

**SL-LOGIC 1.0** Programmable Logical Functions for  
CSP2-F Feeder Protection  
CSP2-L Cable/Line Differential Protection



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# 1 Performance Description - General Product Outline

By using the *SL-LOGIC* up to 32 logic functions can be realized via the logic modules specified in chapter 3 limiting value detection and counting functions are in the planning stage as an extension, that will be available as input elements.

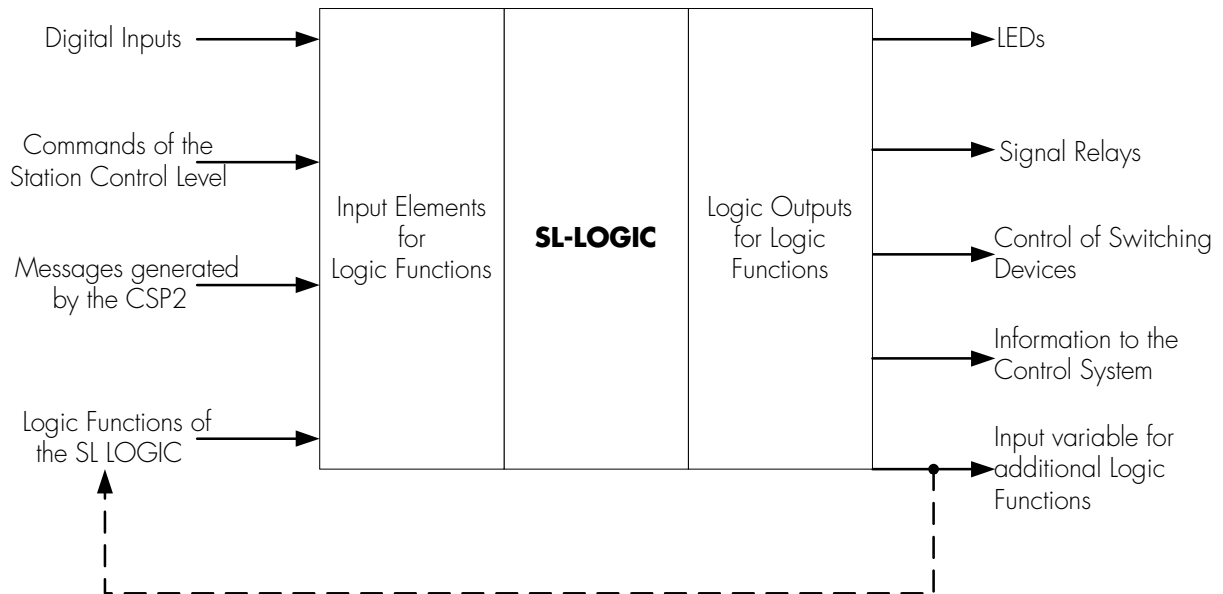


Figure 1.1: SL-LOGIC Performance Outline

The following illustration shows in detail the performance range and the interaction between control unit and the logic. For further explanations and more specified information please see the following chapters of this description.

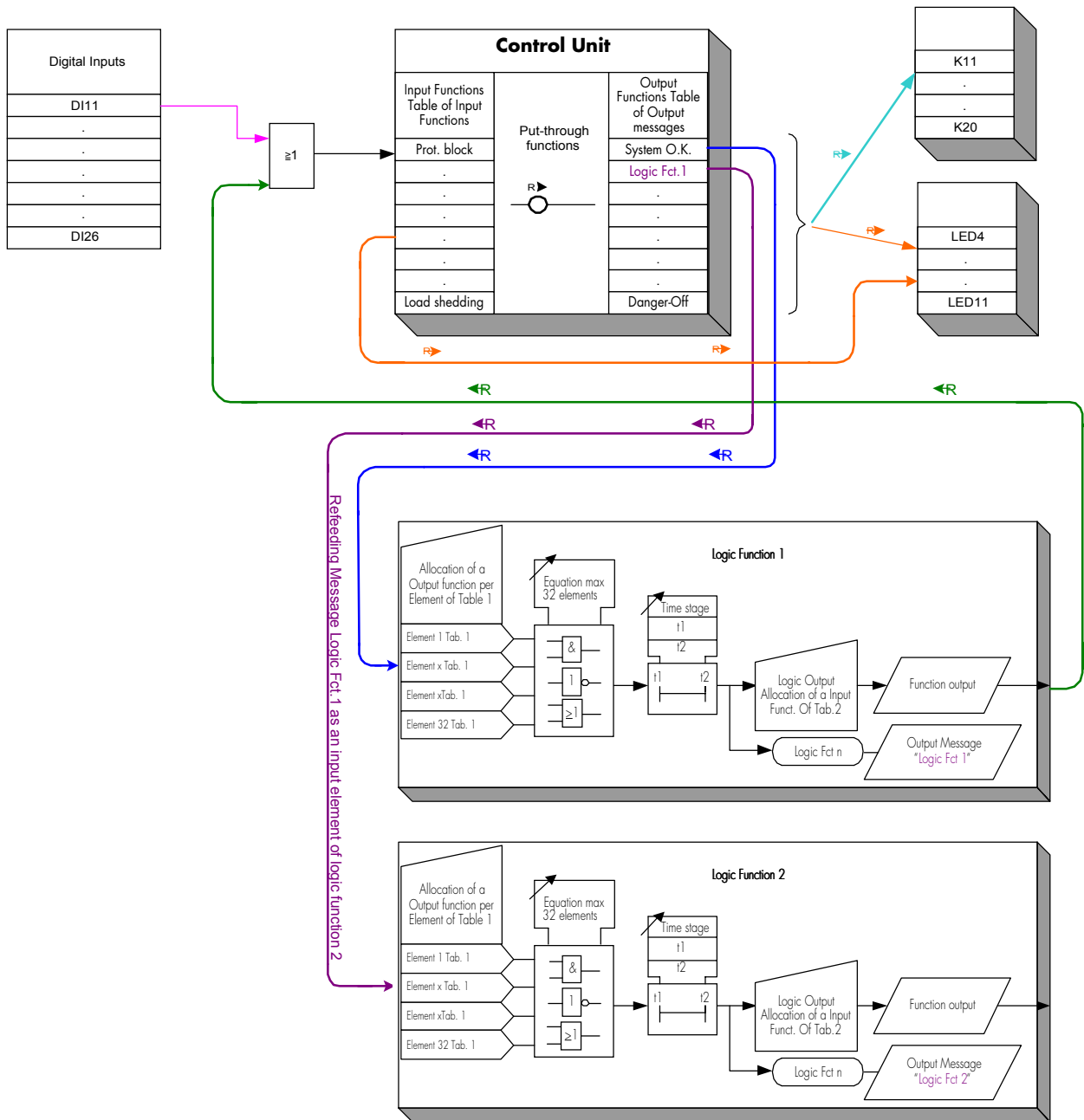


Figure 1.2: SL-LOGIC Detailed Overview

**Important**

- Do not refeed any output signal back into the associated (the same) logic equation as input element.

## 2 Definition of Terms

For all the circuits shown in this Manual applies: All switches and contacts are shown in neutral position. Circuit inputs are marked with the letters E1, E2, ..., En logic-/circuit outputs are marked with "Y" (Y1, Y2, ... Yn).

The switching states are defined as follows:

"1" or "H" (High): is related to a closed switch (=positive logic)

"0" or "L" (Low): is related to an open switch (=positive logic)

The correlation between input and output variables is described in *Truth Tables*

A (Switch)	Y
0 (L) (open)	<b>0 (L) (Off)</b>
1 (H) (closed)	<b>1 (H) (On)</b>

Table 2.1: Positive Logic

Term	Meaning
/	<b>Negation (NOT)</b>
*	<b>Conjunction (AND)</b>
+	<b>Disjunction (OR)</b>
Input Elements - E1, E2, ... En	<b>Circuit Inputs</b>
Logic Equation	<b>Circuit Equation</b>
Output Elements Y1, Y2, ... Yn	<b>Circuit Outputs</b>

Table 2.2: Definition of Terms

### 3 SL-LOGIC Modules

The functional range covers the logic functions "AND", "OR" and "NOT" (only for negation of the input elements), with downstream timer.

Further functions, such as *Limiting Value Monitoring* or *Counter* might be realized in future software versions in additional function blocks, i.e. they are not included in the "Programmable Logic".

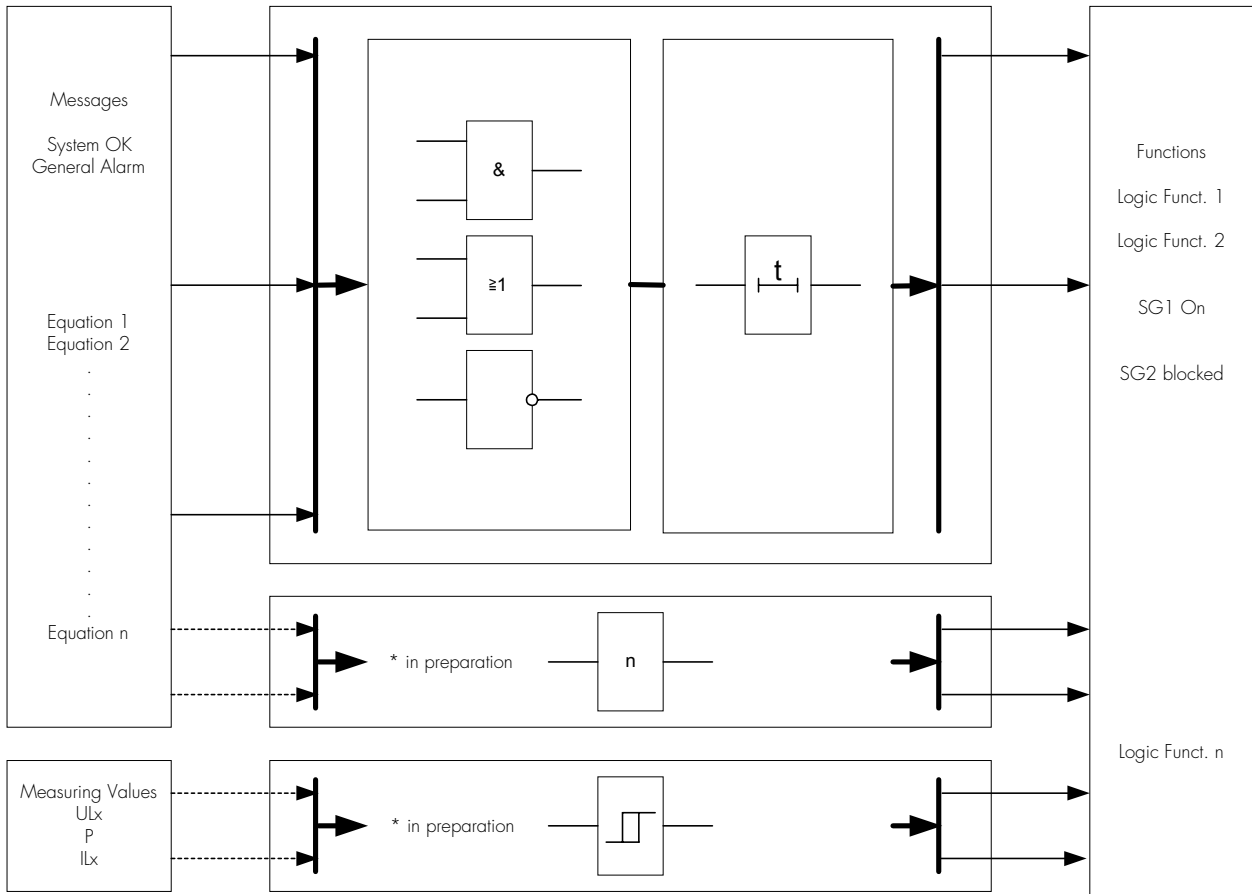


Figure 3.1: Logic Concept

### 3.1 Negation (NOT)

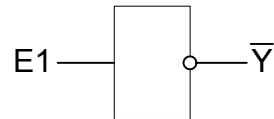


Fig 3.3.1: Logic Symbol Negation

E1	Y
1 (H)	<b>0 (L)</b>

Table 3.1: Truth Table Negation

### 3.2 Conjunction (AND)

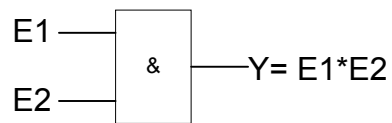


Figure 3.2: Logic Symbol Conjunction

E1	E2	Y
0 (L)	0 (L)	<b>0 (L)</b>
0 (L)	1 (H)	<b>0 (L)</b>
1 (H)	0 (L)	<b>0 (L)</b>
1 (H)	1 (H)	<b>1 (H)</b>

Table 3.2: Truth Table Conjunction

### 3.3 Disjunction (OR)

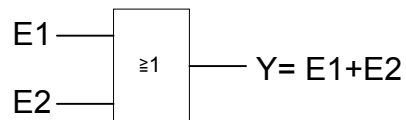


Figure 3.3: Logic Symbol Disjunction

E1	E2	Y
0 (L)	0 (L)	<b>0 (L)</b>
0 (L)	1 (H)	<b>1 (H)</b>
1 (H)	0 (L)	<b>1 (H)</b>
1 (H)	1 (H)	<b>1 (H)</b>

Table 3.3: Truth Table Disjunction

## 4 Ascertaining of Logic Functions (Circuit Equations)

Before setting up a logic function (circuit equation), the function definition (mostly available in text form) has to be analyzed thoroughly. In order to convert the task required into a logic function (circuit equation) there are three different methods possible:

The logic function (circuit equation) can be set up either based on

- the circuit diagram (variant 1) or
- the logic flow chart (variant 2) or
- the truth table (variant 3)

The ascertained logic function (circuit equation) has now to be converted into the *Disjunctive Normal Form* (DNF), (the exception is variant 3, where the *Disjunctive Normal Form* can be directly read off from the *Function-/Truth table*).

### Important

When logic functions (circuit equation) are being set up it is essential to put the *associated disjunctions* into brackets, because *disjunctive* connections (AND) have a higher priority than *conjunctive* connections (OR).

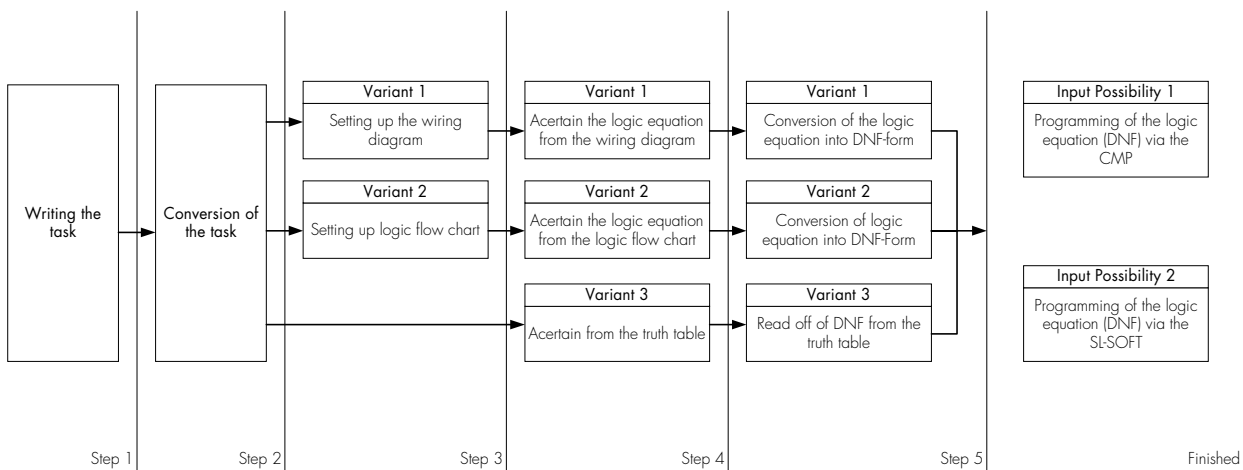


Figure 4. 1: Ascertaining and Input of Logic Functions (Circuit Equation)



#### 4.1 Variant 1: Setting up a logic function based on the wiring diagram

When the wiring diagram is used for setting up a logic function (circuit equation), the following basic principles have to be considered:

- Series connection of contacts means *conjunction* (AND)
- Parallel connection of contacts means *disjunction* (OR)

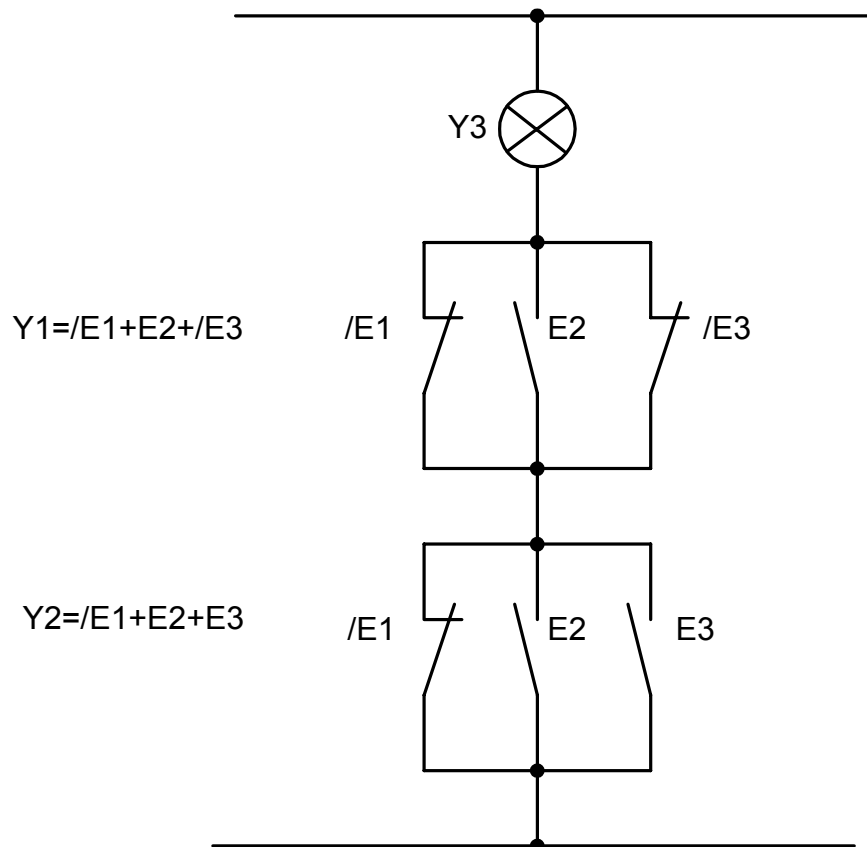


Figure 4.2: Wiring Diagram

The logic function (circuit equation) results from the series connection of the two circuitries "Y1" and "Y2" (see figure 4.2)

$$Y3 = Y1 * Y2 = (/E1 + E2 + /E3) * (/E1 + E2 + E3)$$

## 4.2 Variant 2: Setting up a logic function base on the logic flow chart

If a required function is converted into a *logic flow chart*, the logic or circuit equation can be read off directly from this plan and by using the suitable means it is then to be converted into the *Disjunctive Normal Form* (see chapter 4.1 to 4.4)

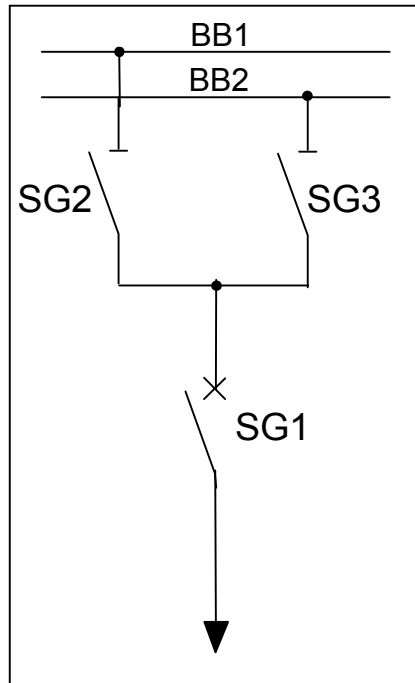


Figure 4.3: Single Line diagram

### Note

For this example the logic equation is available in the *Disjunctive Normal Form* (DNF).

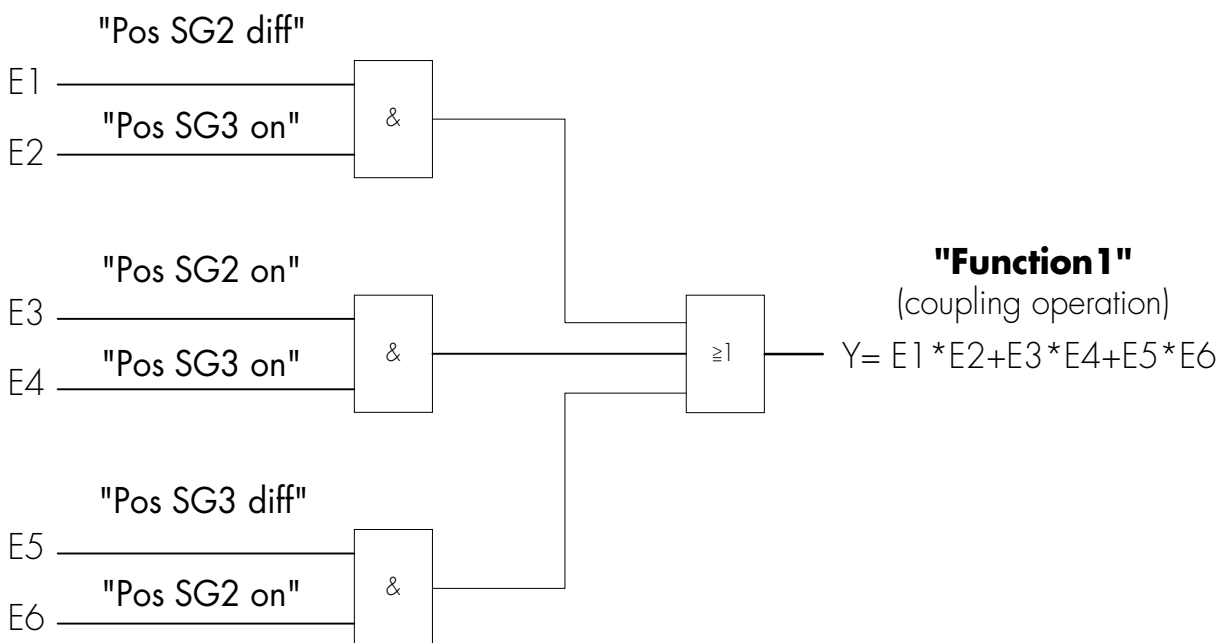


Figure 4.4: Logic Plan „Coupling Operation“

### 4.3 Variant 3: Setting up the Logic function based on the truth table

Line	E1	E2	E3	Y
1	0 (L)	0 (L)	0 (L)	<b>0 (L)</b>
2	0 (L)	0 (L)	H	<b>0 (L)</b>
3	0 (L)	1 (H)	0 (L)	<b>0 (L)</b>
4	1 (H)	0 (L)	0 (L)	<b>0 (L)</b>
5	0 (L)	1 (H)	1 (H)	<b>1 (H)</b>
6	1 (H)	0 (L)	1 (H)	<b>1 (H)</b>
7	1 (H)	1 (H)	0 (L)	<b>1 (H)</b>
8	1 (H)	1 (H)	1 (H)	<b>1 (H)</b>

Table 4.1: Example For Setting Up The Logic Function (Wiring Equation)

Basically applies that the *columns* have to be gated *conjunctively* (AND) and the *rows disjunctively* (OR)

#### 4.3.1 Ascertaining of the logic function for the pickup condition(s)

If the logic function (circuit equation) shall be ascertained for the *Pickup Condition(s)*, then

- the terms for the lines have to be determined firstly (AND conjunctions)
- and the result, the finished logic equation, is obtained by
  - AND-gating in the truth table all the elements of a line for which the output is marked by an "H" (logical state "1").
  - And then these lines (with output marking H respectively "1") to be OR-gated.

Line 5:  $Y = \neg E1 * E2 * E3$

Line 6:  $Y = E1 * \neg E2 * E3$

Line 7:  $Y = E1 * E2 * \neg E3$

Line 8:  $Y = E1 * E2 * E3$

And so the logic function (circuit equation) for the *Pickup Condition* is as follows :

$$Y = (\neg E1 * E2 * E3) + (E1 * \neg E2 * E3) + (E1 * E2 * \neg E3) + (E1 * E2 * E3)$$

#### **4.4 The Disjunctive Normal Form (DNF)**

If a complete *Truth/Function Table* is available then the *Disjunctive Normal Form* (DNF) of the logic function (circuit equation) can be directly read off (see chapters 4.3.1 – 4.5)

#### **4.5 Optimization of the logic functions by way of the Quine MC Cluskey Method**

There are two methods for minimizing the logic functions (circuit equations):

- The *Karnaugh Veitch diagram*. (A graphic method which, however, can only be used for a few input elements)
- The Quine McCluskey method. This method can be used both manually and with suitable software tools.

#### **Note**

For the Quine McCluskey method there are software tools available and with these tools optimization of logic functions (circuit equation) can be carried out over the PC.

## 4.6 Parameter

### „Function“

For activating or deactivating the entire logic, the logic parameter "Function=Active/Inactive" can be used. This parameter can be activated via the *CMP* of the *SL-SOFT*. After the activating process the system is rebooted (about 10 s).

### „Mode“

The logic output of each logic equation can be influenced by a preceding time step. Via parameter "Mode" the following functions are available:

- "Op./Rel.d": Pickup- and Release time delay (can be retriggered) or:
- "Op.d/Pulse.d": Impulse time (cannot be retriggered)

### „t1“

The pickup delay of a logic output of a logic equation is determined by this *time stage parameter*.

### „t2“

Within the mode "Op./Rel.d" the release delay of a logic output of a logic equation is determined by this *time stage parameter*. Within the mode "Op.d/Pulse.d" this parameter determines the *impulse time* (pulse duration).

### „Function output“

- Maximal one free selectable input function can be assigned to each function output of a logic function. " The assignment of a function is not mandatory.
- Logic outputs can be used as input elements for further logic equations. For this purpose the output messages "logicf fct.xy" are available.

### „Equation“

Within the Submenu »Equation« the input elements of the logic equations are parametrized.

SL-LOGIC						Available in CSP2-		
Parameters	Setting/Setting Range	Description	Presetting.	Step Range	Tolerance	L	F3	F5
Function	„active“	LOGIC activated	„inactive“	-		●	●	●
	„inactive“	LOGIC deactivated				●	●	●
Mode	„ Op./Rel.d “	pickup/release delay (can be retriggerd)		-				
	„ Op.d/Pulse.d “	impulse time (cannot be retriggerd)				●	●	●
	None		none					
t1	0...500 s	pickup time delay		10 ms		●	●	●
t2	0...500 s	Mode "Op./Rel.d": release time delay		10 ms		●	●	●
		Mode "Op.d/Pulse.d": Impulse time (pulse duration)						
Function output		one input function can be assigned				●	●	●
Equation		max. 32 input elements				●	●	●

Table 4.2: Setting parameters SL-LOGIC

## 4.7 Programming example of a customer specific switching - over sequence

### Specification of the required task

"The feeder panel of a 10 kV single bus bar system consists of a circuit breaker, an isolating switch and an earthing switch. All three switching devices are electrically controllable by the combined protection and control system **CSP2**.

It is intended to project a switching-over sequence where the feeder is automatically switched over from the supply mode to earthing of the panel within 20 s. When in remote operation this switching-over process shall either be initiated via a signal line from an external common control room (parallel wiring) or from the station control system (e.g. by using the protocol type acc. to IEC 60870-5-103). Initiation of this process, however, should only be possible upon a release signal from the common control room (signal line). The switching-over sequence shall be stopped/interlocked by an external, conventional »EMERGENCY OFF« input element if a pushbutton is pressed or when the signal line is interrupted. Operating status »Supply« and »Earthing« have to be signalled to the common control room."

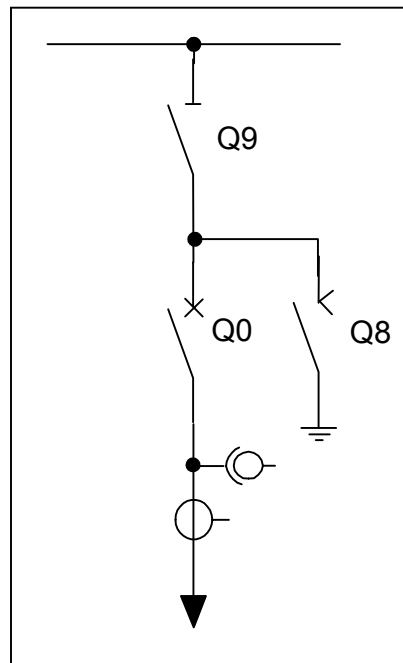


Figure 4.5: Configuration Of The Feeder Panel

### Interpretation and realization of the required task

Based on the conventional task description the *Input Elements* and *Logic Outputs* needed for the **SL-LOGIC** function have firstly to be defined i.e. they have to be named and the logic status to be allocated ("0" or "1"). To achieve this the elements available in the **CSP2** have to be assessed first and then co-ordinated to the task required.

### Initial situation

The output is fed by the feeder, i.e. the earthing switch is open whereas the isolating switch and the CB are closed. This is indicated by the following *Input Elements* and their allocated logic status ("0" or "1"):

„Pos. SG1 ON" = 1 (circuit breaker Q0), => "E1" (input element)  
„Pos. SG1 ON" = 1 (isolating switch Q9), => "E2" (input element)  
„Pos. SG3 OFF" = 1 (earthing switch Q8) => "E3" (input element)

By analyzing the respective switching device positions, the signal of the operational status »Supply« is generated. Since such an application-orientated signal is not available in the **CSP2** as predefined output message, it has to be generated by a logic output of a logic equation:

„Logicfct.1“ = „1“ => "Y1" (Logic output without assignment)

#### **Operational mode and release of the switching-over sequence**

As basic condition for initiating the process, the feeder should be in mode »Remote Operation«. Hence the upper key switch on the **CMPI** has to be put into the horizontal position. By this the output signal "Remote Operation" – supplied by the **CSP2** - is activated. This signal is used as additional input element. Then the logical status applies to the requirement:

„Remote Operation“ = „1“ => "E4" (input element)

Before the switching-over process is started, a „Release“ command from the external common control room is additionally required. A digital input has to be used with an assigned input function which is only processed as signal. For that purpose input function "7", for instance, is available in the **CSP2**. Logic status "1" will be assigned when the necessary condition is met:

„Function 7“ = „1“ => "E5" (input element)

When actuated the external »EMERGENCY OFF« facility is to interlock the switching-over sequence against activation. Over conventional wiring this signal is led to a digital input with signal function "5" assigned to. The closed circuit principle is used for supervision of cable breaks, and so the logic status "0" is assigned to the input element for the **SL-LOGIC** function:

„Function 6“ = „0“ => "E6" (input element)

#### **Command for activating the switching-over sequence.**

The automatic switching-over process (switching sequence) shall either be activated via a digital input, e.g. the input "Function 8" or the station control system (SCS), for example, "SCS Command Output 2". In order to meet the activating conditions the logic statuses and their input elements should be as follows:

„Function 8“ = „1“ => "E7" (input element)

„SCS-Comm.Outp.2“ = „1“ => "E8" (input element)

The commands have to be OR-gated because they can be given optionally. To achieve this, a logic equation is needed with a logic output only used as auxiliary variable for processing:

„Logicfct.2“ = „1“ => "Y2" (logic output without assignment)

#### **Automatic switching-over procedure**

As soon as all a/m conditions are met and the switching-over command is issued, the switching-over procedure is initiated. Firstly the circuit breaker (CB) has to be switched off. Then the respective input elements to be linked in a logic equation and the logic output assigned with control function "C-Comm. SD1 Off" (input function). Taking into account the logic status, this logic output is as follows:

„Logicfct.3“ → „C.Comm. SG1 OFF“ = „1“ => "Y3" (logic output with assignment)

After the circuit breaker has reached the "OFF position", a timer is started which in terms of time monitors the further process until it is completed (earthing). For this timer, however, a separate equation has to be used because logic output "Logicfct.3" is to induce opening of the circuit breaker without a time component. Therefore the input element of this timer is the logic output "Logicfct.3":

„Logicfct.4“ = „1“ => "Y4" (logic output without assignment)

Now the isolating switch Q9 is to be opened. Its de-activation is generated through a further logic function by linking the input element for the "OFF signal" of the CB:

„Pos. SG1 OFF“ = „1“ => "E9" (input element)

with the output of the logic equation for the monitoring time „Logicfct.4“.

This logic equation provides the output where the control function for opening the isolating switch is assigned to:

„Logicfct.5“ → „C Comm. SG2 OFF“ = „1“ => "Y5" (logic output with assignment)

As soon as the isolating switch is opened, the earthing switch shall close and here the related check-back signal of the position is used as input element:

„Pos. SG2 OFF“ = „1“ => "E10" input (element)

### Important

When projecting it is essential to consider a minimal dead time of 700 ms between the position check-back signal of a switching device (exception the CB) and the subsequent control command.

Should an extra running time "*t<sub>n</sub>* ON/OFF" be adjusted for the power output of the switching device, then this time has to be added to the minimal dead time:

$$t_P = 700 \text{ ms} + t_n \text{ ON/OFF}$$

In order to guarantee this dead time, an additional logic equation has to be used. As input elements this equation ought to have the position check-back signal of the isolating switch "Pos. SG2 OFF" as well as the property of the preceding logic output "Log. funct.5". The timer is then to be adjusted according to the mode used for the ON-delayed activation of the logic output. After the dead time has elapsed and the position check-back signal for the open isolating switch was received (AND), the ON- command for the earthing switch should be issued. For this purpose the logic output is assigned with the function "C Comm.SG3 ON":

„Logicfct.6" → „C Comm. SG3 ON" = „1" > "Y6" (logic output with assignment)

As soon as the earthing switch is activated for earthing the feeder, the circuit breaker has to be closed, but only when it is ensured that the earthing switch is in a definite position. As input element for this switching sequence (new logic equation), the position *check-back signal* of the earthing switch is being used:

„Pos. SG3 ON" = „1" => "E11" (input element), as well as the preceding logic output „Logic funct.6" (AND).

Here, too, the dead time has to be considered accordingly, i.e. for the timer of logic equation "Y6" a time delay has to be set. The output of this logic equation is assigned with the input function „C Comm. SG1 ON":

„Logicfct.7" → „C Comm. SG3 ON" = „1" => "Y7" (logic output with assignment)

### Indication of operating state „Earthing“

After the switching-over sequence is completed, the switching devices of the feeder are in the operational state „Earthing“. To enable signalling of this operating state it is necessary to link the following input elements in a further logic equation:

„Pos. SG1 ON" = 1 (CB Q0), => "E1" (input element)

„Pos. SG2 OFF" = 1 (Isolating switch Q9), => "E10" (input element)

„Pos. SG3 ON" = 1 (Earthing switch Q8) => "E11" (input element)

The resulting logic output can then, for instant, be assigned to a signal relay for further processing:

„Logicfct.8" = „1" => "Y8" (logic output without assignment)



### **Preparing the truth table**

By using the *input elements* and *output elements* as defined above, a table (truth table) can be set up where the relation between the logic outputs and their input elements is clearly reflected. Based on this truth table it is possible to set up the logic equations in Disjunctive Normal Form (DNF). But these logic equations would include terms in Full Conjunction (i.e. each of the terms comprises the complete number of existing input elements). In order to keep the logic equations as "lean" as possible, only those input elements relevant for the respective logic output should be assigned with the logic state "0" or "1", all other input elements should be assigned with a "x", to be interpreted as an "optional array". Easier still, to leave the relevant square in the truth table vacant.

### **Note**

"Optional arrays" mean a higher transparency of the truth table and reduce the number of logic equations.

The truth table should not be set up to the whole extension because the number of combinations possible depends on the input elements and these can be numerous (often >10). The number of possible combinations can be computed as follows :

$$N = 2^n$$

N =Number of combinations (logic equations)

n =Number of input elements

It is advisable to list only combinations of logic outputs with the logic state "1".

For this example the *truth table* is as follows:

Input Elements											Logic Outputs							
E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8
1	1	1									1							
						1						1						
							1					1						
			1	1	0						1	1	1					
													1	1				
								1						1	1			
									1						1	1		
										1						1	1	
1										1	1							1

Table 4.3: Truth Table

**Note**

- The abbreviations for the *input elements* E1...E10 and for the *logic outputs* Y1...Y8 do not exist in the **CSP2**! They are only used for more transparency and as abbreviations when preparing the logic equations and the technical documentation.
- To ensure that an *input element* is recognized and processed by the **CSP2**, it has to be assigned with a signal from the List of *Output Functions*.
- Optionally the *Logic Outputs* can either be processed as a mere signal („Logicfct.xy“) or they can be applied with a *Function*. For realizing this a function out of the List of *Input Functions* has to be assigned to a logic output.
- In the double framed squares of the table the results of the individual terms for the respective logic output are stated.
- *Logic Outputs*, too, can be used as *Input elements* for another *logic output*.  
Timers are always part of the logic outputs and can consequently be considered in the *truth table*.

### Setting up of logic equations

The individual logic equations can now be read off of the *truth table*:

$$\begin{aligned}
 Y1 &= E1 * E2 * E3 && \text{(Logic equation 1 in DNF)} \\
 Y2 &= E7 + E8 && \text{(Logic equation 2 in DNF)} \\
 Y3 &= Y1 * E4 * E5 * /E6 * Y2 && \text{(Logic equation 3 in DNF)} \\
 Y4 &= Y3 && \text{(Logic equation 4 in DNF)} \\
 Y5 &= Y4 * E9 && \text{(Logic equation 5 in DNF)} \\
 Y6 &= Y5 * E10 && \text{(Logic equation 6 in DNF)} \\
 Y7 &= Y6 * E11 && \text{(Logic equation 7 in DNF)} \\
 Y8 &= E * E10 * E11 && \text{(Logic equation 8 in DNF)}
 \end{aligned}$$

### Setting up of the logic flow chart based on the logic equations.

A logic flow chart can now be prepared on the ascertained logic equations as listed above.

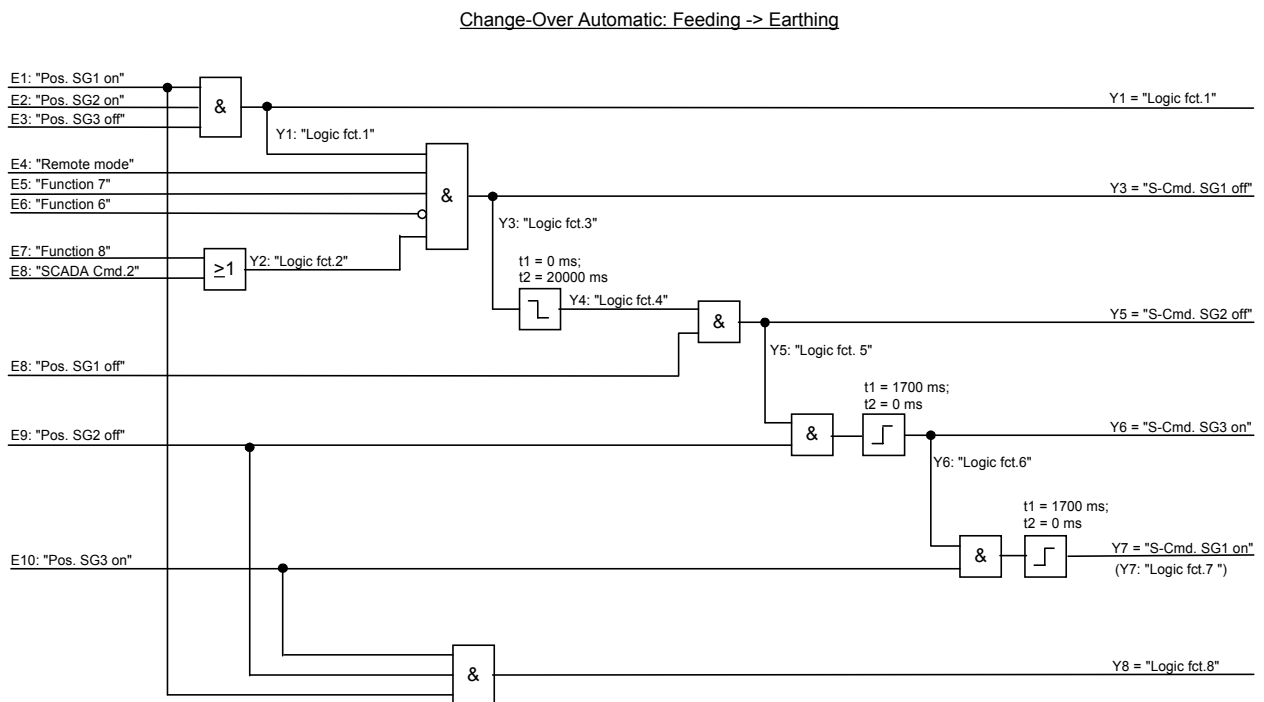


Figure 4.6: Example „Switching-Over Sequence“ : Logic Flow Chart

### Efficient utilization of the SL-LOGIC reduction with regard to the number of logic equations

The *logic flow chart* is to optimize in such a way that for realisation of the user-specific functions as few as possible logic equations are needed, i.e. certain parts of the circuitry/logic equations shall be eliminated and their input elements then be integrated in the subsequent logic equation.

The example shows that the auxiliary variable “Y2”, for instance, can be eliminated. This means that the subsequent logic equation “Y3” (i.e. the one processed as input element in the internal state variable “Y2”) does not receive the internal state variable “Y2” as input element, but the input elements “E6” and “E7”, from which the internal state variable “Y2” was generated. For the logic equation “Y3”, the conversion has to be in a Disjunctive Normal Form (DNF), because a logic equation can only be entered as *DNF* into the *CSP2*. The converted logic equation is then as follows:

$$\begin{aligned}
 Y3 &= Y1 * E4 * E5 * /E6 * Y2 \\
 &= Y1 * E4 * E5 * /E6 * (E7 + E8) \\
 &= Y1 * E4 * E5 * /E6 * E7 + Y1 * E4 * E5 * /E6 * E8 && \text{(Logic equation 3 in DNF)}
 \end{aligned}$$

## Attention

When *logic equations* can be *cut down* this always means an extension of the whole circuitry! It should be duly taken into account that the number of input elements for the subsequent logic equation(s) (into which the input elements of the eliminated logic equation merge) does not exceed 32, because one logic equation can only process 32 input elements.

Only those logic equations are permitted to be eliminated which were introduced as internal state variables and are not needed as signal („Logicfct.xy”) or as function (assignment of an input function).

## Optimization of logic equations according to „Quine Mc Cluskey”

In many cases it is possible to optimize (simplify) the logic equations originated from the functions required. Especially with regard to a number of input elements >5 it is advisable to have an update carried out automatically. There are different software programs available and some of them can even be obtained free of charge (shareware) of the internet.

For the current example an automatic update is not necessary. It is, for instance, not possible to further simplify the logic equation for “Y3”.

## Adaptation of the logic equations

Due to elimination of the logic equation for “Y2” it becomes necessary to change numbering of the logic equations accordingly:

$Y1 = E1 * E2 * E3$	(Logic equation 1 in DNF)
$Y2 = Y1 * E4 * E5 * /E6 * E7 + Y1 * E4 * E5 * /E6 * E8$	(Logic equation 2 in DNF)
$Y3 = Y2$	(Logic equation 3 in DNF)
$Y4 = Y3 * E9$	(Logic equation 4 in DNF)
$Y5 = Y4 * E10$	(Logic equation 5 in DNF)
$Y6 = Y5 * E11$	(Logic equation 6 in DNF)
$Y7 = E1 * E10 * E11$	(Logic equation 7 in DNF)

**Adaptation of the truth table**

When logic equations are eliminated it becomes necessary to change truth tables and logic flow charts accordingly. For adapting the truth table, the column of the eliminated logic equation (here: equation Y2) and the lines showing the results of logic output "Y2" are to be taken out. Numbering is then simply to be corrected.

<b>Input Elements</b>											<b>Logic Outputs</b>						
E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	Y1	Y2	Y3	Y4	Y5	Y6	Y7
1	1	1									1						
			1	1	0	1					1	1					
			1	1	0		1				1	1					
												1	1				
								1						1			
									1					1	1		
										1					1	1	
1									1	1			1			1	1

Table 4.4: Updated Truth Table

### Adaptation of the logic flow chart

The logic flow chart, too, has to be updated.

Change-Over Automatic: Feeding -> Earthing  
(after Elimination of "Logic fct. 2")

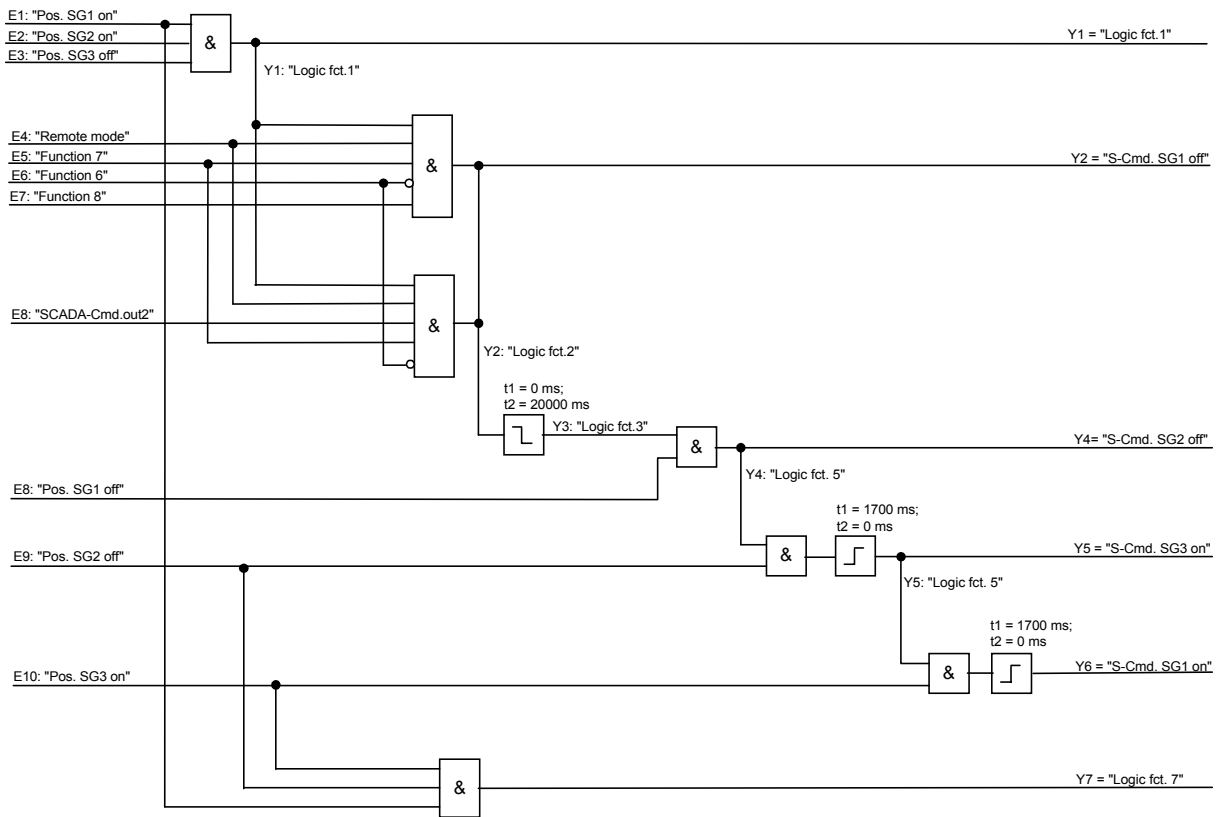


Figure 4.7: Updated Logic Flow Chart

## 5 Input Functions and Output Signals

In order to utilize the entire performance range of the *SL-LOGIC* we have updated and extended the list of input functions and output messages (e.g. by further functions for the detection of switching device positions). The individual functions are specified in the related tables, chapter »Digital Inputs« (input functions) or chapter »Signal Relays« (output signals) of the *CSP2-Manual*.

### Important Note

- Maximal one free selectable input function can be assigned to each function output of a logic function.
- Logic outputs can also be used as input elements for further logic equations. Therefore the messages (output messages) "Logicfct.xy" are available.
- Together with the newly implemented logic we have added some new *Input Functions* to the related list and existing input functions have been modified accordingly (e.g. new input functions for detection of switching device positions).

For controlling the switching devices via the logic, new *Control Functions* have been implemented for the control of SG1 to SG5. As input functions these control functions do not depend on the »LOCAL/REMOTE« switching position. The switching authorization »REMOTE«, can still be realized via the input functions "Cmd1 SGx ON" respectively "Cmdx SGx Off".

## 5.1 List of Output Messages

<b>Output Messages (for LED's, Signal Relays and for Input Elements of the Logic)</b>							Available in <b>CSP2-</b>		
Output Function (displayed text)	Description	Internal output function	Pass through function	LED-Display		Note	L	F3	F5
				LED-Reset	Blink. Code				
„n.a.“	Not assigned	-	-	-	-	-	●	●	●
„System OK“	Message signalling state of the CSP system; at works assigned to signal relay K11 and LED 1 (default) Note: »Self-Test Relay« K11 functions normally as »working current relay« and picks-up when function »System OK« is active. This only is seemingly a contradiction to term »normal closed logic« for a self-test relay which is picked up in released conditions (System OK) and drops in case a fault occurs in the system. In technical respect both versions are operating in the same way.	●	-	-	g	Operation	●	●	●
					r	Failure			
„General alarm“	Message signalling protective alarm (internally or via DI); at works assigned to signal relay K12 and LED 2	●	-	-	fr	-	●	●	●
„General trip“	Message signalling a protective trip (internally or via DI); at works assigned to signal relay K13 and LED 3	●	-	●	r	-	●	●	●
„Alarm: L1“	Protective activation in phase L1	●	-	-	fr	-	●	●	●
„Alarm: L2“	Protective activation in phase L2	●	-	-	fr	-	●	●	●
„Alarm: L3“	Protective activation in phase L3	●	-	-	fr	-	●	●	●
„Alarm: LN“	Protective activation in phase N	●	-	-	fr	-	●	●	●
„Trip: L1“	Protective trip in phase L1	●	-	●	r	-	●	●	●
„Trip: L2“	Protective trip in phase L2	●	-	●	r	-	●	●	●
„Trip: L3“	Protective trip in phase L3	●	-	●	r	-	●	●	●
„Trip: N“	Protective trip in phase N	●	-	●	r	-	●	●	●
„Protect. active“	Message signalling that one of the internal protective functions is set to »active« or an „Input Protection Function“ (e.g. „Protect. Trip 1“) is assigned to a digital input.	●	-	-	g	Protection active	●	●	●
					r	Protection inactive			
„Alarm: Prot.1“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
					-	Fct. inactive			
„Alarm: Trip.1“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
					●	Fct. inactive			
„Prot. blocked“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
					-	Fct. inactive			
„Ctrl. blocked 1“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
„Alarm: l>F“	Overcurrent activation in forward direction or non-directional	●	-	-	fr	-	●	●	●
„Trip: l>F“	Overcurrent trip in forward direction or non-directional	●	-	●	r	-	●	●	●
„Alarm: l>>F“	Short-circuit activation in forward direction or non-directional	●	-	-	fr	-	●	●	●
„Trip: l>>F“	Short-circuit trip in forward direction or non-directional	●	-	●	r	-	●	●	●
„Alarm: l>>>F“	Maximum short-circuit activation in forward direction or non-directional	●	-	-	fr	-	-	●	●
„Trip: l>>>F“	Maximum short-circuit trip in forward direction or non-directional	●	-	●	r	-	-	●	●
„Alarm: l>B“	Overcurrent activation in backward direction or non-directional	●	-	-	fr	-	●	●	●
„Trip: l>B“	Overcurrent trip in backward direction or non-directional	●	-	●	r	-	●	●	●
„Alarm: l>>B“	Short-circuit activation in backward direction or non-directional	●	-	-	fr	-	●	●	●
„Trip: l>>B“	Short-circuit trip in backward direction or non-directional	●	-	●	r	-	●	●	●
„Alarm: l>>>B“	Maximum short-circuit activation in backward direction or non-directional	●	-	-	fr	-	-	●	●
„Trip: l>>>B“	Maximum short-circuit trip in backward direction or non-directional	●	-	●	r	-	-	●	●
„Alarm: le>F“	Earth fault alarm in forward direction or non-directional	●	-	-	fr	-	●	●	●
„Trip: le>F“	Earth fault trip in forward direction or non-directional	●	-	●	r	-	●	●	●
„Alarm: le>>F“	Short-circuit to earth activation in forward direction or non-directional	●	-	-	fr	-	●	●	●
„Trip: le>>F“	Short-circuit to earth trip in forward direction or non-directional	●	-	●	r	-	●	●	●
„Alarm: le>B“	Earth fault activation in backward direction or non-directional	●	-	-	fr	-	●	●	●



<b>Output Messages (for LED's, Signal Relays and for Input Elements of the Logic)</b>							Available in <b>CSP2-</b>		
Output Function (displayed text)	Description	Internal output function	Pass through function	LED-Display			L	F3	F5
				LED-Reset	Blink. Code	Note			
„Trip: le>B“	Earth fault trip in backward direction or non-directional	●	-	●	r	-	●	●	●
„Alarm: le>>B“	Short circuit to earth alarm in backward direction or non-directional	●	-	-	fr	-	●	●	●
„Trip: le>>B“	Short circuit to earth trip in backward direction or non-directional	●	-	●	r	-	●	●	●
„Alarm: I2>“	Unbalanced load alarm, 1st stage	●	-	-	fr	-	●	●	●
„Trip: I2>“	Unbalanced load trip, 1st stage	●	-	●	r	-	-	●	●
„Alarm: I2>>“	Unbalanced load activation, 2 <sup>nd</sup> stage	●	-	-	fr	-	-	●	●
„Trip: I2>>“	Unbalanced load trip, 2 <sup>nd</sup> stage	●	-	●	r	-	-	●	●
„Alarm: I>“	Overload activation	●	-	-	fr	-	●	●	●
„Trip: I>“	Overload trip	●	-	●	r	-	●	●	●
„Trip: Idiff>“	Differential protection trip, 1st stage (only for differential protection system)	●	-	●	r	-	●	-	-
„Trip: Idiff>>“	Differential protection trip, 1st stage (only for differential protection system)	●	-	●	r	-	●	-	-
„Alarm: U>“	Overvoltage alarm, 1 <sup>st</sup> stage	●	-	-	fr	-	●	●	●
„Trip: U>“	Overvoltage trip, 1 <sup>st</sup> stage	●	-	●	r	-	●	●	●
„Alarm: U>>“	Overvoltage alarm, 2 <sup>nd</sup> stage	●	-	-	fr	-	●	●	●
„Trip: U>>“	Overvoltage trip, 2 <sup>nd</sup> stage	●	-	●	r	-	●	●	●
„Alarm: U<“	Undervoltage alarm, 1st stage	●	-	-	fr	-	●	●	●
„Trip: U<“	Undervoltage trip, 1st stage	●	-	●	r	-	●	●	●
„Alarm: U<<“	Undervoltage alarm, 2 <sup>nd</sup> stage	●	-	-	fr	-	●	●	●
„Trip: U<<“	Undervoltage trip, 2 <sup>nd</sup> step	●	-	●	r	-	●	●	●
„Alarm: Ue>“	Residual voltage alarm, 1 <sup>st</sup> stage	●	-	-	fr	-	●	●	●
„Trip: Ue>“	Residual voltage trip, 1 <sup>st</sup> stage	●	-	●	r	-	●	●	●
„Alarm: Ue>>“	Residual voltage alarm, 2 <sup>nd</sup> stage	●	-	-	fr	-	●	●	●
„Trip: Ue>>“	Residual voltage trip, 2 <sup>nd</sup> stage	●	-	●	r	-	●	●	●
„U< block.freq.“	Message signalling blocking of the frequency protection at undervoltage conditions (U < U BF)	●	-	-	fr	-	-	●	●
„Alarm: f1“	Frequency alarm, 1 <sup>st</sup> stage	●	-	-	fr	-	-	●	●
„Trip: f1“	Frequency trip, 1 <sup>st</sup> stage	●	-	●	r	-	-	●	●
„Alarm: f2“	Frequency alarm, 2 <sup>nd</sup> stage	●	-	-	fr	-	-	●	●
„Trip: f2“	Frequency trip, 2 <sup>nd</sup> stage	●	-	●	r	-	-	●	●
„Alarm: f3“	Frequency alarm, 3 <sup>rd</sup> stage	●	-	-	fr	-	-	●	●
„Trip: f3“	Frequency trip, 3 <sup>rd</sup> stage	●	-	●	r	-	-	●	●
„Alarm: f4“	Frequency alarm, 4 <sup>th</sup> stage	●	-	-	fr	-	-	●	●
„Trip: f4“	Frequency trip, 4 <sup>th</sup> stage	●	-	●	r	-	-	●	●
„Alarm: Pr>“	Reverse power alarm, 1 <sup>st</sup> stage	●	-	-	fr	-	-	●	●
„Trip: Pr>“	Reverse power trip, 1 <sup>st</sup> stage	●	-	●	r	-	-	●	●
„Alarm: Pr>>“	Reverse power alarm, 2 <sup>nd</sup> stage	●	-	-	fr	-	-	●	●
„Trip: Pr>>“	Reverse power trip, 2 <sup>nd</sup> stage	●	-	●	r	-	-	●	●
„Alarm: P>“	Power alarm, 1 <sup>st</sup> stage	●	-	-	fr	-	-	●	●
„Trip: P>“	Power trip, 1 <sup>st</sup> stage	●	-	●	r	-	-	●	●
„Alarm: P>>“	Power alarm, 2 <sup>nd</sup> stage	●	-	-	fr	-	-	●	●
„Trip: P>>“	Power trip, 2 <sup>nd</sup> stage	●	-	●	r	-	-	●	●
„AR blocked“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				●	-	Fct. inactive			
„AR in progress“	Message signalling that an AR cycle is active	-	-	-	fr	-	●	●	●
„AR start“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
				-	-	Fct. inactive			
„AR sync.check“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●

<b>Output Messages (for LED's, Signal Relays and for Input Elements of the Logic)</b>							Available in <b>CSP2-</b>		
Output Function (displayed text)	Description	Internal output function	Pass through function	LED-Display		L	F3	F5	
				LED-Reset	Blink. Code				Note
					-	Fct. inactive			
„AR maintenance“	Maintenance message when the AR meter has reached the 1 <sup>st</sup> maintenance reading	●	-	-	fr	-	●	●	●
„AR maint.block“	Maintenance message when the AR meter has reached the 2 <sup>nd</sup> maintenance reading	●	-	●	r	-	●	●	●
„Alarm: CCS“	Message signalling that the protective function »CCS (control circuit supervision)« has detected a fault in the control circuits of the controllable switching devices (interruption).	●	-	●	r	-	●	●	●
„Alarm: CBF“	Message signalling that the protective function »CBF (circuit breaker failure protection)« has recognized trip of the local CB.	●	-	●	r	-	●	●	●
„Ext CB fail“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				●	-	Fct. inactive			
„Fuse fail VT“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				●	-	Fct. inactive			
„Alarm: FF“	Message signalling that the protective function »VTS (voltage transformer supervision)« has detected a fault in the VT circuits.	●	-	●	r	-	●	●	●
„Fuse fail AV“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				●	-	Fct. inactive			
„Alarm:Powercirc.“	Message signalling that the CSP has detected an internal fault within the power circuits of the control outputs.	●	-	●	r	-	●	●	●
„Pos.SG1 on“	Position indication message of switching device 1; active when switching device 1 is in On-Position.	●	-	-	r	On-Pos.	●	●	●
„Pos.SG2 on“	Position indication message of switching device 2; active when switching device 2 is in On-Position.	●	-	-	r	On-Pos.	●	●	●
„Pos.SG3 on“	Position indication message of switching device 3; active when switching device 3 is in On-Position.	●	-	-	r	On-Pos.	●	●	●
„Pos.SG4 on“	Position indication message of switching device 4; active when switching device 4 is in On-Position.	●	-	-	r	On-Pos.	●	●	●
„Pos.SG5 on“	Position indication message of switching device 5; active when switching device 5 is in On-Position.	●	-	-	r	On-Pos.	●	●	●
„CB1 ready“	Message of the corresponding active input funktion	-	●	-	g	Fct. active	●	●	●
					r	Fct. inactive			
„CB2 ready“	Message of the corresponding active input funktion	-	●	-	g	Fct. active	*	●	*
					r	Fct. inactive			
					r	Fct. inactive			
„Cmd1 SG1 on“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
„Cmd1 SG1 off“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
„Cmd2 SG1 on“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
„Cmd2 SG1 off“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
„Cmd SG2 on“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
„Cmd SG2 off“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
„Cmd SG3 on“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
„Cmd SG3 off“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
„Cmd SG4 on“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●

<b>Output Messages (for LED's, Signal Relays and for Input Elements of the Logic)</b>							Available in <b>CSP2-</b>		
Output Function (displayed text)	Description	Internal output function	Pass through function	LED-Display			L	F3	F5
				LED-Reset	Blink. Code	Note			
						- Fct. inactive			
„Cmd SG4 off“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
						- Fct. inactive			
„Cmd SG5 on“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
						- Fct. inactive			
„Cmd SG5 off“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
						- Fct. inactive			
„Plug CB1 out“	Message of the active input function with the same name (DI function)	-	●	-	g	Fct. active	●	●	●
						- Fct. inactive			
„Plug CB2 out“	Message of the active input function with the same name (DI function)	-	●	-	g	Fct. active	*	*	●
						- Fct. inactive			
„Pos. SG diff“	Message signalling the intermediate position of an electrical controllable switching device during a switching action (both position check-back signals: „SGx Signal I“ and „SGx Signal O“ are inactive)	●	-	-	fg	-	●	●	●
„DBB connect.“	Message signalling that connection of the main bus bar with the reserve bus bar is permitted when the digital input »DBBS Coupling« is active.	-	●	-	g	Fct. active	●	●	●
						- Fct. inactive			
„Interlock“	Message signalling that an internal interlocking condition was infringed when a control command was issued; the related control function is blocked. (See Chapter "Interlocking Functions of the CSP2")	●	-	●	fr	-	●	●	●
„Switchgear fail“	Collective message for »Switching Device Defective« when a control action of a switching device was not correct. This output function becomes always active if the differential position (exceeding of the control time) or the fault position (position check-back signals for SGx ON and SGx OFF –both are active-) are recognised by the CSP after the fixed control time has elapsed.	●	-	●	r	-	●	●	●
„SF6 Alarm“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
						- Fct. inactive			
„Remote Mode“	Indication of the CMP key switch position: »Remote Operation«	●	-	-	g	-	●	●	●
„Test Mode“	Indication for COM mode. For internal use only!	●	-	-	fr	-	●	●	●
„Alarm: CMP“	Signalling a system error in the CMP	●	-	-	fr	-	●	●	●
"Pos.SG1 fail"	Message that indicates that SG1 is in an intermediate position if both position indicators („SG1 Signal I“ and „SG1 Signal O“) of SG1 are active.	●	-	●	r	-	●	●	●
"Pos.SG2 fail"	Message that indicates that SG2 is in an intermediate position if both position indicators („SG2 Signal I“ and „SG2 Signal O“) of SG2 are active.	●	-	●	r	-	●	●	●
"Pos.SG3 fail"	Message that indicates that SG3 is in an intermediate position if both position indicators („SG3 Signal I“ and „SG3 Signal O“) of SG3 are active.	●	-	●	r	-	●	●	●
"Pos.SG4 fail"	Message that indicates that SG4 is in an intermediate position if both position indicators („SG4 Signal I“ and „SG4 Signal O“) of SG4 are active.	●	-	●	r	-	●	●	●
"Pos.SG5 fail"	Message that indicates that SG5 is in an intermediate position if both position indicators („SG5 Signal I“ and „SG5 Signal O“) of SG5 are active.	●	-	●	r	-	●	●	●
„SG1 timeout“	Message signalling that the control time for SG1 was exceeded during a switching action. This means that after the fixed control time has exceeded, switching device 1 is still in its initial position or in »Intermediate Position« (both position check-back signals: „SG1 Signal I“ and „SG1 Signal O“ are inactive)	●	-	●	r	-	●	●	●
„SG2 timeout“	Message signalling that the control time for SG2 was exceeded during a switching action. This means that after the fixed control time has exceeded, switching device 2 is still in its initial position or in »Intermediate Position« (both position check-back signals: „SG2 Signal I“ and „SG2 Signal O“ are inactive)	●	-	●	r	-	●	●	●
„SG3 timeout“	Message signalling that the control time for SG3 was exceeded during a switching action. This means that after the fixed control time has exceeded, switching device 3 is still in its initial position or in »Intermediate Position« (both position check-back signals: „SG3 Signal I“ and „SG3 Signal O“ are inactive)	●	-	●	r	-	●	●	●

<b>Output Messages (for LED's, Signal Relays and for Input Elements of the Logic)</b>							Available in <b>CSP2-</b>		
Output Function (displayed text)	Description	Internal output function	Pass through function	LED-Display		Note	L	F3	F5
				LED-Reset	Blink. Code				
„SG4 timeout“	Message signalling that the control time for SG4 was exceeded during a switching action. This means that after the fixed control time has exceeded, switching device 4 is still in its initial position or in »Intermediate Position« (both position check-back signals: „SG4 Signal I“ and „SG4 Signal O“ are inactive)	●	-	●	r	-	●	●	●
„SG5 timeout“	Message signalling that the control time for SG5 was exceeded during a switching action. This means that after the fixed control time has exceeded, switching device 5 is still in its initial position or in »Intermediate Position« (both position check-back signals: „SG5 Signal I“ and „SG5 Signal O“ are inactive)	●	-	●	r	-	●	●	●
„commu. active“	Message signalling that communication between the basic units is active for differential protection.	●	-	-	g	-	●	-	-
„commu. fail“	Message signalling error in communication between the basic units for differential protection.	●	-	-	r	-	●	-	-
„Function 1“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				●		Fct. inactive			
„Function 2“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				●	-	Fct. inactive			
„Function 3“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				●	-	Fct. inactive			
„Function 4“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				-	-	Fct. inactive			
„Function 5“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				-	-	Fct. inactive			
„Function 6“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				-	-	Fct. inactive			
„Function 7“	Message of the active input function with the same name (DI function)	-	●	-	g	Fct. active	●	●	●
				-	-	Fct. inactive			
„Function 8“	Message of the active input function with the same name (DI function)	-	●	-	g	Fct. active	●	●	●
				-	-	Fct. inactive			
„Function 9“	Message of the active input function with the same name (DI function)	-	●	-	g	Fct. active	●	●	●
				-	-	Fct. inactive			
„Function 10“	Message of the active input function with the same name (DI function)	-	●	-	g	Fct. active	●	●	●
				-	-	Fct. inactive			
„SCADA: Commun.ok“	Message signalling that communication to the station control system (SCS) is active.	-	-	-	g	Comm. OK	●	●	●
				-	-	Comm. error			
„Device Reset“	Message of the active input function with the same name (DI function)	-	●	-	g	Fct. active	●	●	●
				-	-	Fct. inactive			
„Ext. prot. act.“	Message of the active input function with the same name (DI function)	-	●	-	g	Fct. active	●	●	●
				-	-	Fct. inactive			
„Alarm: Temp.“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
				-	-	Fct. inactive			
„Trip: Temp.“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				●	-	Fct. inactive			
„Alarm: Buchh.“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
				-	-	Fct. inactive			
„Trip: Buchh.“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				●	-	Fct. inactive			
„Trip: Diff.“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				●	-	Fct. inactive			
„Alarm: Imped.“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
				-	-	Fct. inactive			

<b>Output Messages (for LED's, Signal Relays and for Input Elements of the Logic)</b>							Available in <b>CSP2-</b>		
Output Function (displayed text)	Description	Internal output function	Pass through function	LED-Display			L	F3	F5
				LED-Reset	Blink. Code	Note			
„Trip: Imped.“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
					-	Fct. inactive			
„Fuse fail VC“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				●	-	Fct. inactive			
„Fuse fail Ven“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				●	-	Fct. inactive			
„Fuse fail HH“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				●	-	Fct. inactive			
„Ext. CB trip“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				●	-	Fct. inactive			
„SG1 block.“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
					-	Fct. inactive			
„SG2 block.“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
					-	Fct. inactive			
„SG3 block.“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
					-	Fct. inactive			
„SG4 block.“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
					-	Fct. inactive			
„SG5 block.“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
					-	Fct. inactive			
„Overflow: WP+“	Message of a counter overflow of positive active energy	●	-	●	fg			●	●
„Overflow: WP-“	Message of a counter overflow of negative active energy	●	-	●	fg	-	●	●	●
„Overflow: WQ+“	Message of a counter overflow of positive reactive energy	●	-	●	fg	-	●	●	●
„Overflow: WQ-“	Message of a counter overflow of negative reactive energy	●	-	●	fg	-	●	●	●
„SG23 block.“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
„SG234 block.“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
„SG2345 Interl.“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
„Alarm: Motor“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
					-	Fct. inactive			
„Trip: Motor“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				●	-	Fct. inactive			
„Ctrl. blocked 2“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
„SCADA: Cmd out 1“	Message signalling an unsafe SCADA command, i.e. the signal relay is controlled by a command issued by the control system (SCADA)	●	-	-	fg	-	●	●	●
„SCADA: Cmd out 2“	Message signalling an unsafe SCADA command, i.e. the signal relay is controlled by a command issued by the control system (SCADA)	●	-	-	fg	-	●	●	●
„SCADA: Cmd out 3“	Message signalling an unsafe SCADA command, i.e. the signal relay is controlled by a command issued by the control system (SCADA)	●	-	-	fg	-	●	●	●
„SCADA: Cmd out 4“	Message signalling an unsafe SCADA command, i.e. the signal relay is controlled by a command issued by the control system (SCADA)	●	-	-	fg	-	●	●	●
„SCADA: Cmd out 5“	Message signalling an unsafe SCADA command, i.e. the signal relay is controlled by a command issued by the control system (SCADA)	●	-	-	fg	-	●	●	●
„SCADA: Cmd out 6“	Message signalling an unsafe SCADA command, i.e. the signal relay is controlled by a command issued by the control system (SCADA)	●	-	-	fg	-	●	●	●
„SCADA: Cmd out 7“	Message signalling an unsafe SCADA command, i.e. the signal relay is controlled by a command issued by the control system (SCADA)	●	-	-	fg	-	*	*	●

<b>Output Messages (for LED's, Signal Relays and for Input Elements of the Logic)</b>							Available in <b>CSP2-</b>		
Output Function (displayed text)	Description	Internal output function	Pass through function	LED-Display		L	F3	F5	
				LED-Reset	Blink. Code				Note
„Release CB1 ON“	Message signalling the release command from the SCADA for remote connection of CB1 (via DI)	●	-	-	fg	-	●	●	●
„Ext CB1 off“	Message of the active input function with the same name (DI function)	-	●	●	r	Fct. active	●	●	●
„Ext CB1 on“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
„SG1 on block.1“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
„SG1 on block.2“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
„Alarm: Prot.2“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
„Trip: Prot.2“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
„Alarm: Prot.3“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
„Trip: Prot.3“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
„Alarm: Prot.4“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
„Trip: Prot.4“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
„Alarm: Prot.5“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
„Trip: Prot.5“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
„Alarm: Prot.6“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
„Trip: Prot.6“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
„All SG blocked“	Message signalling the SCADA command or CMP parameter setting to interlock all control commands	●	-	-	fg	-	●	●	●
„SG1 off block.“	Message signalling the SCADA command or CMP parameter setting to interlock the switching OFF command for switching device 1	●	-	-	fg	-	●	●	●
„SG1 on block“	Message signalling the SCADA command or CMP parameter setting to interlock the switching ON command for switching device 1	●	-	-	fg	-	●	●	●
„SG2 off block“	Message signalling the SCADA command or CMP parameter setting to interlock the switching OFF command for switching device 2	●	-	-	fg	-	●	●	●
„SG2 on block“	Message signalling the SCADA command or CMP parameter setting to interlock the switching ON command for switching device 2	●	-	-	fg	-	●	●	●
„SG3 off block“	Message signalling the SCADA command or CMP parameter setting to interlock the switching OFF command for switching device 3	●	-	-	fg	-	●	●	●
„SG3 on block“	Message signalling the SCADA command or CMP parameter setting to interlock the switching ON command for switching device 3	●	-	-	fg	-	●	●	●
„SG4 off block“	Message signalling the SCADA command or CMP parameter setting to interlock the switching OFF command for switching device 4	●	-	-	fg	-	*	*	●
„SG4 on block“	Message signalling the SCADA command or CMP parameter setting to interlock the switching ON command for switching device 4	●	-	-	fg	-	*	*	●
„SG5 off block“	Message signalling the SCADA command or CMP parameter setting to interlock the switching OFF command for switching device 5	●	-	-	fg	-	*	*	●

<b>Output Messages (for LED's, Signal Relays and for Input Elements of the Logic)</b>							Available in <b>CSP2-</b>		
Output Function (displayed text)	Description	Internal output function	Pass through function	LED-Display			L	F3	F5
				LED-Reset	Blink. Code	Note			
„SG5 on block“	Message signalling the SCS command or CMP parameter setting to interlock the switching ON command for switching device 5	●	-	-	fg	-	*	*	●
„Bypath1 CB off“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
				●	-	Fct. inactive			
„Bypath1 CB on“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
				●	-	Fct. inactive			
„Bypath2 CB off“	Message of the active input function with the same name (DI function)	-	●	-	fr	Fct. active	●	●	●
				●	-	Fct. inactive			
„Bypath2 CB on“	Message of the active input function with the same name (DI function)	-	●	-	fg	Fct. active	●	●	●
				●	-	Fct. inactive			
„Load-Shedding“	Message of the active input function with the same name (DI function)	-	●	-	r	Fct. active	●	●	●
				●	-	Fct. inactive			
„Emergency off“	Signal for pressing the „Emergency OFF“ button at the CMP for CB1 (and CB2)	●	-	●	r	-	●	●	●
"Logic fct. 1"	Output message of the of the state of the logic equation 1	●	-	-	g	-	●	●	●
"Logic fct. 2"	Output message of the of the state of the logic equation 2	●	-	-	g	-	●	●	●
"Logic fct. 3"	Output message of the of the state of the logic equation 3	●	-	-	g	-	●	●	●
"Logic fct. 4"	Output message of the of the state of the logic equation 4	●	-	-	g	-	●	●	●
"Logic fct. 5"	Output message of the of the state of the logic equation 5	●	-	-	g	-	●	●	●
"Logic fct. 6"	Output message of the of the state of the logic equation 6	●	-	-	g	-	●	●	●
"Logic fct. 7"	Output message of the of the state of the logic equation 7	●	-	-	g	-	●	●	●
"Logic fct. 8"	Output message of the of the state of the logic equation 8	●	-	-	g	-	●	●	●
"Logic fct. 9"	Output message of the of the state of the logic equation 9	●	-	-	g	-	●	●	●
"Logic fct. 10"	Output message of the of the state of the logic equation 10	●	-	-	g	-	●	●	●
"Logic fct. 11"	Output message of the of the state of the logic equation 11	●	-	-	g	-	●	●	●
"Logic fct. 12"	Output message of the of the state of the logic equation 12	●	-	-	g	-	●	●	●
"Logic fct. 13"	Output message of the of the state of the logic equation 13	●	-	-	g	-	●	●	●
"Logic fct. 14"	Output message of the of the state of the logic equation 14	●	-	-	g	-	●	●	●
"Logic fct. 15"	Output message of the of the state of the logic equation 15	●	-	-	g	-	●	●	●
"Logic fct. 16"	Output message of the of the state of the logic equation 16	●	-	-	g	-	●	●	●
"Logic fct. 17"	Output message of the of the state of the logic equation 17	●	-	-	g	-	●	●	●
"Logic fct. 18"	Output message of the of the state of the logic equation 18	●	-	-	g	-	●	●	●
"Logic fct. 19"	Output message of the of the state of the logic equation 19	●	-	-	g	-	●	●	●
"Logic fct. 20"	Output message of the of the state of the logic equation 20	●	-	-	g	-	●	●	●
"Logic fct. 21"	Output message of the of the state of the logic equation 21	●	-	-	g	-	●	●	●
"Logic fct. 22"	Output message of the of the state of the logic equation 22	●	-	-	g	-	●	●	●
"Logic fct. 23"	Output message of the of the state of the logic equation 23	●	-	-	g	-	●	●	●
"Logic fct. 24"	Output message of the of the state of the logic equation 24	●	-	-	g	-	●	●	●
"Logic fct. 25"	Output message of the of the state of the logic equation 25	●	-	-	g	-	●	●	●
"Logic fct. 26"	Output message of the of the state of the logic equation 26	●	-	-	g	-	●	●	●
"Logic fct. 27"	Output message of the of the state of the logic equation 27	●	-	-	g	-	●	●	●
"Logic fct. 28"	Output message of the of the state of the logic equation 28	●	-	-	g	-	●	●	●
"Logic fct. 29"	Output message of the of the state of the logic equation 29	●	-	-	g	-	●	●	●
"Logic fct. 30"	Output message of the of the state of the logic equation 30	●	-	-	g	-	●	●	●
"Logic fct. 31"	Output message of the of the state of the logic equation 31	●	-	-	g	-	●	●	●
"Logic fct. 32"	Output message of the of the state of the logic equation 32	●	-	-	g	-	●	●	●
"Log.bounce sv1"	Debouncing supervision of the Logic Alarm	●	-	-	g	-	●	●	●
"Log.bounce sv2"	Debouncing supervision of the Logic Alarm Failure	●	-	-	g	-	●	●	●

<b>Output Messages (for LED's, Signal Relays and for Input Elements of the Logic)</b>							Available in <b>CSP2-</b>		
Output Function (displayed text)	Description	Internal output function	Pass through function	LED-Display		Note	L	F3	F5
				LED-Reset	Blink. Code				
"P-Set 1"	Protection parameter set 1 active	●	-	-	g	-	●	●	●
"P-Set 2"	Protection parameter set 1 active	●	-	-	g	-	●	●	●
"P-Set 3"	Protection parameter set 1 active	●	-	-	g	-	●	●	●
"P-Set 4"	Protection parameter set 1 active	●	-	-	g	-	●	●	●
"Pos.SG1 off"	Off-Position SG 1	●	-	-	g	-	●	●	●
"Pos.SG2 off"	Off-Position SG 2	●	-	-	g	-	●	●	●
"Pos.SG3 off"	Off-Position SG 3	●	-	-	g	-	●	●	●
"Pos.SG4 off"	Off-Position SG 4	●	-	-	g	-	●	●	●
"Pos.SG5 off"	Off-Position SG 5	●	-	-	g	-	●	●	●
"Pos.SG1 diff"	Intermediate Position SG 1	●	-	-	fg	-	●	●	●
"Pos.SG2 diff"	Intermediate Position SG2	●	-	-	fg	-	●	●	●
"Pos.SG3 diff"	Intermediate Position SG3	●	-	-	fg	-	●	●	●
"Pos.SG4 diff"	Intermediate Position SG4	●	-	-	fg	-	●	●	●
"Pos.SG5 diff"	Intermediate Position SG5	●	-	-	fg	-	●	●	●
"S-Cmd SG1 on"	Message of the corresponding active input function	●	-	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
"S-Cmd SG1 off"	Message of the corresponding active input function	●	-	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
"S-Cmd SG2 on"	Message of the corresponding active input function	●	-	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
"S-Cmd SG2 off"	Message of the corresponding active input function	●	-	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
"S-Cmd SG3 on"	Message of the corresponding active input function	●	-	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
"S-Cmd SG3 off"	Message of the corresponding active input function	●	-	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
"S-Cmd SG4 on"	Message of the corresponding active input function	●	-	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
"S-Cmd SG4 off"	Message of the corresponding active input function	●	-	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
"S-Cmd SG5 on"	Message of the corresponding active input function	●	-	-	fg	Fct. active	●	●	●
					-	Fct. inactive			
"S-Cmd SG5 off"	Message of the corresponding active input function	●	-	-	fg	Fct. active	●	●	●
					-	Fct. inactive			

Table 5.1: List of output messages



## 5.2 List of Input Functions

<b>Input Functions (for digital inputs and outputs of the logic)</b>								Available in <b>CSP2-</b>		
Input Function (Displayed Text)	Description	Processing (Module)	Assignable	Shown in Display	LED-Display		Note	L	F3	F5
					LED Reset	Blink Code				
„n.a.“	Not assigned (i.e.without function)	-	●	-	-	-	-	●	●	●
„SG1 Signal I“	Position check-back signal for „Switchgear 1 ON“	Interlocking/ Supervision	-	●	-	-	- Fct. active - Fct. inactive	●	●	●
„SG1 Signal O“	Position check-back signal for „ Switchgear 1 OFF“	Interlocking/ Supervision	-	●	-	-	- Fct. active - Fct. inactive	●	●	●
„SG2 Signal I“	Position check-back signal for „ Switchgear 2 ON“	Interlocking/ Supervision	-	●	-	-	- Fct. active - Fct. inactive	●	●	●
„SG2 Signal O“	Position check-back signal for „ Switchgear 2 OFF“	Interlocking/ Supervision	-	●	-	-	- Fct. active - Fct. inactive	●	●	●
„SG3 Signal I“	Position check-back signal for „ Switchgear 3 ON“	Interlocking/ Supervision	-	●	-	-	- Fct. active - Fct. inactive	●	●	●
„SG3 Signal O“	Position check-back signal for „ Switchgear 3 OFF“	Interlocking/ Supervision	-	●	-	-	- Fct. active - Fct. inactive	●	●	●
„SG4 Signal I“	Position check-back signal for „ Switchgear 4 ON“	Interlocking/ Supervision	-	●	-	-	- Fct. active - Fct. inactive	●	●	●
„SG4 Signal O“	Position check-back signal for „ Switchgear 4 OFF“	Interlocking/ Supervision	-	●	-	-	- Fct. active - Fct. inactive	●	●	●
„SG5 Signal I“	Position check-back signal for „ Switchgear 5 ON“	Interlocking/ Supervision	-	●	-	-	- Fct. active - Fct. inactive	●	●	●
„SG5 Signal O“	Position check-back signal for „ Switchgear 5 OFF“	Interlocking/ Supervision	-	●	-	-	- Fct. active - Fct. inactive	●	●	●
„Prot. blocked“	Blocking of those protective functions which have the »Ex Block« parameter in position »active«	Protection	●	-	-	-	rb Fct. active - Fct. inactive	●	●	●
„AR blocked“	External blocking of the AR function	Protection	●	-	-	-	rb Fct. active - Fct. inactive	●	●	●
„AR start“	Start of the AR function triggered by an external protect. trip via a DI function (e.g. „Protective Trip 1“).	Protection	●	-	-	-	rb Fct. active - Fct. inactive	●	●	●
„AR sync.check“	For connection of an external synchronisation check relay. If the related setting is activated in the AR parameter group, the CB is only re-connected within an AR sequence if this digital input is in »active« position.	Protection	●	-	-	-	rb Fct. active - Fct. inactive	●	●	●
„Rev interlock“	Signal input for setting up a protection concept with „Rear Interlocking“. This input is connected with output „Protective Activation X“ of a lower-level protection facility. When the input is active, individual steps of the overcurrent protection functions can be interlocked if their parameters »Rear Interlock.« are set to »active«.	Protection	●	-	-	-	gb Fct. active - Fct. inactive	●	●	●
„Ext CB fail“	Trip signal of external protective facilities (lower-level protective facilities which signal »Circuit Breaker Failure«) incl. OFF command to the local CB.	Protection	●	-	-	●	r Fct. active - Fct. inactive	●	●	●
„Alarm: Prot. 1“	External protective signal: Activation of an external protective facility (for any protective facility).	Protection	●	-	-	-	rb Fct. active - Fct. inactive	●	●	●
„Trip: Prot. 1“	Trip signal of external protective facilities (for any protective facility) incl.OFF command to the local CB. (Activation of the AR function only if a digital input with „AR Start“ has been assigned and was activated).	Protection	●	-	-	●	r Fct. active - Fct. inactive	●	●	●
„Device Reset“	External resetting signal for resetable LED indications and signal relays.	LED Display/ Signal Relay	●	-	-	-	gb Fct. active - Fct. inactive	●	●	●

<b>Input Functions (for digital inputs and outputs of the logic)</b>								Available in <b>CSP2-</b>		
Input Function (Displayed Text)	Description	Processing (Module)	Assignable	LED-Display			L	F3	F5	
				Shown in Display	LED Reset	Blink Code				Note
„Fuse fail VT“	Failure indication of a single-pole autom. fuse for external VTs. Voltage measuring is recognized of being interrupted and all active protective functions for voltage, frequency and power are blocked (ineffective).	Supervision/ Protection	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„Fuse fail AV“	Message signalling failure of the autom. fuse for the supply voltage (aux. voltage) of external devices.	Supervision	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„Alarm: CCS“	Signal coming from an external control circuit supervision.	Supervision	●	-	-	rb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Switch p.-set“	Remote switching between two protective parameter sets (see chapter „Parameter/Protective Parameter“)	Protection	●	-	-	gb	Fct. active	●	●	●
					-	-	Fct. inactive			
„trigg.dist.rec“	Start of the fault recorder from external	Data Re- cording	●	-	-	gb	Fct. active	●	●	●
					-	-	Fct. inactive			
					r	-	Fct. inactive			
„CB1 ready“	Message that signalize, that CB1 is ready. If this function is not active, the switching-on of CB1 is blocked.	Interlocking	●	-	-	g	DI active	●	●	●
					-	r	Fct. inactive			
„CB2 ready“	Message that signalize, that CB2 is ready. If this function is not active, the switching-on of CB2 is blocked.	Interlocking	●	-	-	g	Fct. active	-	●	-
					-	r	Fct. inactive			
„SF6 Alarm“	Message indicating pressure decrease in the gas tank	Supervision	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„Cmd1 SG1 on“	Remote ON command for switching device 1 incl. field interlocking (key switch position at the CMP: „Remote Operation“)	Control	●	-	-	gb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Cmd1 SG1 off“	Remote OFF command for switching device 1 incl. field interlocking (key switch position at the CMP: „Remote Operation“)	Control	●	-	-	gb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Cmd2 SG1 on“	Remote ON command for switching device 1 incl. field interlocking (key switch position at the CMP: „Remote Operation“)	Control	●	-	-	gb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Cmd2 SG1 off“	Remote OFF command for switching device 1 incl. field interlocking (key switch position at the CMP: „Remote Operation“)	Control	●	-	-	gb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Cmd SG2 on“	Remote ON command for switching device 2 incl. field interlocking (key switch position at the CMP: „Remote Operation“)	Control	●	-	-	gb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Cmd SG2 off“	Remote OFF command for switching device 2 incl. field interlocking (key switch position at the CMP: „Remote Operation“)	Control	●	-	-	gb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Cmd SG3 on“	Remote ON command for switching device 3 incl. field interlocking (key switch position at the CMP: „Remote Operation“)	Control	●	-	-	gb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Cmd SG3 off“	Remote OFF command for switching device 3 incl. field interlocking (key switch position at the CMP: „Remote Operation“)	Control	●	-	-	gb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Cmd SG4 on“	Remote ON command for switching device 4 incl. field interlocking (key switch position at the CMP: „Remote Operation“)	Control	●	-	-	gb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Cmd SG4 off“	Remote OFF command for switching device 4 incl. field interlocking (key switch position at the CMP: „Remote Operation“)	Control	●	-	-	gb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Cmd SG5 on“	Remote ON command for switching device 5 incl. field interlocking (key switch position at the CMP: „Remote Operation“)	Control	●	-	-	gb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Cmd SG5 off“	Remote OFF command for switching device 5 incl. field interlocking (key switch position at the CMP: „Remote Operation“)	Control	●	-	-	gb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Plug CB1 out“	CB1 or first CB (Duplex) is removed (or the plug is removed). CB1 symbol in the display disappears, CB1 cannot be controlled any longer.	Interlocking	●	●	-	gb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Plug CB2 out“	Second CB (Duplex only) is removed (or the plug is removed). CB2 symbol in the display disappears, CB2 cannot be controlled any longer.	Interlocking	●	●	-	gb	Fct. active	-	-	●
					-	-	Fct. inactive			
„Ctrl. blocked 1“	Blocking of the ON/OFF control for all electrical controllable	Interlocking	●	-	-	gb	Fct. active	●	●	●

<b>Input Functions (for digital inputs and outputs of the logic)</b>								Available in <b>CSP2-</b>		
Input Function (Displayed Text)	Description	Processing (Module)	Assignable	LED-Display			Note	L	F3	F5
				Shown in Display	LED Reset	Blink Code				
	switching devices					-	Fct. inactive			
„DBB connect.“	The cross coupling of a double bus bar system is applied and the interlocking of switching devices connected at the bus bars is neutralised. (As long as the cross coupling is applied, the bus bars are synchronous).	Interlocking	●	-	-	g	Fct. active	●	●	●
						-	Fct. inactive			
„Function 1“	Message of user defined „Function 1“	Message	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„Function 2“	Message of user defined „Function 2“	Message	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„Function 3“	Message of user defined „Function 3“	Message	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„Function 4“	Message of user defined „Function 4“	Message	●	-	-	r	Fct. active	●	●	●
						-	Fct. inactive			
„Function 5“	Message of user defined „Function 5“	Message	●	-	-	r	Fct. active	●	●	●
						-	Fct. inactive			
„Function 6“	Message of user defined „Function 6“	Message	●	-	-	r	Fct. active	●	●	●
						-	Fct. inactive			
„Function 7“	Message of user defined „Function 7“	Message	●	-	-	g	Fct. active	●	●	●
						-	Fct. inactive			
„Function 8“	Message of user defined „Function 8“	Message	●	-	-	g	Fct. active	●	●	●
						-	Fct. inactive			
„Function 9“	Message of user defined „Function 9“	Message	●	-	-	g	Fct. active	●	●	●
						-	Fct. inactive			
„Function 10“	Message of user defined „Function 10“	Message	●	-	-	g	Fct. active	●	●	●
						-	Fct. inactive			
„Ext prot.act“	Indication as to supervision of external protective devices	Supervision	●	-	-	g	Fct. active	●	●	●
						r	Fct. inactive			
„Alarm: Temp.“	External protection signal: Activation of an external protection device (mainly for temperature monitoring facility)	Protection	●	-	-	rb	Fct. active	●	●	●
						-	Fct. inactive			
„Trip: Temp.“	Trip signal of external protection devices (mainly for temperature monitoring facility) incl. an OFF command to the local CB. (Activation of the AR function only with additional assignment and activation of a digital input with “AR Start”)	Protection	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„Alarm: Buchh.“	External protection signal: Activation of an external protection device (mainly for Buchholz protection facility)	Protection	●	-	-	rb	Fct. active	●	●	●
						-	Fct. inactive			
„Trip: Buchh.“	Trip signal of external protection devices (mainly for Buchholz protection facility) incl. an OFF command to the local CB. (Activation of the AR function only with additional assignment and activation of a digital input with “AR Start”)	Protection	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„Trip: Diff.“	Trip signal of external protection devices (mainly for differential protection facility) incl. an OFF command to the local CB. (Activation of the AR function only with additional assignment and activation of a digital input with “AR Start”)	Protection	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„Alarm: Imped.“	External protection signal: Activation of an external protection device (mainly for distance protection facility)	Protection	●	-	-	rb	Fct. active	●	●	●
						-	Fct. inactive			
„Trip: Imped.“	Trip signal of external protection devices (mainly for distance protection facility) incl. an OFF command to the local CB. (Activation of the AR function only with additional assignment and activation of a digital input with “AR Start”)	Protection	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„Fuse fail VC“	Message signalling failure of the autom. fuse for the control voltage (e.g. of the power circuits)	Protection	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			

<b>Input Functions (for digital inputs and outputs of the logic)</b>								Available in <b>CSP2-</b>		
Input Function (Displayed Text)	Description	Processing (Module)	Assignable	Shown in Display	LED-Display		Note	L	F3	F5
					LED Reset	Blink Code				
„Fuse fail Ven“	Message signalling failure of the autom. fuse for the residual voltage	Protection	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„HH-fuse trip“	Message signalling HH-fuse trip	Protection	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„Ext. CB trip.“	Message signalling failure of external circuit breaker	Protection	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„SG1 block.“	Blocking of the ON/OFF control for switching device 1 (Exception: „EMERGENCY OFF“/AR/Protective trip function for the CB)	Interlocking	●	-	-	rb	Fct. active	●	●	●
						-	Fct. inactive			
„SG2 block.“	Blocking of the ON/OFF control for switching device 2	Interlocking	●	-	-	rb	Fct. active	●	●	●
						-	Fct. inactive			
„SG3 block.“	Blocking of the ON/OFF control for switching device 3	Interlocking	●	-	-	rb	Fct. active	●	●	●
						-	Fct. inactive			
„SG4 block.“	Blocking of the ON/OFF control for switching device 4	Interlocking	●	-	-	rb	Fct. active	●	●	●
						-	Fct. inactive			
„SG5 block.“	Blocking of the ON/OFF control for switching device 5	Interlocking	●	-	-	rb	Fct. active	●	●	●
						-	Fct. inactive			
„SG23 block.“	Blocking of the ON/OFF control for switching devices 2 and 3	Interlocking	●	-	-	gb	Fct. active	●	●	●
						-	Fct. inactive			
„SG234 block.“	Blocking of the ON/OFF control for switching devices 2, 3 and 4	Interlocking	●	-	-	gb	Fct. active	●	●	●
						-	Fct. inactive			
„SG2345 block.“	Blocking of the ON/OFF control for switching devices 2, 3, 4, and 5	Interlocking	●	-	-	gb	Fct. active	●	●	●
						-	Fct. inactive			
„Alarm: Motor“	External protection signal: Activation of an external protection device (mainly for motor protection facility)	Protection	●	-	-	rb	Fct. active	●	●	●
						-	Fct. inactive			
„Trip: Motor“	Trip signal of external protection devices (mainly for motor protection facility) incl. an OFF command to the local CB. (Activation of the AR function only with additional assignment and activation of a digital input with “AR Start”)	Protection	●	-	-	r	Fct. active	●	●	●
						●	Fct. inactive			
„Ctrl blocked 2“	Blocking of the ON/OFF control for all electrical controllable switching devices	Interlocking	●	-	-	gb	Fct. active	●	●	●
						-	Fct. inactive			
„Ext CB1 off“	External disconnection of CB1, irrespectively of the CMP key switch position: Local Operation/Remote Operation. When function „Ext CB1 OFF“ is active, the control commands for reconnection of CB1 are blocked.	Control	●	-	-	r	Fct. active	●	●	●
						●	Fct. inactive			
„Ext CB1 on“	External connection of CB1. Condition for this: Release command from the control system „Release CB1 ON“ has been issued and the CMP key switch is in position “Remote Operation”.	Control	●	-	-	gb	Fct. active	●	●	●
						-	Fct. inactive			
„SG1on block.1“	Blocking of the ON control for switching device 1	Interlocking	●	-	-	gb	Fct. active	●	●	●
						-	Fct. inactive			
„SG1on block.2“	Blocking of the ON control for switching device 1	Interlocking	●	-	-	gb	Fct. active	●	●	●
						-	Fct. inactive			
„Alarm: Prot.2“	External protection signal: Activation of an external protection device (for any protection facility)	Protection	●	-	-	rb	Fct. active	●	●	●
						-	Fct. inactive			
„Trip: Prot.2“	Trip signal of external protection devices (for any protection facility) incl. an OFF command to the local CB. (Activation of the AR function only with additional assignment and activation of a digital input with “AR Start”)	Protection	●	-	-	r	Fct. active	●	●	●
						●	Fct. inactive			
„Alarm: Prot.3“	External protection signal: Activation of an external protection device (for any protection facility)	Protection	●	-	-	rb	Fct. active	●	●	●
						-	Fct. inactive			

<b>Input Functions (for digital inputs and outputs of the logic)</b>								Available in <b>CSP2-</b>		
Input Function (Displayed Text)	Description	Processing (Module)	Assignable	LED-Display			Note	L	F3	F5
				Shown in Display	LED Reset	Blink Code				
„Trip: Prot.3“	Trip signal of external protection devices (for any protection facility) incl. an OFF command to the local CB. (Activation of the AR function only with additional assignment and activation of a digital input with "AR Start")	Protection	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„Alarm: Prot.4“	External protection signal: Activation of an external protection device (for any protection facility)	Protection	●	-	-	rb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Trip: Prot.4“	Trip signal of external protection devices (for any protection facility) incl. an OFF command to the local CB. (Activation of the AR function only with additional assignment and activation of a digital input with "AR Start")	Protection	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„Alarm: Prot.5“	External protection signal : Activation of an external protection device (for any protection facility)	Protection	●	-	-	rb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Trip: Prot.5“	Trip signal of external protection devices (for any protection facility) incl. an OFF command to the local CB. (Activation of the AR function only with additional assignment and activation of a digital input with "AR Start")	Protection	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„Alarm: Prot.6“	External protection signal : Activation of an external protection device (for any protection facility)	Protection	●	-	-	rb	Fct. active	●	●	●
					-	-	Fct. inactive			
„Trip: Prot.6“	Trip signal of external protection devices (for any protection facility) incl. an OFF command to the local CB. (Activation of the AR function only with additional assignment and activation of a digital input with "AR Start")	Protection	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
„Bypass 1 CB off“	Information to the CSP that the CB has been operated directly by an external OFF command (i.e. independently of the <b>CSP2</b> ). (This message is necessary to prevent reconnection by the active AR function when "NC-Start = active")	Protection/ Supervision	●	-	-	rb	Fct. active	●	●	●
					●	-	Fct. inactive			
„Bypass 1 CB on“	Information to the CSP that the CB has been operated directly by an external ON command (i.e. independently of the <b>CSP2</b> ). (This message is necessary to activate the SOTF function and for blocking the AR function temporarily.)	Protection/ Supervision	●	-	-	gb	Fct. active	●	●	●
					●	-	Fct. inactive			
„Bypass 2 CB off“	Information to the CSP that the CB has been operated directly by an external OFF command (i.e. independently of the <b>CSP2</b> ). (This message is necessary to prevent reconnection by the active AR function when "NC-Start = active")	Protection/ Supervision	●	-	-	rb	Fct. active	●	●	●
					●	-	Fct. inactive			
„Bypass 2 CB on“	Information to the CSP that the CB has been operated directly by an external ON command (i.e. independently of the <b>CSP2</b> ). (This message is necessary to activate the SOTF function and for blocking the AR function temporarily.)	Protection / Supervision	●	-	-	gb	Fct. active	●	●	●
					●	-	Fct. inactive			
„Load-Shedding“	Information to the CSP that the CB has been operated directly by an external OFF command (i.e. independently of the <b>CSP2</b> ). (This message is necessary to block the active AR function during load-shedding. When the „Load-Shedding“ function is active, control commands for reconnection of the CB are blocked).	Protection / Supervision	●	-	-	r	Fct. active	●	●	●
					●	-	Fct. inactive			
"SCmd SG1 on"	On-Command for SG1 with check of the field interlocking (key switch position at the CMP: "local operation" or "remote operation")	Control	●	-	-	gb	Fct. active	●	●	●
					●	-	Fct. inactive			
"SCmd SG1 off"	Off-Command for SG1 with check of the field interlocking (key switch position at the CMP: "local operation" or "remote operation")	Control	●	-	-	gb	Fct. active	●	●	●
					●	-	Fct. inactive			
"SCmd SG2 on"	On-Command for SG2 with check of the field interlocking (key switch position at the CMP: "local operation" or "remote operation")	Control	●	-	-	gb	Fct. active	●	●	●
					●	-	Fct. inactive			

<b>Input Functions (for digital inputs and outputs of the logic)</b>								Available in <b>CSP2-</b>		
Input Function (Displayed Text)	Description	Processing (Module)	Assignable	Shown in Display	LED-Display		Note	L	F3	F5
					LED Reset	Blink Code				
"S-Cmd SG2 off"	Off-Command for SG2 with check of the field interlocking (key switch position at the CMP: "local operation" or "remote operation")	Control	●	-	-	gb	Fct. active	●	●	●
					●	-	Fct. inactive			
"S-Cmd SG3 on"	On-Command for SG3 with check of the field interlocking (key switch position at the CMP: "local operation" or "remote operation")	Control	●	-	-	gb	Fct. active	●	●	●
					●	-	Fct. inactive			
"S-Cmd SG3 off"	Off-Command for SG3 with check of the field interlocking (key switch position at the CMP: "local operation" or "remote operation")	Control	●	-	-	gb	Fct. active	●	●	●
					●	-	Fct. inactive			
"S-Cmd SG4 on"	On-Command for SG4 with check of the field interlocking (key switch position at the CMP: "local operation" or "remote operation")	Control	●	-	-	gb	Fct. active	●	●	●
					●	-	Fct. inactive			
"S-Cmd SG4 off"	Off-Command for SG4 with check of the field interlocking (key switch position at the CMP: "local operation" or "remote operation")	Control	●	-	-	gb	Fct. active	●	●	●
					●	-	Fct. inactive			
"S-Cmd SG5 on"	On-Command for SG5 with check of the field interlocking (key switch position at the CMP: "local operation" or "remote operation")	Control	●	-	-	gb	Fct. active	●	●	●
					●	-	Fct. inactive			
"S-Cmd SG5 off"	Off-Command for SG5 with check of the field interlocking (key switch position at the CMP: "local operation" or "remote operation")	Control	●	-	-	gb	Fct. active	●	●	●
					●	-	Fct. inactive			

Table 5.2: Digital input functions - overview

## 6 Debouncing Supervision

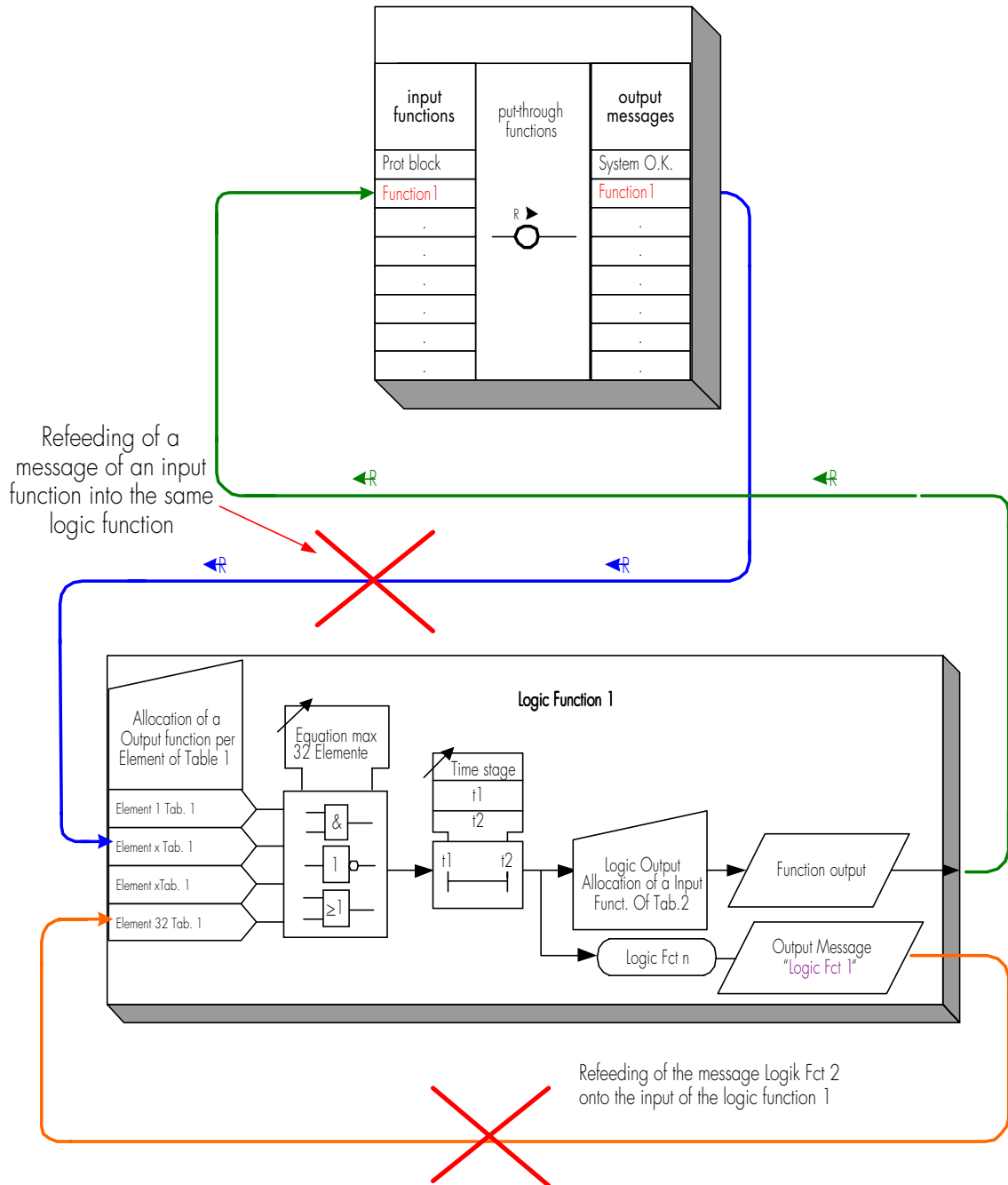


Figure 6.1: Debouncing Supervision

**Important** (see fig. 6.1)

- Do not feed back any output messages as input elements to the associated (the same) logic equation.

The logic function enables to generate many events with only very short intervals (direct feedback without significant time delay and assignment of input functions to the output of logic functions).

A continuous, rapid event generation stresses the system inadmissible and is monitored by an integrated two-step monitoring function, the debouncing supervision.

Normally the logic operates in a 10 ms-cycle. If the number of signal changes exceeds the threshold of 40/320 ms, the first step of the debouncing supervision is responding and reduces the cycle to 100 ms. If now the number of signal changes exceeds the threshold of 400/3200 ms, the second step of the debouncing supervision is responding (Logic debouncing supervision 2) and reduces further the cycle to 500 ms.

Reductions of the cycle times are reset if the thresholds are undershot (10% hysteresis) .

Activating of the debouncing supervision is signalled through respective messages. Additionally a pop-up window appears on the **CMP**.

Merely with regard to the timing accuracy the duly function is impaired.



Figure 6.2: Debouncing Supervision



## 7 Programming of Logic Functions via the CMP

For activating or deactivating the entire logic, the logic parameter "Function Active/Inactive" can be used. This parameter can be activated via the *CMP*. After the activating process the system is rebooted (about 10 s).

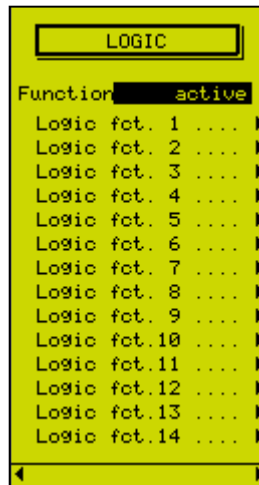


Figure 7.1: Menu Logic

## 7.1 Menu structure of the SL-LOGIC

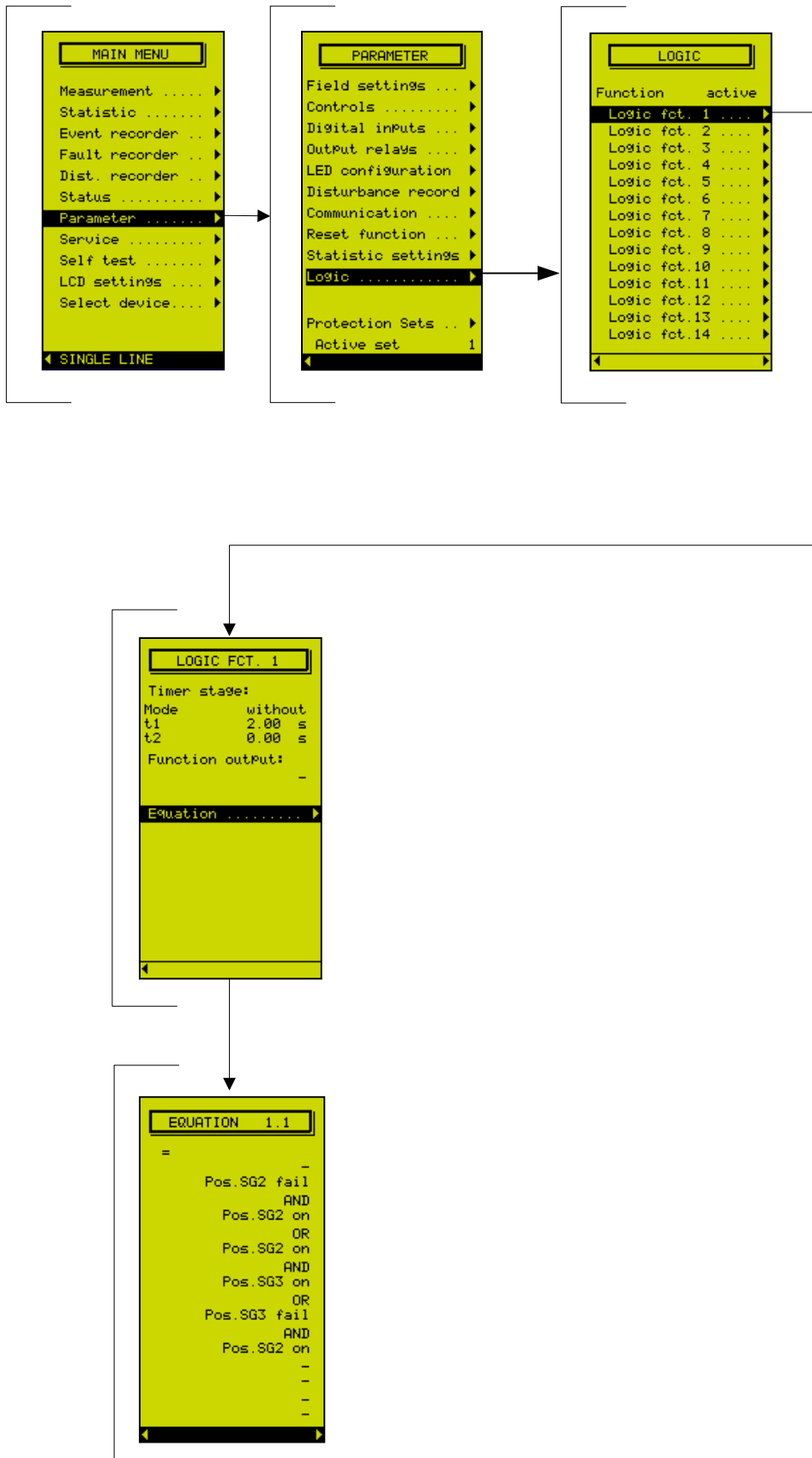


Figure 7.2: Menu Tree SL-LOGIC

## 7.2 Input of the logic function (circuit equation) via the CMP

Firstly the circuit/logic equations have to be ascertained and then to be converted into the *Disjunctive Normal Form* (DNF). See chapters 3 and 4.

Function »Local Operation/Parameter Assignment« in »MODE 2« is to be selected by using the key switch of the *CMP*.

Now the circuit/logic equations can be entered in menu »LOGIC« according to fig. 7.2.

By pressing keys »ENTER« and »RIGHT« the information is stored and only after this process is completed, the equations are accepted by the system. Thereafter the system is restarted.

### 7.2.1 Time stages

The logic output of each logic equation can be influenced by a preceding time step. Via parameter "Mode" the following functions are available:

- Pickup- and Release time delay (can be retriggered) or:
- Pulse duration (cannot be retriggered)

*Pickup- and Release time delay (can be retriggered) (mode „Op./Rel.d“)*

Time step parameter:

Pickup time :  $t1 = 0 - 500$  s step range: 10 ms

Release time:  $t2 = 0 - 500$  s step time: 10 ms

- Change of status from „0“ to „1“ (Low to High) of a logic output becomes only effective after time delay "t1" (= pickup delay).
- Change of status from „1“ to „0“ (High to Low) of a logic output becomes only effective after time delay "t2" (= release delay).

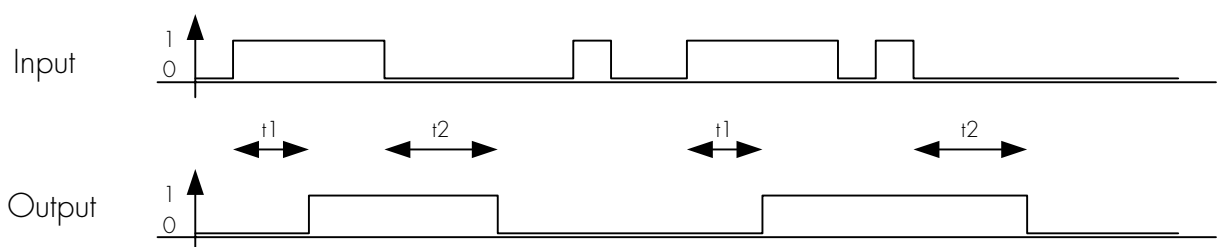


Figure 7.3: Pickup- and Rrelease Time Delay

In mode „Pulse duration“ (cannot be retriggered) (Mode "Op.d/Pulse.d") the following applies

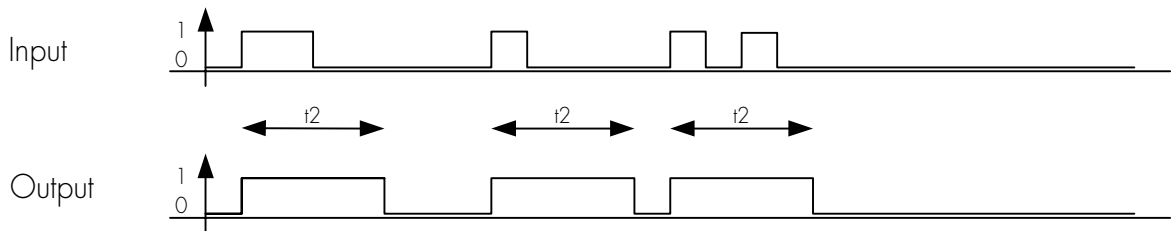
Time stage parameter:

Pickup time:  $t1 = 0 - 500$  s step range: 10 ms

Impulse time:  $t2 = 0 - 500$  s step range: 10 ms

- o If the pickup requirement for a logic output is met, the signal „1“ (High) is applied after the time defined by "t1" for the time defined by t2

Setting  $t1 = 0$  ms,  $t2 > 0$  ms



Setting  $t1 > 0$  ms,  $t2 > 0$  ms

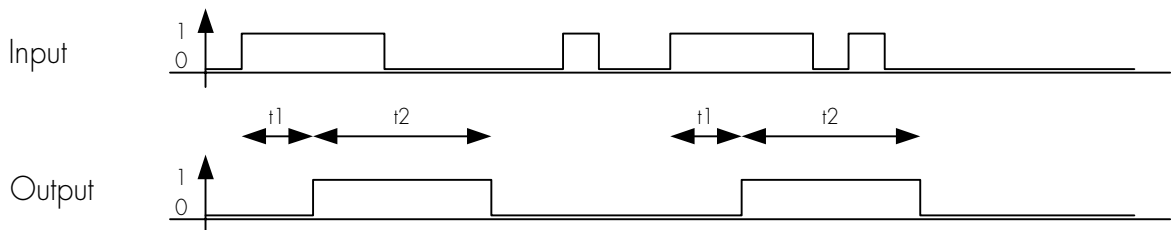


Figure 7.4: Impulse

### 7.3 Plausibility

During the *input/parameterization* of the logic functions they are checked for their plausibility. The following has to be strictly observed:

- There must be no *empty elements* between the input elements.
- An equation is considered plausible when all elements used are entered completely and there are no blanks

If there is an infraction of the plausibility then the setting data is rejected.

#### Example 1: Plausibility check OK

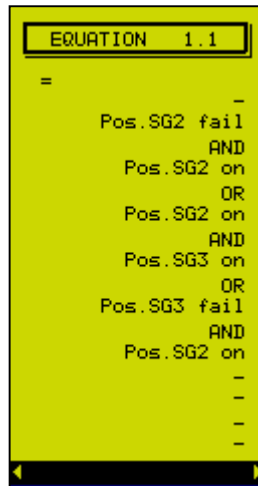


Figure 7.5: Plausibility OK

#### Example 2: Implausible data - There are blanks between the elements

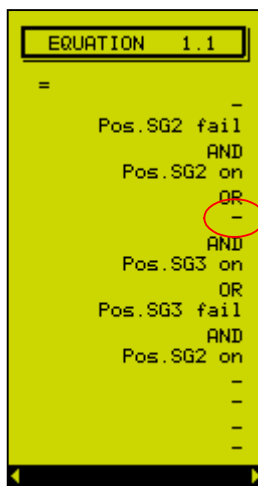


Figure 7.6: Plausibility Blanks



## 7.4 Test/Status Information

The initial status of the logic can be viewed over the *CMP*. The »STATUS« menu includes three submenus : »Digital Inputs«, »Relays« and »Logic«.

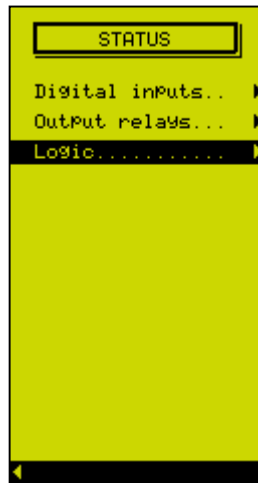


Figure 7.9: CMP Status Menu

The present status "active/inactive" of each logic output of a logic function can be viewed in the menu »LOGIC«. The function allocated to the specific logic output is also displayed.

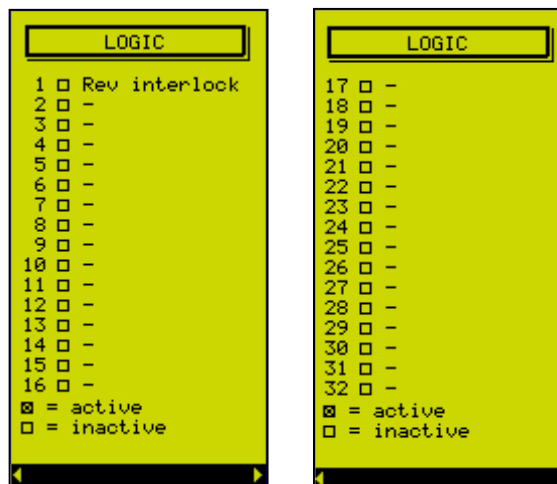


Figure 7.10: CMP Status Of the Logic Outputs

## 8 Programming Of Logic Functions Over the SL-SOFT

The entire Logic can be activated or deactivated over the parameter "Function" within the menu »LOGIC«. This parameter can be activated via the main menu of the CSP2. After the activating process the system is rebooted (about 10 s).

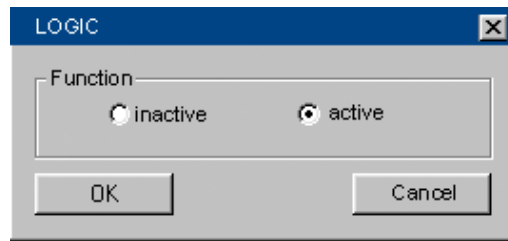


Figure 8.1: (De-)Activating the LOGIC

### 8.1 Input of the logic function (circuit equation) over the SL-SOFT

By double clicking menu item »Logic« in the tree structure, the menu »LOGIC« opens.

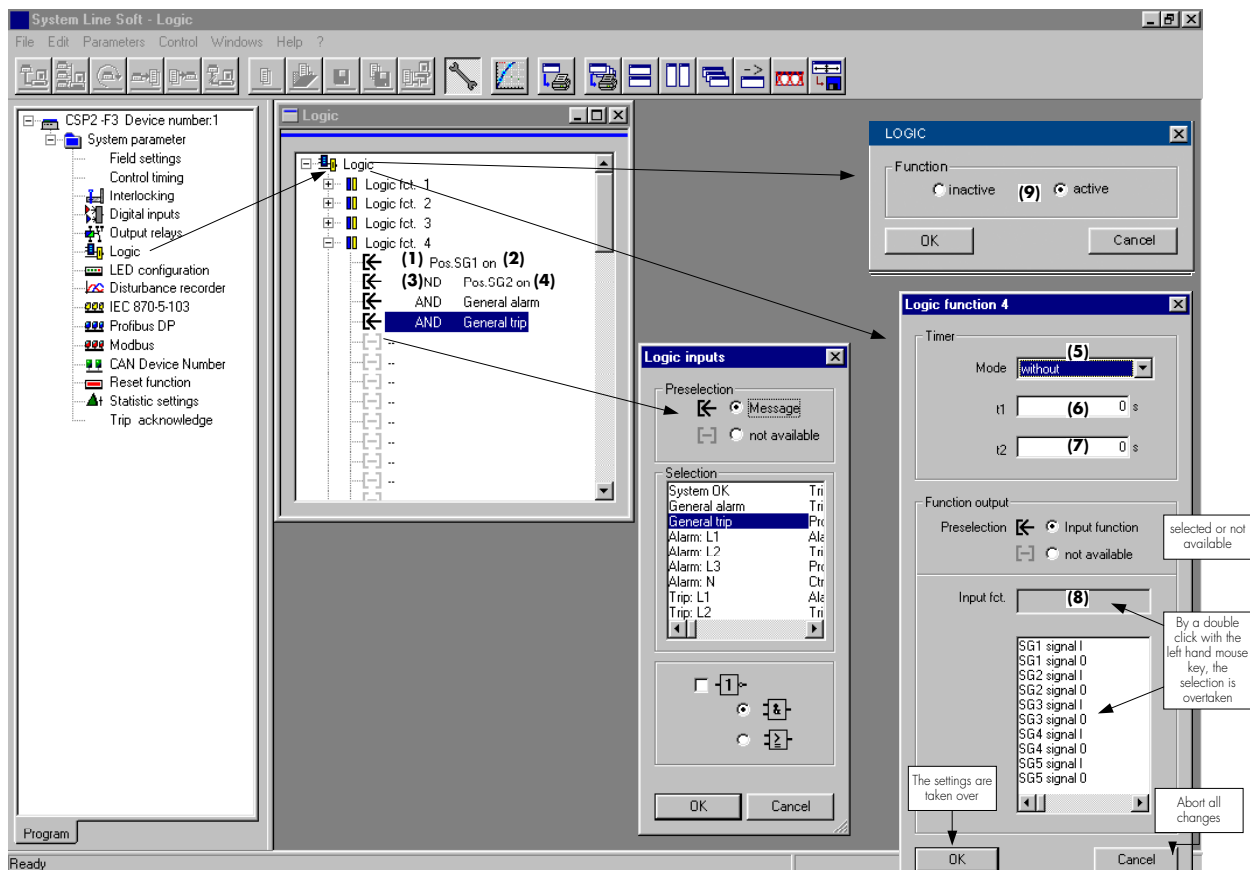


Figure 8.2: Input Of The Circuit- / Logic Equation Over The SLS

#### Programming of the logic equation (1), (2), (3), (4)

By clicking the symbol »+« in front of the wanted logic function (here: logic function 4) with the left mouse key, the corresponding logic function opens. With the left mouse key the menu for choosing the logic inputs can be reached via a click on an parametrized input element or via a click on an free input element. On the position marked with the digit (1) nothing else than "NOT" can be entered. Circuit-/Logic Equations can only be entered in the *Disjunctive Normal Form* (DNF). Hence there must not be any logic circuit before the first element, only a negation is admitted here. For the position marked with the digit (3) the desired logic circuit has to be selected.



The messages marked with digits (2) and (4) can be selected from the window »Logic Inputs«. For each element of an equation applies that firstly the logic circuit is entered and then the messages are chosen.

### Important

There should be not any space lines between the individual elements of a logic equation.

#### Setting of parameters for the time stages and the logic output (5), (6), (7), (8)

By clicking of a »Logic fct. x« with the left mouse key, the related logic window x opens. For the mode of time step (5) there is the choice between pickup- and release time delay or impulse time. The parameters for pickup time or impulse time – dependent on the operational mode selected – can be set with an accuracy of 10ms via  $t1$  (6). For the release time delay  $t2$  (7) can also be set with a definition of 10 ms. Please see chapter 7.2.1 for more information.

An input function is to be assigned to the function output from a list (8). This input function has an effect on the control unit. (See chapter 6).

### 8.1.1 Offline Mode

In order to generate a parameter set in »OFFLINE MODE« (*SL-LOGIC*) firstly the unit type the parameter set is intended for has to be selected. The parameter setting procedure is identical to the one in »Online-MODE«.

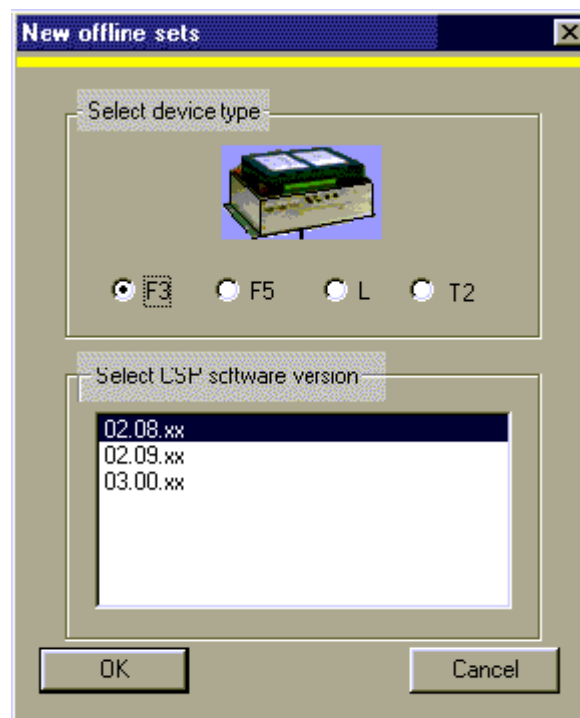


Figure 8.3: SL-LOGIC Offline-Parameter Setting Procedure

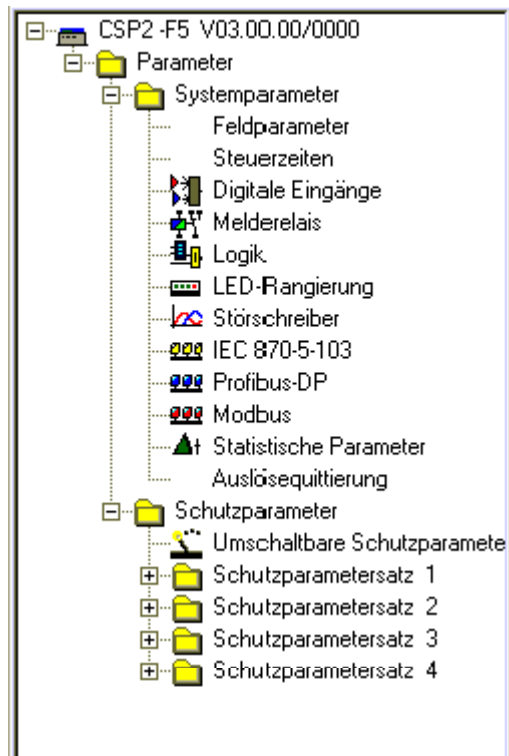


Figure 8.4: SL-LOGIC Offline-Parameter Setting Procedure - Tree Structure

## 8.2 Plausibility - Troubleshooting

### 8.2.1 Plausibility of offline parameter sets

Should the transmission of an offline prepared parameter set from the *SL-SOFT* to a *CSP* unit fail, it might be caused by the following:

1. When preparing the parameter set a wrong unit type was chosen.
2. Adverse software versions. It is not possible to transmit a parameter set based on a newer software version to a *CSP* unit operating with an older software version. In the reverse case, however, there is no problem. An older parameter set can be transmitted to a *CSP* which is operated with a more recent software version. In the latter case the parameters of this set will be transmitted with a "Default Setting".

### 8.2.2 Plausibility of the logic equations

There must be no *empty elements* between the input elements.

An equation is considered plausible when all elements used are entered completely and there are no blanks

If there is an infraction of the plausibility then the setting data is rejected.

### 8.2.3 Test

By clicking branch »Status« in the tree structure, the status of the "digital inputs", the "signal relays" and the "logic functions" can be inquired.

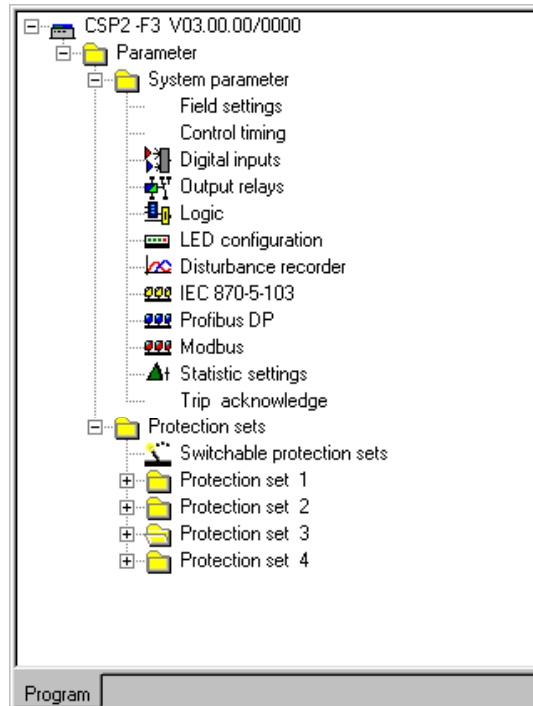


Figure 8.5: Tree Structure - Status

The present status (active/inactive) of each logic output of a logic function can be viewed in the »logic menu«. The function allocated to the specific logic output is also displayed.

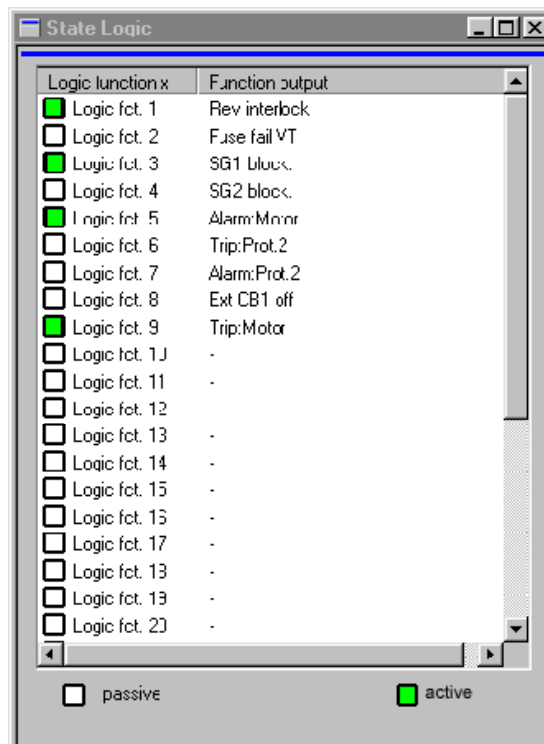


Figure 8.6: Logic Status Display

By double clicking on a logic function with the left mouse button, the input elements and their assigned functionality are shown in a pop-up window.

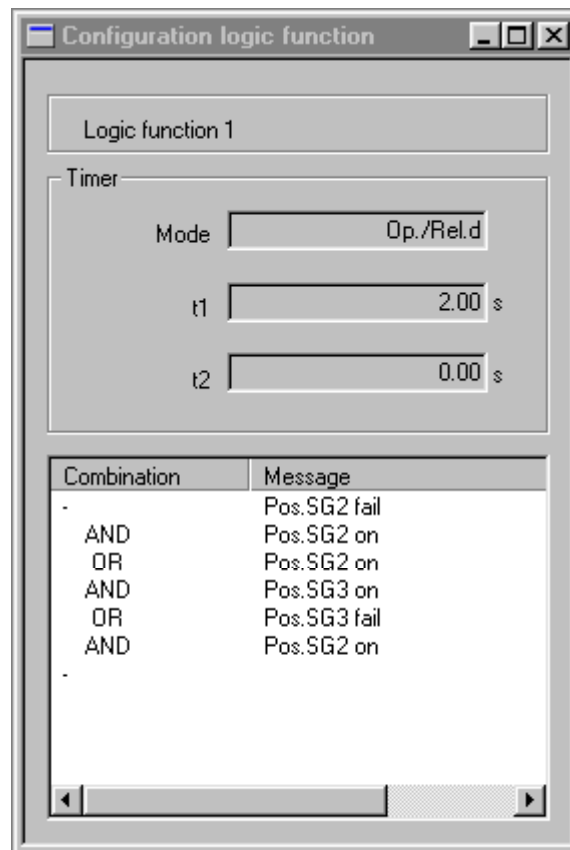


Figure 8.7: Logic - Input Elements

**Note**

In order to recognize false programming of logic equations, the correct functioning of the parameterized logic equations should be checked in the *truth table*.



**This manual undergoes continuous further development and is subject to changes, without prior notice. We reserve the right to include such changes in future editions of the manual.**



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