

- ▶ VDE-AR-N 4110:2018
- ▶ G99 Issue 1 Amendment 6
- ▶ Improved frequency and ROCOF precision
- ▶ Improved CT Saturation Stabilization
- ▶ Improved design of the PC tools
- ▶ Configurable SCADA protocols:
- ▶ Modbus, Profibus, IEC 60870-5-103/-104, DNP3

All HighPROTEC devices have been type tested and certified by KEMA Laboratories (IEC 60255-1:2009).

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 4th Voltage measuring input ⁽²⁾ 2 elements VE> or VX (for synchro-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 Transformers within the line/cable

TRANSFER SIGNALS AND TRANSFER TRIPS

- ▶ Up to 16 digital signals and 4 trips can be transferred via the inter-device communication. Copper wiring is no longer required this way.

INTERCONNECTION MAINS DECOUPLING

- ▶ 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: 6 elements configurable as f<, f>, df/dt (ROCOF), vector surge
- ▶ CB-Intertripping
- ▶ Synchro-check (Generator to mains, mains-to-mains), options e.g. to switch onto dead bus

RECORDERS

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

PC TOOLS

- ▶ Setting and analyzing software Smart view free of charge
- ▶ Including page editor to design own Control pages
- ▶ SCADApter to re-assign datapoints for Retrofit projects: Modbus, Profibus, IEC 60870-5-103/-104

CONTROL

- ▶ up to six breakers (or isolators/grounding switches)
- ▶ Breaker wear

COMMISSIONING SUPPORT

- ▶ Unmanned remote end settings
- ▶ 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, voltage
- ▶ Graphical display of tripping characteristics
- ▶ 8 languages selectable within the relay

COMMUNICATION OPTIONS

- ▶ IEC 61850, Profibus DP
- ▶ Modbus RTU and/or Modbus TCP
- ▶ IEC 60870-5-103/-104
- ▶ DNP 3.0 (RTU, TCP, UDP)
- ▶ SCADApter for Retrofit

CYBER SECURITY

- ▶ Menu for the activation of security settings (e. g. hardening of interfaces)
- ▶ Security Logger
- ▶ Centralized Security Logs (Syslog)
- ▶ Encrypted Connection Smart view - Device
- ▶ Device specific certificates (No man in the middle attacks)
- ▶ Multi-Password-Level

LOGIC

- ▶ Up to 80 logic equations for protection, control and monitoring

TIME SYNCHRONISATION

- ▶ SNTP, IRIG-B00X, Modbus, DNP 3.0, IEC 60870-5-103/-104

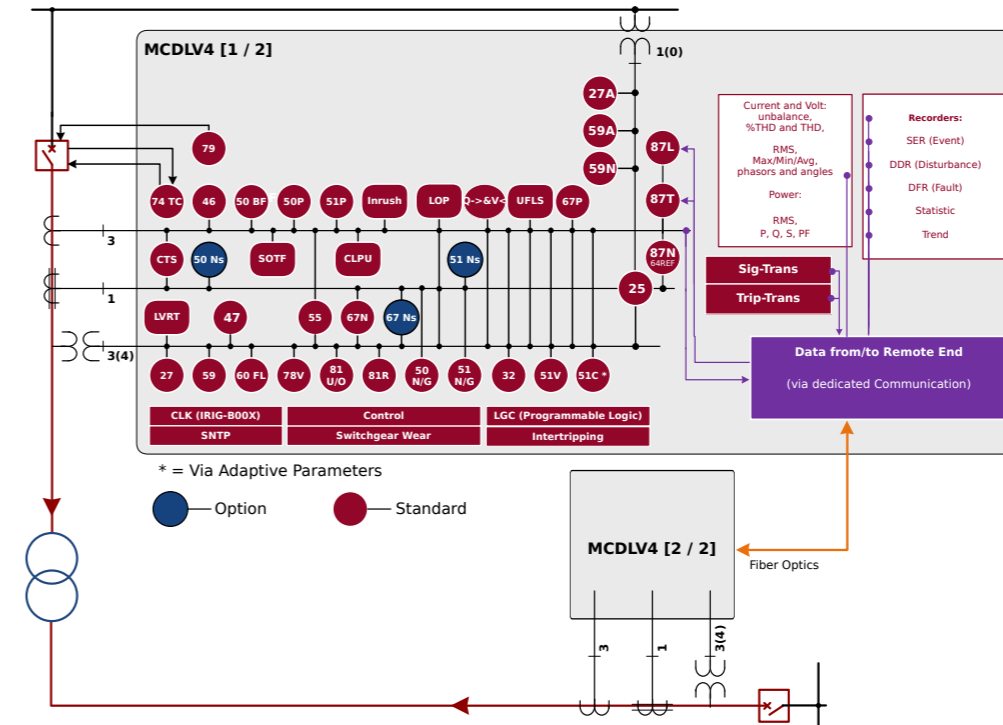
⁽¹⁾ DFT, True RMS or I2 based

⁽²⁾ DFT or True RMS based

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		51C
Voltage dependent overcurrent protection		51V
Negative phase sequence overcurrent protection		51Q
I _{2>} , unbalanced load protection with evaluation of the negative phase sequence currents	2	46
I _B , overload protection with thermal replica and separate pick-up values for alarm and trip functions	1	49
I _{H2} /I _n , inrush detection with evaluation of the 2nd harmonic	1	Inrush
I _G , 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 (Overexcitation)	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	

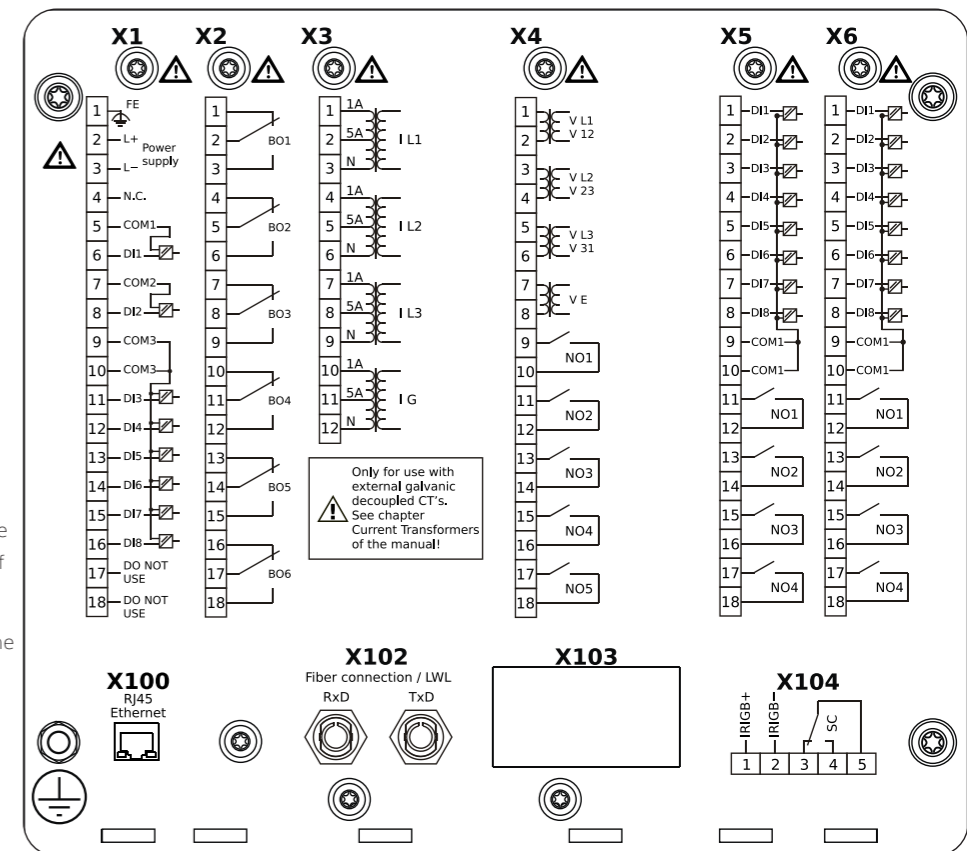
FUNCTIONAL OVERVIEW IN ANSI / IEEE C37.2 FORM



APPROVALS / STANDARDS

- CE** certified regarding UL508 (Industrial Controls)
- UL** certified regarding CSA-C22.2 No. 14 (Industrial Controls)
- SA** certified by EAC (Eurasian Conformity)
- EAC** Type tested and certified by KEMA Laboratories in accordance with the complete type test requirements of IEC 60255-1:2009.
- KEMA** Component certificate regarding the German grid code standard VDE-AR-N 4110 (2018-11)

CONNECTIONS (EXAMPLE)



Complies with IEEE 1547-2003.
 Amended by IEEE 1547a-2014.
 Complies with ANSI C37.90-2005.
 Complies with "Engineering Recommendation G99 Issue 1 Amendment 6 - March 2020".

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						
Housing suitable for door mounting					A	
Housing suitable for 19" rack 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 <i>RS485/terminals</i>					B*	
Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 <i>Ethernet 100 MB/RJ45</i>					C*	
Profibus-DP <i>optic fiber/ST-connector</i>					D*	
Profibus-DP <i>RS485/D-SUB</i>					E*	
Modbus RTU, IEC60870-5-103, DNP3.0 RTU <i>optic fiber/ST-connector</i>					F*	
Modbus RTU, IEC60870-5-103, DNP3.0 RTU <i>RS485/D-SUB</i>					G*	
IEC61850, Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 <i>Ethernet 100MB/RJ45</i>					H*	
IEC60870-5-103, Modbus RTU, DNP3.0 RTU <i>RS485/terminals</i>					I*	
Modbus TCP, DNP3.0 TCP/UDP, IEC60870-5-104 <i>Ethernet 100 MB/RJ45</i>					J*	
IEC61850, Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 <i>Optical Ethernet 100MB/LC duplex connector</i>					K*	
Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 <i>Optical Ethernet 100MB/LC duplex connector</i>					L*	
IEC60870-5-103, Modbus RTU, DNP3.0 RTU <i>RS485/terminals</i>					M*	
IEC61850, Modbus TCP, DNP3.0 TCP/UDP, IEC60870-5-104 <i>Ethernet 100 MB/RJ45</i>					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, for variants MCDLV4-2A and MCDLV4-2D) or 4 (0 ... 300 V, for variant MCDLV4-2E)
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 x 173 mm x 208 mm 8.374 in. x 6.811 in. x 8.189 in. Door mounting: 212.7 mm x 183 mm x 208 mm 8.374 in. x 7.205 in. x 8.189 in.
Weight (max. components)	approx. 4.2 kg / 9.259 lb

19 " Variants Available! **



<https://docs.SEGelectronics.de/hpt-2>

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