1 Description

1.1 General

The ESSK 103 proportional amplifier is used to control the solenoid of a hydraulic valve. The current compensation feature ensures that changes in the coil temperature or fluctuations in the supply voltage do not affect the coil current level. To provide for a trouble free hydraulic function, an optimum level of dither signal is superimposed on the coil current.

The proportional amplifier requires a smoothed DC power supply in the range 12...30 V. The amplifier has an input for a voltage control signal. The control signal terminal has a high input impedance and - for safety reasons - the control signal source should always remain connected. An on-board voltage regulator generates a stabilised DC reference voltage. This can be used, among other purposes, to power the control signal source. The stabilised voltage and amplifier ground are both available at the card's edge connector.

The current at the power output varies linearly with the voltage at the control signal input. With the aid of two trimming potentiometers, both minimum and maximum current values can be set. The adjustment range of the minimum current setting is influenced by the resistance of the control signal potentiometer. The amplifier switches off automatically for the duration of any short circuit at the load terminals. 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 a standard connector plug at the solenoid. To avoid operational problems, the nominal voltage of the solenoid coil should be matched to the amplifier's power supply voltage.

1.2 Models

The card can be ordered with a 31-pin edge connector to DIN 41617 or with screw terminals. For applications in high air humidity, or in equipment with high vibration levels, a fully encapsulated version is available.

1.3 Application example

- Agricultural engineering
- Municipal equipment
- Forestry machines
- Construction equipment

2 Technical data

<table>
<thead>
<tr>
<th>General characteristics</th>
<th>Description, value, unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>V DC</td>
</tr>
<tr>
<td>Reference voltage</td>
<td>V DC</td>
</tr>
<tr>
<td>max. output from reference voltage</td>
<td>mA</td>
</tr>
<tr>
<td>Demand signal voltage</td>
<td>V</td>
</tr>
<tr>
<td>Minimum current (adjustable)</td>
<td>A</td>
</tr>
<tr>
<td>Maximum current (adjustable)</td>
<td>A</td>
</tr>
<tr>
<td>Max. permissible output current</td>
<td>A</td>
</tr>
</tbody>
</table>

*robust analogue technology*
*short-circuit protected*
*reference voltage for control signal generator*
### General characteristics

<table>
<thead>
<tr>
<th>Description, value, unit</th>
<th>General characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dither frequency</td>
<td>Hz factory set at 40 Hz (square wave from) (if required, can alternatively be set at 120 Hz)</td>
</tr>
<tr>
<td>Enclosure protection</td>
<td>IP 00 (non-encapsulated, without housing)</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>°C -20 °C ... + 50°C</td>
</tr>
</tbody>
</table>
| Notable features         | - the power supply input is reverse-polarity protected  
                           | - the amplifier switches off automatically for the duration of excessive coil current (coil short circuit) |
| Dimensions               | mmm approx. 100 x 98 x 20 mm             |
| Mass                     | g approx. 80g non-encapsulated, 180 g encapsulated |
| Connections              | options: connector DIN 41617-S31M or screw terminals |
| Cable length and section | for 1 mm² section wire, max. cable length is 10 metres |

#### 3 Block diagram

![Block diagram](image)

#### 4 Function and dimension

![Function and dimension diagram](image)

Trim Potentiometer, max. 20 turns

\[ P_2 = \text{maximum current (I_{max})} \]

\[ P_1 = \text{minimum current (I_{min})} \]

Dimensions of the card with screw terminals or with edge connector
5 Connection diagram

NOTE: When the pin connector is used, the power supply and the solenoid loads must be connected using both pins.

6 Initial start-up

NOTE: Connect the card in accordance with the connection diagram, using only with trim potentiometer.

7 Setup procedure

1. Set the potentiometer $P_{IN}$ to maximum.
2. Using trim potentiometer $P_2$, and while increasing the signal, set the required maximum current ($I_{max}$) (the coil current must not exceed 2.5 A).
3. Set the potentiometer $P_{IN}$ to minimum.
4. Using trim potentiometer $P_1$, and while decreasing the signal, set the required minimum current ($I_{min}$).
5. Re-check the settings.

The trim potentiometers that are sealed with colour spots are preset in the factory.
8 Ordering code

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES</td>
<td>Electronic without enclosure</td>
</tr>
<tr>
<td>SK</td>
<td>Proportional amplifier</td>
</tr>
<tr>
<td>103</td>
<td>Type</td>
</tr>
</tbody>
</table>

- **Model**
  - 90 = with male edge connector (standard)
  - 91 = with screw terminals (standard)
  - 92 = with screw terminals; side adjustment
  - 93 = with male edge connector; side adjustment
  - 99 = with terminal strip, customised (standard)
  - 80 = with male edge connector; encapsulated model (standard)
  - 81 = with screw terminals; encapsulated model (standard)
  - 82 = with screw terminals; side adjustment; encapsulated model
  - 83 = with male edge connector; side adj.: encapsulated model

- **Power supply** DC 12...30 V

- **Variants / special features** (inserted by the factory)
  - 01 = Dither frequency 120 Hz

9 Accessories

To house the amplifier, Bucher can provide an enclosure that accepts two PG9 cable glands. An ON/OFF switch for the amplifier is also available. To generate demand signals, a potentiometer can be supplied.

As an alternative to the enclosure, a suitable card holder (for model ESSK 103-90 only) can be supplied, as can an appropriate snap-in retaining foot. Connector plugs, type GDM 309, can be used to connect to the solenoids. In the event of proportional valve malfunctions that are caused by long power leads, use connector plugs type GDM 209D.

<table>
<thead>
<tr>
<th>Description</th>
<th>Order no.:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potentiometer 1 kΩ</td>
<td>100214662</td>
</tr>
<tr>
<td>Potentiometer 2.2 kΩ</td>
<td>100214663</td>
</tr>
<tr>
<td>Potentiometer scale knob</td>
<td>100604397</td>
</tr>
<tr>
<td>ON/OFF switch</td>
<td>100606576</td>
</tr>
<tr>
<td>Cable gland PG 9</td>
<td>100601550</td>
</tr>
<tr>
<td>Retaining nut PG 9</td>
<td>100601554</td>
</tr>
<tr>
<td>Plastic enclosure (110 x 188 x 60 mm)</td>
<td>100214819</td>
</tr>
<tr>
<td>Card holder</td>
<td>100606201</td>
</tr>
<tr>
<td>Snap-in retaining foot</td>
<td>100606202</td>
</tr>
<tr>
<td>Female connector, DIN 41617, with solder terminals</td>
<td>100604304</td>
</tr>
<tr>
<td>Connector plug GDM 309</td>
<td>100064970</td>
</tr>
<tr>
<td>Connector plug GDM 209D</td>
<td>100014130</td>
</tr>
</tbody>
</table>
10 Fault Finding

No hydraulic function

Does supply voltage exist at terminals 11 (12) and 6 (5)?

Yes

No

Set control signal potentiometer to maximum.
Is voltage at terminals 3 and 6 = 5 V?

Yes

No

Check power supply and wires for polarity and continuity

Yes

No

Check hydraulic system

Solenoid current adjustable?
Approx. 0.7 - 1.8 A for 12 V
Approx. 0.3 - 0.9 A for 24 V

Yes

No, max. current

No current

Check solenoid leads and solenoid for short circuit.
Does short circuit exist?

Yes

No

Output voltage for solenoids at terminals 13 (14) and 15 (16) approx. 12 V or 24 V?

Yes

No

Disconnect solenoid. Voltage available now?

Yes

No

Break in solenoid leads, solenoid faulty

No

Yes

Short circuit in solenoid leads or solenoid

Card is faulty

Card is faulty

Disconnect demand-signal source from terminal 4.
Is reference voltage available now?

Yes

No

Demand-signal source is faulty, or line short circuit

Clear the short circuit

No

Card is faulty

Does supply voltage exist at terminals 11 (12) and 6 (5)?

Yes

No

Is the reference voltage at terminals 4 and 6 = 5 V?

Yes

No

Disconnect demand-signal source from terminal 4.
Is reference voltage available now?

Yes

No

Card is faulty

Card is faulty

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