easYgen Series Controls for Asynchronous Genset Applications

DESCRIPTION

Woodward's easYgen paralleling genset controls for asynchronous genset applications expand upon the versatility of the popular easYgen-2000 series and easYgen-3000 series genset controls and include a speed measurement device EPU-100.
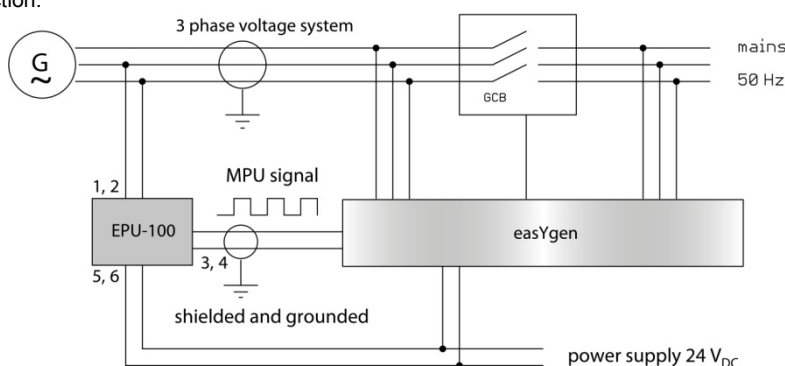
The easYgen controllers provide parameter selection for generator type. When asynchronous generator (induction generator) type is selected, the easYgen controls automatically re-configure to provide special functions for the asynchronous generators. The easYgen asynchronous genset controllers include all the highly-valued features and functions of the standard easYgen models, and an electronic speed measurement device. This device allows the user to easily convert the Remanence voltage into MPU square wave pulses which is then feed into the easYgen controller for speed reference.

The easYgen asynchronous genset application functionality is available in 2 kits:

- **Asynchron KIT-2000** – includes a standard easYgen-2500-P1, plus an EPU-100.
  Applications include parallel operation of a single genset with a utility.

- **Asynchron KIT-3000** – includes a standard easYgen-3500-P2, plus an EPU-100.
  Applications include load sharing of up to 32 gensets in utility parallel operation. This kit is also compatible with Woodward LS-5 series circuit breaker controls, for complex distribution systems with multiple utility feeds and tie breakers.

FEATURES

- As long as the GCB is open the relevant MPU input (speed signal) comes from the EPU-100.
- The closing of the GCB is executed, if the speed is within the corresponding frequency range of the generator operating window. The voltage and phase angle is ignored in this case.
- The generator monitoring (under/over frequency and under/overvoltage/asymmetry) is switched off, until the generator breaker is closed.
- After opening the GCB, under/over frequency and under/overvoltage and asymmetry monitoring is switched on again.
- The synchronoscope is not displayed in the asynchronous mode.
- Operation modes: Auto, Stop, Manual, and Load/No Load test.
- Breaker control: Slip frequency synchronization, open-close control, and breaker monitoring.
- Load transfer features: Open / closed transition, interchange, soft loading / soft unloading.
- Active power and reactive power sharing.
- Discrete and analog I/O expansion board connectivity (Woodward IKD 1 or Phoenix Contact IL series).
- Event recorder (300 events, FIFO) with real time clock (battery backup for min. 5 years).
- Multi-level password protection.
- Multi-lingual capability.
- Perfectly working together. See application sample beside:

- **For asynchronous or induction genset applications**
- **Allows packagers to standardize on a single control platform for multiple uses**
- **Speed input from simple and robust Electronic Pickup Unit**
- **Slip frequency synchronization**
- **Soft loading/unloading features**
- **Open/closed transition**

Asynchron KIT-3000:
- **Sophisticated control with load sharing and load-dependent start/stop of up to 32 units**
- **Provides full connectivity of up to 16 Woodward LS-5 circuit breaker controller**
- **Integrated Generator Group breaker control**
- **Run-up Synchronization**

Asynchron KIT-2000:
- **Economical option for a single genset paralleled with a utility**
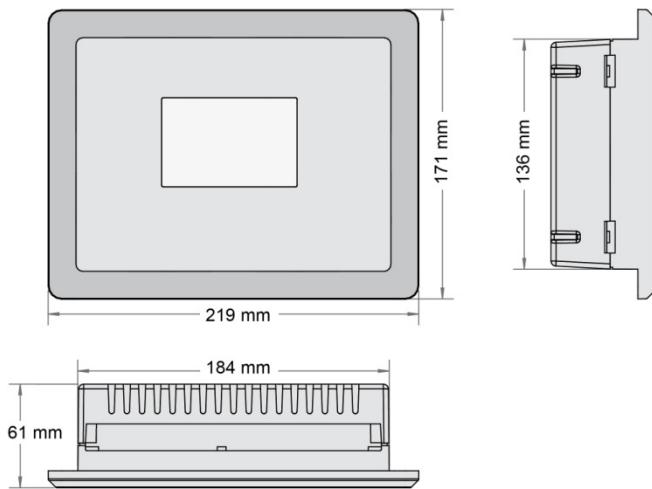- **Four configurable AI/AO**
- **Smaller footprint**

SPECIFICATIONS

Power supply..12/24 Vdc (8 to 40 Vdc)
Intrinsic consumption ....max. 12 W (easYgen-2500-P1)
....max. 19 W (easYgen-3500-P2)
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 ....(人/Δ)
   120 Vac [1]   Rated (V_{rated})...69/120 Vac
                Max. value (V_{max})...86/150 Vac
    Rated voltage phase – ground................ 150 Vac (easYgen-2500P1)
      Rated surge volt. (V_{surge}).....................................2.5 kV
   ***and** 480 Vac [4]*   Rated (V_{rated})...277/480 Vac
                Max. value (V_{max})...346/600 Vac
    Rated voltage phase – ground................ 150 Vac (easYgen-2500P1)
      Rated surge volt. (V_{surge}).....................................4.0 kV
Accuracy ....Class 1
Measurable alternator windings ....(easYgen-3500P2)
....3p-3w, 3p-4w, 3p-4w OD, 1p-2w, 1p-3w
Setting range..................... primary...................................(easYgen-3500P2)
....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 MΩ, [4] 2.0 MΩ
Max. power consumption per path... < 0.15 W
Current (Isolated)   Rated (I_{rated}).. 5 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 (easYgen-3500P2)
Burden..< 0.15 VA
Rated short-time current (1 s) .... $10{\times}I_{rated}$
Power ....(easYgen-3500P2)
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/potential free
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 scalable
Type ....0 to 500 Ohms / 0 to 20 mA
Resolution ....11 Bit
Analog outputs (isolated) ....freely scalable
Type .... ± 10 V / ± 20 mA / PWM
Insulation voltage (continuously) ....100 Vac
Insulation test voltage (≤ 5s) .... 1000 Vac (easYgen-2500P1)
                (1s) .... 500 Vac (easYgen-3500P2)
Resolution ....11/12 Bit (depending on analog output)
± 10 V (scalable)   internal resistance .....~ 500 Ohms (easYgen-2500P1)
                internal resistance ....≤1 kOhms (easYgen-3500P2)
± 20 mA (scalable)   ....maximum load 500 Ohms
Housing   Front panel flush mounting ....Plastic housing
Dimensions   WxHxD .... 219 × 171 × 98 mm (easYgen-2500P1)
                 WxHxD .... 282 × 217 × 99 mm (easYgen-3500P2)
Front cutout   WxH ...... 186 [+1.1] × 138 [+1.0] mm (easYgen-2500P1)
                 WxH ...... 249 [+1.1] × 183 [+1.0] mm (easYgen-3500P2)
Connection..screw/plug terminals 2.5 mm²
Front...insulating surface
Sealing   Front...... IP65 (with screw fastening) (easYgen-2500P1)
                Front...... IP66 (with screw fastening) (easYgen-3500P2)
                Front.................................... IP54 (with clamp fastening)
                Back IP20
Weight...approx. 1,100 g (easYgen-2500P1)
....approx. 1,850 g (easYgen-3500P2)
Disturbance test (CE) ....tested according to applicable EN guidelines
Listings ....UL, cUL, GOST-R, CSA
Marine ....LR (Type Approval),
.... ABS Design Assessment (easYgen-2500P1)
.... ABS Type Approval (easYgen-3500P2)
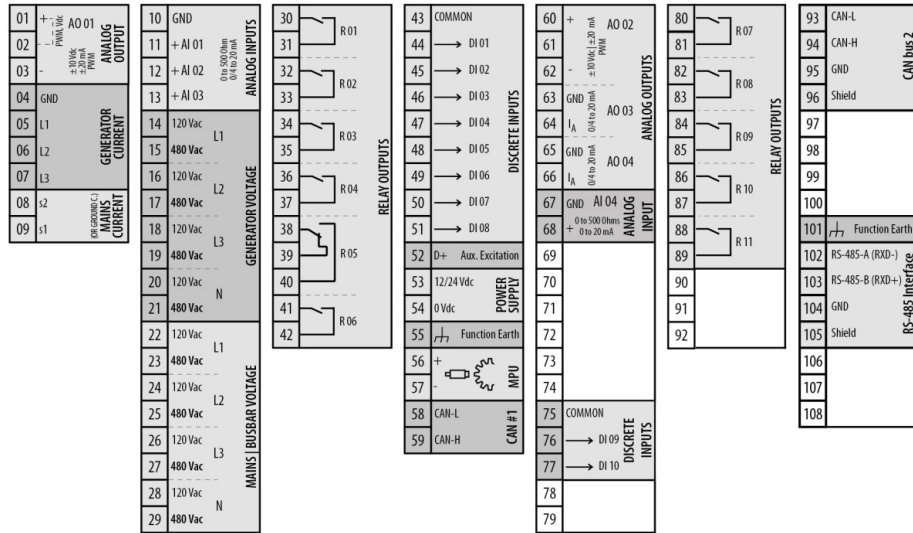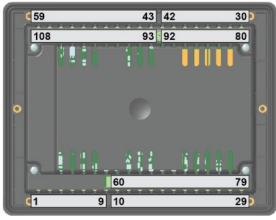
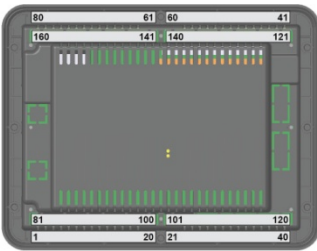# DIMENSIONS

Plastic housing for front panel mounting

easYgen-2500P1

easYgen-3500P2

TERMINAL DIAGRAM
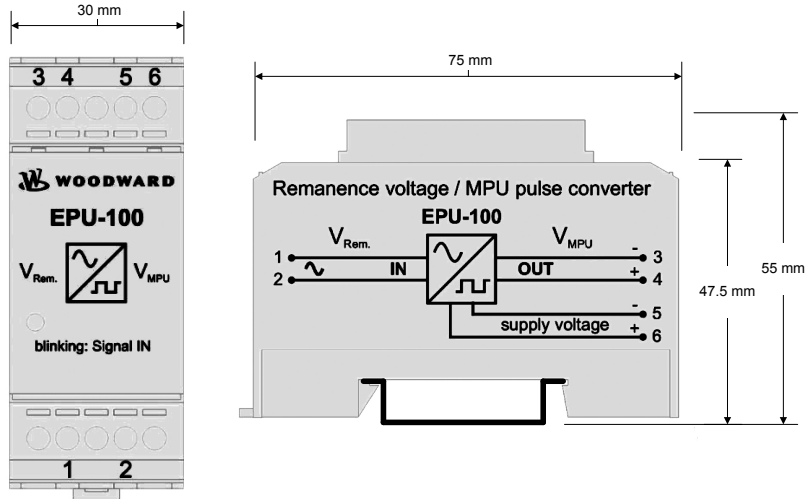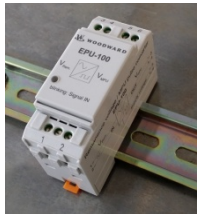
easYgen-2500P1

Terminal	Description
01	+ PWM Vdc — ANALOG OUTPUT
02	±10 Vdc / ±20 mA / PWM — AO 01
03	PWM
04	GND
05	L1
06	L2 — GENERATOR CURRENT
07	L3
08	s2 (OR GROUND C.) MAINS CURRENT
09	s1
10	GND
11	+ AI 01
12	+ AI 02 — 0 to 500 Ohm — ANALOG INPUTS
13	+ AI 03
14	120 Vac — L1
15	480 Vac
16	120 Vac — L2
17	480 Vac — GENERATOR VOLTAGE
18	120 Vac — L3
19	480 Vac
20	120 Vac — N
21	480 Vac
22	120 Vac — L1
23	480 Vac
24	120 Vac — L2 — MAINS | BUSBAR VOLTAGE
25	480 Vac
26	120 Vac — L3
27	480 Vac
28	120 Vac — N
29	480 Vac
30	R 01
31	R 01
32	R 02
33	R 02
34	R 03
35	R 03
36	R 04
37	R 04 — RELAY OUTPUTS
38	R 05
39	R 05
40	R 06
41	R 06
42	R 06
43	COMMON
44	DI 01
45	DI 02
46	DI 03
47	DI 04
48	DI 05 — DISCRETE INPUTS
49	DI 06
50	DI 07
51	DI 08
52	D+ Aux. Excitation
53	12/24 Vdc — POWER SUPPLY
54	0 Vdc
55	Function Earth
56	+ MPU
57	−
58	CAN-L — CAN #1
59	CAN-H
60	+ AO 02
61	PWM ±10 Vdc / ±20 mA — ANALOG OUTPUTS
62	
63	GND AO 03
64	I_A 0/4 to 20 mA
65	GND AO 04
66	I_A
67	GND AI 04 — 0 to 500 Ohm / 0 to 20 mA — ANALOG INPUT
68	+
75	COMMON
76	DI 09 — DISCRETE INPUTS
77	DI 10
80	R 07
81	R 07
82	R 08
83	R 08
84	R 09
85	R 09 — RELAY OUTPUTS
86	R 10
87	R 10
88	R 11
89	R 11
93	CAN-L
94	CAN-H — CAN bus 2
95	GND
96	Shield
101	Function Earth
102	RS-485-A (RXD-)
103	RS-485-B (RXD+) — RS-485 Interface
104	GND
105	Shield

easYgen-3500P2

Terminal	Description
01	s2 L1 (OR GROUND C.) MAINS CURRENT
02	s1
03	s2 L1
04	s1
05	s2 L1 — GENERATOR CURRENT
06	s1
07	s2 L2
08	s1 L3
09	− AI 01
10	+
11	− AI 02 — 0 to 500 Ohm / 0/4 to 20 mA — ANALOG INPUTS
12	+
13	− AI 03
14	+
15	− PWM, Vdc AO 01
16	+ PWM — ANALOG OUTPUTS
17	− PWM, Vdc AO 02
18	+ PWM ±10 Vdc / ±20 mA
19	−
20	−
21	120 Vac L1
22	480 Vac
23	120 Vac L2 — MAINS VOLTAGE
24	480 Vac
25	120 Vac L3
26	480 Vac
27	120 Vac N
28	480 Vac
29	120 Vac L1
30	480 Vac
31	120 Vac L2 — GENERATOR VOLTAGE
32	480 Vac
33	120 Vac L3
34	480 Vac
35	120 Vac N
36	480 Vac
37	120 Vac L1
38	480 Vac — BUSBAR VOLTAGE
39	120 Vac L2 | N
40	480 Vac
41	R 01
42	
43	R 02
44	R 03
45	R 04
46	
47	R 05
48	
49	R 06
50	
51	R 07 — RELAY OUTPUTS
52	
53	R 08
54	
55	R 09
56	
57	R 10
58	R 11
59	R 12
60	
61	Protective Earth
62	Engine Ground
63	12/24 Vdc — POWER SUPPLY
64	0 Vdc
65	D+ Aux. Excitation
66	COMMON
67	DI 01
68	DI 02
69	DI 03
70	DI 04
71	DI 05
72	DI 06 — DISCRETE INPUTS
73	DI 07
74	DI 08
75	DI 09
76	DI 10
77	DI 11
78	DI 12
79	+ MPU
80	−
81	GND CS01 SINKING OUTPUT
82	
83	−
84	+ AI 04
85	−
86	+ AI 05 — 0 to 10 V / (0/4 to 20 mA) — ANALOG INPUTS
87	−
88	+
89	− AI 06 (0/4 to 20 mA)
90	+
91	−
92	1
93	2 AI 07
94	3
95	1
96	2 AI 08 — 0 to 250/2500 Ohm — ANALOG INPUTS
97	3
98	1
99	2 AI 09
100	3
101	1 AI 10
102	2 — 0 to 250/2500 Ohm — ANALOG INPUTS
103	3
109	− AO 04
110	+
111	− AO 05 — 0/4 to 20 mA, isolated — ANALOG OUTPUTS
112	+
113	− AO 06
114	+
121	R 13
122	
123	R 14
124	
125	R 15
126	
127	R 16
128	
129	R 17
130	
131	R 18 — RELAY OUTPUTS
132	
133	R 19
134	
135	R 20
136	
137	R 21
138	
139	R 22
140	
141	DI 13
142	DI 14
143	DI 15
144	DI 16
145	DI 17
146	DI 18
147	DI 19
148	DI 20 — DISCRETE INPUTS
149	DI 21
150	DI 22
151	DI 23
152	COMMON
153	GND S02 SINKING OUTPUT
154	

EPU-100

WOODWARD
EPU-100
V_Rem. V_MPU
blinking: Signal IN

Remanence voltage / MPU pulse converter — EPU-100

1 — V_Rem. — IN — OUT — V_MPU — 3
2 —
4
5 — supply voltage — 6

30 mm, 75 mm, 55 mm, 47.5 mm

(Terminal diagram and dimensions)

FEAUTURE OVERVIEW

	easYgen …	
Model	Asynchron KIT-2000	Asynchron KIT-3000
Measuring		
Generator voltage (3-phase/4-wire)	✓	✓
Generator current (3x true r.m.s.)	✓	✓
Mains voltage (3-phase/4-wire)	✓	✓
Mains or ground current (selectable, 1 x true r.m.s.)	✓	✓
Busbar voltage (1-phase/2-wire)	-	✓
Control		
Breaker control logic (open and closed transition) *FlexApp™*	2	3
Number of supported Woodward LS-5 units	-	16
Automatic, Manual, Stop, and test operating modes	✓	✓
Mains parallel multiple-unit operation (up to …)	1	32 [#1] units
GCB and MCB synchronization (slip synchronization)	✓	✓
Open (break-before-make) and closed (make-before-break) transition	✓	✓
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	✓	✓
Freely configurable PID controllers	-	3
HMI		
Display with Softkey operation *DynamicsLCD™*	Monochrome	Color
Counters for period of use / total operating hours / starts / maintenance	✓	✓
Configuration via PC (ToolKit software included)	✓ (needs DPC cable)	✓
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 [#2] 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: rotation field	✓	✓
Mains: phase shift / df/dt (ROCOF) 78	✓	✓
I/Os		
Speed input through EPU-100	✓	✓
Discrete alarm and control inputs (configurable)	10	10
Discrete outputs (configurable) *LogicsManager™*	11	max. 12
External discrete inputs / outputs via CANopen (maximum)	16 / 16 [#3]	16 / 16
Analog inputs (configurable) *FlexIn™*	4	10 [#4]
Analog outputs (+/- 10V, +/- 20mA, PWM; configurable)	4	5
CAN bus communication interfaces [#5] *FlexCAN™*	2	3
RS-485 Modbus RTU Slave interface(s)	1	1
Service Port to connect via *RS-232 DPC cable* or *DPC USB cable*	✓	✓
Listings/Approvals for the easYgens (EPU-100 is CE marked. For details please see the respective product specifications.)		
UL / cUL listing and CE marked	✓	✓
GOST-R & CSA	✓	✓
LR & ABS Marine	✓	✓
BDEW / VDE-AR-N 4105	-	✓
Part Numbers for the complete KIT	CT inputs: 5A	CT inputs: 5A
easYgen with display for front panel mounting (incl. mounting kit) and EPU	8923-2074	8923-2073
Spare connector kit for easYgen	8928-7297	8923-1314
DPC Service Port cable for easYgen *RS-232 DPC cable*	5417-557	-/-
DPC USB cable	5417-1251	-/-

#1 Refer to the Manual for applications with more than 8 parallel gensets because of bus load limits
#2 Measured ground current
#3 Two digital IO expansion boards (P/N 8440-2028) are connectable via CAN bus to provide 8 additional DIs and DOs each

#4 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)
#5 Freely selectable during configuration between CANopen or J1939; request information