SEG electronics

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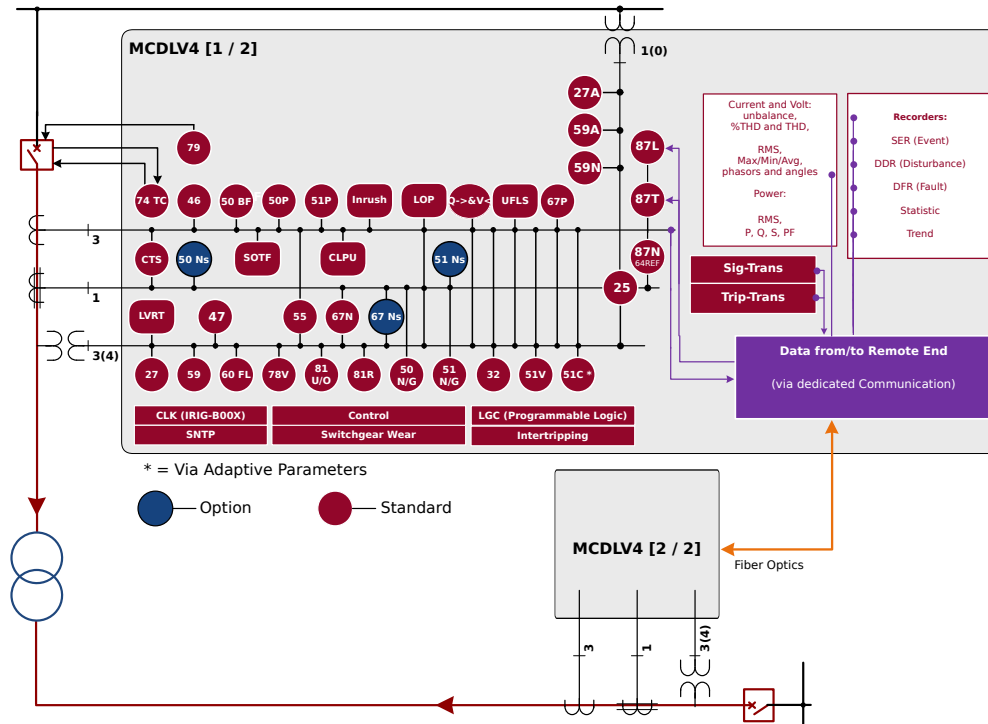
‣ SNTP, IRIG-B00X, Modbus, DNP 3.0, IEC 60870-5-103/-104

[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
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		

	Elements	ANSI
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

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 *

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]

Fiber Optics

3
1
3(4)

APPROVALS / STANDARDS

CE

certified regarding UL508
(Industrial Controls)

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

certified by EAC
(Eurasian Conformity)

KEMA
Type tested and certified by KEMA
Laboratories in accordance with the
complete type test requirements of
IEC 60255-1:2009.

Component certificate regarding the
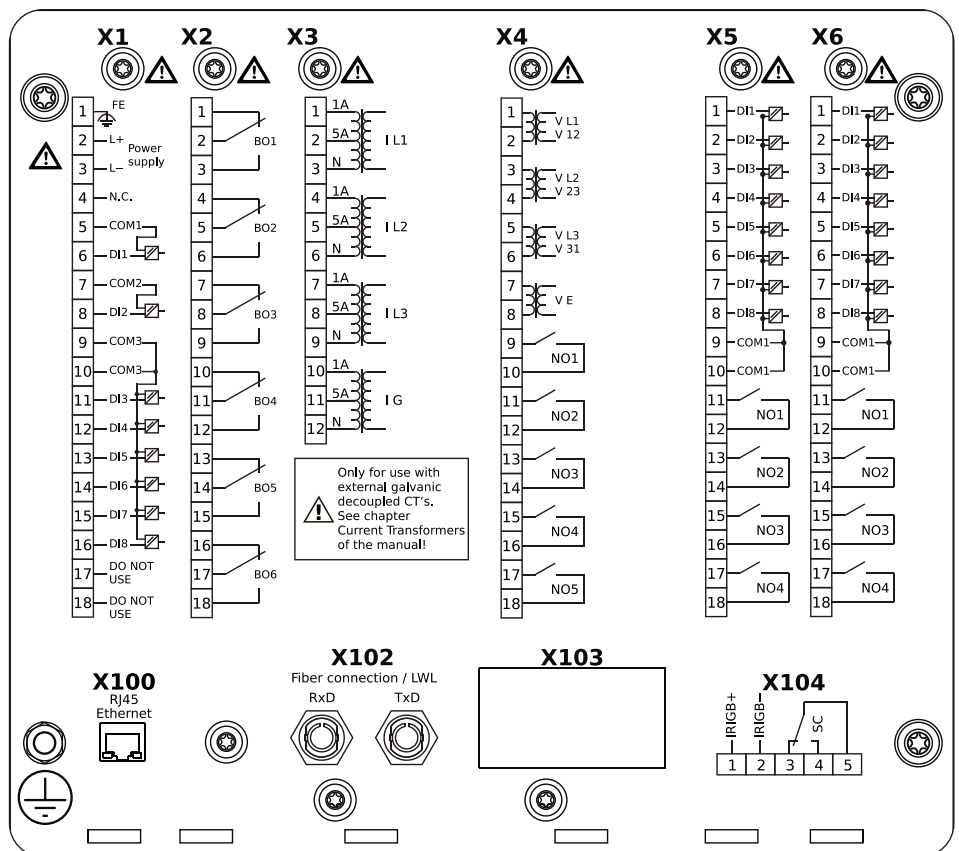German grid code standard
VDE-AR-N 4110 (2018-11)

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".

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
2 V 12
3 V L2
4 V 23
5 V L3
6 V 31
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
Fiber connection / LWL
RxD   TxD

X103

X104
IRIGB+ | IRIGB− | 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		
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 | *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, IEC60870-5-104 | *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, for variants MCDLV4-2**A** and MCDLV4-2**D**)
	or 4 (0 … 300 V, for variant MCDLV4-2**E**)
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	19" flush mounting: 212.7 mm × 173 mm × 208 mm
(W x H x D)	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

19 " Variants Available! **

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

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