WOODWARD

# HighPROTEC-2 | PROTECTION TECHNOLOGY MADE SIMPLE

## MCDGV4-2 | GENERATOR DIFFERENTIAL PROTECTION

NEW FEATURES

- DNP 3.0
- Multiple Communication with one device
- ANSI Menu structure
- Page Editor
- New front plate with USB
- IEC61850 with LC interface

## 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 package comprises 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)
- 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
- 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
- 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

## 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
- 7 languages selectable within the relay

## COMMUNICATION OPTIONS

- IEC61850
- Profibus DP
- Modbus RTU or Modbus TCP
- IEC60870-5-103
- DNP 3.0 (RTU, TCP, UDP)

## 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

## TIME SYNCHRONISATION

- SNTP, IRIG-B00X, Modbus, IEC60870-5-103

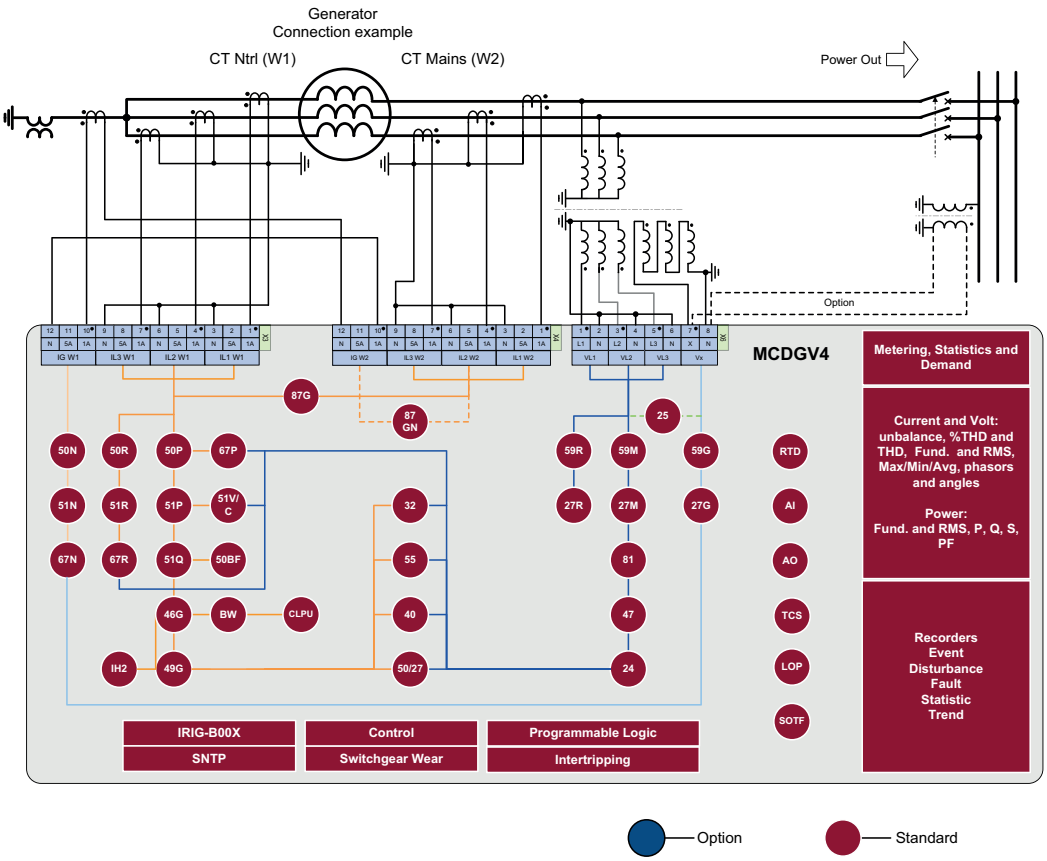
## PC TOOLS

- Setting and analyzing software Smart view for free
- 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<br>Voltage dependent overcurrent protection<br>Negative phase sequence overcurrent protection | | 51C<br>51V<br>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, 51N, 67N |
| 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)<br>V1, under and overvoltage in positive phase sequence system<br>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 |
| 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 (exitation) | 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

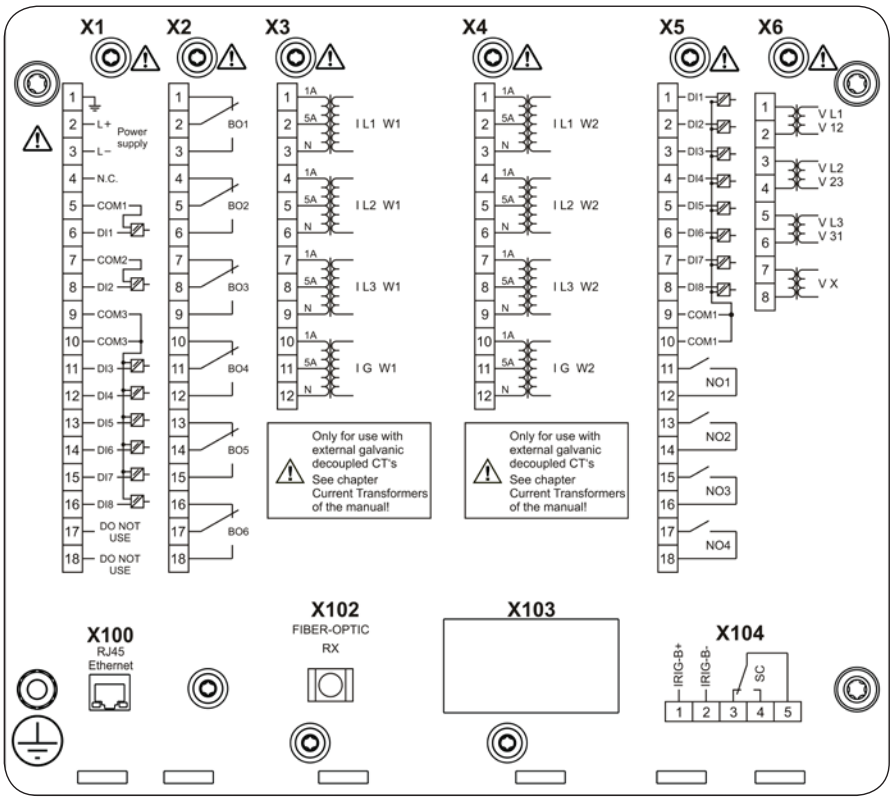
certified by EAC (Eurasian Conformity)

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

complies with IEEE 1547-2003 amended by IEEE 1547a-2014

complies with ANSI C37.90-2005

## CONNECTIONS *(EXAMPLE)*



## ORDER FORM MCDGV4-2

| 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, IEC60870-5-103, DNP3.0 RTU \| *RS485/terminals* | | | | | | | | | B* |
| Modbus TCP, DNP3.0 TCP/UDP \| *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 \| *Ethernet 100MB/RJ45* | | | | | | | | | H* |
| IEC60870-5-103, Modbus RTU, DNP3.0 RTU \| *RS485/terminals*<br>Modbus TCP, DNP3.0 TCP/UDP \| *Ethernet 100 MB/RJ45* | | | | | | | | | I* |
| IEC61850, Modbus TCP, DNP3.0 TCP/UDP \| *Optical Ethernet 100MB/LC duplex connector* | | | | | | | | | K* |
| Modbus TCP, DNP3.0 TCP/UDP \| *Optical Ethernet 100MB/LC duplex connector* | | | | | | | | | L* |
| **Harsh Environment Option** | | | | | | | | | |
| None | | | | | | | | | A |
| Conformal Coating | | | | | | | | | B |
| **Available menu languages (in every device)** | | | | | | | | | |
| Standard English/German/Spanish/Russian/Polish/Portuguese/French | | | | | | | | | |

* 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) or 4 (0–300 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<br>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<br>8.374 in. x 6.811 in. x 8.189 in.<br>Door mounting 212.7 mm x 183 mm x 208 mm<br>8.374 in. x 7.205 in. x 8.189 in. |
| **Weight (max. components)** | approx. 4.7 kg / 10.36 lb |

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DOK-FLY-MCDGV4-2E_Rev.E | Subject to alterations, errors excepted.