Power supply and SEL-Bus system

Parts, installation and trouble-shooting
Introduction

This manual covers the installation and troubleshooting for electrical installation.

Please read the entire manual before installation and use of the product and keep it available for future references.

Safety Precautions

Follow and pay careful attention to instructions with the following symbols:

⚠️ ATTENTION

This symbol indicates a critical moment in the assembly or technical advice.

⚠ WARNING

This symbol indicates a potentially hazardous situation. If not avoided, this could result in serious personal injury or damage to property.

To ensure a correct electrical installation

The key to a properly working and safe installation is to follow this manual to the point, and to select all components and cables correctly. Seldén's guideline for ordering required parts (part no 597-283-E) can be downloaded from www.seldenmast.com. If there are any questions about selecting the right products, please consult an authorized Seldén dealer. All dealers are listed on our website and divided in categories describing their competence. For electrical installation we recommend dealers in the category Advanced Technical Installations.
Contents

Introduction ....................................................................................................................... 2

Contents ............................................................................................................................ 3

1 Power supply & SEL-Bus system .................................................................................. 4
   1.1 Parts sold by Seldén ............................................................................................ 5
   1.2 Parts not sold by Seldén .................................................................................... 6

2 Installation ................................................................................................................... 7
   2.1 Preparing the installation .................................................................................... 7
   2.2 Installing the 12/24V cable main switch and fuse .............................................. 8
   2.3 Installing the PSU and MCU ............................................................................. 9
   2.4 Installing the push button... ............................................................................. 12
   2.5 SEL Bus system ............................................................................................... 13
   2.6 Installing the SEL-Bus cable .......................................................................... 14
   2.7 Configuration of the control button to the SEL-Bus network ......................... 15

3 Operation .................................................................................................................... 16

4 Trouble shooting ........................................................................................................ 17
   4.1 Fault codes ....................................................................................................... 18
   4.2 Error codes ...................................................................................................... 18

5 Technical information ............................................................................................. 19

6 Disposal .................................................................................................................... 19

7 Warranty ................................................................................................................... 19

License information ..................................................................................................... 20
1 Power supply & SEL-Bus system

Seldén’s electrical power system can be connected to a voltage level between 10-30V and will deliver the required power up to 1000W.

The Power Supply Unit (PSU) amplifies the voltage to between 40-48V, just below the limit for high voltage regulation which is at 50V.

The electrical system is equipped with a diagnostic system, with error codes being presented by flashing LED’s on the PSU and Motor Control Unit (MCU).

The PSU, MCU and control button(s) are connected through a Can Bus, referred to here as a SEL-Bus. The SEL-Bus system is used for communication between the units, enabling a diagnostic function and allowing the system to reduce power consumption by putting the system into sleep mode when not in use. During sleep mode there is a small amount of electrical consumption, making it important to switch off the main switch when not using the boat to avoid draining the battery.

⚠️ The SEL-Bus is a standalone system and shall not be connected to any other Can-bus system on the boat, for example the NMEA 2000
1.1 Parts sold by Seldén

The following parts are needed when installing the Seldén Power supply and SEL-Bus system. Quantities and cable lengths will vary for each customer’s set up and can be ordered in standard packages or as individual items, see Order Guide 597-283-E.

<table>
<thead>
<tr>
<th>Item</th>
<th>Art. No.</th>
<th>Quantity</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSU</td>
<td>532-800-10</td>
<td>1</td>
<td><img src="image" alt="PSU" /></td>
</tr>
<tr>
<td>MCU Control Buttons Connection cables etc.</td>
<td></td>
<td>Custom</td>
<td><img src="image" alt="MCU Control Buttons" /></td>
</tr>
<tr>
<td>Female Terminal</td>
<td>532-835</td>
<td>1</td>
<td><img src="image" alt="Female Terminal" /></td>
</tr>
<tr>
<td>Male Terminal</td>
<td>532-836</td>
<td>1</td>
<td><img src="image" alt="Male Terminal" /></td>
</tr>
<tr>
<td>T-connectors</td>
<td>532-839</td>
<td>Custom</td>
<td><img src="image" alt="T-connectors" /></td>
</tr>
<tr>
<td>Integrated switch/fuse</td>
<td></td>
<td></td>
<td><img src="image" alt="Integrated switch/fuse" /></td>
</tr>
<tr>
<td>For 12V power</td>
<td>532-488</td>
<td></td>
<td><img src="image" alt="For 12V power" /></td>
</tr>
<tr>
<td>For 24V power</td>
<td>532-492</td>
<td>1</td>
<td><img src="image" alt="For 24V power" /></td>
</tr>
</tbody>
</table>
### SEL-Bus cable

<table>
<thead>
<tr>
<th>Item</th>
<th>Art. No.</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEL-Bus cable 0.3 m</td>
<td>531-101</td>
<td>Custom</td>
</tr>
<tr>
<td>SEL-Bus cable 1 m</td>
<td>531-102</td>
<td>Custom</td>
</tr>
<tr>
<td>SEL-Bus cable 2 m</td>
<td>531-103</td>
<td>Custom</td>
</tr>
<tr>
<td>SEL-Bus cable 5 m</td>
<td>531-104</td>
<td>Custom</td>
</tr>
<tr>
<td>SEL-Bus cable 10 m</td>
<td>531-105</td>
<td>Custom</td>
</tr>
</tbody>
</table>

### Power cables

<table>
<thead>
<tr>
<th>Item</th>
<th>Art. No.</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Cable Yellow 6mm²</td>
<td>531-048</td>
<td>Custom.</td>
</tr>
<tr>
<td>Power Cable Blue 6mm²</td>
<td>531-049</td>
<td>Purchased per the meter.</td>
</tr>
<tr>
<td>Power Cable Yellow 10mm²</td>
<td>531-050</td>
<td></td>
</tr>
<tr>
<td>Power Cable Blue 10mm²</td>
<td>531-051</td>
<td></td>
</tr>
</tbody>
</table>

### 1.2 Parts not sold by Seldén

The following parts are specific to each boat and are not sold by Seldén:

<table>
<thead>
<tr>
<th>Item</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td>12V or 24V battery, installed in the boat.</td>
</tr>
<tr>
<td>Battery cables –</td>
<td>Use cable colour standard for positive and negative</td>
</tr>
<tr>
<td>Battery to PSU</td>
<td>cables in the boat.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2 Installation

2.1 Preparing the installation

Mount the PSU and MCU, respectively, at a place and position in the boat which fulfils the following criteria:

- PSU is positioned close to battery.
- MCU is positioned close to its respective Seldén Motor Unit (total cable length max 5m).
- PSU and MCU are positioned in a dry place.
- PSU and MCU are positioned so that the cable can form a drop loop. This is to prevent water ingress.

- The PSU and MCU need to be positioned so it will be possible to read any error codes from the LED indicator (see position of LED indicator in illustration to the right) and so that it is possible to read the unit’s ID-label through the transparent lid.

- The PSU and MCU are positioned so that the fuses under the lid can easily be replaced.

- Have in mind that other systems that are already installed in your boat might be affected by the new electronic equipment. Do not install the PSU, MCU and wires close to devices that are sensitive to magnetic interference (e.g. compass, antenna, GPS-receiver).

- All components of the SEL-Bus system (T-connectors, terminals etc.) should be installed in an accessible position which enables inspection and replacement.

⚠️ Install the units in a dry place which prevents water ingress.

⚠️ Do not install the units in the engine compartment or in any other high temperature area.
2.2 Installing the 12/24V cable main switch and fuse.

The main switch and fuse function should be installed between the battery and the PSU. Use one of following two alternatives as your switch/fuse option.

- High current integrated fuse switch
- High current switch and fuse

For a 12V battery system, a 120-160A fuse must be used. For a 24V system, a 60-75A fuse must be used.

Install the switch/fuse and PSU to the battery using cables of the same quality and colours as standard in your boat. The required cable size depends on the battery power and the total length of positive and negative cables in the Battery/PSU-circuit. The cable sizes are listed in the table below:

<table>
<thead>
<tr>
<th>Volt</th>
<th>Total length max 5 m</th>
<th>Total length 5-10 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>12V</td>
<td>Min cable area 25mm²</td>
<td>Min cable area 35mm²</td>
</tr>
<tr>
<td>24V</td>
<td>Min cable area 12mm²</td>
<td>Min cable area 25mm²</td>
</tr>
</tbody>
</table>

⚠️ Turn off the battery switch before connecting the battery and PSU

Connect the 12/24 V circuit as outlined below.
2.3 Installing the PSU and MCU

⚠️ Turn off the battery switch before connecting the PSU and MCU.

Connect the MCU to the PSU using Seldén recommended colour coding:

Positive cable (connected to +VBUS): Dark blue
Negative cable (connected to -VBUS): Yellow

For the required cable area between the PSU and MCU, use a cable dimension corresponding to table below (calculate as the sum of positive and negative cable lengths):

<table>
<thead>
<tr>
<th>Cable dimension (cross sectional area)</th>
<th>Recommended max length (positive and negative cable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6mm²</td>
<td>18m</td>
</tr>
<tr>
<td>10mm²</td>
<td>40m</td>
</tr>
</tbody>
</table>

Turn off the battery switch before connecting the PSU and MCU.
1. Unscrew the 5 Torx head screws (T20) of the PSU lid, highlighted in the image to the right.

2. Remove the lid to uncover the connectors.

3. Install the cable from the positive terminal on the battery, to the connector marked +BAT. Fasten the cable.

4. Install the cable from the negative battery terminal to the connector marked -BAT (GND) and fasten the cable. Use cable colour as standard in the boat.

5. Install the dark blue cable from +VBUS (+48V) on the PSU to +VBUS (+48V) on the MCU.

6. Install the yellow cable from -VBUS (GND) on the PSU to -VBUS (GND) on the MCU.
**MCU wiring**

1. Unscrew the Torx head screws (T20) to open the lid of the MCU units in the same way as on the PSU.

2. Connect the positive dark blue cable from the PSU to the connector marked +VBUS (+48V) and the negative yellow cable to -VBUS (GND). Fasten both connections.

3. To install more MCU’s, connect in parallel to either the PSU or MCU, to get the easiest wiring.

4. Finally, connect the connection cables from the Seldén Motor Unit to their respective connector (L3, L2, L1) of the MCU.

Please read the instructions in each respective Motor Unit manual for correct pairing of cable colour and connector position, as they vary between units.
2.4 Installing the push buttons

A SEL-Bus converter is used to convert signals from the push buttons to the SEL-Bus system CAN protocol.

1. Find an appropriate position for the SEL-Bus Converter; close to buttons and protected from the weather and so the LED indicator is visible during inspection.

2. Cut the green and red cables included in the SEL-Bus converter to the appropriate length. Attach the press cable connectors included in the Push button kit.

3. Connect the green cables to "out"/"first speed" button, using the correct terminal positions as described in respective push button instruction.

4. Connect the red cables to "in"/"second speed" button, using the correct terminal positions as described in respective push button instruction.

(5.) Back lightning, which is optional, is connected to terminal positions as described in respective push button instruction. The lightning is preferably connected to the nav-lights switch. Use the colour coding and cables as standard in your boat.

6. Install the push buttons. Hole dimensions are found in each respective push button instruction.
2.5 SEL-Bus system

Keep the battery switch turned off until all SEL-Bus cables are installed

The SEL-Bus network communicates between the PSU, MCU and control buttons, and provides these units with information. The network uses a “backbone” as a main communication cable that is routed along the boat and “drop cables” to connect the PSU, MCU and control buttons. The SEL-Bus network works in series, which allows the network to be easily expanded.

The SEL-Bus system

T-connector (A): A three-way connector with 1 male and 2 female connectors. The T-connectors are used to connect drop cables from the unit(s) to the backbone.

Male (B1) and female terminal (B2): A 120-ohm resistor at each end of the SEL-Bus backbone. The terminal is essential for a secure signal.

Backbone (C): The main communication cable ends with a terminal at each end.

Units (D): Any system connected to the SEL-Bus via a drop cable. These units are the PSU, MCU and control button(s).

Drop cable (E): The cable connecting a Unit to the backbone. Max. length of 5 m.

Note! The total length of the SEL-Bus network (backbone + drop cables) must not exceed 70m.
2.6 Installing the SEL-Bus cable

1. Start at one end of the backbone. Connect the male terminal to the T-connector.
2. Connect the drop cable from the first unit to the T-connector.
3. Connect the first backbone cable to the T-connector.
4. Connect a new T-connector to the end of the first backbone cable.
5. Repeat step 3-5 for every additional unit (PSU, MCU, control buttons) to be connected to the backbone.
6. Finish by connecting the female terminal to the end of the backbone.
### 2.7 Configuration of the control button to the SEL-Bus network.

1. **Turn the main switch on and wait until the LED lights on the PSU and MCU turn green.**

2. **Push the button behind the LED bulb on the MCU, the LED will turn violet.**
   - Use a plastic or wooden pin to reach the button.

3. **Push and hold the control button (either the in or out button) for 5 seconds and the LED light will turn green on the MCU.**

4. **To configure more units, repeat steps 2-3 for each additional respective MCU and control buttons added.**
   - If you need to change the control buttons between the units, go to points 2, 3 and 4.
3 Operation

The PSU and MCU have a LED that indicate the status of the system.

When the main switch is turned on, the LED turns blue which indicates the PSU and MCU are active and running a start diagnosis. After 5-15 sec the LED changes to green which indicates that the system is working normally and is set to energy saving stand-by mode.

When a control button is pushed and a motor unit is running, the system is activated and the LED turns blue. The LED turns green again after 5-15 sec.

MCU status codes (steady LED colour state)

<table>
<thead>
<tr>
<th>Indication</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Stand-by mode</td>
</tr>
<tr>
<td>Blue</td>
<td>Active mode</td>
</tr>
<tr>
<td>Violet</td>
<td>Control button SEL-Bus configure mode</td>
</tr>
<tr>
<td>Yellow</td>
<td>Start-up calibration</td>
</tr>
</tbody>
</table>

PSU status codes (steady LED colour state)

<table>
<thead>
<tr>
<th>Indication</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Stand-by mode</td>
</tr>
<tr>
<td>Blue</td>
<td>Active mode</td>
</tr>
</tbody>
</table>

⚠️ To save power, turn off the system when not in use.
4 Trouble shooting

Fault codes
If the system experiences an error, it will display this via the LED located next to SEL-Bus output on both the PSU and the MCU. If the system has recently been started it can take up to a minute for the system to start indicating fault codes.

The power supply and the control unit each have their own set of fault codes. The codes are divided into two different categories, warning codes and error codes. The system will continue to indicate fault codes until turned off. If multiple faults are detected the system will indicate these after each other.

Warning codes (flashing white)
The LED will indicate the warning codes by flashing white. See table 4.1.

Error codes (flashing in alternating colours)
Error codes indicate a more serious problem with the system, such as a hardware fault. The system will indicate these by alternating the colour of the LED. See table 4.2.

If, for example, the PSU cannot find any Motor Control Units on the SEL-Bus network, the PSU will identify this as a SEL-Bus cable/network error. The LED of the PSU will flash two times before briefly pausing and repeating the sequence, indicating warning code number 2. If another fault is detected, e.g. memory chip error, the LED will first flash two times in white, pause, then flash red-white-green before pausing and repeating the sequence again.

Write down the code before you shut down the system, as the code will not be memorized.
4.1 Warnings codes

LED-indicator flashes white a specific number of times before a short break.

<table>
<thead>
<tr>
<th>Flashing white sequence</th>
<th>Power Supply Unit, PSU</th>
<th>Motor Control Unit, MCU</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Output current overload or output over/under voltage</td>
<td>Force derivate lockout trigged</td>
</tr>
<tr>
<td>2</td>
<td>SEL-Bus cable/network error</td>
<td>SEL-Bus cable/network error</td>
</tr>
<tr>
<td>3</td>
<td>Device overheat</td>
<td>Device overheated</td>
</tr>
<tr>
<td>4</td>
<td>Cable voltage drop between PSU and MCU (Warning)</td>
<td>PSU communication failure (SEL-Bus problem)</td>
</tr>
<tr>
<td>5</td>
<td>Cable voltage drop between PSU and MCU (Error)</td>
<td>PSU power failure</td>
</tr>
<tr>
<td>6</td>
<td>Input over current limiter activated</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Input over voltage</td>
<td>SEL-Bus control panel error</td>
</tr>
<tr>
<td>8</td>
<td>Input under voltage</td>
<td>-</td>
</tr>
</tbody>
</table>

4.2 Error codes

LED-indicator flashes in alternative colours.

<table>
<thead>
<tr>
<th>Error color combination</th>
<th>Power Supply Unit, PSU</th>
<th>Motor Control Unit, MCU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Hardware fault (no memory chip detected, PCB error etc)</td>
<td>Hardware fault (no memory chip detected, PCB error etc)</td>
</tr>
<tr>
<td>Red, white, red</td>
<td>General electrical hardware error</td>
<td>General electrical hardware error</td>
</tr>
<tr>
<td>Red, white, yellow</td>
<td>-</td>
<td>Bad motor or connection to motor</td>
</tr>
<tr>
<td>Red, white, green</td>
<td>Memory chip error</td>
<td>Memory chip error</td>
</tr>
<tr>
<td>Red, yellow, red</td>
<td>MCU Memory chip inserted in PSU</td>
<td>PSU Memory chip inserted in MCU</td>
</tr>
<tr>
<td>Red, yellow, green</td>
<td>SEL-Bus hardware error</td>
<td>SEL-Bus hardware error</td>
</tr>
<tr>
<td>Red, yellow, blue</td>
<td>Multiple PSU detected</td>
<td>PSU error</td>
</tr>
</tbody>
</table>

Fault Codes are continuously updated. For latest version, please visit www.seldenmast.com.
5 Technical information

The Seldén Power Supply and SEL-Bus system, which has been tested according to standard EN 61800-3, meets the EMC directive 2014/30/EU. This product has also been tested according to standard EN 60945 and meets the limits of emissions for maritime equipment when in standby mode.

6 Disposal

The crossed out wheeled bin symbol on the products means that used electrical and electronic equipment (WEEE) should not be mixed with general household waste. For proper treatment, recovery and recycling, please take this product(s) to designated collection points where it will be accepted free of charge. Alternatively, in some countries, you may be able to return your products to your local retailer upon purchase of an equivalent new product.

Disposing of this product correctly will help save valuable resources and prevent any potential negative effects on human health and the environment, which could otherwise arise from inappropriate waste handling.

Please contact your local authority for further details of your nearest designated collection point.

7 Warranty

Seldén Mast AB guarantees Seldén Power Supply and SEL-Bus system for 2 years. The guarantee covers faults arising from defective design, materials or workmanship.

The guarantee is only valid if the product is assembled, operated and maintained in accordance with this manual and is not subjected to loads in excess of those indicated in the brochure and on the Seldén website.

Complete shipment and warranty conditions are to be found on Seldén’s website www.seldenmast.com. See Resources/Partners information/General information/General conditions of sale (595-546-E).

If the system is repaired or modified by anyone other than Seldén Mast AB or one of our authorized dealers, the guarantee ceases to be valid.

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Parts of the device firmware build on open-source software. Those that require reproduction of license text are given below.

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