SEG electronics

HighPROTEC | PROTECTION TECHNOLOGY MADE SIMPLE

MCDTV4 | TRANSFORMER DIFFERENTIAL PROTECTION

APPLICATION

The MCDTV4 offers an all-in-one solution for HV, MV and LV transformers and it offers much more than just a differential protection package.

Furthermore it can detect critical operation states based on voltage measurement (e.g. Overexcitation). The MCDTV4 provides in addition to that an Interconnection package. This can be used for mains protection at the point of common coupling (e.g. for directional reactive power undervoltage protection). The integrated backup protection package enables the MCDTV4 to act as backup protection (e.g. for downstream breakers). Additional features like demand management are available without extra charge. The protection functions of the MCDTV4 have been adapted to comply with the requirements of the VDE-AR-N-4110:2018.

COMPREHENSIVE TRANSFORMER PROTECTION PACKAGE

‣ The Phase and Ground Differential protection package detects electrical faults within the transformer.
‣ Two elements overexcitation protection (overfluxing)
‣ Overload / Thermal replica for detection of long lasting minor overcurrents Six elements (voltage dependent) time overcurrent protection (ANSI / IEC / 51C / 51V)
‣ Frequency measurement improved (5mHz from 45-55 Hz)
‣ Multiple power elements (Pr, P, Q, S, PF…)
‣ Negative phase sequence protection
‣ Multi level overvoltage protection with settable reset ratio
‣ Multi level undervoltage protection with settable reset ratio
‣ Buchholz supervision via digital input
‣ Unbalanced voltage protection
‣ Optional temperature supervision via external URTD-box with 12 sensors
‣ Wattmetric Ground Fault Protection

INTERCONNECTION PACKAGE

‣ 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)

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

‣ 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 BDEW-White-paper-compliant 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
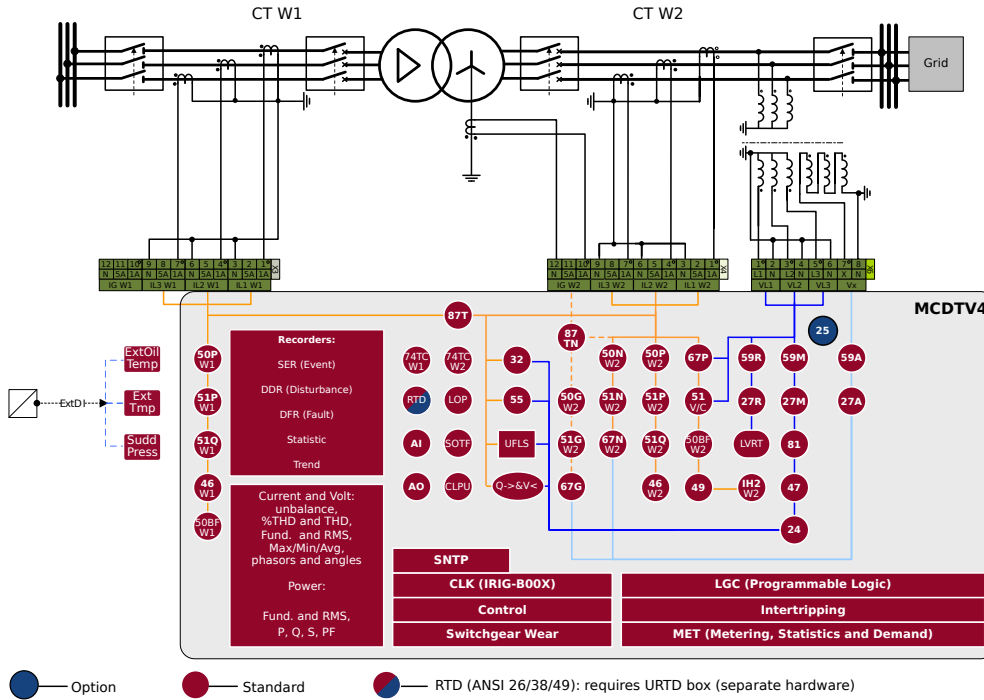
TIME SYNCHRONISATION

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

FUNCTIONAL OVERVIEW

	Elements	ANSI
Protective Functions		
Transformator differential protection, Id>, Id>>	2	87T
Restricted earth fault IdE>, IdE>>	4	87TN / 64REF
I, time overcurrent and short circuit protection Tremendous 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
ThR, 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	2	Inrush
IG, earth overcurrent and short circuit protection, all elements can be configured for directional (multi-polarising) or non-directional supervision. Multiple reset options (instantaneous, definite time, reset characteristics according to IEC and ANSI)	4	50N/G, 51N/G, 67N/G
IE, sensitive wattmetric earth overcurrent- and short circuit trip, all steps directional or non-directional	4	50Ns, 51Ns, 67Ns
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<, f>, df, dt, ROCOF, DF/DT, vector surge, ...	6	81U/O, 81R, 78
VX, residual voltage protection or bus bar voltage for Synch Check	2	27A, 59A, 59N
ExP, External alarm and trip functions	4	
Ext Sudd Press: Embedding sudden pressure via Digital Input	1	
Ext Temp Superv: Embedding external temperature supervision via Digital Input	3	
Ext Oil Temp: Embedding external oil temperature via Digital Input	1	
PQS, Power protection	6	32, 37
PF, Power factor	2	55
LVRT (FRT- Low Voltage Ride Through including optional controlled by AR-feature)	27 (t)	27 (t, AR)
Q(V) Protection (undervolt. dep. directional reactive power protection with reclosing disengaging)		
UFLS (non-discriminating active power direction depending load shedding)		
10-Minutes-Mean-Square-Sliding Supervision: adjustable according to VDE-AR 4105		
Synch Check		25
Volts / Hertz	2	24
RTD temperature supervision via optional RTD-Box with 12 sensors		26
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	2	50BF / 62BF
TCS, trip circuit supervision	2	74TC
LOP, loss of potential	1	60FL
FF, fuse failure protection via digital input	1	60FL
CTS, current transformer supervision	2	60L
CLPU, cold load pickup	1	
SOTF, switch onto fault	1	
THD supervision		
Breaker wear with programmable wear curves		
Recorders: Disturbance recorder, fault recorder, event recorder, trend recorder		

The protective functions of the MCDTV4 have been extended to meet the requirements of VDE-AR-N-4110:2018.

FUNCTIONAL OVERVIEW IN ANSI / IEEE C37.2 FORM

CT W1   CT W2

Grid

MCDTV4

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

Current and Volt:
unbalance,
%THD and THD,
Fund. and RMS,
Max/Min/Avg,
phasors and angles

Power:
Fund. and RMS,
P, Q, S, PF

ExtOil Temp
Ext Tmp
Sudd Press

ExtDI

87T · 87TN · 25
74TC W1 · 74TC W2 · 32 · 50N W2 · 50P W2 · 67P · 59R · 59M · 59A
RTD · LOP · 55 · 50G W2 · 51N W2 · 51P W2 · 51 V/C · 27R · 27M · 27A
AI · SOTF · UFLS · 51G W2 · 67N W2 · 51Q W2 · 50BF W2 · LVRT · 81
AO · CLPU · Q->&V< · 67G · 46 W2 · 49 · IH2 W2 · 47
24

50P W1 · 51P W1 · 51Q W1 · 46 W1 · 50BF W1

SNTP
CLK (IRIG-B00X)   LGC (Programmable Logic)
Control   Intertripping
Switchgear Wear   MET (Metering, Statistics and Demand)

● Option   ● Standard   ◐ RTD (ANSI 26/38/49): requires URTD box (separate hardware)

APPROVALS / STANDARDS

CE

UL — certified regarding UL508 (Industrial Controls)

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

EAC — 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.

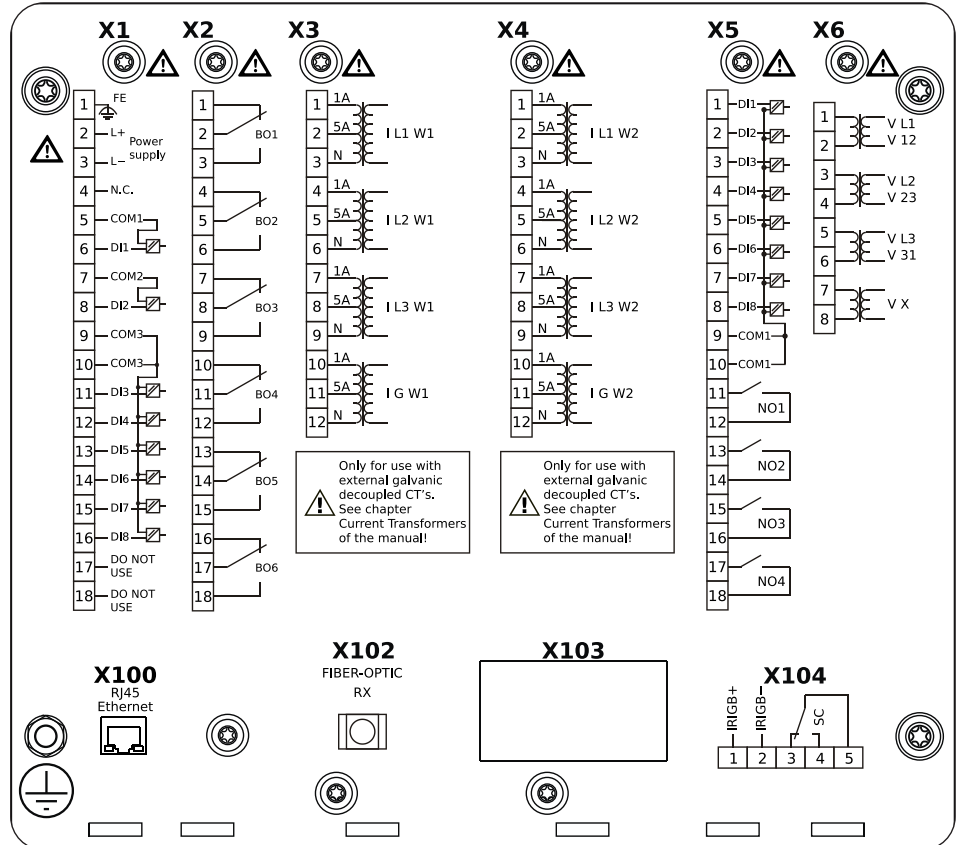Fulfills the requirements of the German grid code standard VDE-AR-N 4110 (2018-11)

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

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 W1
3 N
4 1A
5 5A — I L2 W1
6 N
7 1A
8 5A — I L3 W1
9 N
10 1A
11 5A — I G W1
12 N

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

X4
1 1A
2 5A — I L1 W2
3 N
4 1A
5 5A — I L2 W2
6 N
7 1A
8 5A — I L3 W2
9 N
10 1A
11 5A — I G W2
12 N

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

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 V L1
2 V 12
3 V L2
4 V 23
5 V L3
6 V 31
7 V X
8

X100
RJ45 Ethernet

X102
FIBER-OPTIC RX

X103

X104
IRIGB+
IRIGB−
SC
1 2 3 4 5

ORDER FORM MCDTV4

Transformer Differential Protection					MCDTV4	-2				
Version 2 with USB, enhanced communication and user options										

Digital Inputs	Binary output relays	Analog Inputs/Outputs	Housing	Large Display		
16	11	0/0	B2	X		A
8	11	2/2	B2	X		B

Hardware variant 2

Phase Current 5 A/1 A, Ground Current 5 A/1 A	0
Phase Current 5 A/1 A, W1 Sen. Gr. Curr. 5 A/1 A, W2 Gr. Curr. 5 A/1 A	1
Phase Current 5 A/1 A, W1 Gr. Curr. 5 A/1 A, W2 Sen. Gr. Curr. 5 A/1 A	2
Phase Current 5 A/1 A, W1/W2 Sen. Gr. Curr. 5 A/1 A	3

Housing and mounting

Housing suitable for door mounting	A
Housing suitable for 19" rack mounting **	B

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)
Digital Inputs	Switching thresholds adjustable via software
Analog Inputs (Type B)	0 … 20mA / 4 … 20mA / 0 … 10V
Analog outputs (Type B)	0 … 20mA / 4 … 20mA / 0 … 10V
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. 4.7 kg / 10.36 lb

**19 " Variants Available! **

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

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Subject to alterations, errors excepted.

DOK-FLY-MCDTV4-2E_Rev. M