LS-5 Series
LS-511/521
Circuit Breaker Control & Protection

DESCRIPTION

The LS-5 Series are synchronizer controllers with integrated protective functions. They are designed to enable complex power management applications with multiple incoming mains and bus breakers in combination with easYgen-3400/3500 equipped genset controllers.

The LS-5 devices will manage synchronization, loading and un-loading on each bus segment and send the required voltage and frequency references via CAN bus to the easYgen-3400/3500 genset controllers. LS-5 devices which are located on the incoming mains breakers will automatically detect mains failures and start the corresponding gensets accordingly. Wiring efforts are reduced to a minimum, since only one CAN bus connection is required between all LS-5 and easYgen-3400/3500 controllers. It is not required to wire any AC measurement signals or discrete inputs/outputs between the LS-5 and easYgen-3400/3500 controllers.

Extensive remote control capabilities via discrete inputs or interfaces are provided to easily integrate the LS-5 into each application environment.

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

FEATURES

• Designed as 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
• Synchronization and protection in one compact controller
• Adjustable vector groups for Synchronization
• Automatic mains failure detection
• Automatic and Manual mode
• LS-5 “Stand alone” mode for use without easYgen-3400/3500 System.
• LogicsManager functionality
• CAN and RS-485 interfaces for remote control and visualization purposes
• True RMS sensing
• Available as cabinet front door mounted device or DIN-Rail backpanel mounted metal housing
• Freely configurable relay outputs
• Freely configurable discrete inputs
• QV monitoring
• Time-dependent voltage monitoring

• Up to 16 LS-5 units can be operated in one network with up to 32 easYgen-3400/3500
• 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 requirements in VDE-0126-1-1)
• 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-3400/3500 controls
• LS-5 “Stand alone” mode without the easYgen-3400/3500 is possible
• Preconfigured application modes for the most common applications in the field (MCB or MCB/GGB application)
• Automatic and Manual mode
• Full remote control via CAN or RS-485 interface
• In case transformers are used in the application, vector group adjustment is available
• Breaker open/close failure detection
• Mains decoupling “Test” mode
• Multilingual capability
• Lock Keypad feature
• 8 Freely configurable LED’s are available on the LS-511 back panel mountable device
**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>12/24 Vdc (8 to 40 Vdc)</td>
</tr>
<tr>
<td>Intrinsic consumption</td>
<td>max. ~ 5 W (LS-511)</td>
</tr>
<tr>
<td></td>
<td>max. ~ 6 W (LS-521)</td>
</tr>
<tr>
<td>Ambient temperature (operation)</td>
<td>-20 to 70 °C / -4 to 158 °F</td>
</tr>
<tr>
<td>Ambient temperature (storage)</td>
<td>-30 to 85 °C / -22 to 185 °F</td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>95 %, non-condensing</td>
</tr>
<tr>
<td>Voltage</td>
<td>120 Vac [1]</td>
</tr>
<tr>
<td></td>
<td>Rated (V_{rated}) ............................ 69/120 Vac</td>
</tr>
<tr>
<td></td>
<td>Max. value (V_{max}) ....................... 86/150 Vac</td>
</tr>
<tr>
<td></td>
<td>Rated voltage phase – ground ............. 150 Vac</td>
</tr>
<tr>
<td></td>
<td>Surge volt (V_{surge}) ...................... 2.5 kV</td>
</tr>
<tr>
<td></td>
<td>and 480 Vac [4]</td>
</tr>
<tr>
<td></td>
<td>Rated (V_{rated}) ............................ 277/480 Vac</td>
</tr>
<tr>
<td></td>
<td>Max. value (V_{max}) ....................... 346/600 Vac</td>
</tr>
<tr>
<td></td>
<td>Rated voltage phase – ground ............. 300 Vac</td>
</tr>
<tr>
<td></td>
<td>Surge volt (V_{surge}) ...................... 4.0 kV</td>
</tr>
<tr>
<td>Voltage</td>
<td>Accuracy......................................... Class 1</td>
</tr>
<tr>
<td></td>
<td>Linear measuring range ................... 1.25 x V_{rated}</td>
</tr>
<tr>
<td></td>
<td>Measuring frequency....................... 50/60 Hz (40 to 85 Hz)</td>
</tr>
<tr>
<td></td>
<td>High Impedance Input; Resistance per path...[1] 0.498 MΩ, [4] 2.0 MΩ</td>
</tr>
<tr>
<td></td>
<td>Max. power consumption per path........... &lt; 0.15 W</td>
</tr>
<tr>
<td>Current (Isolated)</td>
<td>Rated (I_{rated}) .........................................[1] 0.1 A or [5] 0.5 A</td>
</tr>
<tr>
<td></td>
<td>Linear measuring range ................... I_{gen} = 1.5 x I_{rated}</td>
</tr>
<tr>
<td></td>
<td>Burden........................................... &lt; 0.15 VA</td>
</tr>
<tr>
<td></td>
<td>Rated short-time current (1 s) ........... [1] 50 x I_{rated}, [5] 10 x I_{rated}</td>
</tr>
<tr>
<td>Discrete inputs</td>
<td>Isolated</td>
</tr>
<tr>
<td></td>
<td>Input range ................................... 12/24 Vdc (8 to 40 Vdc)</td>
</tr>
<tr>
<td></td>
<td>Input resistance............................... approx. 20 kΩ/hms</td>
</tr>
</tbody>
</table>

**DIMENSIONS**

**Plastic housing for front panel mounting**

![Plastic Housing Diagram](image1)

**Metal housing for cabinet mounting**

![Metal Housing Diagram](image2)
### LS-5 Series - Terminal diagram

#### Service Port (USB/RS-232)
- Connected only with Woodward DPC cable

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>480 Vac</td>
<td>System B voltage N</td>
</tr>
<tr>
<td>2</td>
<td>480 Vac</td>
<td>System B voltage L3</td>
</tr>
<tr>
<td>3</td>
<td>480 Vac</td>
<td>System B voltage L2</td>
</tr>
<tr>
<td>4</td>
<td>480 Vac</td>
<td>System B voltage L1</td>
</tr>
<tr>
<td>5</td>
<td>480 Vac</td>
<td>System A voltage N</td>
</tr>
<tr>
<td>6</td>
<td>480 Vac</td>
<td>System A voltage L3</td>
</tr>
<tr>
<td>7</td>
<td>480 Vac</td>
<td>System A voltage L2</td>
</tr>
<tr>
<td>8</td>
<td>480 Vac</td>
<td>System A voltage L1</td>
</tr>
<tr>
<td>9</td>
<td>120 Vac</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>120 Vac</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>480 Vac</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>480 Vac</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>480 Vac</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>480 Vac</td>
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<tr>
<td>15</td>
<td>480 Vac</td>
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<tr>
<td>16</td>
<td>480 Vac</td>
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<tr>
<td>17</td>
<td>480 Vac</td>
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</tr>
<tr>
<td>18</td>
<td>480 Vac</td>
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<tr>
<td>19</td>
<td>480 Vac</td>
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<tr>
<td>20</td>
<td>480 Vac</td>
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<tr>
<td>21</td>
<td>480 Vac</td>
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<td>22</td>
<td>120 Vac</td>
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<td>23</td>
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<td>24</td>
<td>120 Vac</td>
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<td>25</td>
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<td>26</td>
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<tr>
<td>27</td>
<td>120 Vac</td>
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<tr>
<td>28</td>
<td>120 Vac</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>120 Vac</td>
<td></td>
</tr>
</tbody>
</table>

#### Common (terminals 44 to 51)
- Discrete input [DI 01] isolated
  - Lock monitoring
- Discrete input [DI 02] isolated
  - Remote acknowledge
- Discrete input [DI 03] isolated
  - Enable decoupling
- Discrete input [DI 04] isolated
  - Immediate open CB A
- Discrete input [DI 05] isolated
  - Reply: Isolation switch is open
- Discrete input [DI 06] isolated
  - Open CB A
- Discrete input [DI 07] isolated
  - Enable to close CB A
- Discrete input [DI 08] isolated
  - Reply: CB A is open

#### Power supply
- 12/24 Vdc
- 8 to 40 Vdc

#### Function earth

#### CAN bus
- CAN-L
- CAN-H

#### RS-485 interface
- RS-485-B
- RS-485-A

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Subject to technical modifications. * = configurable via LogslotManager

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LS-5 Series - Terminal diagram
**EXAMPLE APPLICATION**

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**FEATURES OVERVIEW**

<table>
<thead>
<tr>
<th>Feature</th>
<th>LS-511</th>
<th>LS-521</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I/Os</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Configurable LEDs on Faceplate</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>System A/B voltage measurement</td>
<td>3-Phases + Neutral</td>
<td>3-Phases + Neutral</td>
</tr>
<tr>
<td>System A current measurement</td>
<td>3-Phase</td>
<td>3-Phase</td>
</tr>
<tr>
<td>Discrete inputs</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Relay outputs</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>CAN Interface</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>RS-485 Interface</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic and Manual operating modes</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Breaker synchronization (slip synchronization/phase matching)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Vector group adjustment for synchronization</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Configurable dead bus closure direction</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>HMI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configuration via HMI and PC</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Event recorder with real time clock (battery backup)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Date and Time Synchronization between LS-5 units and easYgen-3400/3500-P1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Protection</strong></td>
<td></td>
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</tr>
<tr>
<td>Over-/undervoltage (59/27)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Over-/underfrequency (81O/U)</td>
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<td>✓</td>
</tr>
<tr>
<td>Voltage asymmetry (47)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Phase shift (78)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>df/dt (ROCOF) (81)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>QV monitoring</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Time-dependent voltage</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Mains voltage increase (accord. to VDE-AR-N-4105)</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td><strong>Monitoring</strong></td>
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</tr>
<tr>
<td>Breaker open/close monitoring</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Synchronization time out monitoring</td>
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<td>✓</td>
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<tr>
<td><strong>Counter</strong></td>
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<tr>
<td>Circuit breaker closure counter</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td><strong>Listings/Approvals</strong></td>
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<td></td>
</tr>
<tr>
<td>UL / cUL / GOST-R / LR &amp; ABS Marine</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CE Marked</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Part Numbers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LS-511 (1A / 5A)</td>
<td>8440-1951 / 8440-1946</td>
<td>---</td>
</tr>
<tr>
<td>LS-521 (1A / 5A)</td>
<td>---</td>
<td>8440-1952 / 8440-1947</td>
</tr>
<tr>
<td>DIN-Rail mounting Kit for LS-511</td>
<td>8923-1746</td>
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</tr>
<tr>
<td>DPC-RS-232 direct configuration cable</td>
<td>5417-557</td>
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<tr>
<td>DPC-USB direct configuration cable</td>
<td>5417-1251</td>
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