



## LS-5 Series V2

### LS-511/521 1breaker

# Circuit Breaker Control & Protection

#### New Features

- ✓ Two breaker control variants
- ✓ Separate incoming and outgoing current inputs per phase
- ✓ German grid code compliance (VDE AR-N 4105 & BDEW)
- ✓ Enhanced diagnostics and visualization

## DESCRIPTION

Woodward's LS-5 Series relays are synchronizer controllers with integrated mains decoupling and protection features. The applications range from independent synch check relay to complex power management with multiple utility feeds, bus tie-breakers and group breakers in combination with Woodward's easYgen-3400XT/3500XT equipped genset controllers. Wiring efforts are reduced to a minimum, since only one CAN bus connection is required between all LS-5 and easYgen controllers to transmit AC measurement signals, I/O states, flags, etc.

The LS-5x1 devices manage synchronization, loading and un-loading on each bus segment and send the required voltage, frequency and phase angle references via CAN bus to the easYgen-3400XT/3500XT genset controllers. When serving an incoming mains breaker it automatically detects mains failure, performs mains decoupling and sends the start signal to the easYgen. The LS-5x1 is software selectable to be applied as an independent synch check relay, mains circuit breaker control or bus tie-breaker control thereby providing exceptional versatility and value for OEM switchgear builders, generator packagers, and system integrators.

The LS-5x1 Series is available in two different mounting styles. An LS-521 with a plastic housing and graphic LCD display is designed to be mounted on the cabinet's front door. An LS-511 with an aluminum powder coated housing without display is designed to be back panel mounted.

## FEATURES

- Up to 16 LS-5 units can be operated in one network with up to 32 easYgen-3400XT/3500XT
- Phase match or slip frequency synchronization with voltage matching
- Full protection package (including  $df/dt$  (ROCOF), phase shift, and mains voltage increasing protection according to new German grid code)
- Segment control for the load sharing
- Event Log with up to 300 entries
- Automatic date and time synchronization between the LS-5 units and the connected easYgen-3400XT/3500XT controls
- LS-5 "Stand alone" mode without the easYgen-3400XT/3500XT is possible
- Preconfigured application modes that simplify the configuration process for complex multi-breaker applications
- AUTOMATIC and MANUAL mode
- Full remote control via CAN or RS-485 interface
- Vector group adjustment in case transformers are used in the application
- Breaker open/close failure detection
- Mains decoupling "Test" mode
- Lock keypad feature
- 4 freely configurable alarms
- 8 Freely configurable LED's on the LS-511 back panel mountable device
- Multi-lingual capability: English, German, Spanish, French, Italian, Portuguese, Japanese, Chinese, Russian, Turkish, Polish
- Designed as a compact solution for complex power management applications
- Up to 16 LS-5 units can be utilized in one application
- Up to 32 bus segments are possible
- Synch check and mains decoupling in one compact controller
- Adjustable vector groups for synchronization
- Utility import/export control
- Automatic and Manual mode
- LS-5 "Stand alone" mode for use without easYgen-3400XT/3500XT System
- LogicsManager functionality for application customization
- CAN and RS-485 interfaces for remote control and visualization purposes
- True RMS sensing
- Available as cabinet front door mounted device or DIN-Rail back panel mounted metal housing
- Freely configurable relay outputs
- Freely configurable discrete inputs
- QV monitoring
- Time-dependent voltage monitoring
- RoHS2, BDEW and VDE AR-N 4105 compliant

# SPECIFICATIONS

Power supply..... 12/24 Vdc (8 to 40 Vdc)  
 Intrinsic consumption ..... max.~ 5 W (LS-511)  
 ..... max.~ 6 W (LS-521)  
 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** ..... (  $\wedge/\Delta$  )

120 Vac [1] Rated ( $V_{rated}$ )..... 69/120 Vac  
 Max. value ( $V_{max}$ )..... 86/150 Vac  
 Rated voltage phase – ground ..... 150 Vac  
 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 ..... 300 Vac  
 Surge volt. ( $V_{surge}$ )..... 4.0 kV

Accuracy ..... Class 1  
 Linear measuring range .....  $1.25 \times V_{rated}$   
 Measuring frequency..... 50/60 Hz (30 to 85 Hz)  
 High Impedance Input; Resistance per path..... [1] 0.498 M $\Omega$ , [4] 2.0 M $\Omega$

**Current (Isolated)** Rated ( $I_{rated}$ )..... [1] ..1 A or [5] ..1/5 A  
 Linear measuring range .....  $I_{gen} = 1.5 \times I_{rated}$   
 Burden..... < 0.15 VA  
 Rated short-time current (1 s)..... [1]  $50 \times I_{rated}$ , [5]  $10 \times I_{rated}$

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

**Relay outputs** ..... potential free  
 Contact material..... AgCdO  
 Load (GP) ..... AC: 2.00 Aac@250 Vac  
 DC: 2.00 Adc@24 Vdc / 0.36 Adc@125 Vdc / 0.18 Adc@250 Vdc  
 Pilot duty (PD)..... AC: B300  
 DC: 1.00 Adc@24 Vdc / 0.22 Adc@125 Vdc / 0.10 Adc@250 Vdc

**Housing (LS-521)** Front door mounting..... Plastic housing  
 Dimensions WxHxD..... 219 x 171 x 61 mm  
 Front cutout WxH ..... 186 [+1.1] x 138 [+1.0] mm  
 Connection..... screw/plug terminals 2.5 mm<sup>2</sup>  
 Front..... insulating surface  
 Sealing Front..... IP66 (with screw fastening)  
 Front..... IP54 (with clamp fastening)  
 Back ..... IP20

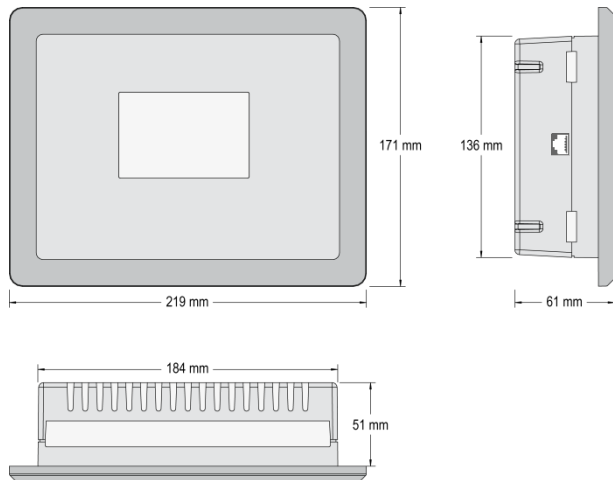
Weight..... approx. 850 g

**Housing (LS-511)** Back panel mounting..... Sheet metal housing  
 Dimensions WxHxD..... 190 x 167 x 47 mm  
 Connection..... screw/plug terminals 2.5 mm<sup>2</sup>  
 Protection system ..... IP 20  
 Weight (plastic/sheet metal) ..... approx. 850/840 g

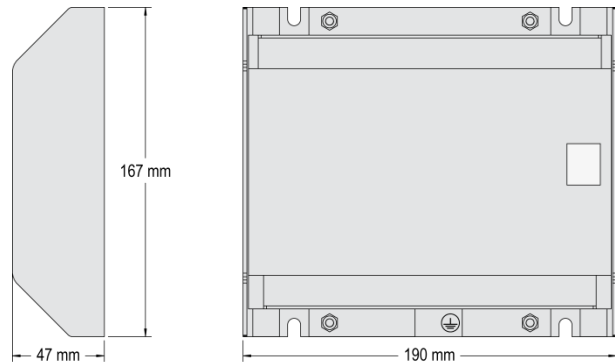
**Disturbance test (CE)** ..... tested according to applicable EN guidelines  
**Listings** ..... CE, UL/cUL, BDEW, VDE AR-N 4105, EAC  
**Marine** ..... Pending: LR, ABS

# DIMENSIONS

**Plastic housing for front panel mounting**




**Metal housing for cabinet mounting**



# TERMINAL DIAGRAM

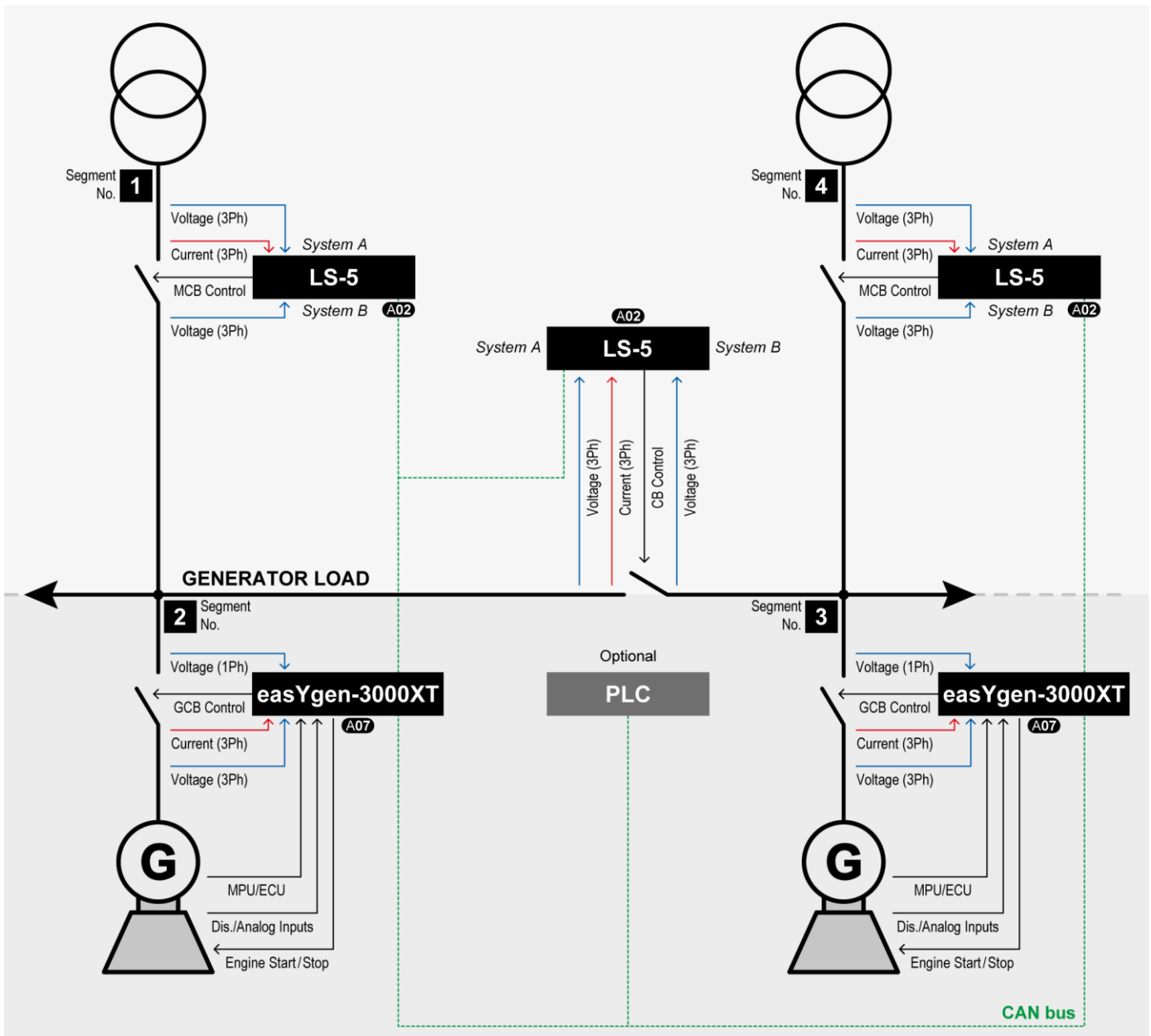
59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
RS-485-A	RS-485-B	CAN-H	CAN-L	No Connection	0 Vdc	12/24 Vdc	No Connection	DI08	DI07	DI06	DI05	DI04	DI03	DI02	DI01	COMMON
RS-485		CAN			POWER SUPPLY			DISCRETE INPUTS								

42	41	40	39	38	37	36	35	34	33	32	31	30
R06		R05			R04		R03		R02		R01	
RELAY OUTPUTS												

SYSTEM A CURRENT						No Connection	
							
S <sub>2</sub> L1	S <sub>1</sub> L1	S <sub>2</sub> L2	S <sub>1</sub> L2	S <sub>2</sub> L3	S <sub>1</sub> L3		
01	02	03	04	05	06	07	08

NO CONNECTION				SYSTEM A VOLTAGE							SYSTEM B VOLTAGE								
				L1	L2	L3	N	L1	L2	L3	N	L1	L2	L3	N				
				120 Vac	480 Vac	120 Vac	480 Vac	120 Vac	480 Vac	120 Vac	480 Vac	120 Vac	480 Vac	120 Vac	480 Vac				
10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29

# EXAMPLE APPLICATION



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For more information contact:

	LS-511	LS-521
<b>I/Os</b>		
Display	No	Yes
Configurable LEDs on Faceplate	Yes	No
System A/B voltage measurement	3-Phases + Neutral	3-Phases + Neutral
System A current measurement	3-Phase	3-Phase
Discrete inputs	8	8
Relay outputs	6	6
CAN Interface	1	1
RS-485 Interface	1	1
<b>Control</b>		
Automatic and Manual operating modes	✓	✓
Breaker synchronization (± slip frequency/phase matching)	✓	✓
Vector group adjustment for synchronization	✓	✓
Configurable dead bus closure direction	✓	✓
<b>HMI</b>		
Configuration via HMI and PC	✓	✓
Event recorder with real time clock (battery backup)	✓	✓
Date and Time Synchronization between LS-5 units and easYgen-3400XT/3500XT	✓	✓
<b>Protection</b>		
Over-/undervoltage (59/27)	✓	✓
Over-/underfrequency (81O/U)	✓	✓
Voltage asymmetry (47)	✓	✓
Phase shift (78)	✓	✓
df/dt (ROCOF) (81)	✓	✓
QV monitoring	✓	✓
Time-dependent voltage	✓	✓
Mains voltage increase (accord. to VDE-AR-N-4105)	✓	✓
<b>Monitoring</b>		
Breaker open/close monitoring	✓	✓
Synchronization time out monitoring	✓	✓
Voltage plausibility	✓	✓
Freely configurable alarms	4	4
<b>Counter</b>		
Circuit breaker closure counter	✓	✓
Energy counters	✓	✓
<b>Listings/Approvals</b>		
UL / cUL / EAC / CE Marked	✓	✓
Pending: LR & ABS Marine	✓	✓
<b>Part Numbers</b>		
	Metal housing	Plastic housing with display
LS-511 (1A / 5A)	8440-2180 / 8440-2152	---
LS-521 (1A / 5A)	---	8440-2178 / 8440-2150
DIN-Rail mounting Kit for LS-511	8923-1746	---
DPC-RS-232 direct configuration cable	5417-557	
DPC-USB direct configuration cable	5417-1251	
Spare parts: Plug set containing all terminal plugs	8928-7544	8928-7545

## RELATED PRODUCTS

- Two breakers control **LS-512/522** (Product Specification # 37665)
- **easYgen-3400XT/3500XT** (Product Specification # 37583)
- **ToolKit** (Product Specification # 03366)
- **Power Generation Learning Module** (Product Specification # 03412): P/N 8447-1012
- Profibus Gateway **ESEPRO** (Application Note # 37577): P/N 8445-1046
- Ethernet (Modbus/TCP) Gateway **ESENET** (Application Note # 37576): P/N 8445-1044
- CANbus to Fiber Optic Converters (Application Note # 37598):  
**DL-CAN** P/N 8445-1049 and **DL-CAN-R** P/N 8445-1048
- Remote Access Gateway (with HMS **Netbiter EasyConnect EC250 and EC350**)