SEG electronics

HighPROTEC | PROTECTION TECHNOLOGY MADE SIMPLE

MCDGV4 | GENERATOR DIFFERENTIAL PROTECTION

NEW FEATURES – RELEASE 3.7

- VDE-AR-N 4110; VDE-AR-N 4120
- 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 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 not only phase, earth current, voltage, frequency and power protection, but also 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)
- 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
- Optional temperature supervision via external URTD-box with 12 sensors

INTERCONNECTION PACKAGE

- 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

- 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

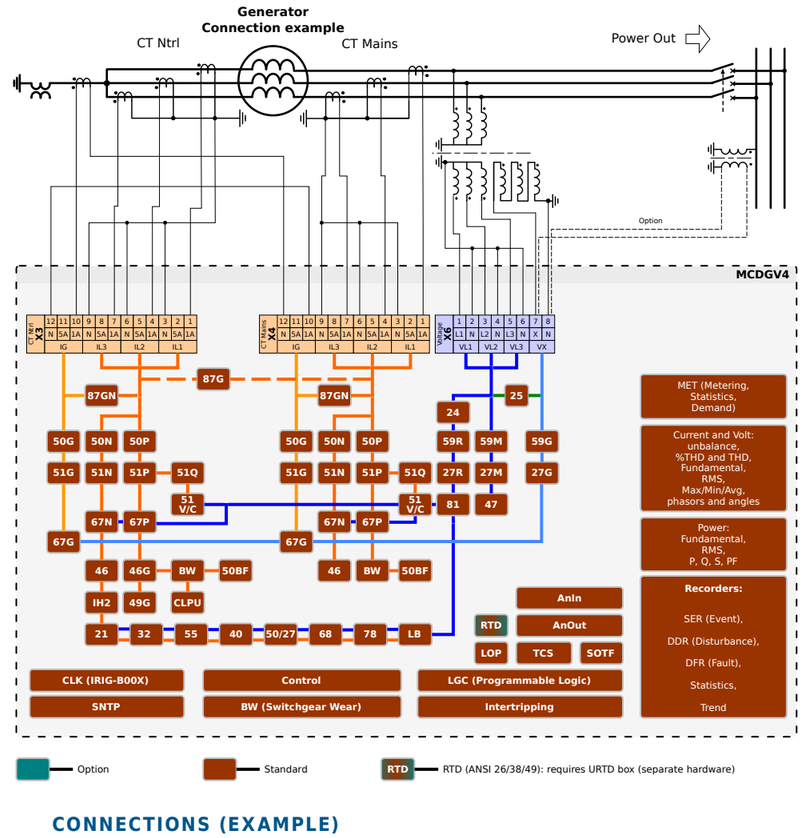
TIME SYNCHRONISATION

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

FUNCTIONAL OVERVIEW

	Elements	ANSI
Protective Functions		
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). Voltage controlled overcurrent protection by means of adaptive parameters Voltage dependent overcurrent protection Negative phase sequence overcurrent protection	6	50P, 51P, 67P 51C 51V 51Q
I2>, unbalanced load protection with evaluation of the negative phase sequence currents	2	46
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		
Synchrocheck		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
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	
THD supervision		
Breaker wear with programmable wear curves		
Recorders: Disturbance recorder, fault recorder, event recorder, trend recorder		

FUNCTIONAL OVERVIEW IN ANSI / IEEE C37.2 FORM



APPROVALS / STANDARDS

certified regarding UL508 (Industrial Controls)

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

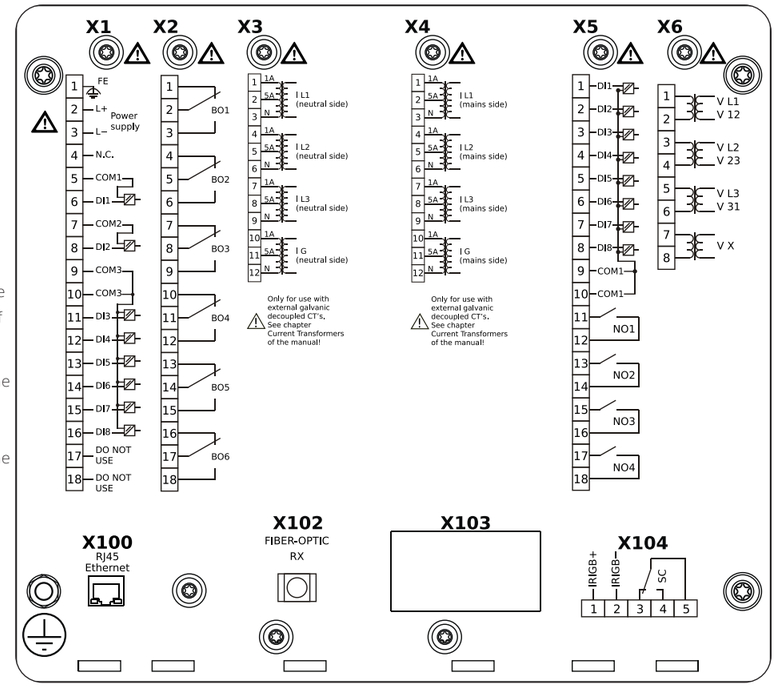
certified by EAC (Eurasian Conformity)

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)
Component certificate regarding the German grid code standard VDE-AR-N 4120 (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)



ORDER FORM MCDGV4

Generator Differential Protection	MCDGV4	-2			
Version 2 with USB, enhanced communication and user options					

Analog In / Analog Out	Digital Inputs	Binary output relays	Voltage inputs	Housing	Large display	
0/0	16	11	0-800 V	B2	X	A
2/2	8	11	0-800 V	B2	X	B
0/0	24	11	0-300 V	B2	X	C
0/0	16	16	0-300 V	B2	X	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				
Housing suitable for door mounting		A		
Housing suitable for 19" rack mounting ** 19 inch rack		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, IEC 60870-5-104 | 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, 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, for variants MCDGV4-2**A** and MCDGV4-2**B**) or 4 (0 ... 300 V, for variants MCDGV4-2**C** and MCDGV4-2**D**)	
Digital inputs	Switching thresholds adjustable via software	
Analog inputs (Variant B)	0 ... 20mA / 4 ... 20mA / 0 ... 10V	
Analog outputs (Variant 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 (Front)	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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