



## 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

# MFR 3

## Multi Function Relay Mains & Generator Protection & Control

### DESCRIPTION (continued)

Protection	ANSI #
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#### 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  $\lambda/\Delta$ : [1] 66/115 Vac or [4] 230/400 Vac  
 Maximum value ( $V_{max}$ ): [1] 150 Vac or [4] 300 Vac  
 Rated voltage  $V_{ph-ground}$ : [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 M $\Omega$ , [4] 0.7 M $\Omega$

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 k $\Omega$

**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 mA<sub>dc</sub>

Maximum gate current ..... 30 mA<sub>dc</sub> (0.5 Vdc)

**Relay outputs** ..... isolated

Contact material ..... AgCdO

Load (GP) ..... 2.00 A<sub>ac</sub>@250 Vdc  
 2.00 A<sub>dc</sub>@24 Vdc / 0.36 A<sub>dc</sub>@125 Vdc / 0.18 A<sub>dc</sub>@250 Vdc

Pilot duty (PD) ..... 1.00 A<sub>dc</sub>@24 Vdc / 0.22 A<sub>dc</sub>@125 Vdc / 0.10 A<sub>dc</sub>@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  $\Omega$

Insulating voltage ..... 1,500 Vdc

**Housing** ..... Type APRANORM DIN 43 700

Dimensions ..... 144x144x118 mm

Front cutout ..... 138[+1.0]x138[+1.0] mm

Connection ..... screw/plug terminals depending on connector 1.5 mm<sup>2</sup> or 2.5 mm<sup>2</sup>

Front ..... insulating surface

Protection system ..... with correct installation

Front ..... IP42  
 (sealed IP54: gasket kit = P/N 8923-1039)

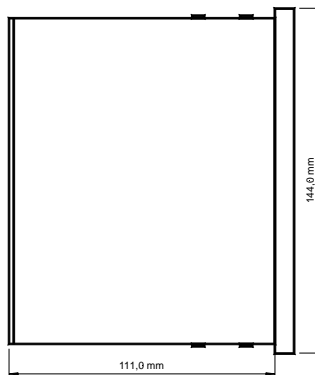
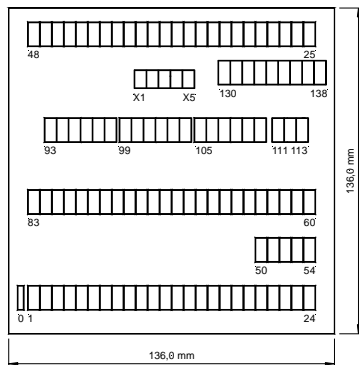
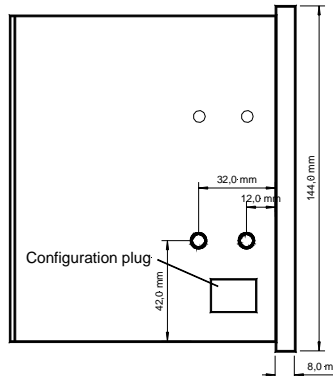
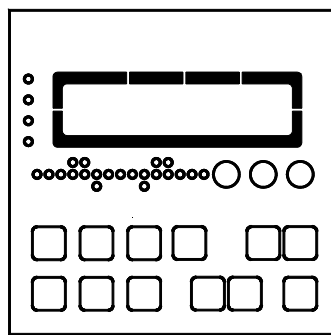
Back ..... IP21

Weight ..... depending on version, approx. 1,000 g

**Disturbance test** (CE) ..... tested according to applicable EN guidelines

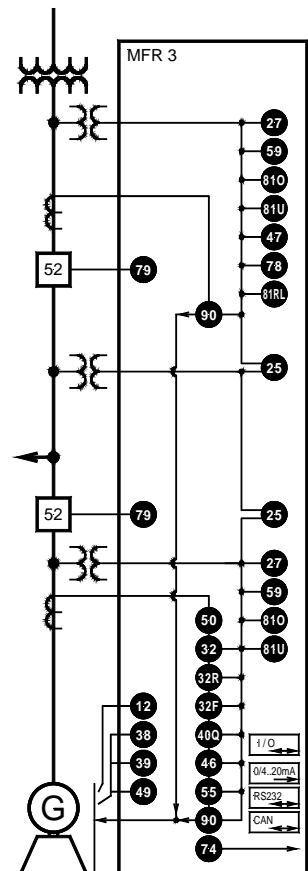
**Listings** ..... UL/cUL listed (voltages up to 300 Vac)

## DIMENSIONS

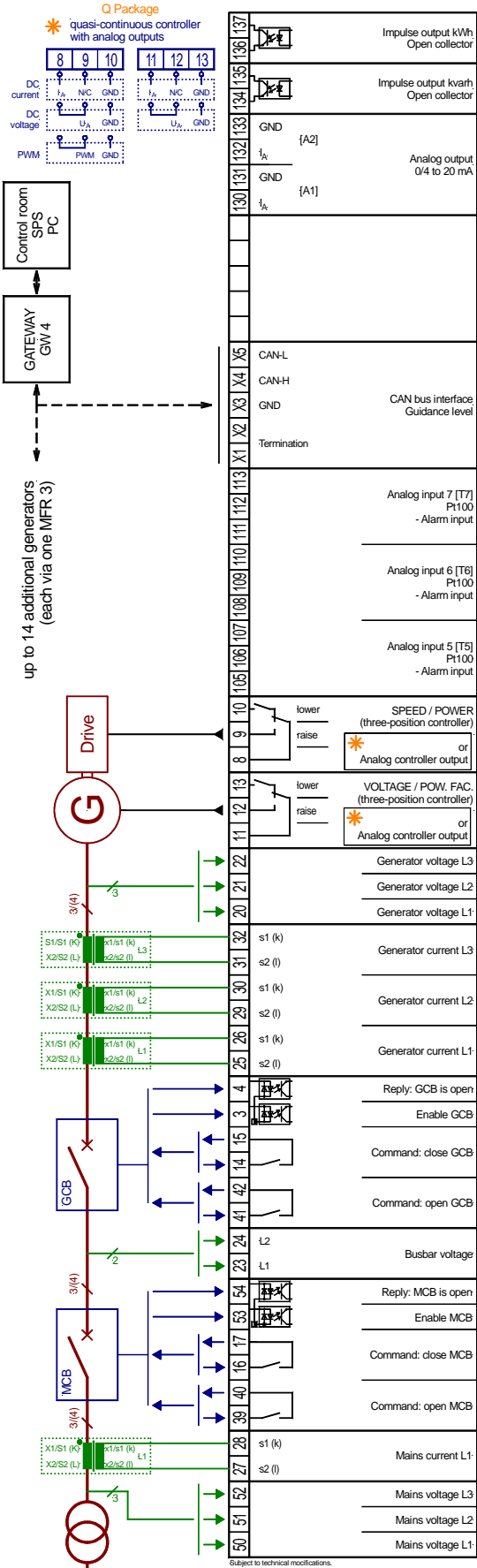


2002-11-21 | MFR 3 Dimensions r3ww-4702-ab.skf

## APPLICATION



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



**WOODWARD**

MFR 32 (Multi Function Relay) Package PSVX+Q

The socket for the PC configuration is situated on the side of the unit. This is where the DPC has to be plugged in.

137	Impulse output kWh Open collector		
136	Impulse output kWh Open collector		
135	GND	[A2]	
134	GND	[A1]	
133	GND		
132	GND		
131	GND		
130	GND		
129	CAN-L		
128	CAN-H		
127	GND		
126	GND		
125	GND		
124	GND		
123	GND		
122	GND		
121	GND		
120	GND		
119	GND		
118	GND		
117	GND		
116	GND		
115	GND		
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51	GND		
50	GND		

# FEATURE OVERVIEW

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