg2
URTD.Windg3 Superv	Signal: Supervision Channel Windg3
URTD.Windg4 Superv	Signal: Supervision Channel Windg4
URTD.Windg5 Superv	Signal: Supervision Channel Windg5
URTD.Windg6 Superv	Signal: Supervision Channel Windg6
URTD.MotBear1 Superv	Signal: Supervision Channel MotBear1
URTD.MotBear2 Superv	Signal: Supervision Channel MotBear2
URTD.LoadBear1 Superv	Signal: Supervision Channel LoadBear1
URTD.LoadBear2 Superv	Signal: Supervision Channel LoadBear2
URTD.Aux1 Superv	Signal: Supervision Channel Aux1
URTD.Aux2 Superv	Signal: Supervision Channel Aux2
URTD.Superv	Signal: URTD Supervision Channel
URTD.active	Signal: URTD active
URTD.Outs forced	Signal: The State of at least one Relay Output has been set by force. That means that the state of at least one Relay is forced and hence does not show the state of the assigned signals.
RTD.active	Signal: active
RTD.ExBlo	Signal: External Blocking
RTD.Blo TripCmd	Signal: Trip Command blocked
RTD.ExBlo TripCmd	Signal: External Blocking of the Trip Command
RTD.Alarm	Alarm RTD Temperature Protection
RTD.Trip	Signal: Trip
RTD.TripCmd	Signal: Trip Command
RTD.Windg 1 Trip	Winding 1 Signal: Trip
RTD.Windg 1 Alarm	Winding 1 Alarm RTD Temperature Protection
RTD.Windg 1 Timeout Alarm	Winding 1 Timeout Alarm
RTD.Windg 1 Invalid	Winding 1 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Windg 2 Trip	Winding 2 Signal: Trip

## General Lists

<i>Name</i>	<i>Description</i>
RTD.Windg 2 Alarm	Winding 2 Alarm RTD Temperature Protection
RTD.Windg 2 Timeout Alarm	Winding 2 Timeout Alarm
RTD.Windg 2 Invalid	Winding 2 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Windg 3 Trip	Winding 3 Signal: Trip
RTD.Windg 3 Alarm	Winding 3 Alarm RTD Temperature Protection
RTD.Windg 3 Timeout Alarm	Winding 3 Timeout Alarm
RTD.Windg 3 Invalid	Winding 3 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Windg 4 Trip	Winding 4 Signal: Trip
RTD.Windg 4 Alarm	Winding 4 Alarm RTD Temperature Protection
RTD.Windg 4 Timeout Alarm	Winding 4 Timeout Alarm
RTD.Windg 4 Invalid	Winding 4 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Windg 5 Trip	Winding 5 Signal: Trip
RTD.Windg 5 Alarm	Winding 5 Alarm RTD Temperature Protection
RTD.Windg 5 Timeout Alarm	Winding 5 Timeout Alarm
RTD.Windg 5 Invalid	Winding 5 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Windg 6 Trip	Winding 6 Signal: Trip
RTD.Windg 6 Alarm	Winding 6 Alarm RTD Temperature Protection
RTD.Windg 6 Timeout Alarm	Winding 6 Timeout Alarm
RTD.Windg 6 Invalid	Winding 6 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.MotBear 1 Trip	Motor Bearing 1 Signal: Trip
RTD.MotBear 1 Alarm	Motor Bearing 1 Alarm RTD Temperature Protection
RTD.MotBear 1 Timeout Alarm	Motor Bearing 1 Timeout Alarm
RTD.MotBear 1 Invalid	Motor Bearing 1 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.MotBear 2 Trip	Motor Bearing 2 Signal: Trip
RTD.MotBear 2 Alarm	Motor Bearing 2 Alarm RTD Temperature Protection
RTD.MotBear 2 Timeout Alarm	Motor Bearing 2 Timeout Alarm
RTD.MotBear 2 Invalid	Motor Bearing 2 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.LoadBear 1 Trip	Load Bearing 1 Signal: Trip
RTD.LoadBear 1 Alarm	Load Bearing 1 Alarm RTD Temperature Protection
RTD.LoadBear 1 Timeout Alarm	Load Bearing 1 Timeout Alarm
RTD.LoadBear 1 Invalid	Load Bearing 1 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.LoadBear 2 Trip	Load Bearing 2 Signal: Trip
RTD.LoadBear 2 Alarm	Load Bearing 2 Alarm RTD Temperature Protection

## General Lists

<i>Name</i>	<i>Description</i>
RTD.LoadBear 2 Timeout Alarm	Load Bearing 2 Timeout Alarm
RTD.LoadBear 2 Invalid	Load Bearing 2 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Aux1 Trip	Auxiliary 1 Signal: Trip
RTD.Aux1 Alarm	Auxiliary 1 Alarm RTD Temperature Protection
RTD.Aux1 Timeout Alarm	Auxiliary 1 Timeout Alarm
RTD.Aux1 Invalid	Auxiliary 1 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Aux2 Trip	Auxiliary 2 Signal: Trip
RTD.Aux2 Alarm	Auxiliary 2 Alarm RTD Temperature Protection
RTD.Aux2 Timeout Alarm	Auxiliary 2 Timeout Alarm
RTD.Aux2 Invalid	Auxiliary 2 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Trip WD Group	Trip all Windings
RTD.Alarm WD Group	Alarm all Windings
RTD.TimeoutAlmWDGrp	Timeout Alarm all Windings
RTD.Windg Group Invalid	Winding Group Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Trip MB Group	Trip all Motor Bearings
RTD.Alarm MB Group	Alarm all Motor Bearings
RTD.TimeoutAlmMBGrp	Timeout Alarm all Motor Bearings
RTD.MotBear Group Invalid	Motor Bearing Group Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Trip LB Group	Trip all Load Bearings
RTD.Alarm LB Group	Alarm all Load Bearings
RTD.TimeoutAlmLBGrp	Timeout Alarm all Load Bearings
RTD.LoadBear Group Invalid	Load Bearing Group Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Trip Any Group	Trip Any Group
RTD.Alarm Any Group	Alarm Any Group
RTD.TimeoutAlmAnyGrp	Timeout Alarm Any Group
RTD.Trip Group 1	Trip Group 1
RTD.Trip Group 2	Trip Group 2
RTD.Timeout Alarm	Alarm timeout expired
RTD.Trip Aux Group	Trip Auxiliary Group
RTD.Alarm Aux Group	Alarm Auxiliary Group
RTD.TimeoutAlmAuxGrp	Timeout Alarm Auxiliary Group
RTD.AuxGrpInvalid	Invalid Auxiliary Group
RTD.ExBlo1-I	Module input state: External blocking1
RTD.ExBlo2-I	Module input state: External blocking2
RTD.ExBlo TripCmd-I	Module input state: External Blocking of the Trip Command

## General Lists

<i>Name</i>	<i>Description</i>
CBF.active	Signal: active
CBF.ExBlo	Signal: External Blocking
CBF.Waiting for Trigger	Waiting for Trigger
CBF.running	Signal: CBF-Module started
CBF.Alarm	Signal: Circuit Breaker Failure
CBF.Lockout	Signal: Lockout
CBF.Res Lockout	Signal: Reset Lockout
CBF.ExBlo1-I	Module input state: External blocking1
CBF.ExBlo2-I	Module input state: External blocking2
CBF.Trigger1-I	Module Input: Trigger that will start the CBF
CBF.Trigger2-I	Module Input: Trigger that will start the CBF
CBF.Trigger3-I	Module Input: Trigger that will start the CBF
TCS.active	Signal: active
TCS.ExBlo	Signal: External Blocking
TCS.Alarm	Signal: Alarm Trip Circuit Supervision
TCS.Not Possible	Not possible because no state indicator assigned to the breaker.
TCS.Aux ON-I	Module Input State: Position indicator/check-back signal of the CB (52a)
TCS.Aux OFF-I	Module input state: Position indicator/check-back signal of the CB (52b)
TCS.ExBlo1-I	Module input state: External blocking1
TCS.ExBlo2-I	Module input state: External blocking2
CTS.active	Signal: active
CTS.ExBlo	Signal: External Blocking
CTS.Alarm	Signal: Alarm Current Transformer Measuring Circuit Supervision
CTS.ExBlo1-I	Module input state: External blocking1
CTS.ExBlo2-I	Module input state: External blocking2
SysA.active	Signal: active
SysA.ExBlo	Signal: External Blocking
SysA.Alm Current Demd	Signal: Alarm averaged demand current
SysA.Alarm I THD	Signal: Alarm Total Harmonic Distortion Current
SysA.Trip Current Demand	Signal: Trip averaged demand current
SysA.Trip I THD	Signal: Trip Total Harmonic Distortion Current
SysA.ExBlo-I	Module input state: External blocking
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input
DI Slot X1.DI 5	Signal: Digital Input
DI Slot X1.DI 6	Signal: Digital Input
DI Slot X1.DI 7	Signal: Digital Input
DI Slot X1.DI 8	Signal: Digital Input



General Lists

<i>Name</i>	<i>Description</i>
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input
BO Slot X2.BO 1	Signal: Binary Output Relay
BO Slot X2.BO 2	Signal: Binary Output Relay
BO Slot X2.BO 3	Signal: Binary Output Relay
BO Slot X2.BO 4	Signal: Binary Output Relay
BO Slot X2.BO 5	Signal: Binary Output Relay
BO Slot X2.DISARMED!	Signal: CAUTION! RELAYS DISARMED in order to safely perform maintenance while eliminating the risk of taking an entire process off-line. (Note: The Self Supervision Contact cannot be disarmed). YOU MUST ENSURE that the relays are ARMED AGAIN after maintenance
BO Slot X2.Outs forced	Signal: The State of at least one Relay Output has been set by force. That means that the state of at least one Relay is forced and hence does not show the state of the assigned signals.
BO Slot X2.BO 1	Signal: Binary Output Relay
BO Slot X2.BO 2	Signal: Binary Output Relay
BO Slot X2.BO 3	Signal: Binary Output Relay
BO Slot X2.DISARMED!	Signal: CAUTION! RELAYS DISARMED in order to safely perform maintenance while eliminating the risk of taking an entire process off-line. (Note: The Self Supervision Contact cannot be disarmed). YOU MUST ENSURE that the relays are ARMED AGAIN after maintenance
BO Slot X2.Outs forced	Signal: The State of at least one Relay Output has been set by force. That means that the state of at least one Relay is forced and hence does not show the state of the assigned signals.
AnOut[1].Force Mode	For commissioning purposes or for maintenance, Analog Outputs can be set by force. By means of this function the normal Analog Outputs can be overwritten (forced).
Event rec.Res all records	Signal: All records deleted
Disturb rec.recording	Signal: Recording
Disturb rec.memory full	Signal: Memory full
Disturb rec.Clear fail	Signal: Clear failure in memory
Disturb rec.Res all records	Signal: All records deleted
Disturb rec.Res rec	Signal: Delete record
Disturb rec.Man Trigger	Signal: Manual Trigger
Disturb rec.Start1-l	State of the module input:: Trigger event / start recording if:
Disturb rec.Start2-l	State of the module input:: Trigger event / start recording if:
Disturb rec.Start3-l	State of the module input:: Trigger event / start recording if:
Disturb rec.Start4-l	State of the module input:: Trigger event / start recording if:
Disturb rec.Start5-l	State of the module input:: Trigger event / start recording if:
Disturb rec.Start6-l	State of the module input:: Trigger event / start recording if:
Disturb rec.Start7-l	State of the module input:: Trigger event / start recording if:
Disturb rec.Start8-l	State of the module input:: Trigger event / start recording if:
Fault rec.Res rec	Signal: Delete record
Trend rec.Hand Reset	Hand Reset
Start rec.Storing	Signal: Data are saved

General Lists

<i>Name</i>	<i>Description</i>
SSV.System Error	Signal: Device Failure
SSV.SelfSuperVision Contact	Signal: SelfSuperVision Contact
Scada.SCADA connected	At least one SCADA System is connected to the device.
Scada.SCADA not connected	No SCADA System is connected to the device
DNP3.busy	This message is set if the protocol is started. It will be reset if the protocol is shut down.
DNP3.ready	The message will be set if the protocol is successfully started and ready for data exchange.
DNP3.active	The communication with the Master (Scada) is active.
DNP3.BinaryOutput0	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput1	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput2	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput3	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput4	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput5	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput6	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput7	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput8	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput9	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput10	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput11	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput12	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput13	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput14	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput15	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput16	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput17	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput18	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput19	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput20	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput21	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput22	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput23	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput24	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput25	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput26	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput27	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput28	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput29	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput30	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput31	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryInput0-l	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.



General Lists

<i>Name</i>	<i>Description</i>
DNP3.BinaryInput41-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput42-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput43-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput44-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput45-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput46-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput47-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput48-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput49-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput50-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput51-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput52-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput53-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput54-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput55-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput56-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput57-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput58-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput59-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput60-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput61-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput62-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP3.BinaryInput63-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
Modbus.Transmission	Signal: SCADA active
Modbus.Scada Cmd 1	Scada Command
Modbus.Scada Cmd 2	Scada Command
Modbus.Scada Cmd 3	Scada Command
Modbus.Scada Cmd 4	Scada Command
Modbus.Scada Cmd 5	Scada Command
Modbus.Scada Cmd 6	Scada Command
Modbus.Scada Cmd 7	Scada Command
Modbus.Scada Cmd 8	Scada Command
Modbus.Scada Cmd 9	Scada Command
Modbus.Scada Cmd 10	Scada Command
Modbus.Scada Cmd 11	Scada Command
Modbus.Scada Cmd 12	Scada Command
Modbus.Scada Cmd 13	Scada Command
Modbus.Scada Cmd 14	Scada Command
Modbus.Scada Cmd 15	Scada Command
Modbus.Scada Cmd 16	Scada Command

General Lists

<i>Name</i>	<i>Description</i>
Modbus.Config Bin Inp1-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp2-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp3-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp4-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp5-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp6-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp7-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp8-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp9-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp10-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp11-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp12-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp13-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp14-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp15-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp16-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp17-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp18-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp19-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp20-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp21-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp22-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp23-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp24-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp25-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp26-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp27-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp28-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp29-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp30-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp31-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp32-I	State of the module input: Config Bin Inp
IEC61850.MMS Client connected	At least one MMS client is connected to the device
IEC61850.All Goose Subscriber active	All Goose subscriber in the device are working
IEC61850.VirtInp1	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp2	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp3	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp4	Signal: Virtual Input (IEC61850 GGIO Ind)

General Lists

<i>Name</i>	<i>Description</i>
IEC61850.VirtInp5	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp6	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp7	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp8	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp9	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp10	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp11	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp12	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp13	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp14	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp15	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp16	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp17	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp18	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp19	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp20	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp21	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp22	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp23	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp24	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp25	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp26	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp27	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp28	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp29	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp30	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp31	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp32	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.Quality of GGIO In1	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In2	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In3	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In4	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In5	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In6	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In7	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In8	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In9	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In10	Self-Supervision of the GGIO Input

General Lists

<i>Name</i>	<i>Description</i>
IEC61850.Quality of GGIO In11	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In12	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In13	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In14	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In15	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In16	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In17	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In18	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In19	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In20	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In21	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In22	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In23	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In24	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In25	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In26	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In27	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In28	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In29	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In30	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In31	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In32	Self-Supervision of the GGIO Input
IEC61850.SPCS01	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC61850.SPCS02	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).
IEC61850.SPCS03	Status bit that can be set by clients like e.g. SCADA (Single Point Controllable Status Output).





General Lists

<i>Name</i>	<i>Description</i>
IEC61850.VirtOut12-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut13-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut14-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut15-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut16-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut17-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut18-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut19-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut20-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut21-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut22-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut23-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut24-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut25-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut26-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut27-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut28-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut29-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut30-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut31-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut32-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC 103.Scada Cmd 1	Scada Command
IEC 103.Scada Cmd 2	Scada Command
IEC 103.Scada Cmd 3	Scada Command
IEC 103.Scada Cmd 4	Scada Command
IEC 103.Scada Cmd 5	Scada Command
IEC 103.Scada Cmd 6	Scada Command
IEC 103.Scada Cmd 7	Scada Command
IEC 103.Scada Cmd 8	Scada Command
IEC 103.Scada Cmd 9	Scada Command
IEC 103.Scada Cmd 10	Scada Command
IEC 103.Transmission	Signal: SCADA active
IEC 103.Failure Event lost	Failure event lost
Profibus.Data OK	Data within the Input field are OK (Yes=1)
Profibus.SubModul Err	Assignable Signal, Failure in Sub-Module, Communication Failure.
Profibus.Connection active	Connection active
Profibus.Scada Cmd 1	Scada Command
Profibus.Scada Cmd 2	Scada Command
Profibus.Scada Cmd 3	Scada Command
Profibus.Scada Cmd 4	Scada Command

## General Lists

<i>Name</i>	<i>Description</i>
Profibus.Scada Cmd 5	Scada Command
Profibus.Scada Cmd 6	Scada Command
Profibus.Scada Cmd 7	Scada Command
Profibus.Scada Cmd 8	Scada Command
Profibus.Scada Cmd 9	Scada Command
Profibus.Scada Cmd 10	Scada Command
Profibus.Scada Cmd 11	Scada Command
Profibus.Scada Cmd 12	Scada Command
Profibus.Scada Cmd 13	Scada Command
Profibus.Scada Cmd 14	Scada Command
Profibus.Scada Cmd 15	Scada Command
Profibus.Scada Cmd 16	Scada Command
IRIG-B.IRIG-B active	Signal: If there is no valid IRIG-B signal for 60 sec, IRIG-B is regarded as inactive.
IRIG-B.High-Low Invert	Signal: The High and Low signals of the IRIG-B are inverted. This does NOT mean that the wiring is faulty. If the wiring is faulty no IRIG-B signal will be detected.
IRIG-B.Control Signal1	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal2	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal3	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal4	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal5	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal6	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal7	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal8	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal9	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal10	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal11	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal12	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal13	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal14	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal15	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).

General Lists

Name	Description
IRIG-B.Control Signal16	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal17	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal18	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
SNTP.SNTP active	Signal: If there is no valid SNTP signal for 120 sec, SNTP is regarded as inactive.
Statistics.ResFc all	Signal: Resetting of all Statistic values (Current Demand, Power Demand, Min, Max)
Statistics.ResFc I Demand	Signal: Resetting of Statistics - Current Demand (avg, peak avg)
Statistics.ResFc Max	Signal: Resetting of all Maximum values
Statistics.ResFc Min	Signal: Resetting of all Minimum values
Statistics.StartFc I Demand-I	State of the module input: Start of the Statistics of the Current Demand
Logics.LE1.Gate Out	Signal: Output of the logic gate
Logics.LE1.Timer Out	Signal: Timer Output
Logics.LE1.Out	Signal: Latched Output (Q)
Logics.LE1.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE1.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE1.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE1.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE1.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE1.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE2.Gate Out	Signal: Output of the logic gate
Logics.LE2.Timer Out	Signal: Timer Output
Logics.LE2.Out	Signal: Latched Output (Q)
Logics.LE2.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE2.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE2.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE2.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE2.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE2.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE3.Gate Out	Signal: Output of the logic gate
Logics.LE3.Timer Out	Signal: Timer Output
Logics.LE3.Out	Signal: Latched Output (Q)
Logics.LE3.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE3.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE3.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE3.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE3.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE3.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE4.Gate Out	Signal: Output of the logic gate
Logics.LE4.Timer Out	Signal: Timer Output

## General Lists

<i>Name</i>	<i>Description</i>
Logics.LE4.Out	Signal: Latched Output (Q)
Logics.LE4.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE4.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE4.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE4.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE4.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE4.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE5.Gate Out	Signal: Output of the logic gate
Logics.LE5.Timer Out	Signal: Timer Output
Logics.LE5.Out	Signal: Latched Output (Q)
Logics.LE5.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE5.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE5.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE5.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE5.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE5.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE6.Gate Out	Signal: Output of the logic gate
Logics.LE6.Timer Out	Signal: Timer Output
Logics.LE6.Out	Signal: Latched Output (Q)
Logics.LE6.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE6.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE6.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE6.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE6.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE6.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE7.Gate Out	Signal: Output of the logic gate
Logics.LE7.Timer Out	Signal: Timer Output
Logics.LE7.Out	Signal: Latched Output (Q)
Logics.LE7.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE7.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE7.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE7.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE7.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE7.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE8.Gate Out	Signal: Output of the logic gate
Logics.LE8.Timer Out	Signal: Timer Output
Logics.LE8.Out	Signal: Latched Output (Q)
Logics.LE8.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE8.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE8.Gate In2-I	State of the module input: Assignment of the Input Signal

General Lists

<i>Name</i>	<i>Description</i>
Logics.LE8.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE8.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE8.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE9.Gate Out	Signal: Output of the logic gate
Logics.LE9.Timer Out	Signal: Timer Output
Logics.LE9.Out	Signal: Latched Output (Q)
Logics.LE9.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE9.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE9.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE9.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE9.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE9.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE10.Gate Out	Signal: Output of the logic gate
Logics.LE10.Timer Out	Signal: Timer Output
Logics.LE10.Out	Signal: Latched Output (Q)
Logics.LE10.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE10.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE10.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE10.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE10.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE10.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE11.Gate Out	Signal: Output of the logic gate
Logics.LE11.Timer Out	Signal: Timer Output
Logics.LE11.Out	Signal: Latched Output (Q)
Logics.LE11.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE11.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE11.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE11.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE11.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE11.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE12.Gate Out	Signal: Output of the logic gate
Logics.LE12.Timer Out	Signal: Timer Output
Logics.LE12.Out	Signal: Latched Output (Q)
Logics.LE12.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE12.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE12.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE12.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE12.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE12.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE13.Gate Out	Signal: Output of the logic gate

General Lists

<i>Name</i>	<i>Description</i>
Logics.LE13.Timer Out	Signal: Timer Output
Logics.LE13.Out	Signal: Latched Output (Q)
Logics.LE13.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE13.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE13.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE13.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE13.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE13.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE14.Gate Out	Signal: Output of the logic gate
Logics.LE14.Timer Out	Signal: Timer Output
Logics.LE14.Out	Signal: Latched Output (Q)
Logics.LE14.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE14.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE14.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE14.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE14.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE14.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE15.Gate Out	Signal: Output of the logic gate
Logics.LE15.Timer Out	Signal: Timer Output
Logics.LE15.Out	Signal: Latched Output (Q)
Logics.LE15.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE15.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE15.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE15.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE15.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE15.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE16.Gate Out	Signal: Output of the logic gate
Logics.LE16.Timer Out	Signal: Timer Output
Logics.LE16.Out	Signal: Latched Output (Q)
Logics.LE16.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE16.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE16.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE16.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE16.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE16.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE17.Gate Out	Signal: Output of the logic gate
Logics.LE17.Timer Out	Signal: Timer Output
Logics.LE17.Out	Signal: Latched Output (Q)
Logics.LE17.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE17.Gate In1-I	State of the module input: Assignment of the Input Signal

General Lists

<i>Name</i>	<i>Description</i>
Logics.LE17.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE17.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE17.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE17.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE18.Gate Out	Signal: Output of the logic gate
Logics.LE18.Timer Out	Signal: Timer Output
Logics.LE18.Out	Signal: Latched Output (Q)
Logics.LE18.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE18.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE18.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE18.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE18.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE18.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE19.Gate Out	Signal: Output of the logic gate
Logics.LE19.Timer Out	Signal: Timer Output
Logics.LE19.Out	Signal: Latched Output (Q)
Logics.LE19.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE19.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE19.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE19.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE19.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE19.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE20.Gate Out	Signal: Output of the logic gate
Logics.LE20.Timer Out	Signal: Timer Output
Logics.LE20.Out	Signal: Latched Output (Q)
Logics.LE20.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE20.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE20.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE20.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE20.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE20.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE21.Gate Out	Signal: Output of the logic gate
Logics.LE21.Timer Out	Signal: Timer Output
Logics.LE21.Out	Signal: Latched Output (Q)
Logics.LE21.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE21.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE21.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE21.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE21.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE21.Reset Latch-I	State of the module input: Reset Signal for the Latching

## General Lists

<i>Name</i>	<i>Description</i>
Logics.LE22.Gate Out	Signal: Output of the logic gate
Logics.LE22.Timer Out	Signal: Timer Output
Logics.LE22.Out	Signal: Latched Output (Q)
Logics.LE22.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE22.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE22.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE22.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE22.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE22.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE23.Gate Out	Signal: Output of the logic gate
Logics.LE23.Timer Out	Signal: Timer Output
Logics.LE23.Out	Signal: Latched Output (Q)
Logics.LE23.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE23.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE23.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE23.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE23.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE23.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE24.Gate Out	Signal: Output of the logic gate
Logics.LE24.Timer Out	Signal: Timer Output
Logics.LE24.Out	Signal: Latched Output (Q)
Logics.LE24.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE24.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE24.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE24.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE24.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE24.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE25.Gate Out	Signal: Output of the logic gate
Logics.LE25.Timer Out	Signal: Timer Output
Logics.LE25.Out	Signal: Latched Output (Q)
Logics.LE25.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE25.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE25.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE25.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE25.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE25.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE26.Gate Out	Signal: Output of the logic gate
Logics.LE26.Timer Out	Signal: Timer Output
Logics.LE26.Out	Signal: Latched Output (Q)
Logics.LE26.Out inverted	Signal: Negated Latched Output (Q NOT)



General Lists

<i>Name</i>	<i>Description</i>
Logics.LE26.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE26.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE26.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE26.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE26.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE27.Gate Out	Signal: Output of the logic gate
Logics.LE27.Timer Out	Signal: Timer Output
Logics.LE27.Out	Signal: Latched Output (Q)
Logics.LE27.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE27.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE27.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE27.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE27.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE27.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE28.Gate Out	Signal: Output of the logic gate
Logics.LE28.Timer Out	Signal: Timer Output
Logics.LE28.Out	Signal: Latched Output (Q)
Logics.LE28.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE28.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE28.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE28.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE28.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE28.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE29.Gate Out	Signal: Output of the logic gate
Logics.LE29.Timer Out	Signal: Timer Output
Logics.LE29.Out	Signal: Latched Output (Q)
Logics.LE29.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE29.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE29.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE29.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE29.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE29.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE30.Gate Out	Signal: Output of the logic gate
Logics.LE30.Timer Out	Signal: Timer Output
Logics.LE30.Out	Signal: Latched Output (Q)
Logics.LE30.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE30.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE30.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE30.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE30.Gate In4-I	State of the module input: Assignment of the Input Signal

General Lists

<i>Name</i>	<i>Description</i>
Logics.LE30.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE31.Gate Out	Signal: Output of the logic gate
Logics.LE31.Timer Out	Signal: Timer Output
Logics.LE31.Out	Signal: Latched Output (Q)
Logics.LE31.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE31.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE31.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE31.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE31.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE31.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE32.Gate Out	Signal: Output of the logic gate
Logics.LE32.Timer Out	Signal: Timer Output
Logics.LE32.Out	Signal: Latched Output (Q)
Logics.LE32.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE32.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE32.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE32.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE32.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE32.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE33.Gate Out	Signal: Output of the logic gate
Logics.LE33.Timer Out	Signal: Timer Output
Logics.LE33.Out	Signal: Latched Output (Q)
Logics.LE33.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE33.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE33.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE33.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE33.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE33.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE34.Gate Out	Signal: Output of the logic gate
Logics.LE34.Timer Out	Signal: Timer Output
Logics.LE34.Out	Signal: Latched Output (Q)
Logics.LE34.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE34.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE34.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE34.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE34.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE34.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE35.Gate Out	Signal: Output of the logic gate
Logics.LE35.Timer Out	Signal: Timer Output
Logics.LE35.Out	Signal: Latched Output (Q)

General Lists

<i>Name</i>	<i>Description</i>
Logics.LE35.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE35.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE35.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE35.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE35.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE35.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE36.Gate Out	Signal: Output of the logic gate
Logics.LE36.Timer Out	Signal: Timer Output
Logics.LE36.Out	Signal: Latched Output (Q)
Logics.LE36.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE36.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE36.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE36.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE36.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE36.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE37.Gate Out	Signal: Output of the logic gate
Logics.LE37.Timer Out	Signal: Timer Output
Logics.LE37.Out	Signal: Latched Output (Q)
Logics.LE37.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE37.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE37.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE37.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE37.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE37.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE38.Gate Out	Signal: Output of the logic gate
Logics.LE38.Timer Out	Signal: Timer Output
Logics.LE38.Out	Signal: Latched Output (Q)
Logics.LE38.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE38.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE38.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE38.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE38.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE38.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE39.Gate Out	Signal: Output of the logic gate
Logics.LE39.Timer Out	Signal: Timer Output
Logics.LE39.Out	Signal: Latched Output (Q)
Logics.LE39.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE39.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE39.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE39.Gate In3-I	State of the module input: Assignment of the Input Signal

## General Lists

<i>Name</i>	<i>Description</i>
Logics.LE39.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE39.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE40.Gate Out	Signal: Output of the logic gate
Logics.LE40.Timer Out	Signal: Timer Output
Logics.LE40.Out	Signal: Latched Output (Q)
Logics.LE40.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE40.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE40.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE40.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE40.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE40.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE41.Gate Out	Signal: Output of the logic gate
Logics.LE41.Timer Out	Signal: Timer Output
Logics.LE41.Out	Signal: Latched Output (Q)
Logics.LE41.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE41.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE41.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE41.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE41.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE41.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE42.Gate Out	Signal: Output of the logic gate
Logics.LE42.Timer Out	Signal: Timer Output
Logics.LE42.Out	Signal: Latched Output (Q)
Logics.LE42.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE42.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE42.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE42.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE42.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE42.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE43.Gate Out	Signal: Output of the logic gate
Logics.LE43.Timer Out	Signal: Timer Output
Logics.LE43.Out	Signal: Latched Output (Q)
Logics.LE43.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE43.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE43.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE43.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE43.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE43.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE44.Gate Out	Signal: Output of the logic gate
Logics.LE44.Timer Out	Signal: Timer Output

General Lists

<i>Name</i>	<i>Description</i>
Logics.LE44.Out	Signal: Latched Output (Q)
Logics.LE44.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE44.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE44.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE44.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE44.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE44.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE45.Gate Out	Signal: Output of the logic gate
Logics.LE45.Timer Out	Signal: Timer Output
Logics.LE45.Out	Signal: Latched Output (Q)
Logics.LE45.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE45.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE45.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE45.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE45.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE45.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE46.Gate Out	Signal: Output of the logic gate
Logics.LE46.Timer Out	Signal: Timer Output
Logics.LE46.Out	Signal: Latched Output (Q)
Logics.LE46.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE46.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE46.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE46.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE46.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE46.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE47.Gate Out	Signal: Output of the logic gate
Logics.LE47.Timer Out	Signal: Timer Output
Logics.LE47.Out	Signal: Latched Output (Q)
Logics.LE47.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE47.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE47.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE47.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE47.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE47.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE48.Gate Out	Signal: Output of the logic gate
Logics.LE48.Timer Out	Signal: Timer Output
Logics.LE48.Out	Signal: Latched Output (Q)
Logics.LE48.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE48.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE48.Gate In2-I	State of the module input: Assignment of the Input Signal

General Lists

<i>Name</i>	<i>Description</i>
Logics.LE48.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE48.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE48.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE49.Gate Out	Signal: Output of the logic gate
Logics.LE49.Timer Out	Signal: Timer Output
Logics.LE49.Out	Signal: Latched Output (Q)
Logics.LE49.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE49.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE49.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE49.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE49.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE49.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE50.Gate Out	Signal: Output of the logic gate
Logics.LE50.Timer Out	Signal: Timer Output
Logics.LE50.Out	Signal: Latched Output (Q)
Logics.LE50.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE50.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE50.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE50.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE50.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE50.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE51.Gate Out	Signal: Output of the logic gate
Logics.LE51.Timer Out	Signal: Timer Output
Logics.LE51.Out	Signal: Latched Output (Q)
Logics.LE51.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE51.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE51.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE51.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE51.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE51.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE52.Gate Out	Signal: Output of the logic gate
Logics.LE52.Timer Out	Signal: Timer Output
Logics.LE52.Out	Signal: Latched Output (Q)
Logics.LE52.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE52.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE52.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE52.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE52.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE52.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE53.Gate Out	Signal: Output of the logic gate

General Lists

<i>Name</i>	<i>Description</i>
Logics.LE53.Timer Out	Signal: Timer Output
Logics.LE53.Out	Signal: Latched Output (Q)
Logics.LE53.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE53.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE53.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE53.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE53.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE53.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE54.Gate Out	Signal: Output of the logic gate
Logics.LE54.Timer Out	Signal: Timer Output
Logics.LE54.Out	Signal: Latched Output (Q)
Logics.LE54.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE54.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE54.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE54.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE54.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE54.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE55.Gate Out	Signal: Output of the logic gate
Logics.LE55.Timer Out	Signal: Timer Output
Logics.LE55.Out	Signal: Latched Output (Q)
Logics.LE55.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE55.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE55.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE55.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE55.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE55.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE56.Gate Out	Signal: Output of the logic gate
Logics.LE56.Timer Out	Signal: Timer Output
Logics.LE56.Out	Signal: Latched Output (Q)
Logics.LE56.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE56.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE56.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE56.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE56.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE56.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE57.Gate Out	Signal: Output of the logic gate
Logics.LE57.Timer Out	Signal: Timer Output
Logics.LE57.Out	Signal: Latched Output (Q)
Logics.LE57.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE57.Gate In1-I	State of the module input: Assignment of the Input Signal

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<i>Name</i>	<i>Description</i>
Logics.LE57.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE57.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE57.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE57.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE58.Gate Out	Signal: Output of the logic gate
Logics.LE58.Timer Out	Signal: Timer Output
Logics.LE58.Out	Signal: Latched Output (Q)
Logics.LE58.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE58.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE58.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE58.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE58.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE58.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE59.Gate Out	Signal: Output of the logic gate
Logics.LE59.Timer Out	Signal: Timer Output
Logics.LE59.Out	Signal: Latched Output (Q)
Logics.LE59.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE59.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE59.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE59.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE59.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE59.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE60.Gate Out	Signal: Output of the logic gate
Logics.LE60.Timer Out	Signal: Timer Output
Logics.LE60.Out	Signal: Latched Output (Q)
Logics.LE60.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE60.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE60.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE60.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE60.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE60.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE61.Gate Out	Signal: Output of the logic gate
Logics.LE61.Timer Out	Signal: Timer Output
Logics.LE61.Out	Signal: Latched Output (Q)
Logics.LE61.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE61.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE61.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE61.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE61.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE61.Reset Latch-I	State of the module input: Reset Signal for the Latching



General Lists

<i>Name</i>	<i>Description</i>
Logics.LE62.Gate Out	Signal: Output of the logic gate
Logics.LE62.Timer Out	Signal: Timer Output
Logics.LE62.Out	Signal: Latched Output (Q)
Logics.LE62.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE62.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE62.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE62.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE62.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE62.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE63.Gate Out	Signal: Output of the logic gate
Logics.LE63.Timer Out	Signal: Timer Output
Logics.LE63.Out	Signal: Latched Output (Q)
Logics.LE63.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE63.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE63.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE63.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE63.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE63.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE64.Gate Out	Signal: Output of the logic gate
Logics.LE64.Timer Out	Signal: Timer Output
Logics.LE64.Out	Signal: Latched Output (Q)
Logics.LE64.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE64.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE64.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE64.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE64.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE64.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE65.Gate Out	Signal: Output of the logic gate
Logics.LE65.Timer Out	Signal: Timer Output
Logics.LE65.Out	Signal: Latched Output (Q)
Logics.LE65.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE65.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE65.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE65.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE65.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE65.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE66.Gate Out	Signal: Output of the logic gate
Logics.LE66.Timer Out	Signal: Timer Output
Logics.LE66.Out	Signal: Latched Output (Q)
Logics.LE66.Out inverted	Signal: Negated Latched Output (Q NOT)

## General Lists

<i>Name</i>	<i>Description</i>
Logics.LE66.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE66.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE66.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE66.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE66.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE67.Gate Out	Signal: Output of the logic gate
Logics.LE67.Timer Out	Signal: Timer Output
Logics.LE67.Out	Signal: Latched Output (Q)
Logics.LE67.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE67.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE67.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE67.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE67.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE67.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE68.Gate Out	Signal: Output of the logic gate
Logics.LE68.Timer Out	Signal: Timer Output
Logics.LE68.Out	Signal: Latched Output (Q)
Logics.LE68.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE68.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE68.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE68.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE68.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE68.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE69.Gate Out	Signal: Output of the logic gate
Logics.LE69.Timer Out	Signal: Timer Output
Logics.LE69.Out	Signal: Latched Output (Q)
Logics.LE69.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE69.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE69.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE69.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE69.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE69.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE70.Gate Out	Signal: Output of the logic gate
Logics.LE70.Timer Out	Signal: Timer Output
Logics.LE70.Out	Signal: Latched Output (Q)
Logics.LE70.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE70.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE70.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE70.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE70.Gate In4-I	State of the module input: Assignment of the Input Signal

General Lists

<i>Name</i>	<i>Description</i>
Logics.LE70.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE71.Gate Out	Signal: Output of the logic gate
Logics.LE71.Timer Out	Signal: Timer Output
Logics.LE71.Out	Signal: Latched Output (Q)
Logics.LE71.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE71.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE71.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE71.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE71.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE71.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE72.Gate Out	Signal: Output of the logic gate
Logics.LE72.Timer Out	Signal: Timer Output
Logics.LE72.Out	Signal: Latched Output (Q)
Logics.LE72.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE72.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE72.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE72.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE72.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE72.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE73.Gate Out	Signal: Output of the logic gate
Logics.LE73.Timer Out	Signal: Timer Output
Logics.LE73.Out	Signal: Latched Output (Q)
Logics.LE73.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE73.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE73.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE73.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE73.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE73.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE74.Gate Out	Signal: Output of the logic gate
Logics.LE74.Timer Out	Signal: Timer Output
Logics.LE74.Out	Signal: Latched Output (Q)
Logics.LE74.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE74.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE74.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE74.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE74.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE74.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE75.Gate Out	Signal: Output of the logic gate
Logics.LE75.Timer Out	Signal: Timer Output
Logics.LE75.Out	Signal: Latched Output (Q)

General Lists

<i>Name</i>	<i>Description</i>
Logics.LE75.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE75.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE75.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE75.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE75.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE75.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE76.Gate Out	Signal: Output of the logic gate
Logics.LE76.Timer Out	Signal: Timer Output
Logics.LE76.Out	Signal: Latched Output (Q)
Logics.LE76.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE76.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE76.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE76.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE76.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE76.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE77.Gate Out	Signal: Output of the logic gate
Logics.LE77.Timer Out	Signal: Timer Output
Logics.LE77.Out	Signal: Latched Output (Q)
Logics.LE77.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE77.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE77.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE77.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE77.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE77.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE78.Gate Out	Signal: Output of the logic gate
Logics.LE78.Timer Out	Signal: Timer Output
Logics.LE78.Out	Signal: Latched Output (Q)
Logics.LE78.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE78.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE78.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE78.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE78.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE78.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE79.Gate Out	Signal: Output of the logic gate
Logics.LE79.Timer Out	Signal: Timer Output
Logics.LE79.Out	Signal: Latched Output (Q)
Logics.LE79.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE79.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE79.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE79.Gate In3-I	State of the module input: Assignment of the Input Signal

General Lists

<i>Name</i>	<i>Description</i>
Logics.LE79.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE79.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logics.LE80.Gate Out	Signal: Output of the logic gate
Logics.LE80.Timer Out	Signal: Timer Output
Logics.LE80.Out	Signal: Latched Output (Q)
Logics.LE80.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE80.Gate In1-I	State of the module input: Assignment of the Input Signal
Logics.LE80.Gate In2-I	State of the module input: Assignment of the Input Signal
Logics.LE80.Gate In3-I	State of the module input: Assignment of the Input Signal
Logics.LE80.Gate In4-I	State of the module input: Assignment of the Input Signal
Logics.LE80.Reset Latch-I	State of the module input: Reset Signal for the Latching
Sgen.Running	Signal; Measuring value simulation is running
Sgen.Ex Start Simulation-I	State of the module input:External Start of Fault Simulation (Using the test parameters)
Sgen.ExBlo	Module input state: External blocking
Sgen.Ex ForcePost-I	State of the module input:Force Post state. Abort simulation.
Sys.PS 1	Signal: Parameter Set 1
Sys.PS 2	Signal: Parameter Set 2
Sys.PS 3	Signal: Parameter Set 3
Sys.PS 4	Signal: Parameter Set 4
Sys.PSS manual	Signal: Manual Switch over of a Parameter Set
Sys.PSS via Scada	Signal: Parameter Set Switch via Scada. Write into this output byte the integer of the parameter set that should become active (e.g. 4 => Switch onto parameter set 4).
Sys.PSS via Inp fct	Signal: Parameter Set Switch via input function
Sys.min 1 param changed	Signal: At least one parameter has been changed
Sys.Setting Lock Bypass	Signal: Short-period unlock of the Setting Lock
Sys.Ack LED	Signal: LEDs acknowledgement
Sys.Ack BO	Signal: Acknowledgement of the Binary Outputs
Sys.Ack Scada	Signal: Acknowledge Scada
Sys.Ack TripCmd	Signal: Reset Trip Command
Sys.Ack LED-HMI	Signal: LEDs acknowledgement :HMI
Sys.Ack BO-HMI	Signal: Acknowledgement of the Binary Outputs :HMI
Sys.Ack Scada-HMI	Signal: Acknowledge Scada :HMI
Sys.Ack TripCmd-HMI	Signal: Reset Trip Command :HMI
Sys.Ack LED-Sca	Signal: LEDs acknowledgement :SCADA
Sys.Ack BO-Sca	Signal: Acknowledgement of the Binary Outputs :SCADA
Sys.Ack Counter-Sca	Signal: Reset of all Counters :SCADA
Sys.Ack Scada-Sca	Signal: Acknowledge Scada :SCADA
Sys.Ack TripCmd-Sca	Signal: Reset Trip Command :SCADA
Sys.Res OperationsCr	Signal:: Res OperationsCr
Sys.Res AlarmCr	Signal:: Res AlarmCr

<i>Name</i>	<i>Description</i>
Sys.Res TripCmdCr	Signal:: Res TripCmdCr
Sys.Res TotalCr	Signal:: Res TotalCr
Sys.Ack LED-I	Module input state: LEDs acknowledgement by digital input
Sys.Ack BO-I	Module input state: Acknowledgement of the binary Output Relays
Sys.Ack Scada-I	Module input state: Acknowledge Scada via digital input. The replica that SCADA has got from the device is to be reset.
Sys.PS1-I	State of the module input respectively of the signal, that should activate this Parameter Setting Group.
Sys.PS2-I	State of the module input respectively of the signal, that should activate this Parameter Setting Group.
Sys.PS3-I	State of the module input respectively of the signal, that should activate this Parameter Setting Group.
Sys.PS4-I	State of the module input respectively of the signal, that should activate this Parameter Setting Group.

### List of the Digital Inputs

The following list comprises all Digital Inputs. This list is used in various Protective Elements (e.g. TCS, Q->&V<...). The availability and the number of entries depends on the type of device.

<i>Name</i>	<i>Description</i>
-.-	No assignment
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input
DI Slot X1.DI 5	Signal: Digital Input
DI Slot X1.DI 6	Signal: Digital Input
DI Slot X1.DI 7	Signal: Digital Input
DI Slot X1.DI 8	Signal: Digital Input
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input

## Signals of the Digital Inputs and Logic

The following list comprises the signals of the Digital Inputs and the Logic. This list is used in various protective elements.

<i>Name</i>	<i>Description</i>
--	No assignment
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input
DI Slot X1.DI 5	Signal: Digital Input
DI Slot X1.DI 6	Signal: Digital Input
DI Slot X1.DI 7	Signal: Digital Input
DI Slot X1.DI 8	Signal: Digital Input
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input
DNP3.BinaryOutput0	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput1	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput2	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput3	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput4	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput5	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput6	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput7	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput8	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput9	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput10	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput11	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput12	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput13	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput14	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput15	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput16	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput17	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput18	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput19	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput20	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput21	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput22	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.

General Lists

<i>Name</i>	<i>Description</i>
DNP3.BinaryOutput23	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput24	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput25	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput26	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput27	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput28	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput29	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput30	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP3.BinaryOutput31	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
Logics.LE1.Gate Out	Signal: Output of the logic gate
Logics.LE1.Timer Out	Signal: Timer Output
Logics.LE1.Out	Signal: Latched Output (Q)
Logics.LE1.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE2.Gate Out	Signal: Output of the logic gate
Logics.LE2.Timer Out	Signal: Timer Output
Logics.LE2.Out	Signal: Latched Output (Q)
Logics.LE2.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE3.Gate Out	Signal: Output of the logic gate
Logics.LE3.Timer Out	Signal: Timer Output
Logics.LE3.Out	Signal: Latched Output (Q)
Logics.LE3.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE4.Gate Out	Signal: Output of the logic gate
Logics.LE4.Timer Out	Signal: Timer Output
Logics.LE4.Out	Signal: Latched Output (Q)
Logics.LE4.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE5.Gate Out	Signal: Output of the logic gate
Logics.LE5.Timer Out	Signal: Timer Output
Logics.LE5.Out	Signal: Latched Output (Q)
Logics.LE5.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE6.Gate Out	Signal: Output of the logic gate
Logics.LE6.Timer Out	Signal: Timer Output
Logics.LE6.Out	Signal: Latched Output (Q)
Logics.LE6.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE7.Gate Out	Signal: Output of the logic gate
Logics.LE7.Timer Out	Signal: Timer Output
Logics.LE7.Out	Signal: Latched Output (Q)
Logics.LE7.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE8.Gate Out	Signal: Output of the logic gate
Logics.LE8.Timer Out	Signal: Timer Output
Logics.LE8.Out	Signal: Latched Output (Q)



## General Lists

<i>Name</i>	<i>Description</i>
Logics.LE8.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE9.Gate Out	Signal: Output of the logic gate
Logics.LE9.Timer Out	Signal: Timer Output
Logics.LE9.Out	Signal: Latched Output (Q)
Logics.LE9.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE10.Gate Out	Signal: Output of the logic gate
Logics.LE10.Timer Out	Signal: Timer Output
Logics.LE10.Out	Signal: Latched Output (Q)
Logics.LE10.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE11.Gate Out	Signal: Output of the logic gate
Logics.LE11.Timer Out	Signal: Timer Output
Logics.LE11.Out	Signal: Latched Output (Q)
Logics.LE11.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE12.Gate Out	Signal: Output of the logic gate
Logics.LE12.Timer Out	Signal: Timer Output
Logics.LE12.Out	Signal: Latched Output (Q)
Logics.LE12.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE13.Gate Out	Signal: Output of the logic gate
Logics.LE13.Timer Out	Signal: Timer Output
Logics.LE13.Out	Signal: Latched Output (Q)
Logics.LE13.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE14.Gate Out	Signal: Output of the logic gate
Logics.LE14.Timer Out	Signal: Timer Output
Logics.LE14.Out	Signal: Latched Output (Q)
Logics.LE14.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE15.Gate Out	Signal: Output of the logic gate
Logics.LE15.Timer Out	Signal: Timer Output
Logics.LE15.Out	Signal: Latched Output (Q)
Logics.LE15.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE16.Gate Out	Signal: Output of the logic gate
Logics.LE16.Timer Out	Signal: Timer Output
Logics.LE16.Out	Signal: Latched Output (Q)
Logics.LE16.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE17.Gate Out	Signal: Output of the logic gate
Logics.LE17.Timer Out	Signal: Timer Output
Logics.LE17.Out	Signal: Latched Output (Q)
Logics.LE17.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE18.Gate Out	Signal: Output of the logic gate
Logics.LE18.Timer Out	Signal: Timer Output
Logics.LE18.Out	Signal: Latched Output (Q)

General Lists

<i>Name</i>	<i>Description</i>
Logics.LE18.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE19.Gate Out	Signal: Output of the logic gate
Logics.LE19.Timer Out	Signal: Timer Output
Logics.LE19.Out	Signal: Latched Output (Q)
Logics.LE19.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE20.Gate Out	Signal: Output of the logic gate
Logics.LE20.Timer Out	Signal: Timer Output
Logics.LE20.Out	Signal: Latched Output (Q)
Logics.LE20.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE21.Gate Out	Signal: Output of the logic gate
Logics.LE21.Timer Out	Signal: Timer Output
Logics.LE21.Out	Signal: Latched Output (Q)
Logics.LE21.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE22.Gate Out	Signal: Output of the logic gate
Logics.LE22.Timer Out	Signal: Timer Output
Logics.LE22.Out	Signal: Latched Output (Q)
Logics.LE22.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE23.Gate Out	Signal: Output of the logic gate
Logics.LE23.Timer Out	Signal: Timer Output
Logics.LE23.Out	Signal: Latched Output (Q)
Logics.LE23.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE24.Gate Out	Signal: Output of the logic gate
Logics.LE24.Timer Out	Signal: Timer Output
Logics.LE24.Out	Signal: Latched Output (Q)
Logics.LE24.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE25.Gate Out	Signal: Output of the logic gate
Logics.LE25.Timer Out	Signal: Timer Output
Logics.LE25.Out	Signal: Latched Output (Q)
Logics.LE25.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE26.Gate Out	Signal: Output of the logic gate
Logics.LE26.Timer Out	Signal: Timer Output
Logics.LE26.Out	Signal: Latched Output (Q)
Logics.LE26.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE27.Gate Out	Signal: Output of the logic gate
Logics.LE27.Timer Out	Signal: Timer Output
Logics.LE27.Out	Signal: Latched Output (Q)
Logics.LE27.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE28.Gate Out	Signal: Output of the logic gate
Logics.LE28.Timer Out	Signal: Timer Output
Logics.LE28.Out	Signal: Latched Output (Q)

## General Lists

<i>Name</i>	<i>Description</i>
Logics.LE28.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE29.Gate Out	Signal: Output of the logic gate
Logics.LE29.Timer Out	Signal: Timer Output
Logics.LE29.Out	Signal: Latched Output (Q)
Logics.LE29.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE30.Gate Out	Signal: Output of the logic gate
Logics.LE30.Timer Out	Signal: Timer Output
Logics.LE30.Out	Signal: Latched Output (Q)
Logics.LE30.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE31.Gate Out	Signal: Output of the logic gate
Logics.LE31.Timer Out	Signal: Timer Output
Logics.LE31.Out	Signal: Latched Output (Q)
Logics.LE31.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE32.Gate Out	Signal: Output of the logic gate
Logics.LE32.Timer Out	Signal: Timer Output
Logics.LE32.Out	Signal: Latched Output (Q)
Logics.LE32.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE33.Gate Out	Signal: Output of the logic gate
Logics.LE33.Timer Out	Signal: Timer Output
Logics.LE33.Out	Signal: Latched Output (Q)
Logics.LE33.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE34.Gate Out	Signal: Output of the logic gate
Logics.LE34.Timer Out	Signal: Timer Output
Logics.LE34.Out	Signal: Latched Output (Q)
Logics.LE34.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE35.Gate Out	Signal: Output of the logic gate
Logics.LE35.Timer Out	Signal: Timer Output
Logics.LE35.Out	Signal: Latched Output (Q)
Logics.LE35.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE36.Gate Out	Signal: Output of the logic gate
Logics.LE36.Timer Out	Signal: Timer Output
Logics.LE36.Out	Signal: Latched Output (Q)
Logics.LE36.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE37.Gate Out	Signal: Output of the logic gate
Logics.LE37.Timer Out	Signal: Timer Output
Logics.LE37.Out	Signal: Latched Output (Q)
Logics.LE37.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE38.Gate Out	Signal: Output of the logic gate
Logics.LE38.Timer Out	Signal: Timer Output
Logics.LE38.Out	Signal: Latched Output (Q)

## General Lists

<i>Name</i>	<i>Description</i>
Logics.LE38.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE39.Gate Out	Signal: Output of the logic gate
Logics.LE39.Timer Out	Signal: Timer Output
Logics.LE39.Out	Signal: Latched Output (Q)
Logics.LE39.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE40.Gate Out	Signal: Output of the logic gate
Logics.LE40.Timer Out	Signal: Timer Output
Logics.LE40.Out	Signal: Latched Output (Q)
Logics.LE40.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE41.Gate Out	Signal: Output of the logic gate
Logics.LE41.Timer Out	Signal: Timer Output
Logics.LE41.Out	Signal: Latched Output (Q)
Logics.LE41.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE42.Gate Out	Signal: Output of the logic gate
Logics.LE42.Timer Out	Signal: Timer Output
Logics.LE42.Out	Signal: Latched Output (Q)
Logics.LE42.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE43.Gate Out	Signal: Output of the logic gate
Logics.LE43.Timer Out	Signal: Timer Output
Logics.LE43.Out	Signal: Latched Output (Q)
Logics.LE43.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE44.Gate Out	Signal: Output of the logic gate
Logics.LE44.Timer Out	Signal: Timer Output
Logics.LE44.Out	Signal: Latched Output (Q)
Logics.LE44.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE45.Gate Out	Signal: Output of the logic gate
Logics.LE45.Timer Out	Signal: Timer Output
Logics.LE45.Out	Signal: Latched Output (Q)
Logics.LE45.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE46.Gate Out	Signal: Output of the logic gate
Logics.LE46.Timer Out	Signal: Timer Output
Logics.LE46.Out	Signal: Latched Output (Q)
Logics.LE46.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE47.Gate Out	Signal: Output of the logic gate
Logics.LE47.Timer Out	Signal: Timer Output
Logics.LE47.Out	Signal: Latched Output (Q)
Logics.LE47.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE48.Gate Out	Signal: Output of the logic gate
Logics.LE48.Timer Out	Signal: Timer Output
Logics.LE48.Out	Signal: Latched Output (Q)

## General Lists

<i>Name</i>	<i>Description</i>
Logics.LE48.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE49.Gate Out	Signal: Output of the logic gate
Logics.LE49.Timer Out	Signal: Timer Output
Logics.LE49.Out	Signal: Latched Output (Q)
Logics.LE49.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE50.Gate Out	Signal: Output of the logic gate
Logics.LE50.Timer Out	Signal: Timer Output
Logics.LE50.Out	Signal: Latched Output (Q)
Logics.LE50.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE51.Gate Out	Signal: Output of the logic gate
Logics.LE51.Timer Out	Signal: Timer Output
Logics.LE51.Out	Signal: Latched Output (Q)
Logics.LE51.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE52.Gate Out	Signal: Output of the logic gate
Logics.LE52.Timer Out	Signal: Timer Output
Logics.LE52.Out	Signal: Latched Output (Q)
Logics.LE52.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE53.Gate Out	Signal: Output of the logic gate
Logics.LE53.Timer Out	Signal: Timer Output
Logics.LE53.Out	Signal: Latched Output (Q)
Logics.LE53.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE54.Gate Out	Signal: Output of the logic gate
Logics.LE54.Timer Out	Signal: Timer Output
Logics.LE54.Out	Signal: Latched Output (Q)
Logics.LE54.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE55.Gate Out	Signal: Output of the logic gate
Logics.LE55.Timer Out	Signal: Timer Output
Logics.LE55.Out	Signal: Latched Output (Q)
Logics.LE55.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE56.Gate Out	Signal: Output of the logic gate
Logics.LE56.Timer Out	Signal: Timer Output
Logics.LE56.Out	Signal: Latched Output (Q)
Logics.LE56.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE57.Gate Out	Signal: Output of the logic gate
Logics.LE57.Timer Out	Signal: Timer Output
Logics.LE57.Out	Signal: Latched Output (Q)
Logics.LE57.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE58.Gate Out	Signal: Output of the logic gate
Logics.LE58.Timer Out	Signal: Timer Output
Logics.LE58.Out	Signal: Latched Output (Q)

General Lists

<i>Name</i>	<i>Description</i>
Logics.LE58.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE59.Gate Out	Signal: Output of the logic gate
Logics.LE59.Timer Out	Signal: Timer Output
Logics.LE59.Out	Signal: Latched Output (Q)
Logics.LE59.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE60.Gate Out	Signal: Output of the logic gate
Logics.LE60.Timer Out	Signal: Timer Output
Logics.LE60.Out	Signal: Latched Output (Q)
Logics.LE60.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE61.Gate Out	Signal: Output of the logic gate
Logics.LE61.Timer Out	Signal: Timer Output
Logics.LE61.Out	Signal: Latched Output (Q)
Logics.LE61.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE62.Gate Out	Signal: Output of the logic gate
Logics.LE62.Timer Out	Signal: Timer Output
Logics.LE62.Out	Signal: Latched Output (Q)
Logics.LE62.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE63.Gate Out	Signal: Output of the logic gate
Logics.LE63.Timer Out	Signal: Timer Output
Logics.LE63.Out	Signal: Latched Output (Q)
Logics.LE63.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE64.Gate Out	Signal: Output of the logic gate
Logics.LE64.Timer Out	Signal: Timer Output
Logics.LE64.Out	Signal: Latched Output (Q)
Logics.LE64.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE65.Gate Out	Signal: Output of the logic gate
Logics.LE65.Timer Out	Signal: Timer Output
Logics.LE65.Out	Signal: Latched Output (Q)
Logics.LE65.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE66.Gate Out	Signal: Output of the logic gate
Logics.LE66.Timer Out	Signal: Timer Output
Logics.LE66.Out	Signal: Latched Output (Q)
Logics.LE66.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE67.Gate Out	Signal: Output of the logic gate
Logics.LE67.Timer Out	Signal: Timer Output
Logics.LE67.Out	Signal: Latched Output (Q)
Logics.LE67.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE68.Gate Out	Signal: Output of the logic gate
Logics.LE68.Timer Out	Signal: Timer Output
Logics.LE68.Out	Signal: Latched Output (Q)

## General Lists

<i>Name</i>	<i>Description</i>
Logics.LE68.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE69.Gate Out	Signal: Output of the logic gate
Logics.LE69.Timer Out	Signal: Timer Output
Logics.LE69.Out	Signal: Latched Output (Q)
Logics.LE69.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE70.Gate Out	Signal: Output of the logic gate
Logics.LE70.Timer Out	Signal: Timer Output
Logics.LE70.Out	Signal: Latched Output (Q)
Logics.LE70.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE71.Gate Out	Signal: Output of the logic gate
Logics.LE71.Timer Out	Signal: Timer Output
Logics.LE71.Out	Signal: Latched Output (Q)
Logics.LE71.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE72.Gate Out	Signal: Output of the logic gate
Logics.LE72.Timer Out	Signal: Timer Output
Logics.LE72.Out	Signal: Latched Output (Q)
Logics.LE72.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE73.Gate Out	Signal: Output of the logic gate
Logics.LE73.Timer Out	Signal: Timer Output
Logics.LE73.Out	Signal: Latched Output (Q)
Logics.LE73.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE74.Gate Out	Signal: Output of the logic gate
Logics.LE74.Timer Out	Signal: Timer Output
Logics.LE74.Out	Signal: Latched Output (Q)
Logics.LE74.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE75.Gate Out	Signal: Output of the logic gate
Logics.LE75.Timer Out	Signal: Timer Output
Logics.LE75.Out	Signal: Latched Output (Q)
Logics.LE75.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE76.Gate Out	Signal: Output of the logic gate
Logics.LE76.Timer Out	Signal: Timer Output
Logics.LE76.Out	Signal: Latched Output (Q)
Logics.LE76.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE77.Gate Out	Signal: Output of the logic gate
Logics.LE77.Timer Out	Signal: Timer Output
Logics.LE77.Out	Signal: Latched Output (Q)
Logics.LE77.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE78.Gate Out	Signal: Output of the logic gate
Logics.LE78.Timer Out	Signal: Timer Output
Logics.LE78.Out	Signal: Latched Output (Q)

## General Lists

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<i>Name</i>	<i>Description</i>
Logics.LE78.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE79.Gate Out	Signal: Output of the logic gate
Logics.LE79.Timer Out	Signal: Timer Output
Logics.LE79.Out	Signal: Latched Output (Q)
Logics.LE79.Out inverted	Signal: Negated Latched Output (Q NOT)
Logics.LE80.Gate Out	Signal: Output of the logic gate
Logics.LE80.Timer Out	Signal: Timer Output
Logics.LE80.Out	Signal: Latched Output (Q)
Logics.LE80.Out inverted	Signal: Negated Latched Output (Q NOT)



## Abbreviations, and Acronyms

The following abbreviations and acronyms are used in this manual.

°C	Degrees Celsius
°F	Degrees Fahrenheit
A	Ampere(s), Amp(s)
AC	Alternating current
Ack.	Acknowledge
AND	Logical gate (The output becomes true if all Input signals are true.)
ANSI	American National Standards Institute
avg.	Average
AWG	American wire gauge
BF	Circuit breaker failure
Bkr	Breaker
Blo	Blocking(s)
BO	Binary output relay
BO1	1st binary output relay
BO2	2nd binary output relay
BO3	3rd binary output relay
calc	Calculated
CB	Circuit breaker
CBF	Module Circuit Breaker Failure protection
CD	Compact disk
Char	Curve shape
CLPU	Cold Load Pickup Module
Cmd.	Command
CMN	Common input
COM	Common input
Comm	Communication
Cr.	Counter(s)
CSA	Canadian Standards Association
CT	Control transformer
Ctrl.	Control
CTS	Current Transformer Supervision
CTS	Current transformer supervision
d	Day
D-Sub-Plug	Communication interface
DC	Direct current
DEFT	Definite time characteristic (Tripping time does not depend on the height of the current.)
delta phi	Vector surge
df/dt	Rate-of-frequency-change
DI	Digital Input
Diagn Cr	Diagnosis counter(s)
Diagn.	Diagnosis

## Abbreviations, and Acronyms

---

DIN	Deutsche Industrie Norm
dir	Directional
EINV	Extremely inverse tripping characteristic
EMC	Electromagnetic compatibility
EN	Europäische Norm
err. / Err.	Error
EVTcon	Parameter determines if the residual voltage is measured or calculated.
Ex	External
Ex Oil Temp	External Oil Temperature
ExBlo	External blocking(s)
ExP	External Protection - Module
ExP	External protection
Ext Sudd Press	Sudden Pressure
Ext Temp Superv	External Temperature Supervision
f	Frequency Protection Module
Fc	Function (Enable or disable functionality = allow or disallow.)
FIFO	First in first out
FIFO Principal	First in first out
fund	Fundamental (ground wave)
gn	Acceleration of the earth in vertical direction (9.81 m/s <sup>2</sup> )
GND	Ground
h	Hour
HMI	Human machine interface (Front of the protective relay)
HTL	Manufacturer internal product designation
Hz	Hertz
I	Phase Overcurrent Stage
I	Fault current
I	Current
I-BF	Tripping threshold
I0	Zero current (symmetrical components)
I1	Positive sequence current (symmetrical components)
I2	Negative sequence current (symmetrical components)
I2>	Unbalanced Load-Stage
I2T	Thermal Characteristic
I4T	Thermal Characteristic
IA	Phase A current
IB	Phase B current
IC	Phase C current
IC's	Manufacturer internal product designation
Id	Differential Protection Module
IdG	Restricted Ground Fault Differential Protection Module
IdGH	Restricted Ground Fault Highset Protection Module
IdH	High-Set Differential Protection Module
IEC	International Electrotechnical Commission
IEC61850	IEC61850

## Abbreviations, and Acronyms

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IEEE	Institute of Electrical and Electronics Engineers
IG	Earth current protection - Stage
IG	Ground current
IG	Fault current
IGNom	Nominal ground current
IH1	1st harmonic
IH2	Module Inrush
IH2	2nd harmonic
in.	Inch
incl.	Include, including
InEn	Inadvertent Energization
Info.	Information
Interl.	Interlocking
Intertripping	Intertripping
INV	Inverse characteristic (The tripping time will be calculated depending on the height of the current)
IR	Calculated ground current
IRIG	Input for time synchronization (Clock)
IRIG-B	IRIG-B-Module
IT	Thermal Characteristic
IX	4th measuring input of the current measuring assembly group (either ground or neutral current)
J	Joule
kg	Kilogram
kHz	Kilohertz
kV	Kilovolt(s)
kVdc or kVDC	Kilovolt(s) direct current
I/In	Ratio of current to nominal current.
L1	Phase A
L2	Phase B
L3	Phase C
lb-in	Pound-inch
LED	Light emitting diode
LINV	Long time inverse tripping characteristic
LoE-Z1	Loss of Excitation
LoE-Z2	Loss of Excitation
Logics	Logic
LOP	Loss of Potential
LV	Low voltage
LVRT	Low Voltage Ride Through
m	Meter
mA	Milliampere(s), Milliamp(s)
man.	Manual
max.	Maximum
meas	Measured
min.	Minimum

## Abbreviations, and Acronyms

---

min.	Minute
MINV	Moderately Inverse Tripping Characteristic
MK	Manufacturer Internal Product Designation Code
mm	Millimeter
MMU	Memory mapping unit
ms	Milli-second(s)
MV	Medium voltage
mVA	Milli volt amperes (Power)
N.C.	Not connected
N.O.	Normal open (Contact)
NINV	Normal inverse tripping characteristic
Nm	Newton-meter
No	Number
Nom.	Nominal
NT	Manufacturer internal product designation code
P	Reverse Active Power
Para.	Parameter
PC	Personal computer
PCB	Printed circuit board
PE	Protected Earth
PF	Power Factor - Module
Ph	Phase
PQS	Power Protection - Module
pri	Primary
PROT or Prot	Protection Module (Master Module)
PS1	Parameter set 1
PS2	Parameter set 2
PS3	Parameter set 3
PS4	Parameter set 4
PSet	Parameter set
PSS	Parameter set switch (Switching from one parameter set to another)
Q	Reverse Reactive Power
Q->&V<	Undervoltage and Reactive Power Direction Protection
R	Reset
rec.	Record
rel	Relative
res	Reset
ResetFct	Reset function
RevData	Review data
RMS	Root mean square
Rst	Reset
RTD	Temperature Protection Module
s	Second
SC	Supervision contact
Sca	SCADA

## Abbreviations, and Acronyms

---

SCADA	Communication module
sec	Second(s)
sec	Secondary
Sgen	Sine wave generator
Sig.	Signal
SNTP	SNTP-Module
SOTF	Switch Onto Fault - Module
StartFct	Start function
Sum	Summation
SW	Software
Sync	Synchrocheck
Sys.	System
t	Tripping delay
t or t.	Time
Tcmd	Trip command
TCP/IP	Communication protocol
TCS	Trip circuit supervision
ThR	Thermal replica module
TI	Manufacturer internal product designation code
TripCmd	Trip command
txt	Text
UL	Underwriters Laboratories
UMZ	DEFT (definite time tripping characteristic)
USB	Universal serial bus
V	Voltage-stage
V	Volts
V/f>	Overexcitation
V012	Symmetrical Components: Supervision of the Positive Phase Sequence or Negative Phase Sequence
Vac / V ac	Volts alternating current
Vdc / V dc	Volts direct current
VDE	Verband Deutscher Elektrotechnik
VDEW	Verband der Elektrizitätswirtschaft
VE	Residual voltage
VG	Residual voltage-Stage
VINV	Very inverse tripping characteristic
VTS	Voltage transformer supervision
W	Watt(s)
WDC	Watch dog contact (supervision contact)
www	World wide web
XCT	4th current measuring input (ground or neutral current)
XInv	Inverse characteristic

## List of ANSI Codes

ANSI	Functions
14	Underspeed
23	Temperature Protection
24	Overexcitation Protection (Volts per Hertz)
25	Synchronizing or Synchronism-check via 4 <sup>th</sup> measuring channel of voltage measurement card
27	Undervoltage Protection
27(t)	Undervoltage (time dependent) Protection
27A	Undervoltage Protection (Auxiliar) via 4 <sup>th</sup> measuring channel of voltage measurement card
27N	Neutral Undervoltage via 4 <sup>th</sup> measuring channel of voltage measurement card
27TN	Third Harmonic Neutral Undervoltage via 4 <sup>th</sup> measuring channel of voltage measurement card
32	Directional Power Protection
32F	Forward Power Protection
32R	Reverse Power Protection
37	Undercurrent / Under Power
38	Temperature Protection (optional via Interface/external Box)
40	Loss of Excitation / Loss of Field
46	Unbalanced Current Protection
46G	Unbalanced Generator Current Protection
47	Unbalanced Voltage Protection
48	Incomplete Sequence (Start-up time Supervision)
49	Thermal Protection
49M	Thermal Motor Protection
49R	Thermal Rotor Protection
49S	Thermal Stator Protection
50BF	Breaker Failure
50	Overcurrent (instantaneous)
50P	Phase Overcurrent (instantaneous)
50N	Neutral Overcurrent (instantaneous)
50Ns	Sensitive Neutral Overcurrent (instantaneous)
51	Overcurrent
51P	Phase Overcurrent
51N	Neutral Overcurrent
51Ns	Sensitive Neutral Overcurrent
51LR	Locked Rotor
51LRS	Locked Rotor Start (during start sequence)
51C	Voltage Controlled Overcurrent (via adaptive Parameters)
51Q	Negative Phase Sequence Overcurrent (multiple trip characteristics)
51V	Voltage Restrained Overcurrent
55	Power Factor Protection
56	Field Application Relay
59	Overvoltage Protection
59TN	Third Harmonic Neutral Overvoltage via 4 <sup>th</sup> measuring channel of voltage measurement card
59A	Overvoltage Protection via 4 <sup>th</sup> (Auxiliar) measuring channel of voltage measurement card
59N	Neutral Overvoltage Protection
60FL	Voltage Transformer Supervision
60L	Current Transformer Supervision
64R	Rotor Earth Fault Protection
64REF	Restricted Ground Fault Protection
66	Starts per h (Start Inhibit)
67	Directional Overcurrent

<b>ANSI</b>	<b>Functions</b>
67N	Directional Neutral Overcurrent
67Ns	Sensitive Directional Neutral Overcurrent
74TC	Trip Circuit Supervision
78V	Vector Surge Protection
79	Auto Reclosure
81	Frequency Protection
81U	Underfrequency Protection
81O	Overfrequency Protection
81R	ROCOF (df/dt)
86	Lock Out
87B	Busbar Differential Protection
87G	Generator Differential Protection
87GP	Generator Phase Differential Protection
87GN	Generator Ground Differential Protection
87M	Motor Differential Protection
87T	Transformer Differential Protection
87TP	Transformer Phase Differential Protection
87TN	Transformer Ground Differential Protection
87U	Unit Differential Protection (protected zone includes generator and step-up transformer)
87UP	Unit Phase Differential Protection (protected zone includes generator and step-up transformer)

## Specifications

### Specifications of the Real Time Clock

Resolution:	1 ms
Tolerance:	<1 minute / month (+20°C [68°F]) <±1ms if synchronized via IRIG-B

### Time Synchronisation Tolerances

The different protocols for time synchronisation vary in their accuracy:

<b>Used Protocol</b>	<b>Time drift over one month</b>	<b>Deviation to time generator</b>
Without time synchronization	<1 min (+20°C)	Time drifts
IRIG-B	Dependent on the time drift of the time generator	<±1 ms
SNTP	Dependent on the time drift of the time generator	<±1 ms
IEC60870-5-103	Dependent on the time drift of the time generator	<±1 ms
Modbus TCP	Dependent on the time drift of the time generator	Dependent on the network load
Modbus RTU	Dependent on the time drift of the time generator	<±1 ms
DNP3	Dependent on the time drift of the time generator	<±1 ms



## Specifications of the Measured Value Acquisition Phase and Ground Current Measuring

Frequency Range:	50 Hz / 60 Hz $\pm$ 10%
Accuracy:	Class 0.5
Amplitude Error if $I < I_n$ :	$\pm 0.5\%$ of the rated current <sup>*3)</sup>
Amplitude Error if $I > I_n$ :	$\pm 0.5\%$ of the measured current <sup>*3)</sup>
Amplitude Error if $I > 2 I_n$ :	$\pm 1.0\%$ of the measured current <sup>*3)</sup>
Harmonics:	Up to 20% 3rd harmonic $\pm 2\%$ Up to 20% 5th harmonic $\pm 2\%$
Frequency Influence:	$< \pm 2\%$ / Hz in the range of $\pm 5$ Hz of the configured nominal frequency
Temperature Influence:	$< \pm 1\%$ within the range of $0^\circ\text{C}$ to $+60^\circ\text{C}$ ( $+32^\circ\text{F}$ to $+140^\circ\text{F}$ )

\*3) For earth current sensitive the precision does not depend on the nominal value but is referenced to 100 mA (with  $I_n = 1$  A) respectively. 500 mA (with  $I_n = 5$  A)

## Protection Elements Accuracy

### NOTICE

The tripping delay relates to the time between alarm and trip.  
 The accuracy of the operating time relates to the time between fault entry and the time when the protection element is picked-up.

Reference conditions for all Protection Elements: sine wave, at rated frequency, THD < 1%  
 Measuring method: Fundamental

<b>Overcurrent Protection Elements: I[x]</b>	<b>Accuracy</b>
I>	±1.5% of the setting value or ±1% I <sub>n</sub>
Dropout Ratio	97% or 0.5% I <sub>n</sub>
t	DEFT ±1% or ±10 ms
Operating Time At testing current >= 2 times pickup value	<36ms
Disengaging Time	<55ms
t-char	±5% (according to selected curve)
t-reset (Reset Mode = t-delay)	±1% or ±10 ms

<b>Overcurrent Protection Elements: I[x] with selected Measuring method = I2 (Negative phase sequence current)</b>	<b>Accuracy</b>
I>	±2% of the setting value or ±1% I <sub>n</sub>
Dropout Ratio	97% or 0.5% I <sub>n</sub>
t	DEFT ±1% or ±10 ms
Operating Time At testing current >= 2 times pickup value	<60ms
Disengaging Time	<45ms

<b>Ground Current Elements: IG[x]</b>	<b>Accuracy <sup>*3)</sup></b>
IG>	±1.5% of the setting value or ±1% I <sub>n</sub>
Dropout Ratio	97% or 0.5% x I <sub>n</sub>
t	DEFT ±1% or ±10 ms
Operating time Starting from IG higher than 1.2 x IG>	<45ms
Disengaging Time	<55ms
t-char	±5% (according to selected curve)
t-reset (Reset Mode = t-delay)	±1% or ±10 ms

\*3) For earth current sensitive the precision does not depend on the nominal value but is referenced to 100 mA (with I<sub>n</sub> = 1 A) respectively 500 mA (with I<sub>n</sub> = 5 A)

<b>Motor Protection:</b>	<b>Accuracy</b>
Stop Declaration Time period current must drop below STPC	<50 ms ±1.5% of the setting value or 1% In
Anti Backspin Blocking time to allow for back spin.	±1sec.
TBS Timer Time between repeated starts.	±1sec.
Reset Starts Per Hour Reset starts per hours timer from oldest start event.	±1 min.

<b>Thermal Model: ThR</b>	<b>Accuracy</b>
Trip Threshold	±2%
Trip Delay	±1% or ±10 ms
Alarm Threshold	±2%
Alarm Delay	±1% or ±10 ms

<b>Jam-Stall Protection: Jam[x]</b>	<b>Accuracy</b>
Pickup	±1.5% of the setting value or 1% In
Dropout Ratio	97% or 0.5% In
t	DEFT ±1% or ±10 ms
Operating Time Starting from I higher than 1.1 x I>	<35 ms
Disengaging Time	<45 ms

<b>Under Load Protection: I&lt;[x]</b>	<b>Accuracy</b>
Threshold	±1.5% of the setting value or 1% In
Dropout Ratio	103% or 0.5% x In
t	DEFT ±1% or ±10 ms
Operating Time Starting from I lower than 0.9 x setting value	<50ms
Disengaging Time	<50 ms

<b>Mechanical Load Shedding: MLS</b>	<b>Accuracy</b>
Pickup Threshold	±1.5% of the setting value or 1% In
Pickup Delay	DEFT ±1% or ±10 ms
Dropout Threshold	±1.5% of the setting value or 1% In
Dropout Delay	DEFT ±1% or ±10 ms

Specifications

<b>Start Delay Timers</b>	<b>Accuracy</b>
Start Delay (common timers)	±1% or ±10 ms
Operating Times	
for IOC, GOC, JAM	<35 ms
for Underload, Generic 1-5	<60 ms

<b>RTD Protection: RTD/URTD</b>	<b>Accuracy</b>
Trip Threshold	±1°C (1.8°F)
Alarm Threshold	±1°C (1.8°F)
t-delay Alarm	DEFT ±1% or ±10 ms
Reset Hysteresis	-2°C (-3.6°F) of threshold ±1°C (1.8°F)

<b>Current unbalance: I2&gt;[x]</b>	<b>Accuracy<sup>*1)</sup></b>
I2>	±2% of the setting value or 1% In
Dropout Ratio	97% or 0.5% x In
%(I2/I1)	±1%
t	DEFT ±1% or ±10 ms
Operating Time	<70 ms
Disengaging Time	<50 ms
K	±5% INV
T-cool	±5% INV

\*1) Negative-sequence current I2 must be ≥ 0.01 x In, I1 must be ≥ 0.1 x In.

<b>Circuit Breaker Failure Protection: CBF</b>	<b>Accuracy</b>
I-CBF>	±1.5% of the setting value or 1% In
t-CBF	±1% or ±10 ms
Operating Time Starting from I Higher than 1.3 x I-CBF>	<40 ms
Disengaging Time	<40 ms

<b>Trip Circuit Supervision: TCS</b>	<b>Accuracy</b>
t-TCS	±1% or ±10 ms

<b>Current Transformer Supervision: CTS</b>	<b>Accuracy</b>
ΔI	±2% of the setting value or 1.5% In
Dropout Ratio	94%
Alarm delay	±1% or ± 10 ms

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