MFR 13
Multi Function Relay Protection

APPLICATIONS
The MFR 1 Series is a family of industrial grade protective relays that offer multiple protective features in a single package.

Using a digital processor to measure true RMS values enables the control to have a high measuring accuracy, regardless of harmonics, transients or disturbing pulses.

The MFR 13 model is a complete generator protection unit packaged into one compact device. Typical applications are generators and switchgear equipment that require independent protection architecture. Different packages offer additional functionality.

The MFR 13/GP is for generator protection use while the MFR 13/GPX adds synch-check functionality for one breaker. A MOD bus RTU Slave interface for communication is added for the MFR 13/GPX-I package.

The compact size and multiple functions of the MFR 13 help to simplify switchgear design. The digital display offers a user-friendly interface to setup the unit as well as monitor the operation and display any alarms.

DESCRIPTION
Features (all)
- True RMS generator voltage measuring
- True RMS generator current measuring
- Configurable trip/control set points
- Configurable delays for each alarm
- Two-line LC display
- Programmable relay outputs to annunciate alarms
- kWh metering
- Front panel and PC configurable
- Multi level password protection
- Language manager (English/German switchable)
- 12/24 Vdc power supply

Protection (all) ANSI #
- Over-/undervoltage (59/27)
- Over-/underfrequency (81O/U)
- Voltage asymmetry (47)
- Zero voltage monitoring
- Overload (32)
- Reverse power (32R)
- Reduced power (32F)
- Unbalanced load (46)
- Reactive power
- Loss of excitation (40Q)
- Independent time-overcurrent (50/51)
- Inverse time-overcurrent (IEC255)
- Inverse time-overcurr. w. volt. restraint(51V)

Package GP
- 3 configurable relays
- Ground fault (calculated) #1 (50GS/51#2GS)

Package GPX
- 8 configurable relays
- True RMS busbar voltage measuring
- Synch-check

Package GPX-I
Same as Package GPX, plus:
- RS-485 Modbus RTU Slave interface

Package K08
Same as Package GPX-I, plus:
- Ground fault (calculated) #1 (50GS/51#2GS)

Package GPY-I
Same as Package GPX-I, plus:
- 3 analog outputs -20/0/4 to 20 mA (configurable)
- Pulse output for kWh

Package GPY-I-N
Same as Package GPY-I, but:
- 90 to 265 Vac/dc power supply (no 24 Vdc)

- Complete generator protection in one unit
- True RMS sensing
- Synch-check
- Discrete inputs for enabling and remote control
- Programmable relay outputs
- PC and front panel configurable
- Microprocessor technology for accurate, repeatable and reliable operation
- Programmable threshold set-points with individual time delays
- CE marked
- UL/cUL Listed
- GL Approval

#1 no GL approval
#2 not according to ANSI guidelines
(three-step protection instead of inverse time characteristic)
**Specifications**

Accuracy .......................................................................................... Class 1
Power supply ...................................................................................... 24 Vdc (18 to 30 Vdc)

GPy-I-N Package: 90 to 265 Vac/dc
Intrinsic consumption .................................................................. max. 12 W
Ambient temperature ................................................................. -20 to 70 °C
Ambient humidity ................................................................. 95%, non-condensing

**Voltage**
- Rated voltage \(V_{ph-ground}\): [1] 150 Vac or [4] 300 Vac
- Rated surge voltage: [1] 2.5 kV or [4] 4.0 kV

Linear measuring range up to \(1.3 \times V_{rated}\)
Measuring frequency .............................................................. 50/60 Hz (40 to 70 Hz)
Input resistance........................................................................ [1] 0.21 MΩ, [4] 0.7 MΩ
Max. power consumption per path ........................................... < 0.15 W

**Current (I_{rated})**
- Liner measuring range up to \(3.0 \times I_{rated}\)
- Rated short-time cur. (1 s) ........................................................ [1] 100.0 \times I_{rated}, [5] 20.0 \times I_{rated}

**Pulse outputs**
- Rated gate voltage ................................................................. 24 Vdc
- Maximum gate voltage .......................................................... 32 Vdc
- Minimum gate current ......................................................... 10 mAdc
- Maximum gate current ......................................................... 30 mAdc (0.5 Vdc)

**Discrete inputs**
- Isolated
- Input range ................................................................. 18 to 250 Vac/dc
- Input resistance ............................................................... approx. 68 kΩ

**Relay outputs**
- Isolated
- Contact material ................................................................. AgCdO
- Load (GP) ................................................................. 24 Vdc@2 Adc, 250 Vac@2 Aac
- Pilot duty (PD) ................................................................. 24 Vdc@1 Adc

**Housing**
- Type APRANORM DIN 43 700
- Dimensions ................................................................. 96 × 72 × 130 mm
- Front cutout ................................................................. 91 [+1.0] × 67 [+1.0] mm
- Connection ................................................................. screw/plug terminals depending on connector
- Insulating surface ............................................................... 1.5 mm², 2.5 mm² or 4 mm²

**Protection system**
- IP 42 from front (with correct installation)

**Disturbance test (CE)**
- Tested according to applicable EN guidelines

**Listings**
- UL/cUL listed for ordinary locations (note: max. voltages apply)

**Approvals**
- GL (Germanischer Lloyd)

**Dimensions**

![Configuration port](image-url)
### Wiring Diagram

#### Subject to technical modifications.

**Relay 1**
- (B/C/D/E: Synch-check, not configurable)
- (Ready for operation)

**Relay 2**
- A (not inverted)
- B (inverted)
- GND

**Relay 3**
- A (not inverted)
- B (inverted)
- GND

**Relay 4**
- A (not inverted)
- B (inverted)
- GND

**Relay 5**
- A (not inverted)
- B (inverted)
- GND

**Relay 6**
- A (not inverted)
- B (inverted)
- GND

**Relay 7**
- A (not inverted)
- B (inverted)
- GND

**Relay 8**
- A (not inverted)
- B (inverted)
- GND

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**Measuring voltage**
- L1
- L2
- L3
- N

**Synchronizing voltage**
- L1
- L2
- L3
- N

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**Analog output 1**
- -20/0/4 to 20 mA

**Analog output 2**
- -20/0/4 to 20 mA

**Analog output 3**
- -20/0/4 to 20 mA

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**Packages:**
- A = Package GP
- B = Package GPX
- C = Package GPX-I, K08
- D = Package GPY-I
- E = Package GPY-I-N

**Interface:**
- Bi-directional
- [RS-485/Modbus RTU Slave]

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**Blocking of watchdog functions/remote acknowledgment**

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**3/4**
- E (open collector)
- C (kWh impulse)

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**MFR 13**
- 24 Vdc
- 90 to 265 Vac/dc
- 0 Vdc

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**CB**
- A/B/C/D: 24 Vdc
- E: 90 to 265 Vac/dc

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**DIF**
- (Synchronizing voltage L3)

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**DIE**
- (Synchronizing voltage L2)

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**Series 2 (fixed)**
- (Synchronizing voltage L1)

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**Series 1 (variable)**
- Measuring voltage
- three-wire or four-wire system

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**Measuring current**
- L1
- L2
- L3

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**Relay 2**
- A (not inverted)
- B (inverted)
- GND

---

**Relay 3**
- A (not inverted)
- B (inverted)
- GND

---

**Relay 4**
- A (not inverted)
- B (inverted)
- GND

---

**Relay 5**
- A (not inverted)
- B (inverted)
- GND

---

**Relay 6**
- A (not inverted)
- B (inverted)
- GND

---

**Relay 7**
- A (not inverted)
- B (inverted)
- GND

---

**Relay 8**
- A (not inverted)
- B (inverted)
- GND

---

**Subject to technical modifications.**

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**2006-02-15 | MFR 13 Wiring Diagram 132ew-08b1s_Oskar.psd**
### FEATURE OVERVIEW

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<th>GPX-I</th>
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* not according to ANSI guidelines (three-step protection instead of inverse time characteristic)

#1 Cable incl. software necessary (DPC)