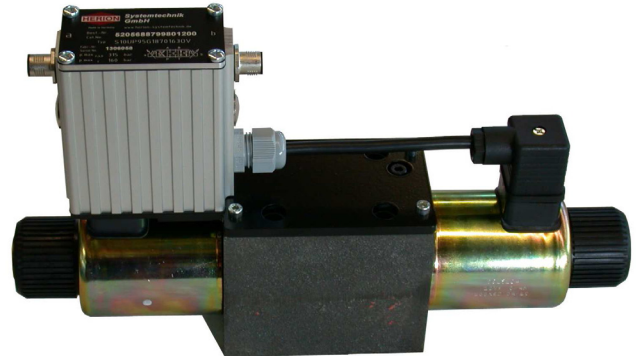


**Proportional directional control valves nominal size 10  
directly controlled with integrated digital electronics  
Interface to DIN 24 340 and ISO 4401 (CETOP05)  
PN [p<sub>max.</sub>] = 315 bar**

- Speed and direction control according to setpoint input**
- Program control, remote control**
- Spring-centred, robust design**
- Low-cost system solution**
- Analogous interface for setpoint**
- Quick and easy parametrization via PC with operating software (USB adaption)**



## Parameters

### General parameters

Designation:  
Direct-controlled proportional directional control valve nominal size 10 with integrated digital electronics

Symbol:  
see device set-up or type key

Design:  
Spool valve

Mounting method:  
Flange mounting

Cable connection:  
Subplate

Installation position:  
preferably horizontal

Mass of directional valve:  
[kg]: 7.2

Mass of the associated subplate:  
G 1/2 [kg]: 2.0  
G 3/4 [kg]: 3.4

Mass of the associated pressure balance 6015530:  
[kg]: 3.3

Ambient temperature range  $\vartheta_u$  [°C]:  
0 to +50

Nominal size:  
10

### Hydraulic parameters

Operating pressure range  $p_{e,max}$  [bar]  
for connection P, A, B:  
up to 315  
for connection T:  
up to 160

Pressurising fluid temperature  $\vartheta_u$  max. [°C]:  
+70

Viscosity:  $\nu$  [mm<sup>2</sup>/s]:  
12 to 500

Flow rate  $Q_{max}$  [l/min]:  
See characteristic curves

Hysteresis [%]:  
< 5%

Responsiveness [%]:  
< 1%

Reversal error [%]:  
< 1%

Oil cleanliness class according to ISO 4406: 20/18/15

Zero flow for  $\Delta p$  100 bar (without pressure balance)  
[cm<sup>3</sup>/min]:  
< 100

### Additional parameters

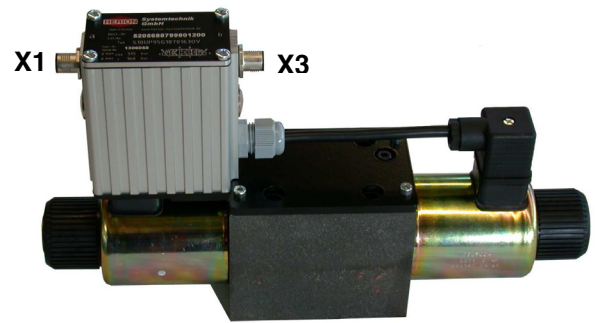
Regulating times approx. [ms]:  
0%..80%: 50

On-time  $ED_{ret}$  [%]:  
100

Protection class for solenoid and electrical connection according to DIN 40050:  
IP 65 (with mounted plug)

## Proportional directional control valves nominal size 10

### Connection assignment



#### X1 (energy supply, setpoint)

8-pin			
	Supply voltage	1	+24 VDC (18 V to 30 V power) *
	Supply voltage	2	+24 VDC (18 V to 30 V power) *
	Supply voltage	3	0 V (Power) *
	Supply voltage	4	0 V (Power) *
	Reference output	5	Reference output +10.0 V
	Setpoint input	6	Analogue GND
		7**	0 ... ±10 V
			0 mA ... 20 mA
		10 mA ... ±10 mA	
		4 mA ... 20 mA	
		12 mA ... ±8 mA	
		5 V ±5 V	
Protective earth	8	PE	

\* For current load > 2 A, all connections 1 – 4 must be used

\*\* Factory-provided in the parameterization for 0 ... ±10 V set

#### X3 (RS232 interface)

5-pin			
		1	n.c.
		2	n.c.
		3	GND
	RS232 Interface	4	TxD
	RS232 Interface	5	RxD

## Digital electronics / drive card

Supply voltage [V DC]: 24 (18 ... 30) Ripple < 10%	Emitted interference: EN 61000-6-3:2007 + A1:2011 and EN 61000-6-4: 2007 + A1: 2011	Setpoint input signals: Signal	Wire break Monitoring	Interface RS232 via 5-pin M12x1 plug on the aluminium casing X3 (adapter cable to USB, see accessories)
Max. power consumption [VA]: 50	Ambient temperature range $\theta_u$ [°C]: 0 to +50	0 ... ±10 V 0 mA ... 20 mA 10 mA ... ±10 mA 4 mA ... 20 mA 4 mA ... 20 mA 12 mA ... ±8 mA 12 mA ... ±8 mA 5 V ±5 V	*1 --- without with without with without with ---	
EMC guidelines for fault- free operation: EN 61000-6-2:2005 and EN61000-4-2	Storage temperature [°C]: -20 to +60			

\*1 if activated

## Construction

The proportional directional control valves nominal size 10 are built according to the 5-chamber system and are designed as spool valves. The valve is proportionally solenoid-operated and is controlled directly. The solenoids are controlled via digital control electronics.

## Application

The proportional directional control valve can be used for the directional and speed control of hydraulic cylinders and hydraulic engines and is used where an expensive servo-valve is too costly and a normal directional valve does not suffice in terms of function. Due to the steadily controllable signal, the various movements can be easily and very precisely moved via the electric remote control.

## Mounting

The devices are attached to the subplates with screws and sealed with O-rings.

## Hydraulic cable connection

Subplate, interface to DIN 24 340-A 10 and ISO 4401-AC-05-4-A.

## Integrated electronics

The inserted digital amplifier card is characterised by the latest technology. The circuit board meets all applicable standards for the EMC. This ensures a high interference resistance and low interference emissions. The system properties are essentially determined by the software and include sufficient power reserves to also take future developments and care measures into account.

### Completely digitalised amplifier and controller with the advantages:

- No potentiometer on the card
- No setting of jumpers required
- All necessary settings/ parametrizations via RS232 interface
- Safety for the user when setting
- Use of a modern 16 bit  $\mu$ C

- Flash EPROM for easy software update for adaptations and extensions without replacing the EPROM (download from PC via RS232)
- Using a watchdog and reset module results in a high level of reliability and safety

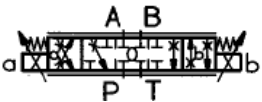
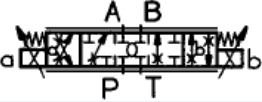
### Functionality when using the RS232 interface:

- Changing individual parameters "on the fly" without controller interruption or interferences

## Proportional directional control valves nominal size 10

### Device set-up (standard versions)

#### S10UP (proportional directional control valve nominal size 10, controlled)

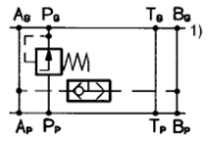
Symbol	Symbol no.	Q <sub>Nom.</sub> at Δp 10 bar	Code	Type	Order number
	187	60 l/min	023	S10UP95G187 023 30V	5205712.7998.012.00
	212	60 l/min	023	S10UP95G212 023 30V	5205714.7998.012.00
	233	60 l/min	023	S10UP95G233 023 30V	5205716.7998.012.00

Other designs available on request

### Subplate

Designation	Comment	Type	Order number
G1/2	Dimensional drawing, see page 9	P S 10 G 4 001 2 0 0	1065184
G3/4	Dimensional drawing, see page 9	P S 10 G 5 001 2 0 0	2840036

### Pressure balance

Symbol	Comment	Order number
	The combination of a proportional directional control valve and pressure balance valve results in a proportional current regulation valve. This means: When using a pressure maintenance valve, the set volume flow remains nearly constant, even with varying pressure (see volume flow consistency characteristic curve). Dimensional drawing, see page 8	6015530

### Fastening screws

Designation	Comment	Order number
Cylinder head screws (M6x60) DIN 912-10.9	Without pressure balance	0700411
Cylinder head screws (M6x110) DIN 912-10.9	In conjunction with pressure balance 6015530	0659221

## Order

The devices are characterised by the type. The ordering code indicates the composition of the type designation. Standard versions are included in the device line-up. It is advantageous to indicate the order number in addition to the type designation for these standard versions. Other device versions can be compiled by means of type combinations. When ordering from the factory, these devices then receive an order number that is evident from the order confirmation.

O-rings are included in the scope of delivery for flange mounting devices.

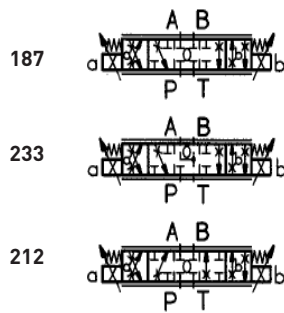
The connection plate, pressure balance, mounting screw, cable plug must be ordered separately (see accessories).

## Ordering code

### Proportional valve

<b>S</b>	<b>10</b>	<b>UP</b>	<b>95</b>	<b>G</b>	...	...	<b>3</b>	<b>0</b>	<b>V</b>
					1	2	3		4

1 Symbol:



[other symbols by request]

- 2 Code: **023** (see characteristic curves)  
 3 Design status: **3**  
 4 Sealing material: **V** – FKM (e.g. Viton)

### Subplate

<b>P</b>	<b>S</b>	<b>10</b>	<b>G</b>	...	<b>001</b>	...	<b>0</b>	<b>0</b>
				1		2		

- 1 Pipe: **4** – G 1/2 (internal thread according to  
**5** – G 3/4 DIN ISO 228/1)  
 2 Design status: **2**

## Ordering example

4/3-directional valve nominal size 10,  
 Symbol 187, code 023  
 and associated subplate G1/2  
 and pressure balance 6015530

### Directional valve:

Type designation:  
 S10UP 95 G 187 023 3 0 V  
 Order no.:  
**5205712.7998.012.00**

### Connection plate:

Type designation:  
 P S 10 G 4 001 2 0 0  
 Order no.:  
**1065184**

### Pressure balance:

Order no.:  
**6015530**

### Fastening screws:

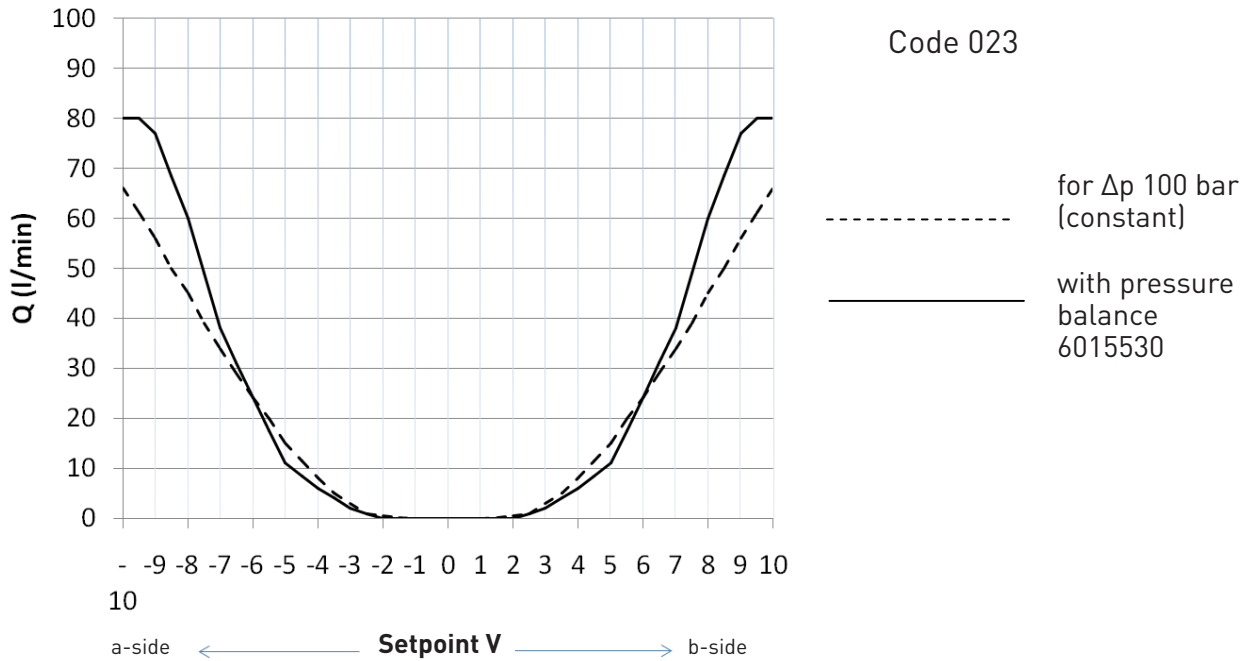
[4 pieces required]  
 Cylinder head screw:  
 (M 6 x 110 DIN 912-10.9)  
 Order no.:  
**0659221**

## Proportional directional control valves nominal size 10

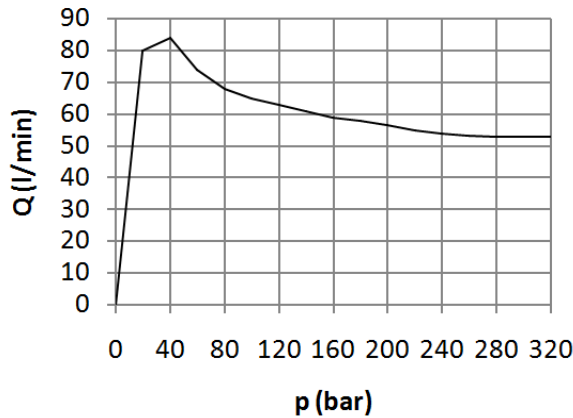
### Characteristic curve S10UP without or with pressure balance 6015530

(quasi-static 0V → +10V or 0V → -10V setpoint)

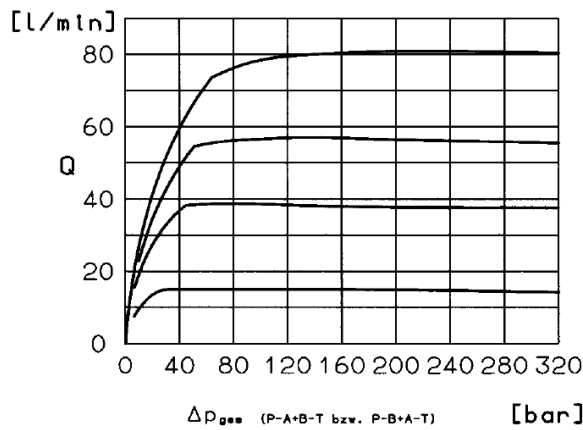
∅u: 40°C, v: 46 mm<sup>2</sup>/s



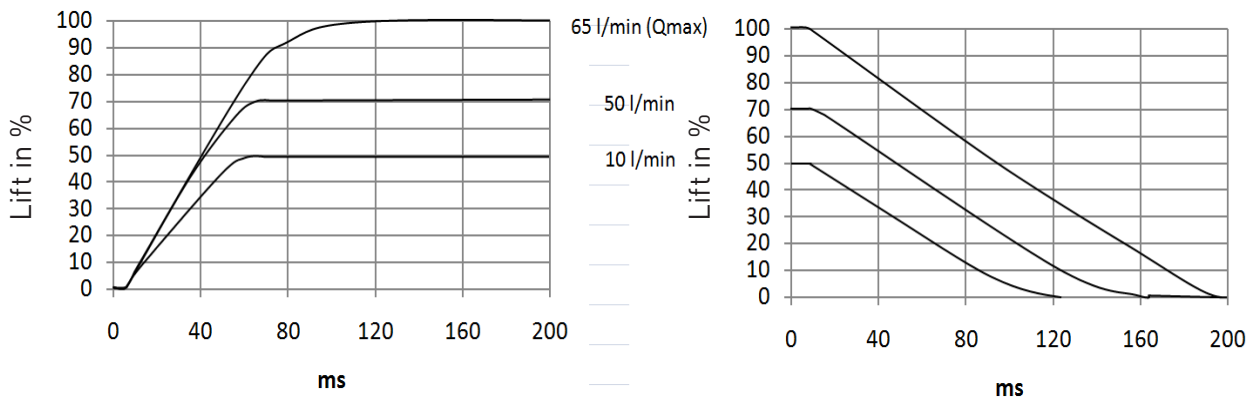
**Power limit S10UP at 100% opening, without pressure balance**



**Volume flow consistency S10UP with pressure balance 6015530**



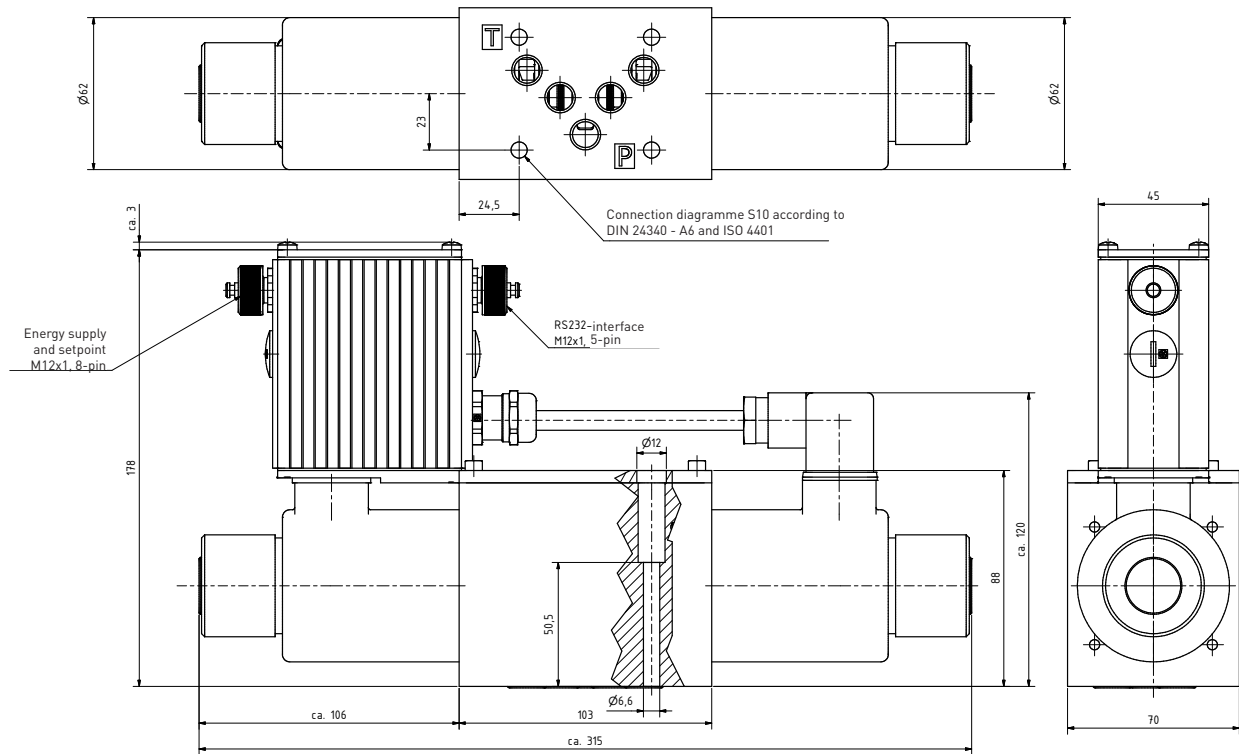
**Step response S10UP without pressure balance (for  $\Delta p$  100 bar)**



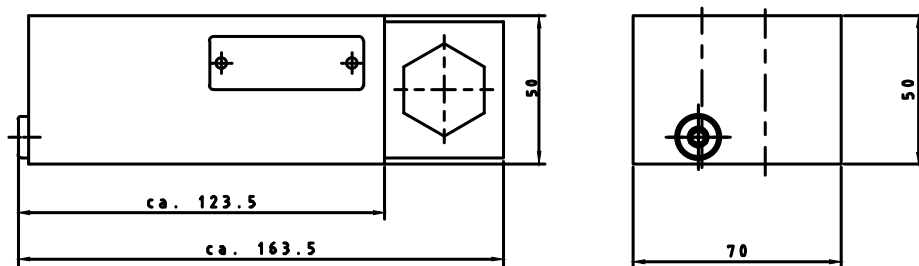
# Proportional directional control valves nominal size 10

## Dimensional drawings

### Directional valves



### Pressure balance 6015530





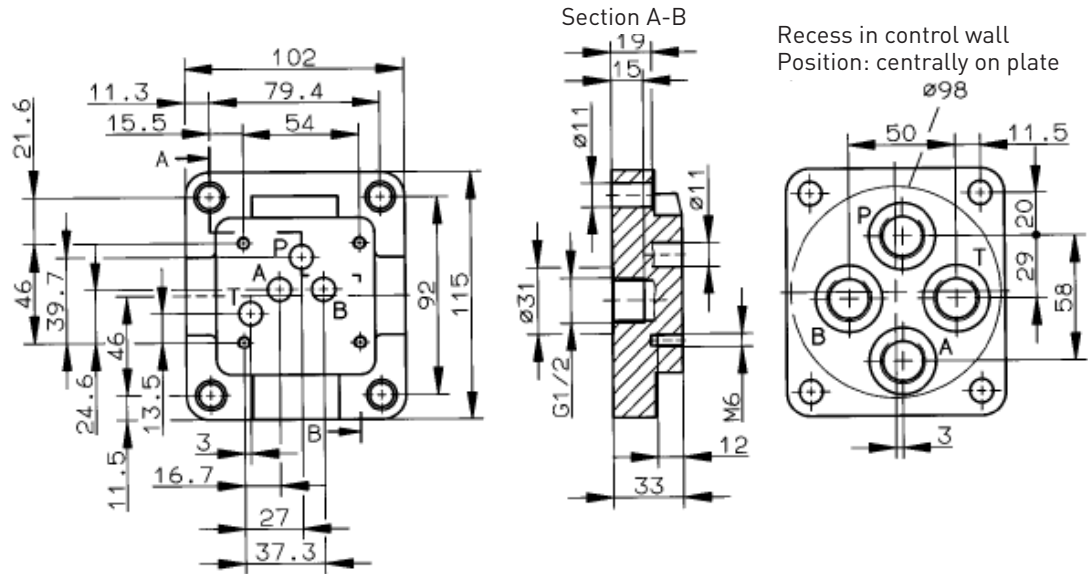
## Proportional directional control valves nominal size 10

Connection plates nominal size 10 with interface to DIN 24 340-A 10 and ISO 4401-AC-05-4-A

### Connection plate 1

Order no.: 1065184

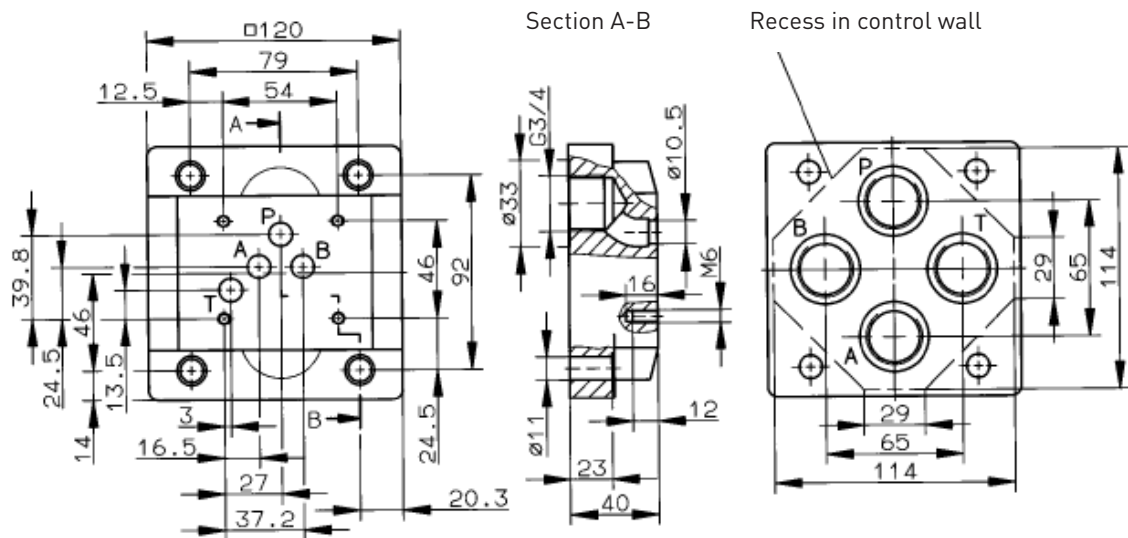
G 1/2



### Connection plate 2

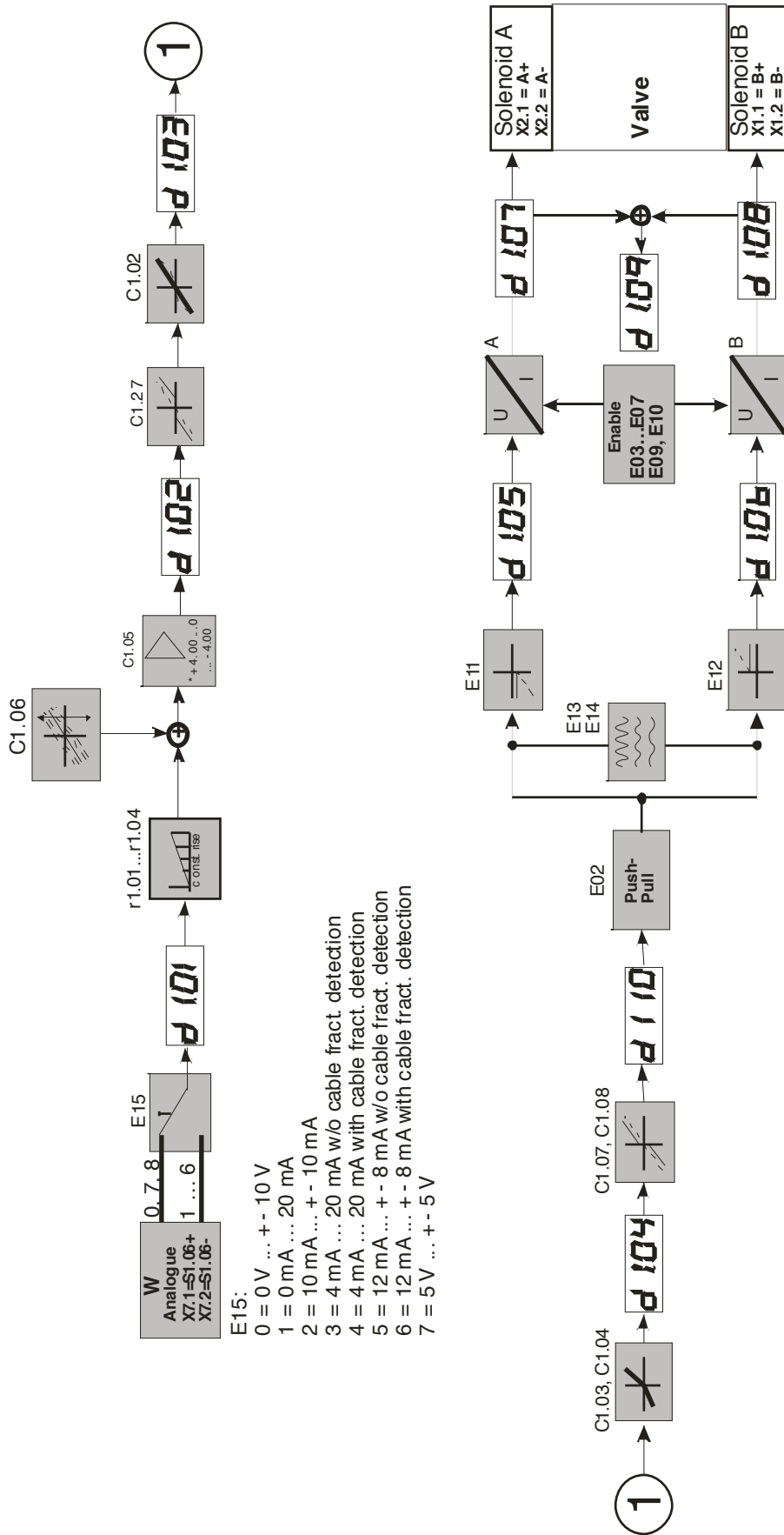
Order no.: 2840036

G 3/4



Software structure diagrams

Mode 1; controlled, one valve



- E15:
- 0 = 0 V ... +- 10 V
  - 1 = 0 mA ... 20 mA
  - 2 = 10 mA ... +- 10 mA
  - 3 = 4 mA ... 20 mA w/o cable fract. detection
  - 4 = 4 mA ... 20 mA with cable fract. detection
  - 5 = 12 mA ... +- 8 mA w/o cable fract. detection
  - 6 = 12 mA ... +- 8 mA with cable fract. detection
  - 7 = 5 V ... +- 5 V

### Complete parameter list

Controller Parameters Controller settings						
	Function	Unit	Step	Min	Max	Code
E00	Operating mode  Set to 1 at the factory		1	1	6	<b>1 = regulated;</b> one valve
E02	Push-Pull operation			off	1	off = off 1 = active
E03	Solenoid selection  Set to 2,4 A at the factory, no changes made			0.800	2.700	1 = 0.800 = 0,8 A 2 = 1.100 = 1,1 A 3 = 1.300 = 1,3 A 4 = 1.600 = 1,6 A <b>5 = 2.400 = 2,4 A</b> 6 = 2.700 = 2,7 A
E04	Excite P-component of the current controller		0001	0000	9999	
E05	Excite I-component of the current controller		0001	0000	9999	
E06	Excite P-component of the current controller		0001	0000	9999	
E07	Excite I-component of the current controller		0001	0000	9999	
E09	Time delay release	s	0.001	0.000	9.999	
E10	Solenoid current adjustment		00.01	00.50	01.10	Variable adjustment of the max. current
E11	Bias current	V	0.001	0.000	+3.000	3,000 V = 30% of the solenoid current
E12	Bias current	V	0.001	0.000	+3.000	
E13	Dither amplitude	V	0.001	0.000	+3.000	
E14	Dither frequency	Hz	0001	0001	0300	
E15	Signal definition for setpoint  Set to 0 =±10 V at the factory		1	0	7	<b>0 = ±10 V</b> 1 = 0 mA .. 20 mA (o.D) 2 = 10 mA .. ±10 mA (m.D) 3 = 4 mA .. 20 mA (o.D) 4 = 4 mA .. 20 mA (m.D) 5 = 12 mA .. ±8 mA (o.D) 6 = 12 mA .. ±8 mA (m.D) 7 = 5 V ±10 V (without wire break monitoring o.D.) (with wire break monitoring, m.D.)
E25	Enable / disable release					off = amplifier off 1 = amplifier active

## Proportional directional control valves nominal size 10

### Complete parameter list

<b>Controller Parameters Controller settings for branch 1</b>						
	Function	Unit	Step	Min	Max	Code
C1.02	Characteristic curve		1	0	5	off = linear 1 ... 5 = curve
C1.03	Amplification A	V/V	00.01	00.00	02.00	
C1.04	Amplification B	V/V	00.01	00.00	02.00	
C1.05	Setpoint sign / amplification			-4	+4	
C1.06	Offset setpoint	V	0.001	-9.999	+9.999	
C1.07	Dead zone compensation A	V	0.001	0.000	+9.999	9.999 max. solenoid current
C1.08	Dead zone compensation B	V	0.001	0.000	+9.999	
C1.27	Hysteresis setpoint	V	0.001	0.000	+9.999	

<b>Ramp parameters for branch 1</b>						Code
	Function	Unit	Step	Min	Max	
r1.01	Ramp from 0 → -	s	0.01	00.00	39.50	
r1.02	Ramp from - → 0	s	0.01	00.00	39.50	
r1.03	Ramp from 0 → +	s	0.01	00.00	39.50	
r1.04	Ramp from + → 0	s	0.01	00.00	39.50	

<b>Display parameters for branch 1</b>					
	Function	Unit	Step	Min	Max
d1.01	Display sum for all analogue setpoints	V	0.001	-9.999	+9.999
d1.02	Sum of all analogue setpoints after ramp	V	0.001	-9.999	+9.999
d1.03	Setpoint according to linearisation	V	0.001	-9.999	+9.999
d1.04	Setpoint according to amplification adjustment	V	0.001	-9.999	+9.999
d1.05	Control for solenoid A		0.001	-9.999	+9.999
d1.06	Control for solenoid B		0.001	-9.999	+9.999
d1.07	Solenoid current A	A	0.001	0.000	5.000
d1.08	Solenoid current B	A	0.001	0.000	5.000
d1.09	Total current for solenoid A + B	A	0.001	0.000	5.000
d1.10	Reference variable	V	0.001	-9.999	+9.999

Accessories



Designation	Description	Order number
1 HSTool	Parametrization software. Parametrization, storage and documentation of the setting. Available in German and English.	5150024
2 Cable plug for X3	USB connection cable for communication between PC and integrated electronics for interface RS232, with approx. 5 metre cable.	0618852
3 Cable plug for X1	8-pin round plug M12x1 for energy supply and setpoint	0618853
4 O-ring spare part kit:	Consists of 5 x O-rings	0701623

Seals available only as spare parts kit.

Repairs may only be carried out by the manufacturer or by authorised specialised personnel.

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