

Proportional Amplifier

ESSK 113-***



1 General

1.1 Product description

The ESSK 113 proportional amplifier is used to control the solenoid of a hydraulic valve.

The current compensation feature ensures that the current through the solenoid coil remains constant when the coil heats up, or if the supply voltage fluctuates.

A superimposed dither signal ensures trouble-free hydraulic functions.

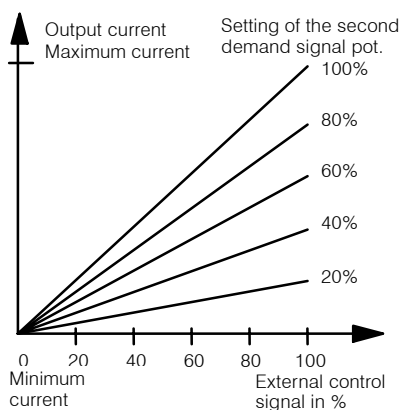
1.2 Advantages

- Supply voltage 12 – 30V
- Two demand signals
- Voltage, current or pulse frequency input for Demand Signal 1
- Four selectable frequency ranges
- Input for Enable or Disable signal
- Diagnostic facilities

1.3 Function

The proportional amplifier requires a smoothed DC power supply in the range 12 ... 30 V.

The operational status of the proportional amplifier is influenced by the external control signal on the one hand, and on the other by a second demand signal potentiometer. The control voltage at the input to the amplifier is thus dependent on the amplitude of the external control signal and on the setting of the second demand signal potentiometer (see diagram).



The solenoid current as a function of the external control signal and the setting of the second demand signal potentiometer

A variable voltage is applied at the external control signal input. A tachogenerator or a potentiometer (powered by the card) can be used as the source. If the external control signal must be a pulse frequency, a proximity switch (Namur or NPN) can be used as the source. The card is provided with an integral f/V converter that will change the pulse frequency into the necessary voltage form. The power supply to the card is also available at an output terminal to supply the proximity switch.

A potentiometer is used as the second demand signal. If the potentiometer is replaced by a wire jumper, the amplifier control voltage will always be the same as the voltage at the external control signal input. The demand signal terminal and the external control signal terminal both have a high input impedance and - for reasons of safety - the control signal source should therefore always remain connected to the card.

An on-board voltage regulator generates a stabilised DC reference voltage. This can be used, among other purposes, to power the potentiometer for the external control signal.

The card has an integral ramp generator (control signal voltage integrator). The ramp feature ensures that a rapid change in the control signal voltage is translated into a gradual change in the output current. Minimum and maximum values for the output current can be set by using two trimming potentiometers.

Within the amplifier, a quenching diode is connected in parallel with the power output. This protects the output stage against switch-off spikes. It is therefore possible to use standard connector plugs for the solenoid coils.

The amplifier is provided with a row of LEDs that indicate its operational status. It also has Busy and Error outputs. When the power stage is supplying current, the signal at the Busy output is Low. The Error output has a low signal when there is a fault on the solenoid cable

1.4 Commissioning

1. Connect the card in accordance with the connection diagram and configure the jumpers as required. If the external demand signal is not a pulse frequency, go to step 3.
2. Apply the maximum pulse frequency to the frequency input terminal f in. Connect a voltmeter between screw terminal 7 (U_b -) and screw terminal 3 (U (f)). Using trim potentiometer P1 (f in (max)), adjust the voltage to 5.2 V. If this is not possible, set it to the highest possible voltage.
3. Turn trim potentiometer P3 (ramp) fully to the left (minimum).
4. Set both demand signals to maximum. Connect a voltmeter between screw terminal 7 (U_b -) and screw terminal 11 (U_{dem} 2 out). Using potentiometer P2 (demand signal scaling), adjust the voltage to 5.8V.
5. Set Demand Signal 2 (if provided) to maximum. Slowly increase Demand Signal 1 from its minimum value until the Busy LED just begins to light. Using trim potentiometer P4 (I_{min}), and with a falling signal, set the required minimum current.
6. Set both demand signals to maximum again. Using trim potentiometer P5 (I_{max}), and with a rising signal, set the required maximum current.
7. Check the minimum and maximum speeds and, if necessary, repeat steps 5 and 6.
8. Set the required ramp delay times with the trim potentiometer P3.
 fully left (ACW) = min. delay
 fully right (CW) = max. delay

The potentiometers that are sealed with colour spots are pre-set in the factory.

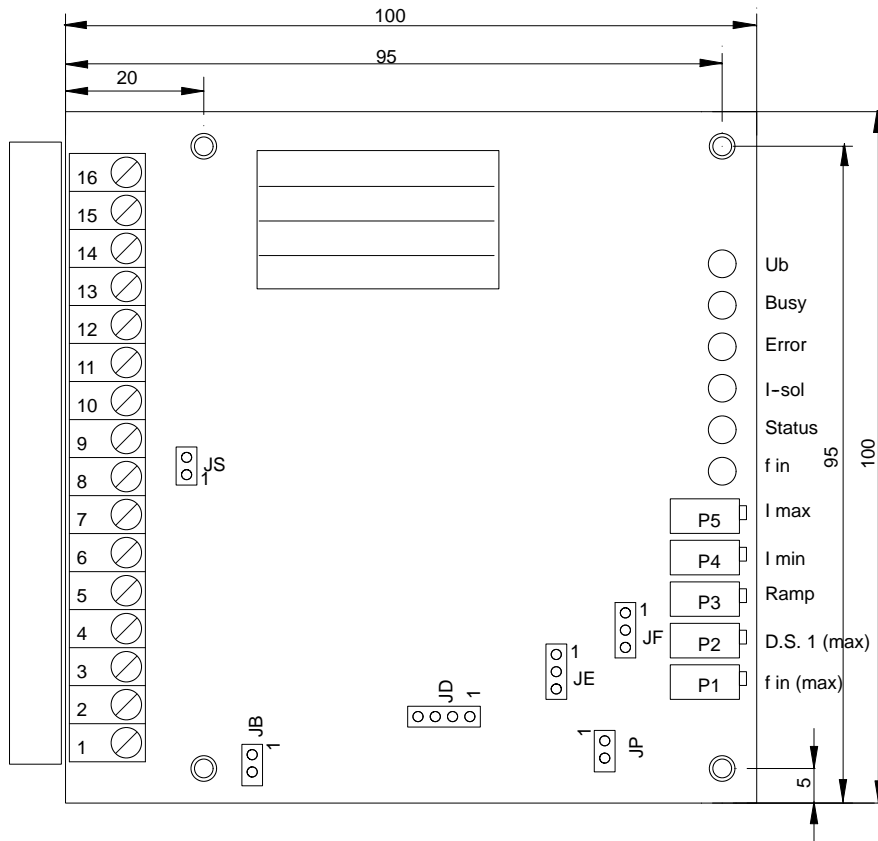
1.5 Models

The amplifier can be ordered with a 32-pin male connector to DIN 41612 Type D or with screw terminals. For applications in high air humidity, or in equipment with high vibration levels, a fully encapsulated version is available.

2 Technical data

| | |
|---------------------------------------|---|
| Supply voltage (U _b) | 12 - 30V DC |
| Reference voltage (U _{ref}) | 8V DC, maximum 20mA |
| Demand signal input 1 | 0 .. 4V / 0 ... 10V (R _i approx. 100 kΩ) / 0 ... 20 mA (R _i = 200Ω) Selectable with jumper JS |
| Demand signal input 2 | 0 to 6V (external potentiometer, 4.7 kΩ) |
| Frequency/voltage converter | Can be set for NPN sensor, PNP (Nampur) sensor, or inductive AC source Input impedance 12 kΩ or 1kΩ, selectable with jumper JB Switching threshold: (selectable with jumper JP) High > 7.5V; Low < 4.5V High > 4.5V; Low < 2V Input frequency range: (selectable with jumper(s) JD) 25 - 60 Hz 60 - 90 Hz 250 Hz ... 1100 Hz |
| Enable input | Can be set for NPN or PNP sensors; selectable with jumper JE Can be configured for Enable / Disable / No Function with jumper JF Input impedance R _i approx. 50 kΩ Switching thresholds approx.: High > 7.5V Low < 1.3V |
| Solenoid output | Max. output current 2.5 A Min. current setting I _{min} = 0.2 - 1.2A Max. current setting I _{max} = I _{min} + 2A |
| Error and BSY outputs | I _{max} out: 0.5 mA / 6V I _{max} in: 5 mA / 2.8V |
| Electrical connections | Male connector to DIN 41612, Type D, or screw terminals |
| Enclosure protection | IP 00 |
| Dimensions | 100 mm x 100 mm x 24 mm (W x H x D) non-encapsulated |
| Operating temperature range | -20°C to +50°C |

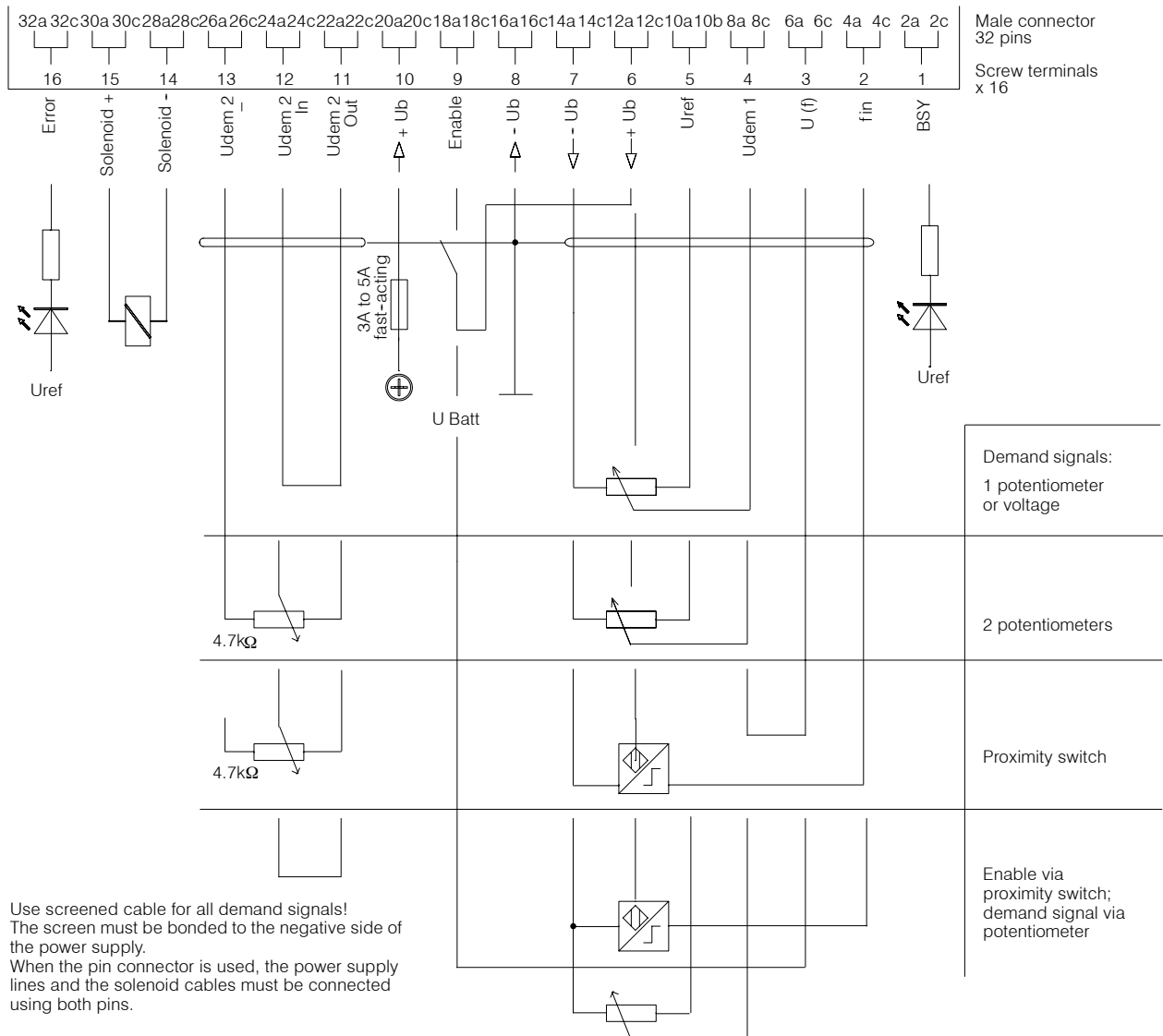
3 Dimensions



4 Jumper settings

| | | | | | | | | | | | | |
|-----------------|----|-----|----------------------|-----|------------------------|----|-----|----------------------------------|-----|------------------------------|----|-----|
| Demand Signal 1 | JS | 1-2 | Enable signal source | JE | 1-2 | JE | 2-3 | Switching threshold Frequency In | JP | 1-2 | | |
| Voltage | - | | PNP | X | | | | High > 7.5V, Low < 4.5V | - | | | |
| Current | X | | NPN | | | X | | High > 4.5V, Low < 2V | X | | | |
| Frequency input | JD | 1-2 | JD | 3-4 | Enable signal function | JF | 1-2 | JF | 2-3 | Input impedance Frequency In | JB | 1-2 |
| 25 - 60 Hz | X | | X | | Enable | X | | | | 1 kOhm | X | |
| 60 - 90 Hz | X | | | | Disable | | | X | | 12 kOhm | - | |
| 250 Hz | | | X | | No function | - | | - | | | | |
| ... 1100 Hz | - | | - | | | | | | | | | |

5 Connection diagram



6 Diagnostics

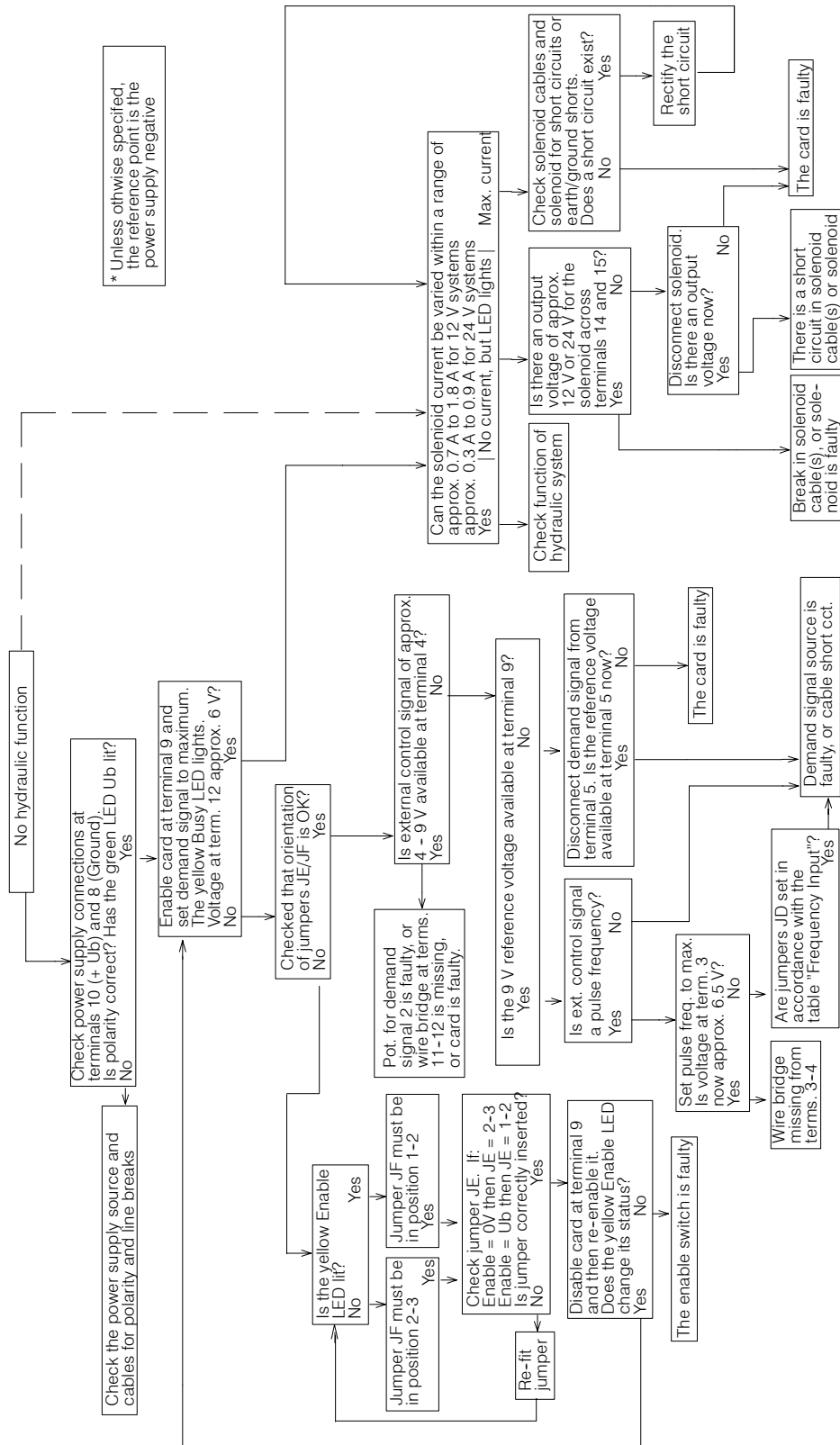
| LED | State | Meaning |
|--------|---|---|
| f-in | On or blinking | Pulse frequency is available at terminal 2 |
| Status | See table "Examples of jumper settings" | Output is enabled, alternatively disabled |
| I-sol | On | Voltage is available at the solenoid output |
| Error | On | No solenoid connected, or over-temperature condition |
| Busy | On | Demand signal is available, card is enabled or not disabled |
| Ub | On | The 8 V internal power supply is available |

| The Busy LED | The I-sol LED | The Error LED | |
|--------------|---------------|---------------|-------------------------|
| On | On | Off | Normal operation |
| On | On | On | No solenoid connected |
| On | Off | Off | Short circuit at output |
| On | Off | On | Over-temperature |

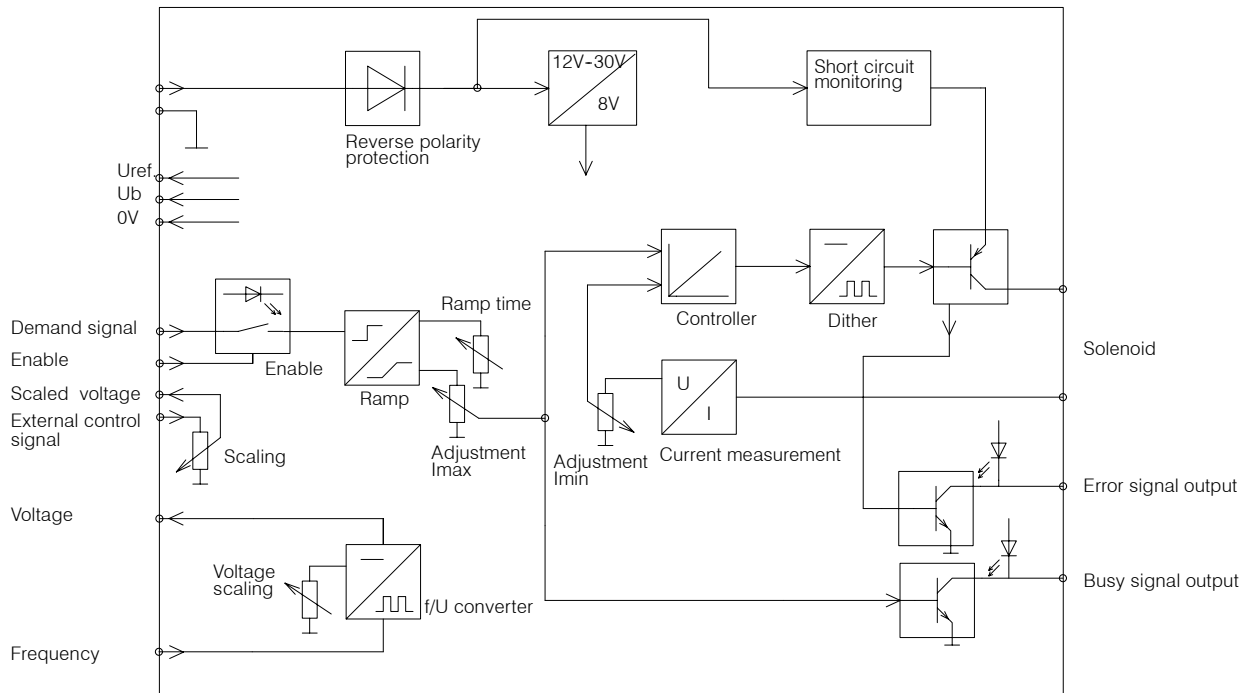
7 Examples of jumper settings

| Function required | | | Jumper settings | |
|----------------------------|-----------------|-------------|-----------------|-----------|
| | | Diagnostics | | |
| Signal at the Enable input | Solenoid output | LED State | Jumper JE | Jumper JF |
| Low | Enabled | On | 1-2 | 1-2 |
| Low | Disabled | On | 1-2 | 2-3 |
| Low | Disabled | Off | 2-3 | 1-2 |
| Low | Enabled | Off | 2-3 | 2-3 |
| High | Disabled | Off | 1-2 | 1-2 |
| High | Enabled | Off | 1-2 | 2-3 |
| High | Enabled | On | 2-3 | 1-2 |
| High | Disabled | On | 2-3 | 2-3 |
| | Enabled | On | Not connected | 1-2 |
| | Disabled | On | Not connected | 2-3 |

8 Fault finding



9 Block diagram



10 Ordering code

| | | E | S | S | K | 1 | 1 | 3 | - | 9 | 1 | * | * | * | / | |
|-----------------------------|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|
| Electronic product | | | | | | | | | | | | | | | | |
| Push-in card | = S | | | | | | | | | | | | | | | |
| Proportional amplifier | = SK | | | | | | | | | | | | | | | |
| Type | | | | | | | | | | | | | | | | |
| Design | with male connector = 90 with screw terminals (standard) = 91 with male connector; encapsulated version = 80 with screw terminals; encapsulated version (standard) = 81 | | | | | | | | | | | | | | | |
| Power supply 12 ... 30 V DC | = *** | | | | | | | | | | | | | | | |

11 Accessories

An amplifier housing is available. A 17-pole and a 6-pole bulkhead plug can be fitted in the housing. Bucher Hydraulics can supply the bulkhead plugs, the line sockets and two potentiometers. A tachogenerator or proxim-

ity switch (NPN or Namur) is also available.

To connect the solenoids, type GDM 309 connector plugs are available. If

control malfunctions occur as a result of over-long power leads, then type GDM 209D connector plugs should be used instead.

| | Ordering No. |
|--|--------------|
| Potentiometer | 100214664 |
| Potentiometer indicator knob | 100604397 |
| Switch, 10 A, 1 pole (on-off-on) | 100607692 |
| Switch, 10 A, 1 pole (on-off) | 100607681 |
| Switch, 10 A, 1 pole (mom-off-mom) | 100607691 |
| Switch, 10 A, 1 pole (mom-on) | 100609738 |
| Bulkhead plug, 17 pole | 100607821 |
| Seal for 17-pole bulkhead plug | 100607822 |
| Protective cap for 17-pole bulkhead plug | 100607823 |
| Line socket, 17 pole | 100607819 |
| Protective cap for 17-pole line socket | 100607820 |
| Bulkhead plug, 6 pole | 100607984 |
| Seal for 6-pole bulkhead plug | 100607985 |
| Protective cap for 6-pole bulkhead plug | 100607987 |
| Line socket, 6 pole | 100607983 |
| Protective cap for 6-pole line socket | 100607986 |
| Makrolon housing (160 mm x 120 mm x 55 mm) | 100228962 |
| Front plate, ELSK 113-***** | 100228959 |
| Coil connector plug GDM 309 | 100064970 |
| Coil connector plug GDM 209D | 100014130 |
| Proximity switch Bi5-P18-Y0X | 100014642 |

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