



easYgen-3400/3500 Marine Genset Control for Complex Breaker Applications

DESCRIPTION

The easYgen-3400/3500 Marine devices are control units for marine genset management applications. The numerous inputs and outputs, along with a modular software structure, permit you to use the easYgen-3000 Series for a wide range of applications. Also the easYgen-3000 Series is compatible for isolated, island parallel, mains parallel and multiple unit mains parallel operations. The easYgen-3000 Series controllers can be connected to network up to 32 gensets with automatic sequencing.

The easYgen-3400/3500 devices are designed to interact with Woodward's LS-5 Series controllers. The LS-5 Series are synchronizers and load share controllers with integrated protective functions. They are designed to enable complex power management applications with multiple mains and bus breakers in combination with easYgen-3400/3500 equipped genset controllers. The status of each LS-5 unit connected to the easYgen-3400/3500 can be visualized in the color graphics display for full system overview.

Two variants are available: the easYgen-3400 for cabinet back panel installation, and the easYgen-3500 with a color graphics display and soft keys for cabinet door mounting.

FlexApp™ – This feature provides the tools to easily configure the number of operated breakers: None, GCB, GCB and MCB, GGB (Generator Group Breaker) and additional modes for Woodward LS-5 device interaction.

LogicsManager™ – Woodward's LogicsManager enables changes to the operation sequences and adaption to specific needs. The LogicsManager accomplishes this by monitoring a range of measuring values and internal states, which are combined logically with Boolean operators and programmable timers. This enables creation and/or modification of control and relay functions.

DynamicsLCD™ – The adaptive and interactive 5.7", 320x240 pixel color graphical LC display with soft keys and a clear menu structure ensures intuitive user operation and navigation.

FEATURES

- Provides full connectivity to Woodward's LS-5 breaker protection and control devices to enable complex power management applications with multiple mains and bus breakers. 16 LS-5 units can be used in total in combination with up to 32 Generators in one application.
- In case transformers are used in the application, configurable voltages and vector group adjustment is available for the synchronization process.
- Run-up synchronization is available to get several synchronous generators onto the load in a very short time. Therefore all generators are paralleled by closing their circuit breakers during the engine start sequence. Then after a certain speed is achieved the voltage regulators are enabled and the generators will produce voltage.
- Run-up synchronization can also be applied, if transformers are used in the application and the generators can't handle the high in-rush currents when closing the live generator to the dead transformer. Using the run-up synchronization method allows the generator and transformer to build up voltage gradually through the start without producing large in-rush currents.
- Breaker control: Slip frequency / phase matching synchronization, open-close control, breaker monitoring
- Load transfer features: open / closed transition, interchange, soft loading / soft unloading, mains parallel
- Remote control via interface and discrete/analog inputs for adjusting speed, frequency, voltage, power, reactive power, and power factor set points
- Complete integrated engine and generator protection as well as mains monitoring features
- Freely configurable PID controllers for various control purposes, such as heating circuit control (CHP applications), water level, fuel level, or pressure and/or other process values
- Special Scania S6, MTU ADEC, Volvo EMS2 & EDC4, Deutz EMR2, MAN MFR/EDC7, SISU EEM, Cummins and Woodward E3 ECU support
- Configurable trip levels / delay timers / alarm classes for monitoring and protective functions
- Clear text display and evaluation of up to 100 J1939 analog values
- Discrete and analog I/O expansion board connectivity (Woodward IKD 1 or Phoenix Contact IL series)
- Multi-lingual capability (English, German, French, Spanish, Chinese, Japanese, Italian, Portuguese, Turkish, Russian, Polish)

- Color Display
- DNV, ABS and LR marine approved
- 3-Phase busbar or mains voltage sensing and monitoring
- Timer countdowns visible on display screen
- Start/Stop Logic can be turned off for shaft generator control
- Dual redundant Generator breaker feedback monitoring
- Provides full connectivity of up to 16 Woodward LS-5 Series devices.
- Adjustable vector groups for Synchronization
- Integrated Generator Group breaker control
- Run-up Synchronization
- Automatic Segment Control
- Stand-by operation
- Import/export control
- Open/closed transition
- Load sharing and load-dependent start/stop for up to 32 units
- CANopen / J1939 ECU Control

SPECIFICATIONS

Power supply 12/24 Vdc (8 to 40 Vdc)
 Intrinsic consumption max. 17 W
 Ambient temperature (operation) -20 to 70 °C / -4 to 158 °F
 Ambient temperature (storage) -30 to 80 °C / -22 to 176 °F
 Ambient humidity 95 %, non-condensing

Voltage ($\sqrt{\Delta}$)
 100 Vac [1] Rated (V_{rated}) 69/120 Vac
 Max. value (V_{max}) 86/150 Vac
 Rated surge volt. (V_{surge}) 2.5 kV
and 400 Vac [4] Rated (V_{rated}) 277/480 Vac
 Max. value (V_{max}) 346/600 Vac
 Rated surge volt. (V_{surge}) 4.0 kV

Accuracy Class 1
 Measurable alternator windings ... 3p-3w, 3p-4w, 3p-4w OD, 1p-2w, 1p-3w
 Setting range primary 50 to 650,000 Vac
 Linear measuring range $1.25 \times V_{rated}$
 Measuring frequency 50/60 Hz (40 to 85 Hz)
 High Impedance Input; Resistance per path [1] 0.498 M Ω , [4] 2.0 M Ω
 Max. power consumption per path < 0.15 W

Current (Isolated) Rated (I_{rated}) [1] ..1 A or [5] ..15 A
 Linear measuring range $I_{gen} = 3.0 \times I_{rated}$
 $I_{mains/ground} = 1.5 \times I_{rated}$

Setting range 1 to 32,000 A
 Burden < 0.15 VA
 Rated short-time current (1 s) [1] $50 \times I_{rated}$, [5] $10 \times I_{rated}$

Power
 Setting range 0.5 to 99,999.9 kW/kvar

Discrete inputs isolated
 Input range 12/24 Vdc (8 to 40 Vdc)
 Input resistance approx. 20 kOhms

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 inputs (none isolated) freely scaleable
 Type 0 to 500 Ohms / 0 to 20 mA
 Resolution 11 Bit

Analog outputs (isolated) freely scaleable
 Type $\pm 10 V / \pm 20 mA / PWM$
 Insulation voltage (continuously) 100 Vac
 Insulation test voltage (1s) 500 Vac
 Resolution 11/12 Bit (depending on analog output)
 $\pm 10 V$ (scaleable) internal resistance ≤ 1 kOhms
 $\pm 20 mA$ (scaleable) maximum load 500 Ohms

Housing Front panel flush mounting Plastic housing
 Dimensions WxHxD 282 x 217 x 99 mm
 Front cutout WxH 249 [+1.1] x 183 [+1.0] mm
 Connection screw/plug terminals 2.5 mm²
 Front insulating surface
 Sealing Front IP66 (with screw fastening)
 Front IP54 (with clamp fastening)
 Back IP20

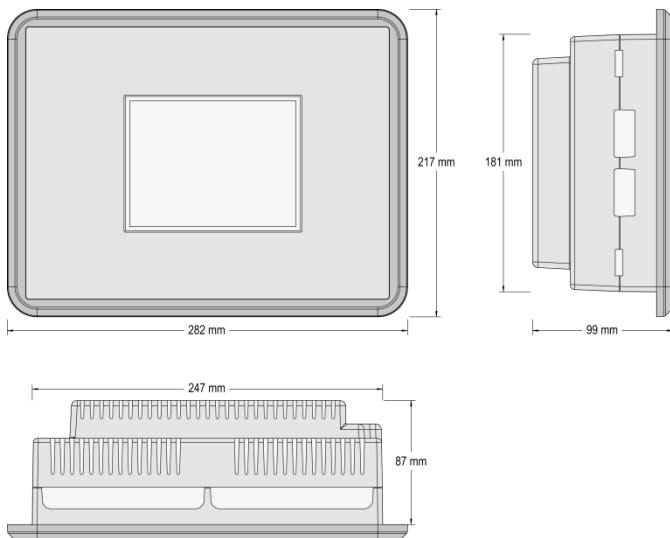
Weight approx. 1,850 g

Housing Back panel mounting Sheet metal housing
 Dimensions WxHxD 250 x 227 x 84 mm
 Connection screw/plug terminals 2.5 mm²
 Protection system IP 20
 Weight approx. 2,150 g

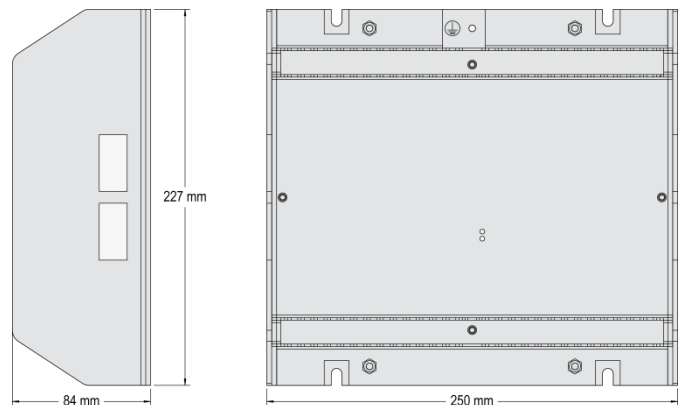
Disturbance test (CE) tested according to applicable EN guidelines
Listings UL, cUL, GOST-R, CSA
Marine DNV, LR (Type Approval); ABS (Design Assessment)

DIMENSIONS

Plastic housing for front panel mounting

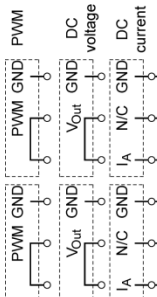


Metal housing for cabinet mounting



TERMINAL DIAGRAM

		Serial #2 RS-485 isolated (Interface #2)	WOODWARD		Serial #1 RS-232 isolated (Interface #1)		
	40	480 Vac	Busbar voltage (system 1) L2 N		Relay [R 01] isolated ^{*1} Fixed to „Ready for operation“	[R 01]	41
	39	120 Vac					42
	38	480 Vac	Busbar voltage (system 1) L1		Relay [R 02] isolated ^{*1} Preconfigured to „Centralized alarm“	[R 02]	43
	37	120 Vac			Relay [R 03] isolated ^{*1} Preconfigured to „Starter“	[R 03]	44
	36	480 Vac	Generator voltage N		Relay [R 04] isolated ^{*1} Preconfigured to „Fuel solenoid / gas valve“	[R 04]	45
	35	120 Vac					46
	34	480 Vac	Generator voltage L3		Relay [R 05] isolated ^{*1} Preconfigured to „Preglow“	[R 05]	47
	33	120 Vac					48
	32	480 Vac	Generator voltage L2		Relay [R 06] isolated ^{*1} Fixed to „Command: close GCB“ if GCB activated	[R 06]	49
	31	120 Vac					50
	30	480 Vac	Generator voltage L1		Relay [R 07] isolated ^{*1} Fixed to „Command: open GCB“ if GCB activated otherwise preconfigured to „Mains decoupling“	[R 07]	51
	29	120 Vac					52
	28	480 Vac	Mains voltage N		Relay [R 08] isolated ^{*1} Fixed to „Command: close MCB“ if MCB activated	[R 08]	53
	27	120 Vac					54
	26	480 Vac	Mains voltage L3		Relay [R 09] isolated ^{*1} Fixed to „Command: open MCB“ if MCB activated otherwise configured to „Mains decoupling“	[R 09]	55
	25	120 Vac					56
	24	480 Vac	Mains voltage L2		Relay [R 10] isolated ^{*1} Fixed to „Command: close GGB“ if GGB activated otherwise preconfigured to „Auxiliary services“	[R 10]	57
	23	120 Vac			Relay [R 11] isolated ^{*1} Fixed to „Command: open GGB“ if GGB activated otherwise preconfigured to „Alarm class A or B“	[R 11]	58
	22	480 Vac	Mains voltage L1		Relay [R 12] isolated ^{*1} Preconfigured to „Alarm class C, D, E or F“	[R 12]	59
	21	120 Vac					60
	20	-	[AO 02]	Analog outputs +/-10 Vdc +/-20 mA PWM isolated	Protective earth PE ^{*2}		61
	19	-			Engine ground		62
	18	+			Power supply	12/24 Vdc	63
	17	-	[AO 01]		Power supply	8 to 40 Vdc	64
	16	-		Auxiliary excitation isolated	0 Vdc	65	
	15	+		Common (terminals 67 to 78)		66	
	14	+	[AI 03]	Discrete input [DI 01] isolated ^{*1} Emergency stop	[DI 01]	67	
	13	-		Discrete input [DI 02] isolated ^{*1} Start in Auto	[DI 02]	68	
	12	+	[AI 02]	Discrete input [DI 03] isolated ^{*1} Low oil pressure	[DI 03]	69	
	11	-		Discrete input [DI 04] isolated ^{*1} Coolant temp.	[DI 04]	70	
	10	+	[AI 01]	Discrete input [DI 05] isolated ^{*1} Alarm acknowledge	[DI 05]	71	
	09	-		Discrete input [DI 06] isolated ^{*1} Enable MCB	[DI 06]	72	
	08	s1	L3	Discrete input [DI 07] isolated Reply: MCB open	[DI 07]	73	
	07	s2		Discrete input [DI 08] isolated Reply: GCB open	[DI 08]	74	
	06	s1	L2	Discrete input [DI 09] isolated ^{*1} Fixed to „GGB open“ if GGB control activated	[DI 09]	75	
	05	s2		Discrete input [DI 10] isolated ^{*1,3} Fixed to „Load busbar is dead“ if GGB control act.	[DI 10]	76	
	04	s1	L1	Discrete input [DI 11] isolated ^{*1,4} Reply: GCB closed	[DI 11]	77	
	03	s2		Discrete input [DI 12] isolated ^{*1}	[DI 12]	78	
	02	s1		MPU input	+	79	
	01	s2			-	80	
			CAN bus #3 System level isolated (Interface #5)	CAN bus #2 Engine level isolated (Interface #4)	CAN bus #1 Guidance level isolated (Interface #3)		



easYgen-3400/3500 Marine

*1 = parameter 4128 must be configured to „on“
*2 = parameter 3421 must be configured to „on“

Subject to technical modifications.

^{*1} = configurable via LogicsManager ^{*2} = only available in easYgen-3500

FEATURES OVERVIEW

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Distributors & Service

Woodward has an international network of distributors and service facilities. For your nearest representative, call the Fort Collins plant or see the Worldwide Directory on our website.

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		easYgen-3000 Series	
		3400 Marine	3500 Marine
Model	Package	P1	P1
Measuring			
Generator voltage (3-phase/4-wire)		✓	✓
Generator current (3x true r.m.s.)		✓	✓
Mains voltage (3-phase/4-wire)		✓	✓
Mains or ground current (1x true r.m.s.) #1		✓	✓
Busbar voltage (1-phase/2-wire)		✓	✓
Control			
Breaker control logic (open and closed transition)	<i>FlexApp™</i>	2	2
Number of supported Woodward LS-5 units		16	16
Automatic, Manual, Stop, and test operating modes		✓	✓
Single and multiple-unit operation		✓	✓
Mains parallel multiple-unit operation (up to 32 units) #2		✓	✓
AMF (auto mains failure) and stand-by operation		✓	✓
Critical mode operation		✓	✓
GCB and MCB synchronization (slipping / phase matching)		✓	✓
GGB (Generator group breaker) control		✓	✓
Run-up synchronization		✓	✓
Interchange (import / export control)		✓	✓
Load-dependent start/stop		✓	✓
n/f, V, P, Q, and PF remote control via analog input or interface		✓	✓
Load/var sharing for up to 32 gensets		✓	✓
Freely configurable PID controllers		3	3
HMI			
Color Display with Soft key operation	<i>DynamicsLCD™</i>	-	✓
Start/stop logic for diesel / gas engines		✓	✓
Counters for operating hours / starts / maintenance / active/reactive energy		✓	✓
Configuration via PC #3		✓	✓
Event recorder entries with real time clock (battery backup)		300	300
Protection			
ANSI#			
Generator: voltage / frequency	59 / 27 / 81O / 81U	✓	✓
Generator: overload, reverse/reduced power	32 / 32R / 32F	✓	✓
Generator: unbalanced load	46	✓	✓
Generator: instantaneous overcurrent	50	✓	✓
Generator: time-overcurrent (IEC 255 compliant)	51	✓	✓
Generator: ground fault #4	50G	✓	✓
Generator: power factor	55	✓	✓
Generator: rotation field		✓	✓
Engine: overspeed / underspeed	12 / 14	✓	✓
Engine: speed / frequency mismatch		✓	✓
Engine: D+ auxiliary excitation failure		✓	✓
Mains: voltage / frequency	59 / 27 / 81O / 81U	✓	✓
Mains: phase shift / rotation field / df/dt (ROCOF)	78	✓	✓
I/Os			
Speed input (magnetic / switching; Pickup)		✓	✓
Discrete alarm inputs (configurable)		10	10
Discrete outputs (configurable)	<i>LogicsManager™</i>	max. 12	max. 12
External discrete inputs / outputs via CANopen (maximum)		32 / 32	32 / 32
Analog inputs #5 (configurable)	<i>FlexIn™</i>	3	3
Analog outputs (+/- 10V, +/- 20mA, PWM; configurable)		2	2
External analog inputs / outputs via CANopen (maximum)		16 / 4	16 / 4
Display and evaluation of J1939 analog values (supported SPNs)		100	100
CAN bus communication interfaces #6	<i>FlexCAN™</i>	3	3
RS-232/485 Modbus RTU Slave interface(s)		1 / 1	1 / 1
Listings/Approvals			
UL / cUL Listing		✓	✓
GOST-R & CSA		✓	✓
LR, ABS & DNV Marine		✓	✓
CE Marked		✓	✓
Part Numbers			
1A CT inputs / front panel mounting with display #7	P/N 8440-	-	2046
5A CT inputs / front panel mounting with display #7	P/N 8440-	-	2047
1A CT inputs / cabinet back mounting w/o display	P/N 8440-	2044	-
5A CT inputs / cabinet back mounting w/o display	P/N 8440-	2045	-
Spare connector kit		8928-7371	8923-1314

#1 mains or ground current selectable

#2 refer to the Manual for applications with more than 8 parallel gensets because of bus load limits

#3 via serial connection and ToolKit software (included)

#4 measured ground current

#5 selectable during configuration between VDO (0 to 180 Ohm, 0 to 5 bar), VDO (0 to 180 Ohm, 0 to 10 bar), VDO (0 to 380 Ohm, 40 to 120°C), VDO (0 to 380 Ohm, 50 to 150°C), Pt100, Resistive input (one- or two-pole, 2pt. linear or 9pt. user defined), or 20 mA (0/4 to 20 mA, freely configurable)

#6 freely selectable during configuration between CANopen or J1939; request information

#7 a screw and a clamp kit are delivered with the unit for fastening