Electric Drives
and Controls

Hydraulics

Linear Motion and
Assembly Technologies

Pneumatics

Service

Rexroth
Bosch Group

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

Contents

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

A10V	O			/	53			–						P
01	02	03	04		05	06	07		08	09	10	11	12	13

Axial piston unit

01	Swash plate design, variable	A10V

Operating mode

02	Pump, open circuit	O

Size

03	$\approx$ Displacement $V_{g\,max}$ in cm^3	18	28	45	63	85

Control device

			18	28	45	63	85	
	Electro-proportional control with							
	Pressure control							
		U = 12 V	●	●	●	●	●	EP1D
		U = 24 V	●	●	●	●	●	EP2D
	Pressure and flow control, X-T open (Load Sensing)							
		U = 12 V	●	●	●	●	●	EP1DF
		U = 24 V	●	●	●	●	●	EP2DF
	Pressure and flow control, X-T closed (Load Sensing)							
		U = 12 V	●	●	●	●	●	EP1DS
		U = 24 V	●	●	●	●	●	EP2DS
04	Electro-hydraulic pressure control							
		U = 12 V	●	●	●	●	●	EP1ED
		U = 24 V	●	●	●	●	●	EP2ED
	Pressure and flow control with deactivation of EP function, X-T open (Load Sensing)							
		U = 12 V	●	●	●	●	●	EK1DF
		U = 24 V	●	●	●	●	●	EK2DF
	Pressure and flow control with deactivation of EP function, X-T closed (Load Sensing)							
		U = 12 V	●	●	●	●	●	EK1DS
		U = 24 V	●	●	●	●	●	EK2DS
	Electro-hydraulic pressure control with deactivation of EP function							
		U = 12 V	●	●	●	●	●	EK1ED
		U = 24 V	●	●	●	●	●	EK2ED

Series

05	Series 5, Index 3	53

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	●	●	●	●	●	P

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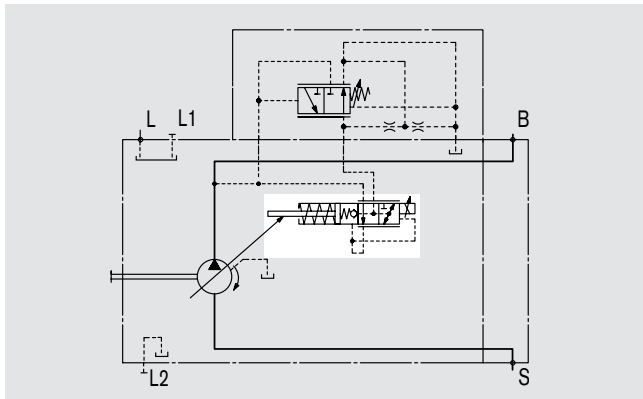
EP - Electro-proportional control

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 ($V_{g\,max}$). With the solenoid de-energized, (signal current < beginning of control) the pump will swivel from $V_{g\,max}$ to $V_{g\,min}$ 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 $V_{g\,min}$.

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.
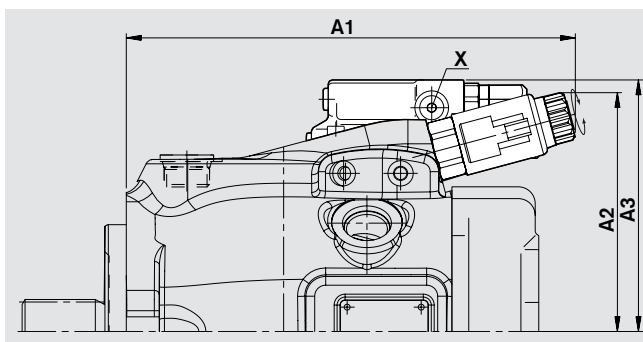
Schematic EP.D

Ports

B	Pressure port
S	Suction port
L, L_1, L_2	Case drain ports (L_1 and L_2 plugged)
X	Pilot pressure port

Technical data, solenoids

Technical data, solenoids	EP1	EP2
Voltage	12 V (±20 %)	24 V (±20 %)
Control current		
Begin of control at $V_{g\,min}$	400 mA	200 mA
End of control at $V_{g\,max}$	1200 mA	600 mA
Limit current	1,54 A	0,77 A
Nominal resistance (at 20°C)	5,5 Ω	22,7 Ω
Dither frequency for PWM- signal	100 - 200 Hz	100 - 200 Hz
Duty cycle	100 %	100 %
Solenoid class of material	H (T_{max} = 180°C)	
Protection	see connector selection page 7	

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

Characteristic EP1/2

Hysteresis < 5%

Dimensions EP.D./EK.D.

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

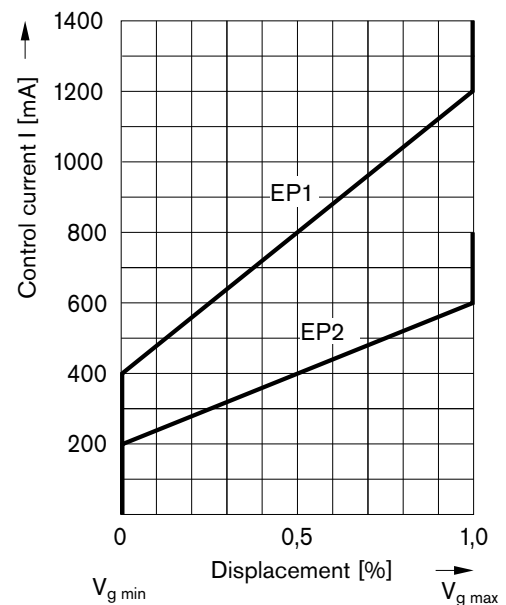| NG	18	28	45	60	85
A1	218.5	224	228	241	267
A2	110	117	120	125	142
A3	122	130	131.5	140	149.5

For detailed dimensios 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 $V_{g\,max}$ on accidental loss of current signal (eg. 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 $V_{g\,max}$-position is held through the bias spring. In order to overcome this spring force the solenoid must be energized (I_{res}).
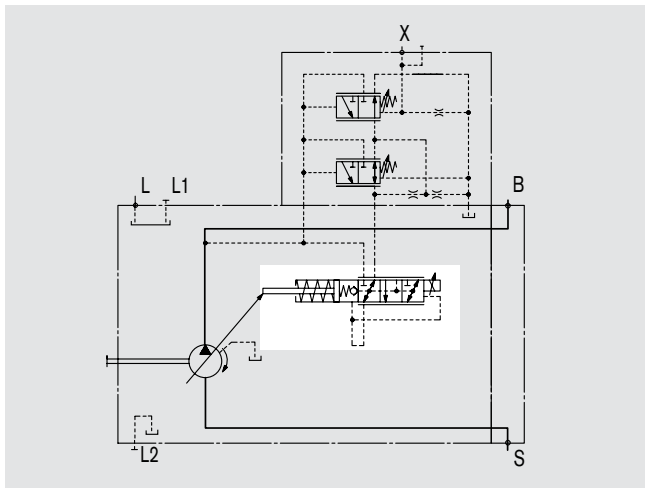
Technical data, solenoids	EK1	EK2
Voltage	12 V (±20 %)	24 V (±20 %)
Control current		
Begin of control at $V_{g\,min}$	400 mA	200 mA
End of control at $V_{g\,max}$	1200 mA	600 mA
Limit current	1,54 A	0,77 A
Nominal resistance (at 20℃)	5,5 Ω	22,7 Ω
Dither frequency for PWM signal	100 - 200 Hz	100 - 200 Hz
Duty cycle	100 %	100 %
Solenoid class of material	H (T_{max} = 180℃)	
Protection	see connector selection page 7	

Operating temperature range at valve -20℃ to +115℃

Schematic EK.DF

Ports

B   Pressure port
S   Suction port
L, L_1, L_2 Case drain ports (L_1 and L_2 plugged)
X   Pilot pressure port

Dimensions see page 3

Characteristic EK

Hysteresis < 5%
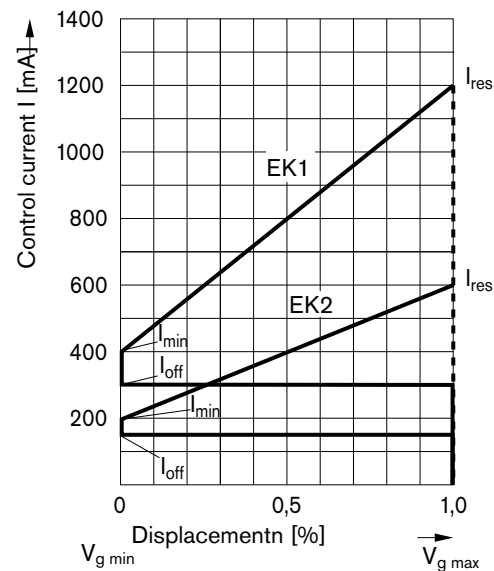
	EK1..	EK2..
I_{min} [mA]	400	200
I_{max} [mA]	1200	600
I_{off} [mA]	< 300	< 150
I_{res} [mA]	> 1200	> 600

For changes in current signal strenght at operating pressures below 150 bar, ramp times of > 150 ms are necessary.

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

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 $V_{g\,min}$.

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 elctro-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 neede flow. This is accomplished by means of a fixed differential pressure over a valve opening or orifice located between pump and actuator.

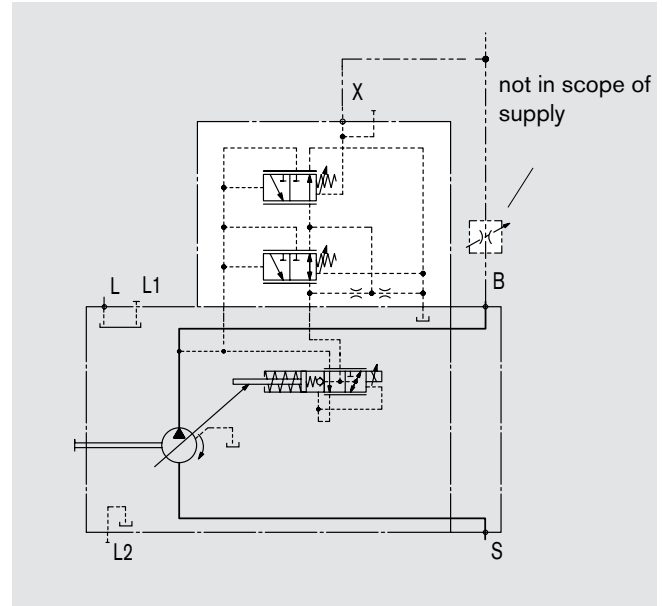Version EP.D**S** or EK.D**S** have no connection between X-port and tank (pump case).

Schematic EP.DF

Schematic EP.D

Ports
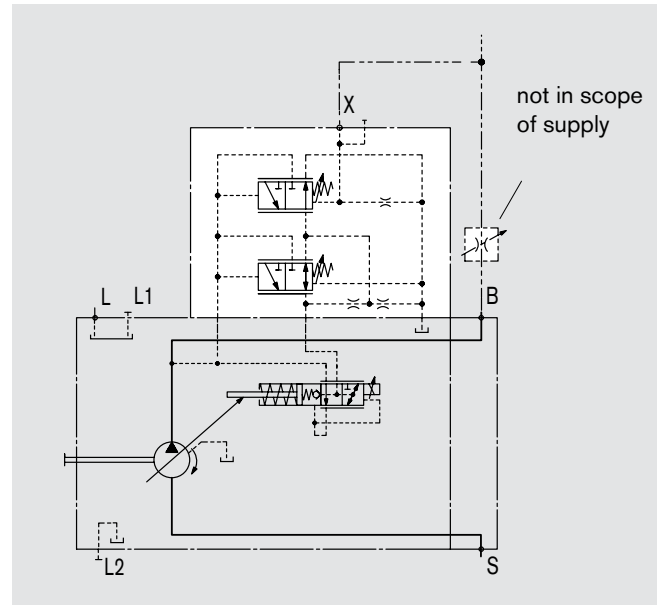
B   Pressure port
S   Suction port
L, L₁, L₂   Case drain ports (L₁ and L₂ plugged)
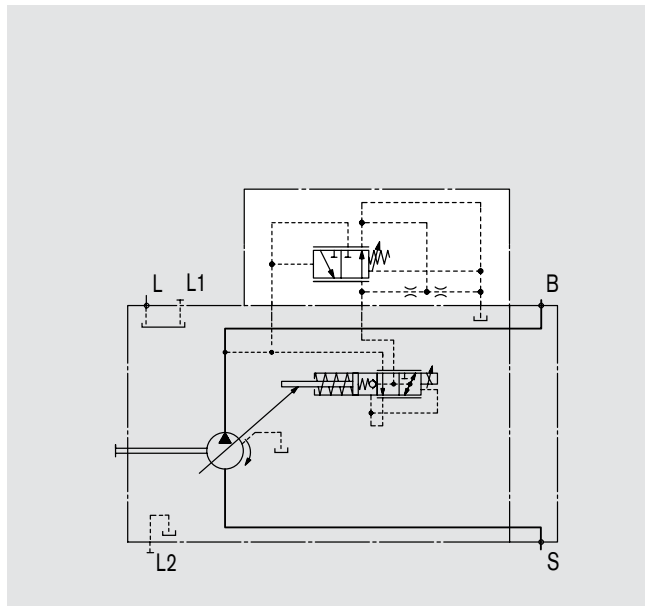
Schematic EP.DS

Ports

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).
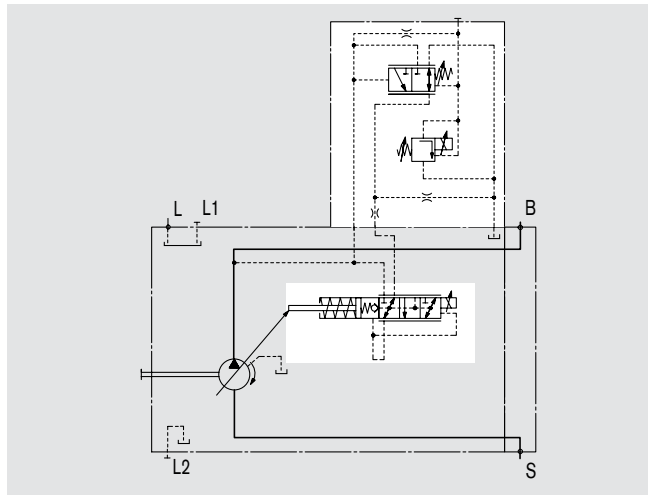
The solenoid is controlled with a PWM signal.

For further information on the ED-control see RE 92707.
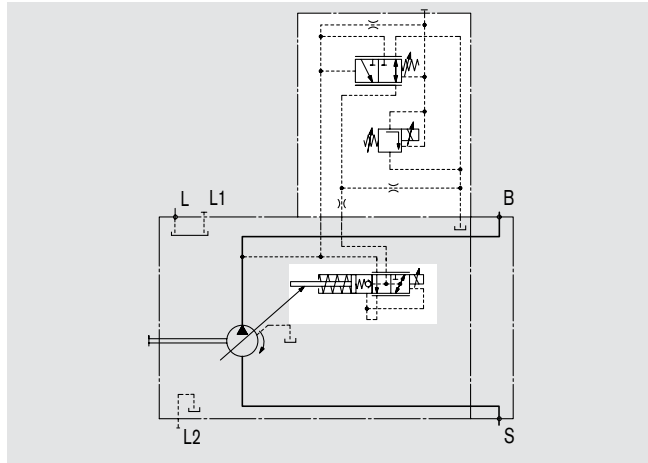
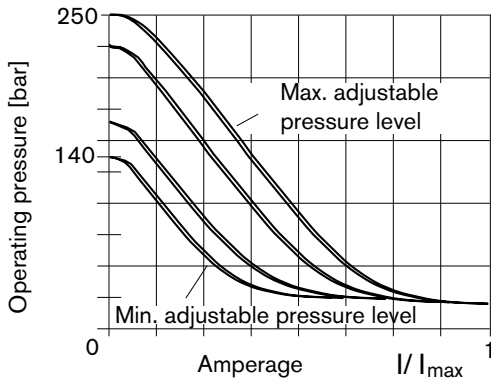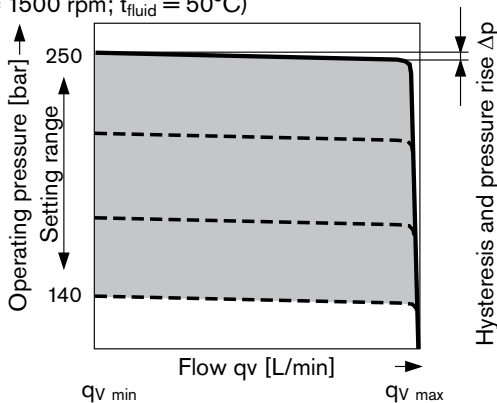## Static current-pressure characteristic (inverse proportional) ED

(measured with pump in standby)

Hysteresis static current-pressure characteristic < 3bar.

Static flow-pressure characteristic

(at n = 1500 rpm; t_{fluid} = 50°C)

Control data

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

Schematic EP.ED

Schematic EK.ED

Dimensions EP.ED/EK.ED

Before finalising your design please request a certified installation drawing. Dimensions in mm.
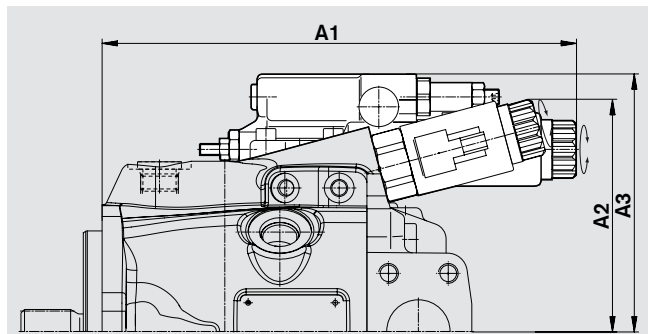
NG	18	28	45	60	85
A1	220	240	250	250	281.5
A2	110	117	120	125	142
A3	122	130	132	140	149.5

For detailed dimensions see data sheet RE 92703.

Solenoid connectors

Technical data, solenoid	ED for EP1/EK1	ED for EP2/EK2
Voltage	12 V (±20 %)	24 V (±20 %)
Control current		
Begin of control at $q_{V\,min}$	100 mA	50 mA
End of control at $q_{V\,max}$	1200 mA	600 mA
Limit current	1,54 A	0,77 A
Nominal resistance (at 20°C)	5,5 Ω	22,7 Ω
Dither frequency for PWM signal	100 - 200 Hz	100 - 200 Hz
Duty cycle	100 %	100 %
Solenoid class of material	H (T_{max} = 180°C)	
Protection	see connector selection on page 7	

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

DEUTSCH DT04-2P-EP04, 2-pole

permanently moulded, without bi-directional suppressor diode (Standard) _____**P**
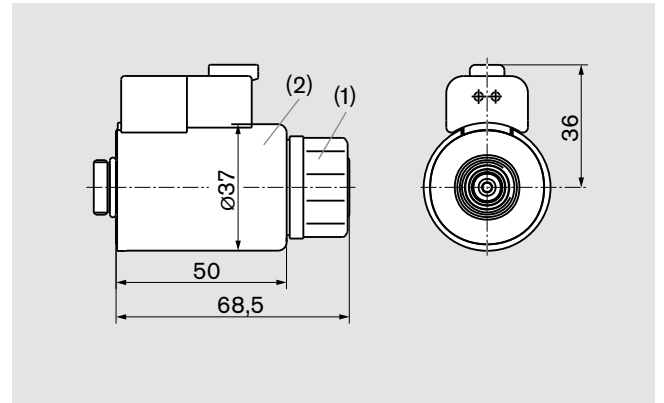
Protection to DIN/EN 60529: IP69K

Male connector

DEUTSCH DT06-2S-EP04
Rexroth Mat.-Nr. R902601804

comprising: DT-designation

– 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.

Note:

Plug orientation can be changed by rotation of the solenoid body.

Please observe the following procedure:

– 1. Loosen the fastening nut (1)

– 2. Rotate the solenoid body (2) into the desired orientation

– 3. Retighten fastening nut
Tightening torque: 5^{+1} Nm
(wrench size across flats SW26, 12kt DIN 3124)

Electronic controls

Control	Electronic function	Electronic unit		Further information
Electric pressure control	Regulated current output	RA	analogue	RE 95 230
		VT2000	analogue	RE 29 904
		RC2-2/21 [1]	digital	RE 95 201

[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_{Gmax} 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.