MFR 3

Multi Function Relay
Mains & Generator
Protection & Control

APPLICATIONS

Woodward's MFR 3 Multi function Relay incorporates functions and features for multiple application with up to 14 generators, each with a maximum individual rating of 16MW. Whether isolated or in parallel with the utility this device was designed for generators and switchgear equipment that require independent protection.
The MFR 3 digitally measures true RMS values ensuring measurement accuracy - maintaining integrity against harmonics, transients or power surges. Mains voltage monitoring may be configured as phase-phase or phase-neutral. Front panel push-buttons allow direct control of power circuit breakers, setpoint values, and configuration of the unit. A phase sequence detection prevents a breaker closure in case of mismatching phases.
The MFR 3 is available for one (MFR 31) or two (MFR 32) circuit breakers. Even if the MFR 31 front panel reflects only one circuit breaker, it may operate two.
For utility parallel applications the combined mains and generator breaker protection offer a very compact solution. In addition to protection the MFR 3 offers frequency, voltage, real power and re-active power control allowing load/var sharing

DESCRIPTION

Features

- True RMS 8× voltage (gen/bus/mains)
- True RMS 4× current (gen/mains)
- Battery voltage monitoring
- Phase sequence detection
- kWh/kvarh/oper.hours/start/maintenance counter
- Configurable trip/control set points
- Configurable delays for each alarm
- 12 configurable discrete alarm inputs
- 7 configurable/programmable relays
- 2 conf. analog outputs (20 mA)
- 2 conf. pulse outputs for kWh/kvarh
- Two-line LC display
- Synchroscope
- Push-buttons for direct control
- CAN bus communication
- Language manager (English/German preloaded)
- Multi level password protection

DESCRIPTION (continued)

Protection — ANSI

Mains
- Over-/undervoltage (59/27)
- Over-/underfrequency (81O/U)
- Phase/vector shift (78)
- df/dt (ROCOF) (81RL)

Generator
- Over-/undervoltage (2 steps) (59/27)
- Over-/underfrequency (2 steps) (81O/U)
- Overload (32)
- Reverse/reduced power (32R/F)
- Unbalanced load (46)
- Loss of excitation (40Q)
- Definite time-overcurrent (TOC) (50)
- Inverse time-overc. (incl. volt. restr.) (51V)
- Calculated earth fault (64)

Controller

- Synchronizer for 1 or 2 breaker/s (gen/mains)
- Isolated operation
- Mains parallel operation
- Softloading
- Speed/frequency/real power
- Voltage/power factor cosphi
- Mains import/export power
- Load/var sharing (up to 14 generators)
- Remote real power setpoint (0/4 to 20 mA)

Package PSVX

- Remote power factor setpoint (0/4 to 20 mA)
- 5 analog measuring inputs (1 x 0/4 to 20 mA, 4 x Pt100)
- Event recorder with real time clock

Option Q

- Discrete raise/lower for n/f/V/P/Q *
- Analog raise/lower for n/f/V/P/Q *
- PWM raise/lower for n/f/P *

* n = speed; f = frequency; V = voltage; P = real power; Q = reactive power

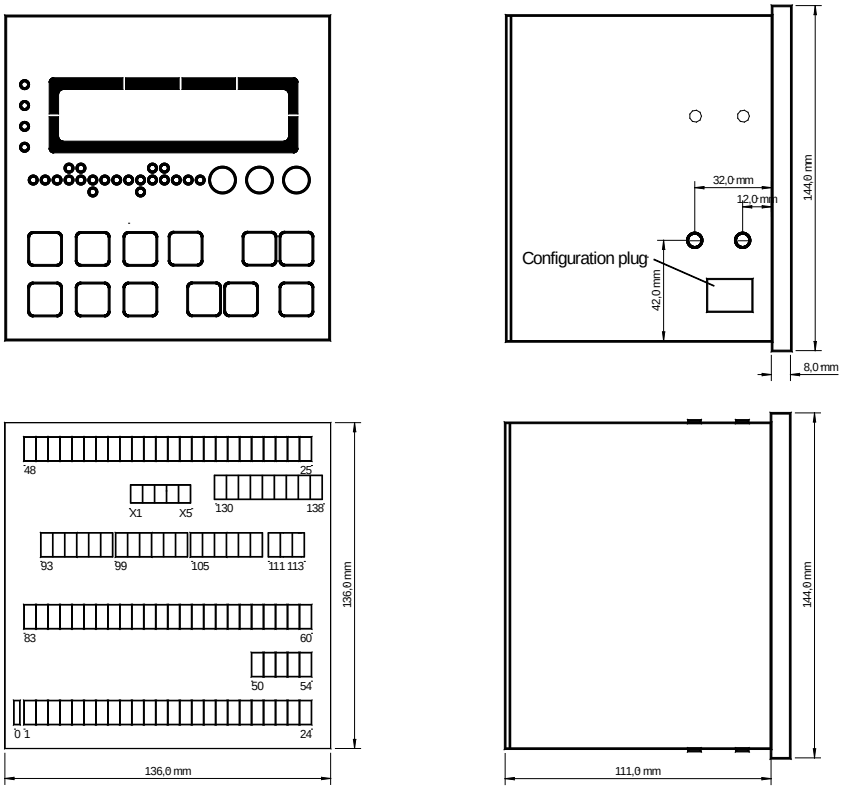
- Complete controller with generator and mains protection, synchronizer, and load/var control in one single digital relay
- True RMS sensing
- Synchronization for one/two circuit breakers
- Load/var sharing for up to 14 participants
- Counters for kWh, kvarh, engine starts, operating hours, maintenance call
- Freely configurable discrete and analog alarm inputs
- Freely configurable relay and analog outputs
- PC and front panel configurable
- CAN bus based communication
- Microprocessor technology for accurate, repeatable and reliable operation
- Programmable two step threshold set points with individual time delays
- CE marked
- UL/cUL Listed

SPECIFICATIONS (for details refer to manual 37107)

Accuracy ..... Class 1
Power supply ..... 12/24 Vdc (9.5 to 32 Vdc)
Intrinsic consumption ..... max. 15 W
Ambient temperature ..... -20 to 70 °C
Ambient humidity ..... 95 %, non-condensing
Voltage ..... Rated value U_N: [1] 66/115 Vac or [4] 230/400 Vac
Maximum value (V_{max}): [1] 150 Vac or [4] 300 Vac
Rated voltage $V_{ph\text{-}ground}$: [1] 150 Vac or [4] 300 Vac
Rated surge voltage: [1] 2.5 kV or [4] 4.0 kV
Measuring frequency ..... 50/60 Hz (40 to 70 Hz)
Linear measuring range up to ..... $1.3 \times V_{rated}$
Input resistance ..... [1] 0.21 MW, [4] 0.7 MW
Max. power consumption per path ..... < 0.15 W
Current (I_{rated}) ..... [5] ../5 A
Linear measuring range up to ..... $I_{gen} = 3.0 \times I_{rated}$
$I_{mains} = 1.5 \times I_{rated}$
Load ..... < 0.15 VA
Rated short-time current (1 s) ..... [5] $10 \times I_{rated}$
Discrete inputs ..... isolated
Input range ..... 18 to 250 Vac or dc
Input resistance ..... approx. 68 kW
Analog input ..... freely scaleable
Type ..... 0/4 to 20 mA, Pt100
Resolution ..... 10 Bit
Pulse outputs ..... transistor output
Rated gate voltage ..... 24 Vdc
Maximum gate voltage ..... 32 Vdc
Minimum gate current ..... 10 mAdc
Maximum gate current ..... 30 mAdc (0.5 Vdc)

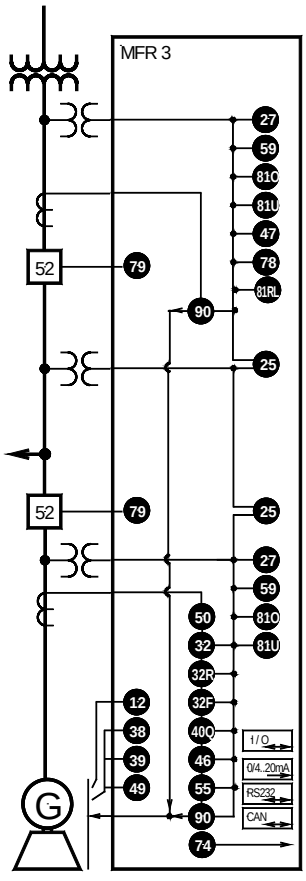
Relay outputs ..... isolated
Contact material ..... AgCdO
Load (GP) ..... 2.00 Aac@250 Vac
2.00 Adc@24 Vdc / 0.36 Adc@125 Vdc / 0.18 Adc@250 Vdc
Pilot duty (PD) .....
1.00 Adc@24 Vdc / 0.22 Adc@125 Vdc / 0.10 Adc@250 Vdc
Analog output ..... isolated
Type ..... 0/4 to 20 mA, freely scaleable
Resolution ..... 8/12 Bit (depending on model)
Max. load 0/4 to 20 mA ..... 500 W
Insulating voltage ..... 1,500 Vdc
Housing ..... Type APRANORM DIN 43 700
Dimensions ..... 144×144×118 mm
Front cutout ..... 138[+1.0]´ 138[+1.0] mm
Connection ..... screw/plug terminals depending on connector 1.5 mm² or 2.5 mm²
Front ..... insulating surface
Protection system ..... with correct installation
Front IP42
(sealed IP54; gasket kit = P/N 8923-1039)
Back IP21
Weight ..... depending on version, approx. 1,000 g
Disturbance test (CE) ..... tested according to applicable EN guidelines
Listings ..... UL/cUL listed (voltages up to 300 Vac)

DIMENSIONS

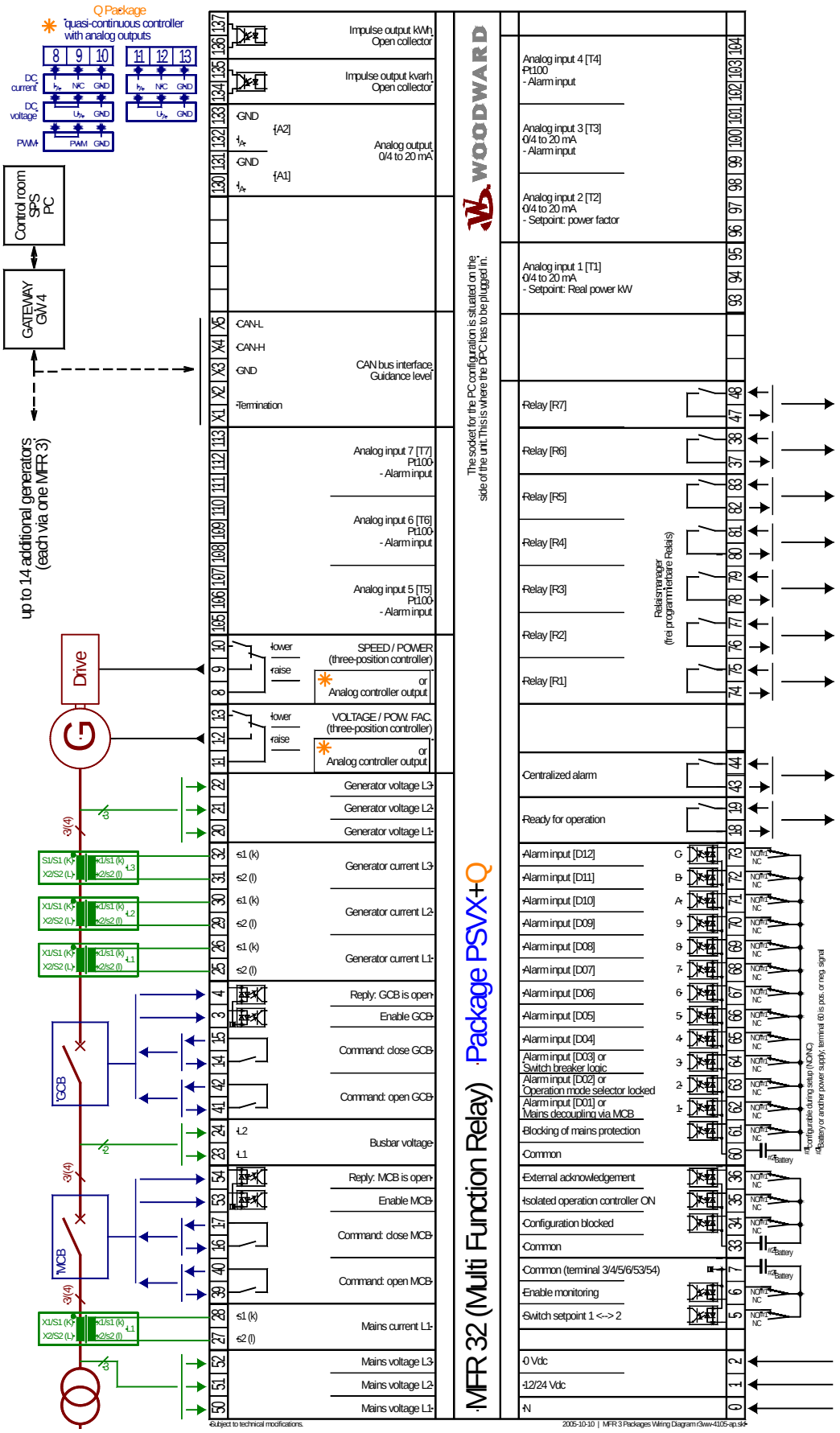


2002-11-21 | MFR 3 Dimensions r3ww-4702-ab.skf

APPLICATION



WIRING DIAGRAM (example: MFR 32; for MFR 31 refer to manual 37107)



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FEATURE OVERVIEW

	ANSI	MFR 31 PSVX+Q	MFR 32 PSVX+Q
Control			
Breaker control logic		1	2
Synchronization	25	ü	ü
Isolated single-unit operation		ü	ü
Mains parallel operation		ü	ü
Softloading			ü
Accessories			
kWh counter		ü	ü
kvarh counter		ü	ü
Operation hrs./start/maintenance counter		ü	ü
Configuration via PC #1		ü	ü
Event recorder, real time clock		50	50
Protection			
Mains: over-/undervoltage	59/27	ü	ü
Mains: over-/underfrequency	81O/U	ü	ü
Mains: df/dt (ROCOF)	81RL	ü	ü
Mains: dj /dt (phase/vector jump)	78	ü	ü
Gen.: Over-/undervoltage	59/27	ü	ü
Gen.: Over-/underfrequency	81O/U	ü	ü
Gen.: Overload	32	ü	ü
Gen.: Reverse power	32R	ü	ü
Gen.: Reduced power	32F/37	ü	ü
Gen.: Unbalanced load	46	ü	ü
Gen.: Loss of excitation	40Q	ü	ü
Gen.: Definite time-overcurrent (TOC)	50	ü	ü
Gen.: Inverse time-overc. (incl. volt. restr.)	51V*	ü	ü
Gen.: Calculated earth fault	64	ü	ü
Controller			
Discrete raise/lower: n/f & P #4		ü #4	ü #4
Discrete raise/lower: V & Q #4		ü #4	ü #4
Analog raise/lower: n/f & P #4/5		ü	ü
Analog raise/lower: V & Q #4/5		ü	ü
PWM raise/lower: n/f & P #4/5		ü	ü
Mains import/export power control		ü	ü
Real power setpoint 0/4 to 20 mA		ü	ü
Power factor setpoint 0/4 to 20 mA		ü	ü
Load/var sharing for 14 participants		ü	ü
I/O's			
Discrete alarm inputs (configurable)		12	12
Relay outputs (configurable)	74	7	7
Analog inputs (configurable)		5 #2	5 #2
Analog outputs 0/4 to 20 mA (configurab.)		2	2
Impulse output for kWh/kvarh		ü	ü
CAN bus communication #3		ü	ü
Listings/Approvals			
CE Marked		ü	ü
UL/cUL listed		ü	ü
Part numbers P/N			
Measuring inputs 100 Vac, ../5 A (8440-		-1631	-1633
Measuring inputs 400 Vac, ../5 A (8440-		-1632	-1634

* according to IEC guidelines
#1 Cable incl. software necessary (DPC)
#2 [T3] = 0/4-20 mA, [T4]-[T7] = Pt100
#3 Remote monitoring, control, configuration (GW 4 could be used for several interfaces)
#4 n = speed; f = frequency; V = voltage, P = real power; Q = reactive power
#5 +/-20 mA and +/-10 Vdc and PWM signal (type and range configurable); bias/discrete setpoint via relay manager

Subject to technical modifications.

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