Axial piston variable pump with electro-proportional control
A10VO... EP../EK..

Data sheet

Series 53
Size NG18 to 85
Nominal pressure 250 bar
Peak pressure 315 bar
open circuit operation

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Features
- Electro-proportional control, current dependent
- High control accuracy
- Fail safe function in case of power loss, i.e. for operation with brake and steering systems
- Compatible with the use of standard proportional amplifiers
- Compact design

Possible applications
- Suitable for systems with speed sensing power control
- For operation of machines with fixed speeds i.e.
  - Generator drives
  - Speed control of individual cylinders
  - Compressor drives

Further information:
Variable pump A10VO/5x Size 10...85 RE 92703
Electro-hydraulic pressure control ED RE 92707
# Type code / Standard program

<table>
<thead>
<tr>
<th>A10V</th>
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<th>/</th>
<th>53</th>
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<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>02</td>
<td>03</td>
<td>04</td>
<td>05</td>
<td>06</td>
<td>07</td>
<td>08</td>
<td>09</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>04</td>
<td>05</td>
<td>06</td>
<td>07</td>
</tr>
</tbody>
</table>

## Axial piston unit
- **01** Swash plate design, variable

## Operating mode
- **02** Pump, open circuit

## Size
- **03** Displacement $V_{g_{\text{max}}}$ in cm³

## Control device

### Electro-proportional control with
#### Pressure control
- U = 12 V
- U = 24 V

### Pressure and flow control, X-T open (Load Sensing)
- U = 12 V
- U = 24 V

### Pressure and flow control, X-T closed (Load Sensing)
- U = 12 V
- U = 24 V

### Electro-hydraulic pressure control
- U = 12 V
- U = 24 V

### Pressure and flow control with deactivation of EP function, X-T open (Load Sensing)
- U = 12 V
- U = 24 V

### Pressure and flow control with deactivation of EP function, X-T closed (Load Sensing)
- U = 12 V
- U = 24 V

### Electro-hydraulic pressure control with deactivation of EP function
- U = 12 V
- U = 24 V

## Series
- **05** Series 5, Index 3

All further details of type code items 06 to 12 can be found in data sheet RE 92703

## Solenoid connectors
- **13** DEUTSCH – connector permanently moulded, 2-pole – without suppressor diode

- ● = available
- ○ = in preparation
- – = not available
EP - Electro-proportional control

The electro-proportional swivel angle control enables a direct adjustment of the cradle swivel angle and thus a stepless and reproducible control of the pump displacement. The necessary force on the control valve spool is generated by a proportional solenoid. The pump displacement is proportional to the solenoid current (begin of control see table on the right side).

Without pressure in the pump outlet a bias spring swivels the cradle to its max. angle (Vg max). With the solenoid de-energized, (signal current < beginning of control) the pump will swivel from Vg max to Vg min as soon as the outlet pressure exceeds 14 bar. A PWM signal is used to control the solenoid.

EP.D: After reaching a pre-set pressure level, the pressure control function regulates the pump displacement, if necessary down to Vg min.

A pressure level of at least 14 bar is required to control the pump displacement. The necessary control fluid is taken out of the pump outlet.

**Schematic EP.D**

**Ports**
- B Pressure port
- S Suction port
- L, L1, L2 Case drain ports (L1 and L2 plugged)
- X Pilot pressure port

**Dimensions**

Before finalising your design please request a certified installation drawing. Dimensions in mm.

**Technical data, solenoids**

<table>
<thead>
<tr>
<th>EP1</th>
<th>EP2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>12 V (±20 %)</td>
</tr>
<tr>
<td>Control current</td>
<td></td>
</tr>
<tr>
<td>Begin of control at Vg min</td>
<td>400 mA</td>
</tr>
<tr>
<td>End of control at Vg max</td>
<td>1200 mA</td>
</tr>
<tr>
<td>Limit current</td>
<td>1,54 A</td>
</tr>
<tr>
<td>Nominal resistance (at 20°C)</td>
<td>5,5 Ω</td>
</tr>
<tr>
<td>Dither frequency for PWM signal</td>
<td>100 - 200 Hz</td>
</tr>
<tr>
<td>Duty cycle</td>
<td>100 %</td>
</tr>
<tr>
<td>Solenoid class of material</td>
<td>H (Tmax = 180°C)</td>
</tr>
<tr>
<td>Protection</td>
<td>see connector selection page 7</td>
</tr>
</tbody>
</table>

Operating temperature range at valve -20°C to +115°C

**Characteristic EP1/2**

Hysteresis < 5%

**NG 18 28 45 60 85**

| A1 | 218.5 | 224 | 228 | 241 | 267 |
| A2 | 110   | 117 | 120 | 125 | 142 |
| A3 | 122   | 130 | 131.5 | 140 | 149.5 |

For detailed dimensions see data sheet RE 92703.
**EK - EP with deactivation of EP function**

The version EK... is based completely on the EP... control version (see page 3).

In addition to the electro-proportional swivel angle control EP this execution features a deactivation of control in its characteristic. This causes the pump to swivel to \( V_{g \text{ max}} \) on accidental loss of current signal (e.g. cable failure or loose connection) and operate with the functions of the DRF control valve.

A PWM-signal is used to control the solenoid.

A pressure level of at least 14 bar is required to control the displacement. The necessary control fluid is taken out of the pump outlet.

The \( V_{g \text{ max}} \) position is held through the bias spring. In order to overcome this spring force the solenoid must be energized (\( I_{\text{res}} \)).

**Schematic EK.DF**

![Schematic EK.DF](image)

**Ports**

- B: Pressure port
- S: Suction port
- L, L1, L2: Case drain ports (L1 and L2 plugged)
- X: Pilot pressure port

**Technical data, solenoids**

<table>
<thead>
<tr>
<th></th>
<th>EK1</th>
<th>EK2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>12 V (±20 %)</td>
<td>24 V (±20 %)</td>
</tr>
<tr>
<td>Control current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Begin of control at ( V_{g \text{ min}} )</td>
<td>400 mA</td>
<td>200 mA</td>
</tr>
<tr>
<td>End of control at ( V_{g \text{ max}} )</td>
<td>1200 mA</td>
<td>600 mA</td>
</tr>
<tr>
<td>Limit current</td>
<td>1,54 A</td>
<td>0,77 A</td>
</tr>
<tr>
<td>Nominal resistance (at 20°C)</td>
<td>5,5 Ω</td>
<td>22,7 Ω</td>
</tr>
<tr>
<td>Dither frequency for PWM signal</td>
<td>100 - 200 Hz</td>
<td>100 - 200 Hz</td>
</tr>
<tr>
<td>Duty cycle</td>
<td>100 %</td>
<td>100 %</td>
</tr>
<tr>
<td>Solenoid class of material</td>
<td>H (( T_{\text{max}} = 180°C ))</td>
<td></td>
</tr>
<tr>
<td>Protection</td>
<td>see connector selection page 7</td>
<td></td>
</tr>
</tbody>
</table>

Operating temperature range at valve \( -20°C \) to \(+115°C\)

**Characteristic EK**

Hysteresis < 5%

![Characteristic EK](image)

**Ports**

<table>
<thead>
<tr>
<th></th>
<th>EK1..</th>
<th>EK2..</th>
</tr>
</thead>
<tbody>
<tr>
<td>( I_{\text{min}} ) [mA]</td>
<td>400</td>
<td>200</td>
</tr>
<tr>
<td>( I_{\text{max}} ) [mA]</td>
<td>1200</td>
<td>600</td>
</tr>
<tr>
<td>( I_{\text{off}} ) [mA]</td>
<td>&lt; 300</td>
<td>&lt; 150</td>
</tr>
<tr>
<td>( I_{\text{res}} ) [mA]</td>
<td>&gt; 1200</td>
<td>&gt; 600</td>
</tr>
</tbody>
</table>

For changes in current signal strength at operating pressures below 150 bar, ramp times of > 150 ms are necessary.
Overriding the electro-proportional swivel angle control is a hydraulic pressure-flow control function. After reaching a pre-set pressure level, the pressure control function regulates the pump displacement, if necessary down to \( V_g_{\text{min}} \). This function overrides the EP- or EK-control, i.e. below this pre-set pressure level the current dependent displacement control is in action.

Pressure setting range from 20 to 250 bar. For more information on the pressure-flow control see also RE 92 703.

The pressure control function has priority over the electro-proportional swivel angle and the flow control.

In addition to the pressure control, the flow control can regulate the pump flow (load sensing). Through this feature, the generated flow is equal to the actually needed flow. This is accomplished by means of a fixed differential pressure over a valve opening or orifice located between pump and actuator.

Version EP.DS or EK.DS have no connection between X-port and tank (pump case).

**Schematic EP.DF**

**Schematic EP.DS**

**Ports**

**EP(K).DF/EP(K).DS - with pressure and flow control**

- **B** Pressure port
- **S** Suction port
- **L, L1, L2** Case drain ports (L1 and L2 plugged)

- **X** Pilot pressure port
EP(K).ED - with electro-hydraulic pressure control

The max. pump output pressure is set through a command current signal to the ED valve solenoid.

When system pressure (load pressure) reaches this pressure level, the pump’s control valve spool shifts and causes an increase or decrease in the pump’s swivel angle (flow) in order to maintain this set pressure level.

The pump output flow matches the needed input flow to the actuators. The desired pressure level can be set steplessly by varying the solenoid current.

When the current signal to the ED-valve solenoid drops towards a zero value, the max. output pressure is limited by an adjustable mechanical pressure cut off (inverse proportional characteristic; secure fail safe function in case of a loss of power e.g. for use as fan drives).

The solenoid is controlled with a PWM signal.

For further information on the ED-control see RE 92707.

Static current-pressure characteristic (inverse proportional) ED

(measured with pump in standby)

Hysteresis static current-pressure characteristic < 3bar.

Static flow-pressure characteristic

(at n = 1500 rpm; tfluid = 50°C)

Hysteresis and pressure rise Δp 4bar.

Control data

Standard standby setting 20 bar, other values on request. Hysteresis and pressure rise Δp 4bar.

For detailed dimensions see data sheet RE 92703.
Solenoid connectors

<table>
<thead>
<tr>
<th>Technical data, solenoid</th>
<th>ED for EP1/EK1</th>
<th>ED for EP2/EK2</th>
</tr>
</thead>
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<tr>
<td>Voltage</td>
<td>12 V (±20 %)</td>
<td>24 V (±20 %)</td>
</tr>
<tr>
<td>Control current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Begin of control at q_V_min</td>
<td>100 mA</td>
<td>50 mA</td>
</tr>
<tr>
<td>End of control at q_V_max</td>
<td>1200 mA</td>
<td>600 mA</td>
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<td>see connector selection</td>
<td>on page 7</td>
</tr>
<tr>
<td>Operating temperature range at valve</td>
<td>-20°C to +115°C</td>
<td></td>
</tr>
</tbody>
</table>

DEUTSCH DT04-2P-EP04, 2-pole
permanently moulded, without bi-directional suppressor diode

Protection to DIN/EN 60529: IP69K

Male connector
DEUTSCH DT06-2S-EP04
Rexroth Mat.-Nr. R902601804
comprising:
- 1 housing __________________ DT06-2S-EP04
- 1 key ______________________ W2S
- 2 bushings ___________________ 0462-201-16141

The male connector is not in the scope of supply. Can be supplied by Rexroth however on request.

Electronic controls

<table>
<thead>
<tr>
<th>Control</th>
<th>Electronic function</th>
<th>Electronic unit</th>
<th>Further information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric pressure control</td>
<td>Regulated current output</td>
<td>RA</td>
<td>RE 95 230</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VT2000</td>
<td>RE 29 904</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RC2-2/21 1)</td>
<td>RE 95 201</td>
</tr>
</tbody>
</table>

1) Current output for two valves, separately controllable
General information

- The pump A10VO was designed for operation in open loop circuits.
- Systems design, installation and commissioning requires trained technicians or tradesmen.
- All hydraulic ports can only be used for the fastening of hydraulic service lines.
- During and shortly after operation of a pump the housing and especially a solenoid can be extremely hot. Take suitable safety measures (e.g. wear protective clothing).
- All given data and information has to be adhered to.
- Regarding the tightening torques the following must be observed:
  - Female threads in the axial piston unit:
    The max. permissible tightening torques $M_{G\max}$ are maximum values for the female threads and may not be exceeded
  - Fittings:
    Please comply with the manufacturer's information regarding the max. permissible tightening torques for the used fittings.
  - Fastening screws:
    For fastening screws to DIN 13 we recommend to check the permissible tightening torque in each individual case acc. to VDI 2230.