



## Woodward Industrial Controls Power Management Products Catalog



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## Woodward Power Management Products Overview

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From the very simplest power generation applications to the most complex, Woodward has the power management control to meet your needs. Based on decades of experience with genset control, load/var sharing, synchronization and power protection technologies, Woodward's power management product line is unsurpassed in the world.

Woodward's fully integrated generator set control panels are designed to control, monitor, and protect the complete generator system, including the engine, generator, switchgear, and utility power. This product range spans the full range of generator set applications—from the simple, low-cost GCP Series 10 controls for stand-alone or emergency generators, up to the EGCP-3 controls for complex, multiple generator, multiple utility feed systems.

In addition to the protective relaying functions built into the GCP and EGCP genset controls, Woodward offers a line of multi-function protective relays that protect the generator or utility for numerous ANSI-standard faults in a single, compact and low-cost unit.

Other Woodward analog and digital controls provide discrete functionality, including synchronization, load sharing, generator load sensing and loading, and import/expert control.

Regardless of your application, Woodward has a cost-effective control to meet your needs.

For further information please visit our homepage at

**<http://www.woodward.com/smart-power>**

## Genset Controls

### Overview and Feature Mix

Woodward's fully integrated generator set control panels are designed to control, monitor, and protect the complete generator system, including the engine, generator, switchgear, and utility power supply. This product range spans the full range of generator set applications—from the simple, low-cost easYgen-1000 Series controls for stand-alone or emergency generators up to the GCP-30 Series / EGCP-3 controls for complex, multiple generator, multiple utility feed systems.



prod'spec:  
37180

**easYgen-1500** - The 2<sup>nd</sup> Generation of genset controls is designed to provide a maximum of flexibility in a user friendly, easy-to-use, and intuitive design with a big graphical display for simple applications. This high sophisticated trend-setting technology offers a maximum of flexibility for each user. New technologies included are: **FlexApp™** - This intelligent and flexible feature provides the tool for simple adjustment of multiple applications.

**DynamicsLCD™** - The graphical LCD provides softkeys that vary depending on application and operation. **FlexIn™** - The included two analog inputs can be freely configured through the user (Model "1500" only). **FlexCAN™** - Flexible CAN bus for multiple use. Selectable during configuration.

**LogicsManager™** - A large number of measuring values, inputs, internal states or constant values can be combined logically to operate a relay contact or an internal function. **FlexRange™** - The true rms voltage measuring combines both rated 120 Vac and rated 480 Vac. Users need to keep only one unit on stock. A event recorder with real-time clock (battery backed) can store up to 50 events.



prod'spec:  
37180

**easYgen-1400** - Same features as the easYgen-1500, but mounting type DIN-rail without LCD and features provided via the LCD.



prod'spec:  
03243

The **GCP-20** is also designed for emergency and stand-by power applications, but controls the speed governor and voltage regulator to provide no-break transfer (closed transition) to and from the utility. The GCP-20 monitors the generator and the utility and protects for voltage, current, frequency, active and reverse power, load imbalance, and overload faults. The engine is monitored for speed, temperature and pressure.

The control includes a total of 14 discrete alarm inputs, 4 analog engine signal inputs, 1 switching/magnetic Pickup input, and 4 freely configurable relay outputs. Additional external units interfering with the control, remote control and analog speed/voltage bias signals are available as options.

→ Please request special versions from our sales department.



prod'spec:  
03243

The **GCP-21** incorporates control and synchronizing logic for one circuit breaker and is well suited for isolated and mains parallel operation in stand-by, combined heat and power, and peak shaving applications. A softloading feature is included in this control unit.

Additional protection features include phase/vector shift and reduced power faults as well as a quick mains failure detection for permanent operation in parallel with the utility (no separate utility protection device necessary).

The GCP-21 control includes a total of 14 discrete alarm inputs, 4 analog engine signal inputs, 1 switching/magnetic Pickup input, and 4 freely configurable relay outputs. Additional external units interfering with the control, remote control and analog speed/voltage bias signals are available as options.

→ **Please request special versions from our sales department.**



prod'spec:  
03243

The **GCP-22** adds control logic for two circuit breakers, providing mains failure detection, ATS transfer switch control (open transition), no-break transfer (closed transition), and softloading feature for both directions utility to generator and generator to utility.

→ **Please request special versions from our sales department.**



prod'spec:  
03240

The most powerful of the new genset control panels — the **GCP-31** and **GCP-32** units — are similar in function to the GCP-21 and GCP-22 controls, but add load sharing and var sharing capabilities for multiple unit operation. They also incorporate a synchroscope on the front panel.

Standard I/O include 16 discrete alarm inputs, 7 analog engine or generator signal inputs, 1 switching/magnetic Pickup input, and 7 freely configurable relay outputs.

Additional external units interfering with the control, additional inputs/outputs, remote control and analog speed/voltage bias signals are available as options. A real-time clock and event recorder is also available.

→ **Please request special versions from our sales department.**



prod'spec:  
03219

The **EGCP-2** is a microprocessor based complete generator control and engine management package. It is designed for use with an automatic voltage regulator and a Woodward or other speed control to automate and protect diesel or gas engine based generator sets. Designed for small to medium size generator sets, the EGCP-2 can be configured to operate stand-alone or utility paralleled sets. A network of EGCP-2 controls is capable of controlling up to eight unmanned generator sets for base-load, peak shaving or backup power generation.



prod'specs:  
03300  
03301  
03302

Designed for medium- and large-sized generators, the **EGCP-3** adds to the powerful EGCP-2 product with advanced IEEE protection algorithms, utility-grade metering, individual control of utility and inter-tie breakers, added input/output capabilities and backward compatibility with Woodward DSLC/MSLC synchronizers. A network of up to 16 EGCP-3 controls can handle your most sophisticated base-load, peak shaving or backup power generation applications.

Based on Woodward's powerful GAP™ application programming tools, the EGCP-3 can be easily customized by Woodward, your Woodward distributor or, with a GAP license and minimal training, by OEM customers.

## easYgen-1000 - Features Matrix

For simple genset applications.

Breaker Control		
	easYgen-1400	easYgen-1500
<b>Breaker Control</b>		
Generator voltage measuring	✓	✓
Generator current measuring	✓	✓
Mains voltage measuring	✓	✓
Mains/ground current measuring	✓	✓
Breaker control logic	0/0/1/2	0/0/1/2
Isolated single-unit operation	✓	✓
AMF (auto mains failure op.)	✓	✓
Stand-by operation	✓	✓
Open transition (break-before-make)	✓	✓
<b>Accessories</b>		
Start/stop logic for Diesel/Gas engines	✓	✓
kWh counter	✓	✓
Operating hours/start/maintenance counter	✓	✓
Configuration via PC #1	✓	✓
Event recorder, running hours		
Event recorder, real time clock	50	50
<b>Protection</b>		
Generator: voltage/frequency	✓	✓
Generator: overload	✓	✓
Generator: reverse power	✓	✓
Generator: reduced power	✓	✓
Generator: load imbalance	✓	✓
Generator: definite time-overcurrent	✓	✓
Generator: inverse time-overcurrent	✓	✓
Generator: ground fault (alt. mains cur.)	✓	✓
<b>I/O's</b>		
Magnetic/switching Pickup input	✓	✓
Discrete alarm inputs (configurable)	8/8/7/5	8/8/7/5
Relay outputs (configurable)	8/8/6/4	8/8/6/4
Analog inputs (fixed; see prod'spec)		
Analog inputs (configurable; see prod'spec)	2	2
CAN bus communication, 32part.	✓	✓
<b>Listings/Approvals</b>		
CE marked	✓	✓
UL/cUL listed	✓	✓
Marine Approval	✓	✓
<b>Special Features</b>		
FlexApp (application Mode selection)	✓	✓
DynamicsLCD (graphical display)		✓
FlexIn (variable analog inputs)	✓	✓
FlexCAN (variable CAN bus)	✓	✓
LogicsManager (programmable relays)	✓	✓
FlexRange (wise meas. voltage range)	✓	✓

#1 Cable incl. software necessary

### GCP-20 Series - Features Matrix

For single-unit and utility control applications.

Package	GCP-20			GCP-21				GCP-22		
	none	B	X	none	B	R	X	B	R	X
<b>Breaker Control</b>										
Breaker control logic	2	2	2	1	1	1	1	2	2	2
Synchronization	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Isolated single-unit operation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AMF (auto mains failure op.)	✓	✓	✓					✓	✓	✓
Stand-by operation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CHP operation				✓	✓	✓	✓	✓	✓	✓
Peak load op. (auto start/stop)				✓	✓	✓	✓	✓	✓	✓
Mains parallel operation				✓	✓	✓	✓	✓	✓	✓
Open transition (break-before-make)	✓	✓	✓					✓	✓	✓
Closed transition (make-before-break)	✓	✓	✓					✓	✓	✓
Softloading								✓	✓	✓
<b>Accessories</b>										
Start/stop logic for Diesel/Gas engines	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
kWh counter	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Operating hours/start/maintenance counter	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Configuration via PC #1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Protection</b>										
Generator: voltage/frequency	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mains: volt./freq./phase shift				✓	✓	✓	✓	✓	✓	✓
Generator: overload	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Generator: reverse power	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Generator: reduced power	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Generator: load imbalance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Generator: time-overcurrent (TOC)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Controller</b>										
Discrete raise/lower: n/f	✓			✓						
Discrete raise/lower: U	✓			✓						
Discrete raise/lower: P				✓						
Discrete raise/lower: Q				✓						
Analog raise/lower: n/f (+/-3 Vdc)		✓	✓		✓	✓	✓	✓	✓	✓
Analog raise/lower: U (+/-5 Vdc)		✓	✓		✓	✓	✓	✓	✓	✓
Analog raise/lower: P (+/-3 Vdc)					✓	✓	✓	✓	✓	✓
Analog raise/lower: Q (+/-5 Vdc)					✓	✓	✓	✓	✓	✓
Mains import/export power				✓	✓	✓	✓	✓	✓	✓
Load-dependent start/stop				✓	✓	✓	✓	✓	✓	✓
Real power setpoint value: 0/4..20 mA							✓			✓
<b>I/O's</b>										
Magnetic/switching Pickup	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Discrete alarm inputs (configurable)	14	14	14	14	14	14	14	14	14	14
Relay outputs (configurable)	4	4	4	4	4	4	4	4	4	4
Analog inputs (config.; see prod'spec)			4				3			3
Analog outputs 0/4..20 mA (config.)							2			2
CAN bus communication #2			✓			✓	✓		✓	✓
<b>Listings/Approvals</b>										
UL/cUL listed	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

#1 Cable incl. software necessary

#2 Remote monitoring, control, configuration (GW 4 could be used for several interfaces)

For multiple-unit and utility control applications.

Package	GCP-20		GCP-21				GCP-22			
	LS	LSX	LS	LSB	LSR	LSX	LS	LSB	LSR	LSX
<b>Breaker Control</b>										
Breaker control logic	2	2	1	1	1	1	2	2	2	2
Synchronization	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Isolated single-unit operation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AMF (auto mains failure op.)	✓	✓					✓	✓	✓	✓
Stand-by operation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CHP operation			✓	✓	✓	✓	✓	✓	✓	✓
Peak load op. (auto start/stop)			✓	✓	✓	✓	✓	✓	✓	✓
Mains parallel operation			✓	✓	✓	✓	✓	✓	✓	✓
Open transition (break-before-make)	✓	✓					✓	✓	✓	✓
Closed transition (make-before-break)	✓	✓					✓	✓	✓	✓
Softloading	✓ #1	✓ #1	✓ #1	✓ #1	✓ #1	✓ #1	✓	✓	✓	✓
<b>Accessories</b>										
Start/stop logic for Diesel/Gas engines	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
kWh counter	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Operating hours/start/maintenance counter	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Configuration via PC #2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Protection</b>										
Generator: voltage/frequency	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mains: volt./freq./phase shift			✓	✓	✓	✓	✓	✓	✓	✓
Generator: overload	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Generator: reverse power	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Generator: reduced power	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Generator: load imbalance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Generator: time-overcurrent (TOC)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Controller</b>										
Discrete raise/lower: n/f	✓		✓				✓			
Discrete raise/lower: U	✓	✓	✓		✓		✓		✓	
Discrete raise/lower: P			✓				✓			
Discrete raise/lower: Q			✓		✓		✓		✓	
Analog raise/lower: n/f (+/-3 Vdc)		✓		✓	✓	✓		✓	✓	✓
Analog raise/lower: U (+/-5 Vdc)				✓	✓	✓		✓	✓	✓
Analog raise/lower: P (+/-3 Vdc)				✓	✓	✓		✓	✓	✓
Analog raise/lower: Q (+/-5 Vdc)				✓		✓		✓		✓
Mains import/export power			✓	✓	✓	✓	✓	✓	✓	✓
Load-dependent start/stop			✓	✓	✓	✓	✓	✓	✓	✓
Real power setpoint value: 0/4..20 mA						✓				✓
Load/var sharing	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>I/O's</b>										
Magnetic/switching Pickup	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Discrete alarm inputs (configurable)	14	14	14	14	14	14	14	14	14	14
Relay outputs (configurable)	4	4	4	4	4	4	4	4	4	4
Analog inputs (config.; see prod'spec)		4			4	3			4	3
Analog outputs 0/4..20 mA (config.)						2				2
CAN bus communication #3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Listings/Approvals</b>										
UL/cUL listed	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

#1 In isolated parallel operation with min. 2 gensets in parallel

#2 Cable incl. software necessary (DPC)

#3 Remote monitoring, control, configuration (GW 4 could be used for several interfaces)

## GCP-30 Series and EGCP-2 - Features Matrix

Optimized for multiple-unit and utility control applications.

Package	GCP-31				EGCP-2	GCP-32			
	A	R	U	X		A	R	U	X
<b>Control</b>									
Breaker control logic	1	1	1	1	2	2	2	2	2
Synchronization	✓	✓	✓	✓	✓	✓	✓	✓	✓
Isolated single-unit operation	✓	✓	✓	✓	✓	✓	✓	✓	✓
AMF (auto mains failure op.)					✓	✓	✓	✓	✓
Stand-by operation	✓	✓	✓	✓	✓	✓	✓	✓	✓
CHP operation	✓	✓	✓	✓	✓	✓	✓	✓	✓
Peak load op. (auto start/stop)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mains parallel operation	✓	✓	✓	✓	✓	✓	✓	✓	✓
Process control operation					✓				
Open transition (break-before-make)					✓	✓	✓	✓	✓
Closed transition (make-before-break)					✓	✓	✓	✓	✓
Softloading	✓ #1	✓ #1	✓ #1	✓ #1	✓	✓	✓	✓	✓
<b>Accessories</b>									
Start/stop logic for Diesel/Gas engines	✓	✓	✓	✓	✓	✓	✓	✓	✓
kWh counter	✓	✓	✓	✓	✓	✓	✓	✓	✓
Operating hours/start/maintenance counter	✓	✓	✓	✓	✓	✓	✓	✓	✓
Configuration via PC #2	✓	✓	✓	✓	✓	✓	✓	✓	✓
Event recorder, real time clock			50	50	8			50	50
<b>Protection</b>									
Generator: voltage/frequency	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mains: volt./freq./phase shift	✓	✓	✓	✓		✓	✓	✓	✓
Generator: overload	✓	✓	✓	✓	✓	✓	✓	✓	✓
Generator: reverse power	✓	✓	✓	✓	✓	✓	✓	✓	✓
Generator: reduced power	✓	✓	✓	✓		✓	✓	✓	✓
Generator: load imbalance	✓	✓	✓	✓		✓	✓	✓	✓
Generator: time-overcurrent (TOC)	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Controller</b>									
Discrete raise/lower: n/f & P	✓		✓ #3		✓				
Discrete raise/lower: U & Q	✓		✓ #3		✓	✓		✓	
Analog raise/lower: n/f & P (+/-3 Vdc)		✓	✓ #3	✓		✓	✓	✓ #4	✓
Analog raise/lower: U & Q (+/-5 Vdc)		✓	✓ #3	✓			✓		✓
PWM raise/lower: n/f & P			✓ #3						
Mains import/export power	✓	✓	✓	✓	✓	✓	✓	✓	✓
Load-dependent start/stop	✓	✓	✓	✓	✓	✓	✓	✓	✓
Real power setpoint value: 0/4..20 mA			✓	✓				✓	✓
Load/var sharing	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>I/O's</b>									
Magnetic/switching Pickup	✓	✓	✓	✓	✓	✓	✓	✓	✓
Discrete alarm inputs (configurable)	16	16	16	16	16	16	16	16	16
Relay outputs (configurable)	7	7	7	7	12	7	7	7	7
Analog inputs (config.; see prod'spec)			3	6	2			6	6
Analog outputs 0/4..20 mA (configurable)			2	2				2	2
CAN bus communication #5	✓	✓	✓	✓		✓	✓	✓	✓
LS 4 - Circuit Breaker Control #6			✓						
<b>Listings/Approvals</b>									
UL/cUL listed	✓	✓	✓	✓	✓	✓	✓	✓	✓

#1 In isolated parallel operation with min. 2 gensets in parallel

#2 Cable incl. software necessary

#3 +/-20 mA and +/-10 Vdc and PWM signal (type and range configurable); bias setpoints via relay manager

#4 0..5 Vdc signal

#5 Remote monitoring, control, configuration (GW 4 could be used for several interfaces)

#6 External unit

# Synchronizers

## Overview and Feature Mix

Analog and digital synchronizers from Woodward span the full range of synchronizer capabilities, providing precise voltage and phase matching capabilities for every application, from the simplest to the most demanding



prod'spec: 03241

The **SPM-D10** digital synchronizer incorporates control logic for one circuit breaker (incl. a two-phase synchronization), display of ac data on front panel, a user keypad, a built-in synchroscope, and easy configuration. Also available is built-in utility protection for over-/undervoltage, over-/under-frequency, phase/vector shift; generator protection for over-/undervoltage, over-/under-frequency, and for reverse/reduce power and overload.

The **SPM-D21** additionally offers synchronization for a 2nd circuit breaker. A real power and power factor control as well as a protection for generator over-/undervoltage/-frequency, reverse power, and a mains failure detection (over-/undervoltage/-frequency and phase/vector shift) are added to this package.

The **SPM-D10/YB** is a three-phase synchronizer that includes the complete control logic for one power circuit breaker. An additional expanded function logic to couple synchronous networks and different de-energized (black) busses completes this unit to a complete and powerful solution.



prod'spec: 02006

The **DSLCTM** control is a microprocessor-based synchronizer and load control designed for use on three-phase ac generators equipped with Woodward or other compatible speed controls and compatible automatic voltage regulators. The DSLC control is a synchronizer, a load sensor, a load control, a dead bus closing system, and optionally a VAR/PF and process control, all integrated into one powerful, yet convenient package.



prod'spec: 02021

The **MSLC** control is a microprocessor-based load control designed for three-phase electric power generation sites equipped with Woodward DSLC Digital Synchronizer and Load Control units which operate in parallel with the utility. The MSLC is a synchronizer, a utility load sensor, an import/export load level control, a power factor control, and a master process control.

## Multi Function Relays

### Overview and Feature Mix

MFR 1 Multi Function Relays provide monitoring and protection for a wide range of power generation and distribution applications. Each of the MFR series protects for the designated faults, monitors and displays the generator or utility ac signals, includes one ANSI 74 alarm relay and 3 output relays, and is easily configured via the service interface.



prod'spec:  
MFR 11: 03244  
MFR 12: 03249  
MFR 13: 03245

The **MFR 11** provides voltage protection only, and different packages are available for different applications. The

- MFR 11/MP package includes protection for over-/undervoltage, over-/underfrequency, and voltage asymmetry faults. The
- MFR 11/NU package adds a wide range power supply. The
- MFR 11/VDEW package provides protection for over-/undervoltage, over-/underfrequency, voltage asymmetry faults and protection for phase/vector shift, the
- MFR 11/G59 package adds protection for df/dt (ROCOF) faults, and five additional relay outputs, the
- MFR 11/G59N package adds a wide range power supply to the G59 package. The
- MFR 11/SC package was made for synch-check and zero-voltage monitoring.

The **MFR 12** provides current protection only, and different packages are available for different applications. The

- MFR 12/CP package includes protection for time-overcurrent and calculated ground faults.
- MFR 12/51V package includes protection for time-overcurrent, calculated ground faults, and voltage restraint time overcurrent. Additional five relay can be used to output the alarms.
- MFR 12/IKIVR package provides protection for ground faults via measurement of the displacement voltage.
- MFR 12/50-51GN package provides protection for directional ground faults.

The **MFR 13** provides voltage, current and power protection. Different packages are available for different applications. The

- MFR 13/GP package provides protection for over-/undervoltage, over-/underfrequency, voltage asymmetry, time-overcurrent, overload, reduced/reverse load, load imbalance, re-active power (loss of excitation), power factor cosphi, calculated ground fault, voltage restraint overcurrent protection as well as monitoring for zero-voltage.
- MFR 13/GPX package adds five additional configurable relay outputs and a synch-check relay function (without calculated ground-fault). The
- MFR 13/GPX-I package additionally offers a MOD bus RTU slave interface. The
- MFR 13/GPY-I package additionally offers 3 analog outputs -20/0/4..+20 mA with analog output manager

→ Please request special versions from our sales department.

Other Woodward multi-function relays—such as the MFR 2/3 and ESDR units—provide specialized protection, synchronization and monitoring functions.



prod'spec: 03247

The **MFR 15** provides voltage, current and power protection as well as automatic control and synchronization. Different packages are available for different applications. The

- **MFR 15/SY package** provides protection for over-/undervoltage, over-/underfrequency, voltage asymmetry, time-overcurrent, overload, reduced/reverse load, load imbalance, re-active power (loss of excitation), power factor cosphi as well as synchronization for one power circuit breaker, automatic control for real power and power factor cosphi. An 0/4 .20 mA analog signal could be used to feed an external power setpoint value to the control. Three freely configurable analog outputs and an pulse output for kWh complete this package. The
- **MFR 15/SYN package** adds load sharing, the
- **MFR 15/SYN-I package** adds a MOD bus RTU slave interface.

→ **Please request special versions from our sales department.**



prod'spec: 03248

The **MFR 2** control combines protection for both the generator and the utility with synchronization logic for two circuit breakers. It controls frequency, voltage, real generator power, power factor (cosphi), and load/var sharing. It also displays kWh, kvarh, operating hours, number of starts and maintenance calls.

The MFR 2 includes 4 discrete alarm inputs, 4 freely configurable relay outputs, and features a synchroscope on the front panel. Two different packages offer flexibility.

→ **Please request special versions from our sales department.**



prod'spec: 37166

The **MFR 3** adds additional I/O's and a softloading feature as well as push-buttons for direct control on the front panel.

The MFR 3 includes 12 discrete alarm inputs, 7 freely configurable relay outputs, and features a synchroscope on the front panel. Two different packages offer flexibility.

→ **Please request special versions from our sales department.**



prod'spec: 03250

The **ESDR 4** and **ESDR 4T** are three-phase current differential protection relays for generators, motors and, with the ESDR 4T, even transformers in unit connection.

The currents flowing into the individual conductors are measured by means of current transformers at both sides of the protection object(s).

Any two-phase or three phase short circuits and ground leakage's are recognized by the ESDR 4 and ESDR 4T as fault currents.



prod'spec: 37169

The **TUG 4** is a protection relay for separate two-step protection of up to 16 measuring inputs. Included functions are conversion of measured values of d.c. signals from generator/prime mover, protective functions for temperature (two levels of alarm/monitoring), and 4 relay outputs for user configuration.

### MFR 11-12-13 - Features Matrix

	ANSI	MFR 11						MFR 12				MFR 13				
		MP	NU	VDEW	G69	G59N	SC	CP	51V	IVKR	50-51GN	GP	GPX	GPX-I	GPY-I	GPY-I-N
<b>Measuring/Display</b>																
Voltage		✓	✓	✓	✓	✓	✓		✓			✓	✓	✓	✓	✓
Voltage (for synch-check)							✓						✓	✓	✓	✓
Current								✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Accessories</b>																
kWh counter												✓	✓	✓	✓	✓
Configuration via PC		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Protection</b>																
Overvoltage	59	✓	✓	✓	✓	✓						✓	✓	✓	✓	✓
Undervoltage	27	✓	✓	✓	✓	✓						✓	✓	✓	✓	✓
Overfrequency	81O	✓	✓	✓	✓	✓						✓	✓	✓	✓	✓
Underfrequency	81U	✓	✓	✓	✓	✓						✓	✓	✓	✓	✓
Voltage asymmetry	47	✓	✓	✓	✓	✓						✓	✓	✓	✓	✓
dφ/dt (phase/vector jump)	78			✓	✓	✓										
df/dt (ROCOF)	81RL				✓	✓										
Overload	32											✓	✓	✓	✓	✓
Reverse power	32R											✓	✓	✓	✓	✓
Reduced power	32F/37											✓	✓	✓	✓	✓
Load imbalance	46											✓	✓	✓	✓	✓
Re-active power												✓	✓	✓	✓	✓
Zero voltage							✓					✓	✓	✓	✓	✓
Loss of excitation	40Q											✓	✓	✓	✓	✓
Time-overcurrent	50/51*							✓	✓			✓	✓	✓	✓	✓
Ground fault, calculated	50GS/51*GS							✓	✓			✓				
Ground fault, measured	64G									✓						
Voltage restraint time-overcur.	51V								✓			✓	✓	✓	✓	✓
Directional ground fault	50/51GN										✓					
<b>Function</b>																
Synch-check	25						✓						✓	✓	✓	✓
Black start to dead busbar							✓					✓	✓	✓	✓	✓
<b>I/O's</b>																
Output relays	74	3	3	3	8	8	3	3	8	8	3	3	8	8	8	8
Analog out. -20/0/4..+20 mA (cnf.)															3	3
Impulse output for kWh															✓	✓
RS485/MOD bus RTU slave														✓	✓	✓
<b>Power Supply</b>																
24 Vdc		✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
75..265 Vac & 90..300 Vdc			✓			✓										✓
<b>Listings/Approvals</b>																
UL/cUL listed		✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
GL (Marine)		✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

\* not according to ANSI guidelines (three-step protection instead of inverse time characteristic)

## MFR 15-2-3 - Features Matrix

	ANSI	MFR 15			MFR 2		MFR 3	
		SY	SYN	SYN-I	PSV	PSVA	PSV	PSVX
<b>Control</b>								
Breaker control logic		1	1	1	2	2	2	2
Synchronization	25	✓	✓	✓	✓	✓	✓	✓
Isolated single-unit operation		✓	✓	✓	✓	✓	✓	✓
Mains parallel operation		✓	✓	✓	✓	✓	✓	✓
Softloading							✓	✓
<b>Accessories</b>								
kWh counter		✓	✓	✓	✓	✓	✓	✓
kvarh counter					✓	✓	✓	✓
Operat. hours/start/mainten. counter					✓	✓	✓	✓
Configuration via PC #1		✓	✓	✓	✓	✓	✓	✓
Event recorder, real time clock								50
<b>Protection</b>								
Gen.: Over-/undervoltage	59/27	✓	✓	✓	✓	✓	✓	✓
Mains: over-/undervoltage	59/27				✓	✓	✓	✓
Gen.: Over-/underfrequency	81O/U	✓	✓	✓	✓	✓	✓	✓
Mains: over-/underfrequency	81O/U				✓	✓	✓	✓
Voltage asymmetry	47	✓	✓	✓	✓	✓	✓	✓
Mains: dφ/dt (phase/vector jump)	78				✓	✓	✓	✓
Mains: df/dt (ROCOF)	81RL					✓	✓	✓
Gen.: Overload	32	✓	✓	✓	✓	✓	✓	✓
Gen.: Reverse power	32R	✓	✓	✓	✓	✓	✓	✓
Gen.: Reduced power	32F/37	✓	✓	✓	✓	✓	✓	✓
Gen.: Load imbalance	46	✓	✓	✓	✓	✓	✓	✓
Gen.: Re-active power					✓	✓	✓	✓
Gen.: Loss of excitation	40Q	✓	✓	✓	✓	✓	✓	✓
Gen.: Time-overcurrent (TOC)	50/51*	✓	✓	✓	✓	✓	✓	✓
<b>Controller</b>								
Discrete raise/lower: n/f & P		✓	✓	✓	✓	✓	✓	✓
Discrete raise/lower: U & Q/cosφ		✓	✓	✓	✓	✓	✓	✓
Mains import/export power							✓	✓
Real power set: 0/4..20 mA		✓	✓	✓		✓	✓	✓
Load sharing			✓	✓	✓	✓	✓	✓
var sharing					✓	✓	✓	✓
<b>I/O's</b>								
Discrete alarm inputs (config.)					4	4	12	12
Relay outputs (configurable)	74	3	3	3	4	4	7	7
Analog inputs (conf.; see prod'spec)								6
Analog outputs 0/4..20 mA (cnf.)		3	3			2	2	2
Impulse output for kWh		✓	✓			✓	✓	✓
Impulse output for kvarh						✓	✓	✓
RS485/MOD bus RTU slave				✓				
CAN bus communication #2						✓	✓	✓
<b>Power supply</b>								
24 Vdc		✓	✓	✓	✓	✓	✓	✓
75..265 Vac & 90..300 Vdc								
<b>Listings/Approvals</b>								
UL/cUL listed		✓	✓	✓	✓	✓	✓	✓
GL (Marine)		✓	✓	✓				

\* not according to ANSI guidelines (three-step protection instead of inverse time characteristic)

#1 Cable incl. software necessary

#2 Remote monitoring, control, configuration (GW 4 could be used for several interfaces)

# Discrete-Function Controls and Accessories

## Overview and Feature Mix

To complete your power management system, Woodward offers the most complete range of analog and digital controls available in the industry.



prod'spec: 37170

The **GW 4** is an extension to many of the GCP genset control units, providing the communications interface from the GCP network to a variety of external buses. Available communication buses include RS232, RS485, MOD bus, Profibus, the Leonhard-Data-Protocol and even an external modem. All this secondary interface/bus systems receive/send data from/to the Guidance Level CAN bus network used for the GCP Series. Upon request more protocols will be available.



prod'spec: 37167

The **LS 4** is a power circuit breaker control for complex applications where additional section switches (e.g. bus-couplers) exist. The measurement value logging and the "switch-in order" for the power circuit breakers are put into effect in the LS 4. The set value for the synchronization is transmitted from the LS 4 via the CAN bus to the genset controller (e.g. GCP).



prod'spec: 37168

The **UMT 1** is a digital multi measuring transducer. that measures true rms via three-phase measuring of voltage and current. Three analog outputs - 20/0/4..+20 mA and an analog output manager offers the flexibility to output every measured and calculated value. The impulse output can be configured to output kWh/h or kvarh/h.



prod'spec: 03258

The **SG 2D** Engine Speed Governor is a digital speed governor with display for the direct control of an actuator with a PWM signal (PID). The speed is directly measured via a Pickup and is used for the speed regulation via the PWM signal (several versions available).



prod'spec: 37174

The **ST 3** Lambda Control is a digital air-fuel-ration control, used to achieve low exhaust emission values in gas powered machines. The Lambda voltage is directly measured and evaluated in the ST 3. The regulating signals given to the gas regulating path may for instance be transmitted via a stepper motor or an analog output.



prod'spec: 37171

The **IKD 1** is an external I/O expansion board. If the digital inputs and outputs in the controller are not sufficient, 8 digital inputs and outputs can be connected via the CAN bus with this extension card. It is possible to connect two IKD 1 to the controller in parallel.



prod'spec: 37172

The **IKN 1** is an external 20 channel NiCrNi temperature scanner. It is an Intelligent Terminal NiCrNi to measure up to 20 different temperatures, including mean-value generation and limit value monitoring. The measured data is transmitted via the CAN bus to the controller, where they can be displayed. Configuration via CAN bus is also possible.



prod'spec:  
02012  
82011

The **Real Power Sensor** is a solid-state electronic device housed in a metal chassis intended for installation in a prime mover control cabinet. The unit contains its own power supply and is powered separately from the speed control. The Real Power Sensor constantly monitors the generator output voltage and current with transformers. These transformers are selected to provide potential voltage of 115 Vac or 230 Vac at nominal generator voltage. The current transformers are selected to provide a 5-amp secondary current at full generator output. The Real Power Sensor provides a signal to the speed control that is proportional to the output power of the generator. The Real Power Sensor is used with Woodward speed controls to measure generator output power and provide a kilowatt signal to the speed control.



prod'spec: 03218

The **Digital Reference Unit** generates a precise voltage that may be used wherever a very accurate reference signal is required. Typical use combines the Digital Reference Unit with other Woodward controls for regulation of speed or load. This device provides precise electronic control of the reference-signal voltage. The level of the reference signal can be manually or automatically selected from maximum to minimum with an additional adjustable intermediate set point.



prod'spec: 82314

The **Generator Load Sensor** adds droop or isochronous load sharing for paralleling generator sets having Woodward speed control systems. It has an SPM-A Synchronizer input and shares load with all other Woodward load-sharing systems. This unit is used with the EPG system and the Woodward 2301A and 701A Speed Controls. The Generator Load Sensor uses paralleling lines to ensure proportional load sharing when generators are isochronously paralleled.



prod'spec: 02013

**Woodward Process and Import/ Export Controls**, with Woodward load or speed controls, give you process control of an engine system. Process controls will control any process where the controlled parameter is determined by the load or speed of a engine and where the controlled parameter can be monitored as a 1 to 5Vdc,  $\pm 5$  Vdc, 4 to 20 mAdc or  $\pm 20$  mAdc input signal, depending on your specific process control needs. A process input signal of 0 to 10Vdc is optional if you use an external control-point potentiometer. Process and Import/ Export controls are available for a wide range of process configurations. This control compares process transducer input signals to operator-set references. The difference between each input and the reference setting is sent to a circuit which is sent, as an operating voltage, to a speed or load control. The load or speed control then changes or maintains the engine load or speed and in turn, maintains a constant process setting.



prod'spec: 82047

Here's the do-it-all control for use in power generation with diesel, gas or gasoline engines driving generator sets. The **2301A Load Share and Speed Control** is available in forward- or reverse-acting systems and in several speed ranges for applications requiring either droop or isochronous speed control. Models are available with either accelerating or decelerating ramps. This tough unit can stand up particularly well to harsh environments. Built-in protection guards against Electromagnetic Interference/ Radio Frequency Interference (EMI/ RFI), humidity, salt spray, dust and vibration.



prod'spec: 03204

The **2301D Load Share and Speed Control** is a digital version of the 2301A it incorporates all of the capabilities of the 2301A but adds the speed and precision of digital electronics. Additionally, all settings are made in the software (no pots to adjust) and changes are made quickly and easily.

## Woodward Services

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### How to Contact Woodward

In North America use the following address when shipping or corresponding:

#### Woodward

PO Box 1519  
1000 East Drake Rd  
Fort Collins CO 80522-1519, USA

Phone	+1 (970) 482-5811	(24 hours)
Toll-free	+1 (800) 523-2831	(North America)
Fax	+1 (970) 498-3058	
e-mail	icinfo@woodward.com	
Website	www.woodward.com	

For assistance outside North America, call one of the following international Woodward facilities to obtain the address and phone number of the facility nearest your location where you will be able to get information and service.

<u>Facility</u>	<u>Phone Number</u>
Brazil	+55 (19) 3708 4800
India	+91 (129) 230 7111
Japan	+81 (476) 93-4661
The Netherlands	+31 (23) 56 61111
Germany	+49 (711) 789 54-0

You can also contact the Woodward Customer Service Department or consult our worldwide directory on Woodward's website ([www.woodward.com](http://www.woodward.com)) for the name of your nearest Woodward distributor or service facility. [For worldwide directory information, go to [www.woodward.com/ic/locations](http://www.woodward.com/ic/locations).]

### Engineering Services

Woodward Engineering Services offers the following after-sales support for Woodward products. For these services, you can contact us by telephone, by e-mail, or through the Woodward website.

- Technical Support
- Product Training
- Field Service

Contact information:

Telephone—+1 (970) 482-5811  
Toll-free Phone (in North America)—1 (800) 523-2831  
E-mail—icinfo@woodward.com  
Website—[www.woodward.com/ic](http://www.woodward.com/ic)

**Technical Support** is available through our many worldwide locations or our authorized distributors, depending upon the product. This service can assist you with technical questions or problem solving during normal business hours. Emergency assistance is also available during non-business hours by phoning our toll-free number and stating the urgency of your problem. For technical support, please contact us via telephone, e-mail us, or use our website and reference *Customer Services* and then *Technical Support*.

**Product Training** is available at many of our worldwide locations (standard classes). We also offer customized classes, which can be tailored to your needs and can be held at one of our locations or at your site. This training, conducted by experienced personnel, will assure that you will be able to maintain system reliability and availability. For information concerning training, please contact us via telephone, e-mail us, or use our website and reference *Customer Services* and then *Product Training*.

Customer Services has also created the first of several planned CBT (computer based training) modules, available on CD-ROM from Woodward or from any Woodward authorized Distributor. Currently available is part number 8928-358, **Basic Governing and Control Theory**. Further information is also available in product specification 03221.

**Field Service** engineering on-site support is available, depending on the product and location, from one of our many worldwide locations or from one of our authorized distributors. The field engineers are experienced both on Woodward products as well as on much of the non-Woodward equipment with which our products interface. For field service engineering assistance, please contact us via telephone, e-mail us, or use our website and reference *Customer Services* and then *Technical Support*.

## Sales Support

To request sales assistance (order status, price & delivery, order entry, including 24-hour emergency support), please contact the Woodward agency listed for your area.

### ➤ North America

- **Woodward**

PO Box 1519

1000 East Drake Rd

Fort Collins CO 80522-1519, USA

Phone	+1 (970) 482-5811	(24 hours)
Toll-free	+1 (800) 523-2831	(North America)
Fax	+1 (970) 498-3058	
e-mail	icinfo@woodward.com	
Website	www.woodward.com	

**➤ South America****• Woodward Governor (Reguladores) Ltda**

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**➤ Europe/Africa/Middle East/western Asia/North America/South America  
(Power Management Products only)****• Woodward Governor Company**

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Website [www.woodward.com/smart-power](http://www.woodward.com/smart-power)

**➤ Eastern/southern Asia & Pacific****• Woodward Governor (Japan), Ltd**

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Fax +81 (476) 93-7939  
e-mail [tomsal@woodward.com](mailto:tomsal@woodward.com)

For fastest service, contact your local distributor or office. But if all else fails, contact the Industrial Controls 24-hour emergency number (for emergency and/or down situations to provide delivery of available parts or technical assistance): 800-523-2831 (toll-free in North America) or +1-970-482-5811 (from anywhere).

## Repair Services

The following factory options are available for servicing Woodward equipment, based on the standard Woodward Product and Service Warranty (5-01-1205) that is in effect at the time the product is purchased from Woodward or the service is performed:

- Replacement/Exchange (24-hour service)
- Flat Rate Repair
- Flat Rate Remanufacture

If you are experiencing problems with installation or unsatisfactory performance of an installed system, the following options are available:

- Consult the troubleshooting guide in the manual.
- Contact

Woodward technical assistance (see "How to Contact Woodward" later in this chapter) and discuss your problem. In most cases, your problem can be resolved over the phone. If not, you can select which course of action you wish to pursue based on the available services listed in this section.

## Replacement/Exchange

Replacement/Exchange is a premium program designed for the user who is in need of immediate service. It allows you to request and receive a like-new replacement unit in minimum time (usually within 24 hours of the request), providing a suitable unit is available at the time of the request, thereby minimizing costly downtime. This is also a flat rate structured program and includes the full standard Woodward product warranty (Woodward Product and Service Warranty 5-01-1205).

This option allows you to call in the event of an unexpected outage, or in advance of a scheduled outage, to request a replacement control unit. If the unit is available at the time of the call, it can usually be shipped out within 24 hours. You replace your field control unit with the like-new replacement and return the field unit to the Woodward facility as explained below (see "Returning Equipment for Repair" later in this chapter).

Charges for the Replacement/Exchange service are based on a flat rate plus shipping expenses. You are invoiced the flat rate replacement/exchange charge plus a core charge at the time the replacement unit is shipped. If the core (field unit) is returned to Woodward within 60 days, Woodward will issue a credit for the core charge. [The core charge is the average difference between the flat rate replacement/exchange charge and the current list price of a new unit.]

**Return Shipment Authorization Label.** To ensure prompt receipt of the core, and avoid additional charges, the package must be properly marked. A return authorization label is included with every Replacement/Exchange unit that leaves Woodward. The core should be repackaged and the return authorization label affixed to the outside of the package. Without the authorization label, receipt of the returned core could be delayed and cause additional charges to be applied.

## Flat Rate Repair

Flat Rate Repair is available for the majority of standard products in the field. This program offers you repair service for your products with the advantage of knowing in advance what the cost will be. All repair work carries the standard Woodward service warranty (Woodward Product and Service Warranty 5-01-1205) on replaced parts and labor.

## Flat Rate Remanufacture

Flat Rate Remanufacture is very similar to the Flat Rate Repair option with the exception that the unit will be returned to you in "like-new" condition and carry with it the full standard Woodward product warranty (Woodward Product and Service Warranty 5-01-1205). This option is applicable to mechanical products only.

## Technical Publications

Woodward produces technical product specifications and technical manuals, as well as some brochures and catalogs. All product specs, and most manuals, are available in PDF (electronic) format. The product specs and many manuals are available on the Internet in an open directory ([www.woodward.com/ic](http://www.woodward.com/ic) and click on **Publications**). Other manuals are available in a password-protected directory. If you cannot find the publication you need on the Woodward website, e-mail [icinfo@woodward.com](mailto:icinfo@woodward.com) to order what you need.

## Woodward Distributor Network

Woodward service and sales are available throughout the world from Woodward plants and offices, from Woodward Distributors, and from other Woodward authorized agents. The latest listing of every Woodward location, including address, phone, fax, and e-mail, is contained in our worldwide directory, which is available on the Woodward website ([www.woodward.com/ic/locations](http://www.woodward.com/ic/locations)).

These locations handle Woodward *power management* applications:

### Western Hemisphere

#### ➤ Canada

Rocky Mountain/Western Canada (AB, BC, MB, NT, NU, SK, YT)

- **Alberta Governor Service**

5977 103A Street

Edmonton, AB T6H 2J7, Canada

Phone +1 (780) 437-4673

Fax +1 (780) 434-2339

e-mail [todd@albertagovernor.com](mailto:todd@albertagovernor.com)

Central/Eastern Canada (NB, NF, NS, ON, PE, QC), St Pierre et Miquelon

- **Croman**

548 Edgeley Boulevard

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Concord, ON L4K 1B6, Canada

Phone +1 (416) 667-5952

Toll-free +1 (800) 268-9506 (North America)

Fax +1 (416) 667-5919

e-mail [rbryan@toromont.com](mailto:rbryan@toromont.com) (Applications)

e-mail [controlsystems@toromont.com](mailto:controlsystems@toromont.com) (General Inquiries)

Website [www.cromancontrols.com](http://www.cromancontrols.com)

#### ➤ Caribbean/Central America

Anguilla, Antigua & Barbuda, Aruba, Barbados, Belize, Cayman Islands, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, French Guyana, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Martinique, Montserrat, Netherlands Antilles, Nicaragua, Panama, Saint Kitts & Nevis, Saint Lucia, Saint Vincent & Grenadines, Suriname, Trinidad & Tobago, Turks & Caicos Islands, British Virgin Islands

- **Power Management & Control Systems NV (PMCS)**

Curaçao Airport Economic Zone

Building F - Unit FI-3

Curaçao, Netherlands Antilles

Phone +599 (9) 833-9365

Fax +599 (9) 833-93663

e-mail [info@pmcsnv.com](mailto:info@pmcsnv.com)

Website [www.pmcsnv.com](http://www.pmcsnv.com)

➤ **Caribbean**

Bahamas, Bermuda, Jamaica, Puerto Rico, US Virgin Islands

• **Governor Control Systems Inc. (GCS)**

3190 SW 4th Avenue

Fort Lauderdale, FL 33315, USA

Phone	+1 (954) 462-7404	
Toll-free	+1 (877) 659-6328	(North America)
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Mexico• **AZO Engineered Systems SA de CV**

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