WOODWARD

HighPROTEC | PROTECTION TECHNOLOGY MADE SIMPLE

MCDLV4 | CABLE AND LINE DIFFERENTIAL PROTECTION SYSTEM

APPLICATION

The MCDLV4 protection system protects cables and lines up to 24 km.
The system is able to replace up to six protection devices.

  2 Cable and Line Differential Devices
+ 2 Directional Feeder Backup Devices
+ 1 In-Zone Transformer Differential Device
+ 1 Mains Decoupling Device
= 6 devices combined in one system

The protection functions of the MCDLV4 have been adapted to comply with the requirements of the VDE-AR-N-4110:2018.

CABLE AND LINE DIFFERENTIAL
→ Protection for cables and lines up to 24 km

DIRECTIONAL FEEDER BACKUP [1]
→ Six elements phase overcurrent protection directional and non-directional (ANSI/IEC/51C/51V)
→ Four elements earth fault protection [2] non-directional or directional (multi-polarising)
→ Wattmetric Ground Fault Protection
→ Two elements unbalanced load protection
→ Voltage protection [2] six elements selectable: V<, V>
→ Six elements unbalanced voltage supervision
→ Flexible Fourth Voltage measuring input [2] 2 elements VE> or VX (for synch-check)
→ Each of the six elements frequency protection can be used as: f<, f>, ROCOF, vector surge...
→ Six elements power protection each can be used as: P>, P<, Pr, Q>, Q<, Qr, S>, S<
→ Two elements power factor (PF)

IN-ZONE TRANSFORMER DIFFERENTIAL
→ Full Differential Protection for Transfomers within the line/cable

[1] DFT, True RMS or I2 based
[2] DFT or True RMS based

INTERCONNECTION/ MAINS DECOUPLING
The comprehensive interconnection package is summarized within one menu:
→ Non-discriminating active power direction depending load shedding
→ FRT (LVRT): Settable FRT-Profiles, optional AR coordinated
→ QV-Protection: Undervoltage-Reactive Power protection
→ Automatic Reconnection
→ Frequency protection: Six elements configurable as f<, f>, df/dt (ROCOF), Vector Surge *5mHz from 45-55 Hz
→ CB-Intertripping
→ Synch Check (Generator to mains, mains-to-mains), options e.g. to switch onto dead bus

TRANSFER SIGNALS AND TRANSFER TRIPS
→ Up to 16 digital signals and 4 trips can be transferred via the inter-device communication. Copper wiring is not longer required this way.

RECORDERS
→ Disturbance recorder: 120 s non volatile
→ Fault recorder: 20 faults
→ Event recorder: 300 events
→ Trend recorder: 4000 non volatile entries

IT SECURITY
→ Menu for the activation of BDEW-Whitepaper-compliant security settings (e.g. hardening of interfaces)
→ Security Logger
→ Self-monitoring; Syslog
→ Encrypted connection with smart view

LOCAL AND REMOTE COMMISSIONING SUPPORT
→ USB connection
→ Unmanned remote end parameter setting
→ Unmanned remote end monitoring
→ Unmanned remote end failure analysis
→ Customizable Display (Single-Line, ...)
→ Customizable Inserts
→ Copy and compare parameter sets
→ Configuration files are convertible
→ Forcing and disarming of output relays
→ Fault simulator: current and voltage
→ Graphical display of tripping characteristics
→ 8 languages selectable within the relay

COMMUNICATION OPTIONS
→ IEC61850
→ Profibus DP
→ Modbus RTU and/or Modbus TCP
→ IEC60870-5-103
→ IEC 60870-5-104
→ DNP 3.0 (RTU, TCP, UDP)
→ SCADApter for Retrofit

LOGIC
→ Up to 80 logic equations for protection, control and monitoring

TIME SYNCHRONISATION
→ SNTP, IRIG-B00X, Modbus, DNP 3.0, IEC60870-5-103/-104
→ Protection Communication

PC TOOLS
→ Setting and analyzing software Smart view for free
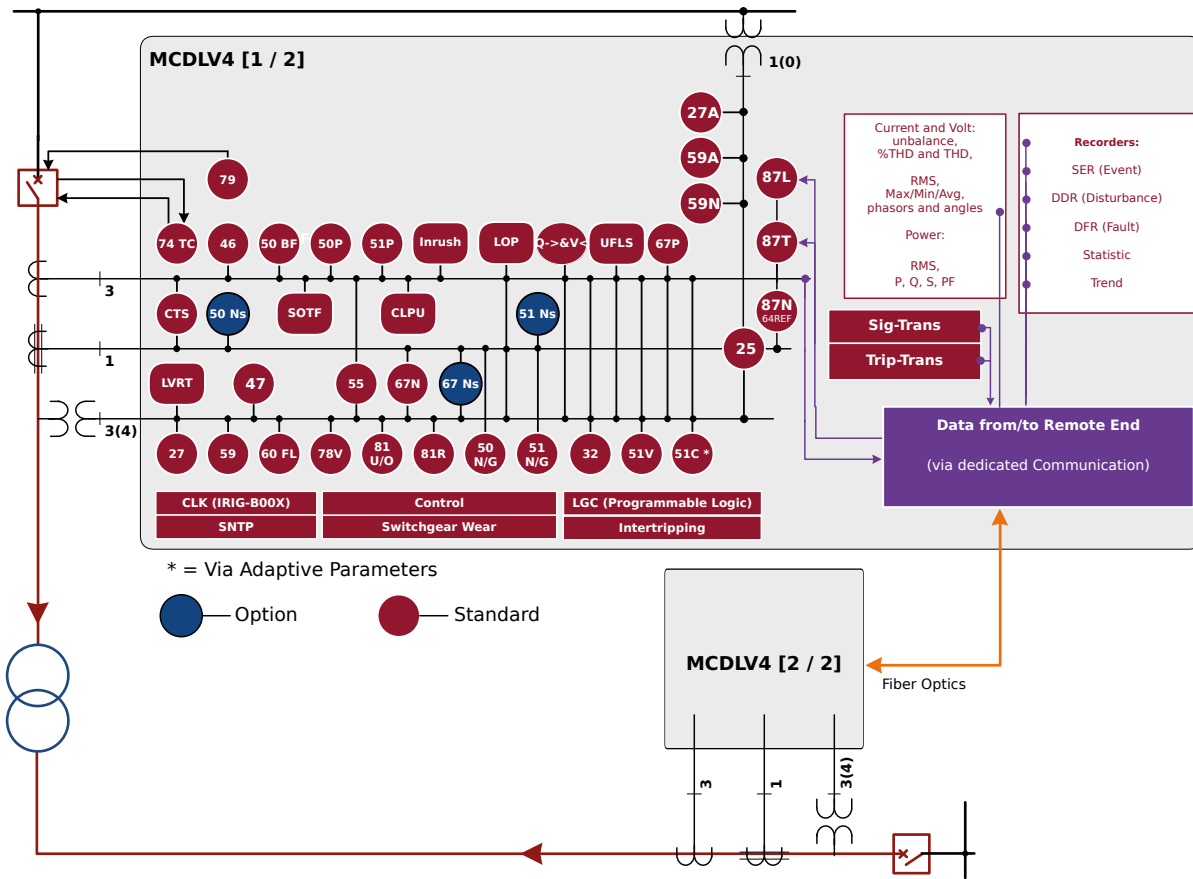→ Including page editor to design own pages

FUNCTIONAL OVERVIEW

	Elements	ANSI
Protective Functions		
Cable and Line differential protection	1	87L
In-Zone Transformer differential protection	1	87T
I, time overcurrent and short circuit protection, all elements can be configured for directional or non-directional supervision. Multiple reset options (instantaneous, definite time, reset characteristics according to IEC and ANSI).	6	50P, 51P, 67P
Voltage controlled overcurrent protection by means of adaptive parameters Voltage dependent overcurrent protection Negative phase sequence overcurrent protection		51C 51V 51Q
I2>, unbalanced load protection with evaluation of the negative phase sequence currents	2	46
IB, overload protection with thermal replica and separate pick-up values for alarm and trip functions	1	49
IH2/In, inrush detection with evaluation of the 2nd harmonic	1	Inrush
IG, earth overcurrent and short circuit protection, all elements can be configured for directional (multi-polarising) or non-directional supervision. Tremendous reset options (instantaneous, definite time, reset characteristics according to IEC and ANSI).	4	50N/G, 51N/G, 67N/G
V<, V>, V(t)<, under- and overvoltage protection, time dependent undervoltage protection	6	27, 59
Voltage asymmetry supervision (V012) V1, under and overvoltage in positive phase sequence system V2, overvoltage in negative phase sequence system	6	47
Each of the six frequency protection elements can be used as: f< fs, df, dt, ROCOF, DF/DT, vector surge, ...	6	81U/O, 81R, 78
VX, residual voltage protection or bus bar voltage for Synch Check	2	25 or 59N
AR, automatic reclosing	1	79
ExP, External alarm and trip functions	4	
PQS, Power protection	6	32, 37
PF, Power factor	2	55
FRT (optional coordination with AR-feature)	27 (t)	27 (t, AR)
Q(V) Protection (undervolt. dep. directional reactive power protection)	1	
Reconnection Module	2	
UFLS (non-discriminating active power direction depending load shedding)	1	
10-Minutes-Mean-Square-Sliding Supervision: adjustable according to VDE-AR 4105	1	
Synch Check	1	25
V/f (Overexitation)	2	24
Control and Logic		
Control: Position indication, supervision time management and interlockings for up to 6 breakers		
Logic: Up to 80 logic equations, each with 4 inputs, selectable logical gates, timers and memory function		
Supervision Functions		
CBF, circuit breaker failure protection	1	50BF
TCS, trip circuit supervision	1	74TC
LOP, loss of potential	1	60FL
FF, fuse failure protection via digital input	1	60FL
CTS, current transformer supervision	1	60L
CLPU, cold load pickup	1	
SOTF, switch onto fault	1	
Demand management and peak value supervision (current and power)	1	
THD supervision	1	
Breaker wear with programmable wear curves	1 / Bkr	
Recorders: Disturbance recorder, fault recorder, event recorder, trend recorder	1	

FUNCTIONAL OVERVIEW IN ANSI FORM

MCDLV4 [1 / 2]

1(0)

27A
59A
59N
87L
87T
87N 64REF
25

79
74 TC | 46 | 50 BF | 50P | 51P | Inrush | LOP | Q->&V< | UFLS | 67P
CTS | 50 Ns | SOTF | CLPU | 51 Ns
LVRT | 47 | 55 | 67N | 67 Ns
27 | 59 | 60 FL | 78V | 81 U/O | 81R | 50 N/G | 51 N/G | 32 | 51V | 51C *

3
1
3(4)

Current and Volt:
unbalance,
%THD and THD,

RMS,
Max/Min/Avg,
phasors and angles

Power:

RMS,
P, Q, S, PF

Recorders:

SER (Event)
DDR (Disturbance)
DFR (Fault)
Statistic
Trend

Sig-Trans
Trip-Trans

Data from/to Remote End

(via dedicated Communication)

CLK (IRIG-B00X) | Control | LGC (Programmable Logic)
SNTP | Switchgear Wear | Intertripping

* = Via Adaptive Parameters

● —— Option
● —— Standard

MCDLV4 [2 / 2]

3
1
3(4)

Fiber Optics

APPROVALS

CE

UL
certified regarding UL508 (Industrial Controls)

CSA
certified regarding CSA-C22.2 No. 14 (Industrial Controls)

EAC
certified by EAC (Eurasian Conformity)

Type tested regarding IEC 60255-1 and regarding IEC 61850
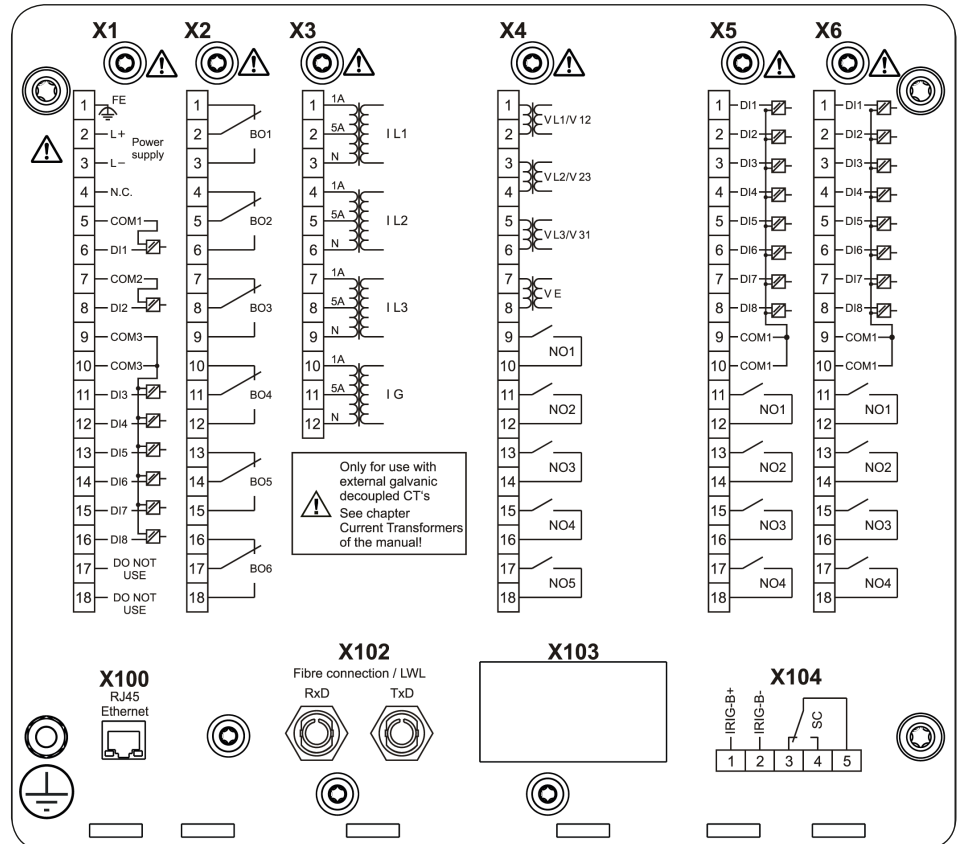
TÜV NORD CERT GmbH
Grid Code Compliant
certified regarding „BDEW-Richtlinie für Erzeugungsanlagen am Mittelspannungsnetz", Ausgabe Juni 2008 (German grid code standard)

complies with IEEE 1547-2003 amended by IEEE 1547a-2014

complies with ANSI C37.90-2005

complies with „Engineering Recommendation G59, Issue 3, Amendment 4, July 2018"

CONNECTIONS *(EXAMPLE)*

X1
1 FE
2 L+ — Power supply
3 L–
4 N.C.
5 COM1
6 DI1
7 COM2
8 DI2
9 COM3
10 COM3
11 DI3
12 DI4
13 DI5
14 DI6
15 DI7
16 DI8
17 DO NOT USE
18 DO NOT USE

X2
1
2 BO1
3
4
5 BO2
6
7
8 BO3
9
10
11 BO4
12
13
14 BO5
15
16
17 BO6
18

X3
1 1A
2 5A — I L1
3 N
4 1A
5 5A — I L2
6 N
7 1A
8 5A — I L3
9 N
10 1A
11 5A — I G
12 N

Only for use with external galvanic decoupled CT's
See chapter Current Transformers of the manual!

X4
1 V L1/V 12
2
3 V L2/V 23
4
5 V L3/V 31
6
7 V E
8
9 NO1
10
11 NO2
12
13 NO3
14
15 NO4
16
17 NO5
18

X5
1 DI1
2 DI2
3 DI3
4 DI4
5 DI5
6 DI6
7 DI7
8 DI8
9 COM1
10 COM1
11 NO1
12
13 NO2
14
15 NO3
16
17 NO4
18

X6
1 DI1
2 DI2
3 DI3
4 DI4
5 DI5
6 DI6
7 DI7
8 DI8
9 COM1
10 COM1
11 NO1
12
13 NO2
14
15 NO3
16
17 NO4
18

X100
RJ45
Ethernet

X102
Fibre connection / LWL
RxD   TxD

X103

X104
IRIG-B+ | IRIG-B- | SC
1 | 2 | 3 | 4 | 5

ORDER FORM MCDLV4

Line differential protection					MCDLV4	-2				

Version 2 with USB, enhanced communication and user options

Voltage measuring	Digital Inputs	Binary output relays	Housing	Large display		
X	8	7	B2	X		A
X	16	13	B2	X		D
X	24	20	B2	X		E

Hardware variant 2

Phase Current 5 A/1 A, Ground Current 5 A/1 A	0
Phase Current 5 A/1 A, Sensitive Ground Current 5 A/1 A	1

Housing and mounting

Door mounting	A
Door mounting 19" (flush mounting)	B

Interdevice Communication

LC duplex connector, mono mode (up to 24 km), multi mode (up to 4 km)	0
ST connector, BFOC2.5, multi mode (up to 2 km)	1

Communication protocol

Without protocol	A
Modbus RTU, IEC60870-5-103, DNP3.0 RTU | *RS485/terminals*	B*
Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 | *Ethernet 100 MB/RJ45*	C*
Profibus-DP | *optic fiber/ST-connector*	D*
Profibus-DP | *RS485/D-SUB*	E*
Modbus RTU, IEC60870-5-103, DNP3.0 RTU | *optic fiber/ST-connector*	F*
Modbus RTU, IEC60870-5-103, DNP3.0 RTU | *RS485/D-SUB*	G*
IEC61850, Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 | *Ethernet 100MB/RJ45*	H*
IEC60870-5-103, Modbus RTU, DNP3.0 RTU | *RS485/terminals* Modbus TCP, DNP3.0 TCP/UDP, IEC60870-5-104 | *Ethernet 100 MB/RJ45*	I*
IEC61850, Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 | *Optical Ethernet 100MB/LC duplex connector*	K*
Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 | *Optical Ethernet 100MB/LC duplex connector*	L*
IEC60870-5-103, Modbus RTU, DNP3.0 RTU | *RS485/terminals* IEC61850, Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 | *Ethernet 100 MB/RJ45*	T*

Harsh Environment Option

None	A
Conformal Coating	B

Available menu languages (in every device)

English / German / Spanish / Russian / Polish / Portuguese / French / Romanian

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

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

Current inputs	4 (1 A and 5 A) with automatic CT Disconnect
Voltage inputs	4 (0–800 V, or 0–300 V for Type "E" with enhanced digital inputs and outputs)
Digital Inputs	Switching thresholds adjustable via software
Power supply	Wide range power supply
	24 V_{DC} – 270 V_{DC} / 48 V_{AC} – 230 V_{AC} (–20/+10%)
Terminals	All terminals plug type
Type of enclosure	IP54

Dimensions of housing
 (W x H x D)
	19" flush mounting: 212.7 mm × 173 mm × 208 mm
	  8.374 in. × 6.811 in. × 8.189 in.
	 Door mounting: 212.7 mm × 183 mm × 208 mm
	  8.374 in. × 7.205 in. × 8.189 in.

Weight (max. components)	approx. 4.2 kg / 9.259 lb

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