Released

WOODWARD

HighPROTEC | PROTECTION TECHNOLOGY MADE SIMPLE

MCDGV4 | GENERATOR DIFFERENTIAL PROTECTION

NEW FEATURES - Release 3.6

- VDE-AR-N 4110
- Wattmetric Ground Fault Protection
- IEC 60870-5-104
- SCADApter for Retrofit
- Usability improvements
- IT Security
- Improved Frequency and ROCOF precision*

APPLICATION

The generator differential protection relay MCDGV4 is a high precision protection for medium and high power generators. The step-up transformer can be integrated into the protection zone (unit protection/ block protection). In addition to the phase and earth differential protection, the device provides a variety of generator-specific protection functions.
The "all-inclusive" package comprises also phase, earth current, voltage, frequency and power protection. In addition to that the device offers an undervoltage directional reactive power protection with reconnection function and an adjustable Fault Ride Through (FRT) with AR detection.
The intuitive operating concept with plausibility checks and extensive commissioning functions such as the built-in fault simulator allows a safe and time-optimized maintenance and commissioning. The parameter setting and evaluation software Smart view SE can be used consistently across the entire family of devices.

COMPREHENSIVE GENERATOR PROTECTION PACKAGE

- The phase and ground differential protection package detects electrical faults within the generator or within the generator and the step-up transformer (unit protection)
- Two elements overexcitation protection (overfluxing) e. g. for the protection of the step-up transformer during run-up (V/f)
  *i5mHz from 45-55 Hz
- Two elements underexcitation in order to detect faulty excitation
- Overload (Stator) / Thermal replica for the detection of long lasting minor overcurrents
- Six elements (voltage dependent) overcurrent protection (ANSI / IEC / 51C / 51V)
- Multiple reverse power elements for the protection of the prime mover (Pr, P, Q, S, PF…)
- Negative phase sequence protection
- Two elements phase distance protection
- Out of step tripping
- Power swing blocking
- 100% Stator ground fault protection (via third harmonic)
- Multi level overvoltage protection with settable reset ratio in order to protect the stator winding and the step-up transformer against inadmissable voltages
- Multi level undervoltage protection with settable reset ratio
- Wattmetric Ground Fault Protection
- Inadvertent energization detection in order to detect the inadvertent supply of the mains voltage to the generator during standstill
- Buchholz supervision via digital input
- Unbalanced voltage protection
- Multi-Password-Level
- Optional temperature supervision via external URTD-box with 12 sensors

INTERCONNECTION PACKAGE

The comprehensive interconnection package is summarized within one menu:

- FRT (LVRT): Settable FRT-Profiles, optional AR coordinated
- QV-Protection: Undervoltage-Reactive Power protection
- Automatic Reconnection
- Considerably frequency protection package: Six elements configurable as f<, f>, df/dt (ROCOF), Vector Surge
- CB-Intertripping
- Synch 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

TIME SYNCHRONISATION

- SNTP, IRIG-B00X, Modbus, DNP 3.0, IEC60870-5-103/-104

COMMISSIONING SUPPORT

- USB connection
- Customizable Display (Single-Line, ...)
- Customizable Inserts
- Intergrated fault simulator: current and voltage
- Copy and compare parameter sets
- Configuration files are convertible
- Forcing and disarming of output relays
- Graphical display of tripping characteristics
- 8 languages selectable within the relay

COMMUNICATION OPTIONS

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

IT SECURITY

- Menu for the activation of BDEW-Whitepaper-compliant security settings
- Security Logger
- Self-monitoring; Syslog
- Encrypted connection with Smart view

CONTROL

- of up to six breakers (or isolators/ grounding switches)
- Breaker wear
- Exchange of single lines

LOGIC

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

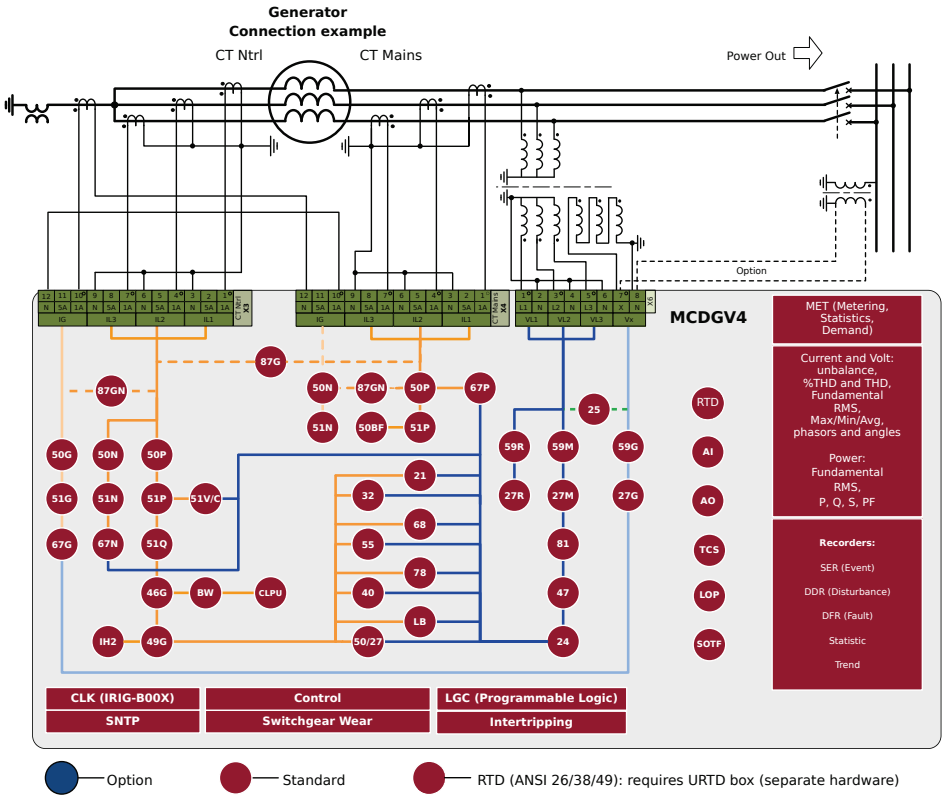
PC TOOLS

- Setting and analyzing software Smart view free of charge
- Including Page Editor to design own pages

FUNCTIONAL OVERVIEW

	Elements	ANSI
Protective Functions		
Generator differential protection, Id>, Id>>	2	87G
Generator- and step-up transformer differential protection (block/unit protection)		87GT
Restricted earth fault IdE>, IdE>>	4	64REF / 87N
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	
Generator unbalanced	1	46G
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
IE, sensitive 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< fs, df, dt, ROCOF, DF/DT, vector surge, ...	6	81U/O, 81R, 78
VX, residual voltage protection or bus bar voltage for Synch Check or 100% - stator ground fault via evaluation of third harmonic	2	27TN / 27A / 59A / 59N
Phase distance (backup) protection	2	21P
Power swing blocking		68
Load blinder		
Out of step tripping (pole-slip protection)		78
ExP, External alarm and trip functions	4	
PQS, Power protection	6	32, 37
PF, Power factor	2	55
FRT (Fault Ride Through including controlled by AR-feature)	27 (t)	27 (t, AR)
Q(V) Protection (undervolt. dep. directional reactive power protection with reclosing disengaging)		
10-Minutes-Mean-Square-Sliding Supervision: adjustable according to VDE-AR 4105		
Synch Check		25
Volts / Hertz	2	24
Loss of field (excitation)	2	40
Inadvertent energization		50/27
Optional Supplemental Devices		
URTD box: RTD temperature supervision via optional RTD-Box with 12 sensors		26
XR1: Rotor earth fault protection (DIN-Rail-Mounting)		64R
XE2DC: DC current - Loss of excitation, rotating diode failure detection (DIN-Rail-Mounting)		24, 40, 56
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	
THD supervision		
Breaker wear with programmable wear curves		
Recorders: Disturbance recorder, fault recorder, event recorder, trend recorder		
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		

FUNCTIONAL OVERVIEW IN ANSI FORM



APPROVALS

certified regarding UL508 (Industrial Controls)

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

Type tested according to IEC60255-1

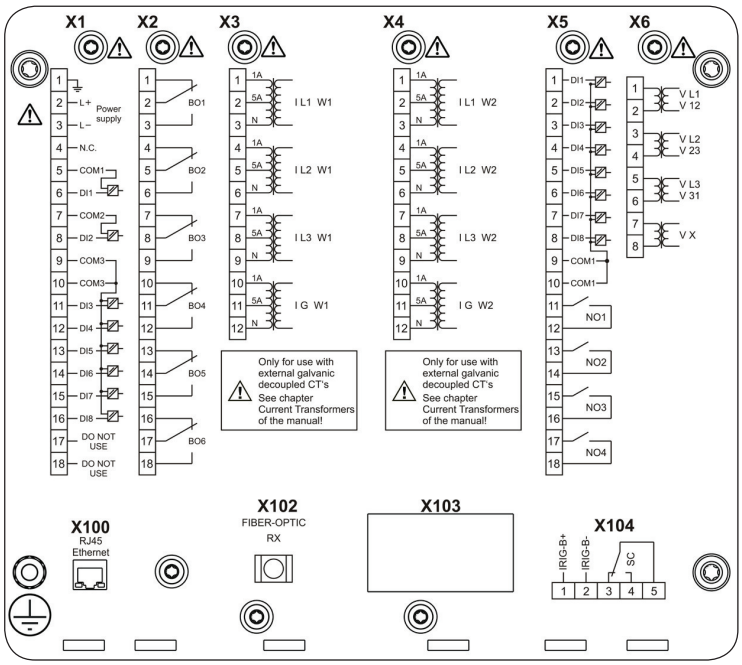
certified by EAC (Eurasian Conformity)

certified regarding „BDEW-Richtlinie für Erzeugungsanlagen am Mittelspannungsnetz“, Ausgabe Juni 2008 (German grid code standard)

Lloyd’s Register Type Approval Certificate

Type Approval Certificate from CQC China

CONNECTIONS *(EXAMPLE)*



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“

ORDER FORM MCDGV4

Generator Differential Protection						MCDGV4 -2				
Version 2 with USB, enhanced communication and user options										
Digital Inputs	**Binary output relays**	**Analog Inputs/Outputs**	**Housing**	**Large display**	**Voltage inputs**					
16	11	0/0	B2	X	0-800 V	A				
8	11	2/2	B2	X	0-800 V	B				
24	11	0/0	B2	X	0-300 V	C				
16	16	0/0	B2	X	0-300 V	D				
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		
Communication protocol										
Without protocol									A	
Modbus RTU, IEC 60870-5-103, DNP 3.0 RTU | *RS485/terminals*									B*	
Modbus TCP, DNP 3.0 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, IEC 60870-5-103, DNP 3.0 RTU | *optic fiber/ST-connector*									F*	
Modbus RTU, IEC 60870-5-103, DNP 3.0 RTU | *RS485/D-SUB*									G*	
IEC 61850, Modbus TCP, DNP 3.0 TCP/UDP, IEC 60870-5-104 | *Ethernet 100MB/RJ45*									H*	
IEC 60870-5-103, Modbus RTU, DNP 3.0 RTU | *RS485/terminals* Modbus TCP, DNP 3.0 TCP/UDP, IEC60870-5-104 | *Ethernet 100 MB/RJ45*									I*	
IEC 61850, Modbus TCP, DNP 3.0 TCP/UDP, IEC 60870-5-104 | *Optical Ethernet 100MB/LC duplex connector*									K*	
Modbus TCP, DNP 3.0 TCP/UDP, IEC 60870-5-104 | *Optical Ethernet 100MB/LC duplex connector*									L*	
IEC 60870-5-103, Modbus RTU, DNP 3.0 RTU | *RS485/terminals* IEC 61850, Modbus TCP, DNP 3.0 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	8 (1 A and 5 A) with automatic CT Disconnect
Voltage inputs	4 (0 … 800 V, for variants "A" and "B") or 4 (0 … 300 V, for variants "C" and "D")
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

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