

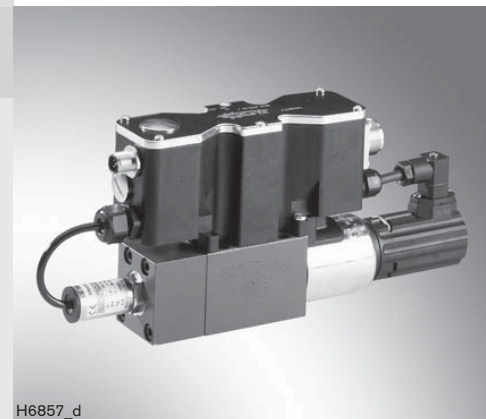
# Proportional directional valve, direct operated, with pQ functionality

**RE 29014/06.05** 1/18  
Replaces: RE 29014-02-M

**Type STW 0195, type STW 0196**

STW 0195: Size 6  
Component series 2X

STW 0196: Size 10  
Component series 1X



H6857\_d

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## Features

- Direct operated 3-way proportional valve with integrated digital closed-loop control electronics type IAC-P, for controlling a pressure in port A
- Completely matched unit, consisting of a position-controlled valve, pressure sensor and field bus interface
- Actuation via proportional solenoid with central thread and detachable coil
- Closed-loop position controlled valve spool
- Integrated pressure sensor plate (optional)
- For subplate mounting: Porting pattern to ISO 4401
- Analogue interfaces for command and actual values
- Version for CAN bus with CANopen protocol DS 408 or Profibus DP
- Separate component plugs for power supply and bus interfacing
- Fast commissioning by means of PC and commissioning software WINPED

Ordering code

STW0195-2X/1V-24CF6

With integrated digital electronics and pQ functionality  
Size 6

Component series 20 to 29  
(20 to 29: unchanged installation and connection dimensions)

Nominal flow  
P → A 10 l/min, A → T 20 l/min  
P → A 20 l/min, A → T 20 l/min

FKM = rectangular profile rings suitable for mineral oils  
(HL, HLP) to DIN 51524

= 2X

= 1

= 2

= V

Further details in clear text

Interface A6 or F6  
A6 = ±10 VDC  
F6 = 4 to 20 mA

Bus interface  
C = CAN bus DS - 408  
P = Profibus DP V0/V1

Supply voltage  
24 = 24 VDC

Pressure stage of the integrated pressure sensor  
3 = Nominal pressure 50 bar  
5 = Nominal pressure 160 bar  
8 = Nominal pressure 250 bar

STW0196-1X/1V-24CF6

With integrated digital electronics and pQ functionality  
Size 10

Component series 10 to 19  
(10 to 19: unchanged installation and connection dimensions)

Nominal flow  
P → A 65 l/min,  
A → T 60 l/min,  
B → T 60 l/min

FKM = rectangular profile rings suitable for mineral oils  
(HL, HLP) to DIN 51524

= 1X

= 1

= V

Further details in clear text

Interface A6 or F6  
A6 = ±10 VDC  
F6 = 4 to 20 mA

Bus interface  
C = CANBus DS - 408  
P = Profibus DP V0/V1

Supply voltage  
24 = 24 VDC

Pressure stage of the integrated pressure sensor  
3 = Nominal pressure 50 bar  
5 = Nominal pressure 160 bar  
8 = Nominal pressure 250 bar

Standard types, symbols

Type	Size	Material no.	Symbol
STW 0195-2X/1V5-24CF6 STW 0195-2X/1V8-24CF6	6 6	R900767353 R901018622	
STW 0195-2X/2V5-24CF6 STW 0195-2X/2V8-24CF6	6 6	R901006499 R901006529	
STW 0196-1X/1V5-24CF6 STW 0196-1X/1V8-24CF6	10 10	R900705778 R901021786	

## Structure, function, section

### Structure

The IAC-P valve basically consists of:

- Housing (1) with mounting face
- Control spool (2) with compression spring (3)
- Solenoid and pressure tube (4) with central thread
- Position transducer (5)
- Pressure sensor (6)
- Integrated digital closed-loop control electronics IAC-P (7) with bus interface (X2) and central plug-in connector (X1).

### Functional description

- With de-energised solenoid (4), spool position  $A \rightarrow T$  (with STW 0196-1X/1 additionally  $B \rightarrow T$ )
- Functions:
  - Open-loop flow control (Q)
  - Closed-loop pressure control (p)
  - Alternating closed-loop control p/Q
- The command value can be fed forward alternatively via an analogue interface (X1) or via the field bus interface (X2, X3).
- The actual value signals are made available via an analogue interface (X1) and can be read out additionally via the field bus (X2, X3).
- The controller parameters are adjusted via the field bus (X2, X3).
- For safety reasons, separate supply voltage for bus/controller and power part (output stage)

The digital integrated control electronics allow the following faults to be detected: (Diagnosis)

- Cable break of pressure sensor supply cable (6)
- Undervoltage
- Break of position transducer cable (5)
- Communication error
- Watchdog
- Cable break of command value inputs

The following additional functions are available:

- Pressure ramp
- Internal command value profile
- Enable function analogue/digital
- Fault output 24 V

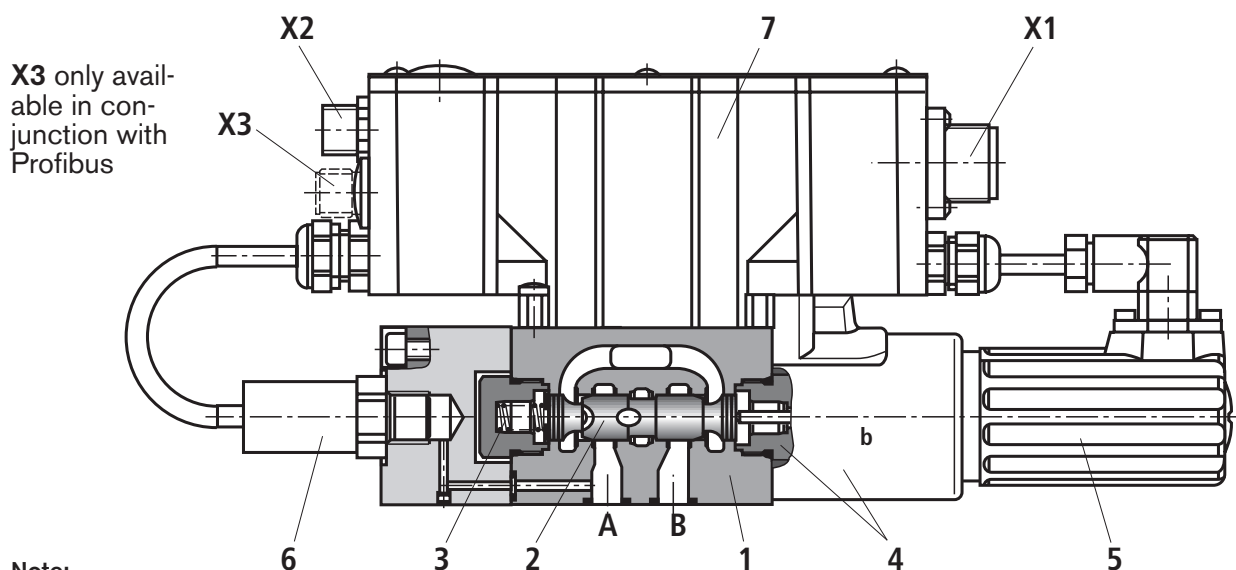
### PC program WINPED

For performing engineering work and parameterising the IAC-P valves, the user can utilize the commissioning software WINPED (see Accessories).

- Parameterisation
- Diagnosis
- Comfortable data administration on a PC
- PC operating systems: Windows 2000 or Windows XP

$Q_{comm}$	Q open-loop control	p closed-loop control
$< 12 \text{ mA}$	$A \rightarrow T$	inactive
$> 12 \text{ mA}$	Alternating closed-loop control: ( $A \rightarrow T$ or $P \rightarrow A$ ) Open-loop Q control ( $Q_{comm}$ ) with pressure limitation ( $p_{comm}$ ) While pressure limitation is active, the following is valid: $Q_{act} \leq Q_{comm}$	

### Functional section of STW 0195-2X



### Note:

Draining of the tank line must be prevented. In the case of a corresponding installation situation, install a suitable pre-load valve.

**Technical data** (for applications outside these parameters, please consult us!)

General				STW195		STW196	
Installation orientation				Optional, preferably horizontal			
Storage temperature range				°C	-20 ... +80		
Ambient temperature range				°C	-20 ... +50		
Weight				kg	2.4	6.5	
Hydraulic (measured with HLP 46 at $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$ and $p = 100\text{ bar}$ )							
Operating pressure <sup>1)</sup>		50 bar	bar	50			
Ports P, A, B	with sensor	160 bar	bar	160			
		250 bar	bar	250			
Port T	with sensor	50 bar	bar	50			
		160 bar	bar	160			
		250 bar	bar	210			
Nominal flow $q_{V\text{ nom}}$ at $\Delta p = 5\text{ bar}$ (see also flow characteristic curves from page 10)		from P → A	l/min	Spool 1	Spool 2	65	
				10	20		
		from A → T	l/min	20	20	A → T, B → T	60
Max. flow				See characteristic curves and power limit from page 10			
Hydraulic fluid				Mineral oil (HL, HLP) to DIN 51524, further hydraulic fluids on enquiry			
Hydraulic fluid temperature range				°C	-20 ... +80, preferably +40 ... +50		
Viscosity range				mm²/s	20 ... 380, preferably 30 ... 46		
Max. permissible degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)				Class 20/18/15 <sup>2)</sup>			
Hysteresis				%	≤ 0.1		
Range of inversion				%	≤ 0.05		
Response sensitivity				%	≤ 0.05		
Zero point drift				%10 K	≤ 0.15		
				%100 bar	≤ 0.1		
Electrical							
Supply voltage	Nominal voltage	VDC	24				
	Upper limit value	VDC	19.4				
	Lower limit value	VDC	35				
Max. permissible residual ripple content				Vss	2		
Current consumption	$I_{\text{max}}$	A	2				
	Impulse current	A	3				
Command value signals				mA	4 ... 20 or via CAN bus		
Duty cycle <sup>3)</sup>				%	100		
Max. coil temperature <sup>4)</sup>				°C	up to 150		
Type of protection of the valve to EN 60529				IP 65 with cable socket correctly mounted and locked			

<sup>1)</sup> Operating pressure, due to valve and sensor<sup>2)</sup> The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components. For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081<sup>3)</sup> Apply the supply voltage to the valve only, when required for the functional sequence of the machine.<sup>4)</sup> Due to the surface temperatures of solenoid coils, observe European standards EN 563 and EN 982.

## Technical data (for applications outside these parameters, please consult us!)

Sensors			STW 195 (size 6) and STW 196 (size 10)		
Measuring range	$p_N$	bar	50	160	250
Overload protection	$p_{max}$	bar	120	320	500
Burst pressure	$p$	bar	550	800	1200
Matching error	Zero point		< 0.15 % of final value		
	Final value		< 0.3 %		
Temperature coefficient in the nominal temperature range					
Highest temperature coefficient of zero point			< 0.2 % / 10 K		
Highest temperature coefficient of range			< 0.2 % / 10 K		
Characteristic curve deviation			< 0.2 %		
Hysteresis			< 0.1 %		
Repeatability			< 0.05 %		
Adjustment time (10 - 90%)		$t$	< 2 ms		
Long-term drift (1 year) under reference conditions			< 0.2 %		
Conformity			CE to EMC Directives 89/336/EEC, 93/68/EEC, 93/44/EEC		

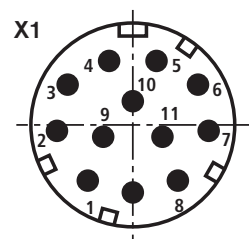
## Electrical connections, pin assignment

### Component plug pin assignment X1, 11-pin + PE to DIN EN 175201-804

Pin	No. or litz wire colour <sup>1)</sup>	Pin assignment of interface A6	Pin assignment of interface F6
1	1	24 VDC ( $u(t) = 19.4 \text{ V} \dots 35 \text{ V}$ ), $I_{max} = 1.7 \text{ A}$ (for output stage)	
2	2	0 V $\triangleq$ load zero, reference for pins 1 and 9	
3	white	Enable input 9 ... 35 V $\triangleq$ enable ON	
4	yellow	$\pm 10 \text{ V}$ command value Q $R_i > 50 \text{ k}\Omega$	4...20 mA command value Q $R_i = 100 \Omega$
5	green	Reference for command values Q and P	
6	violet	$\pm 10 \text{ V}$ actual value Q	4...20 mA actual value Q (load impedance max. 300 $\Omega$ )
7	pink	0 ... 10 V command value P $R_i > 50 \text{ k}\Omega$	4...20 mA command value P $R_i = 100 \Omega$
8	red	0 ... 10 V actual value P	4...20 mA actual value P (load impedance max. 300 $\Omega$ )
9	brown	Control voltage, level like pin 1, $I_{max} = 0.3 \text{ A}$ (for signal part and bus)	
10	black	0V reference potential for pins 3, 6, 8 and 11 (connected to pin 2 within the valve)	
11	blue	Fault output 24 V (19.4 V ... 35 V), 200 mA max. load	
PE	green-yellow	Connected to heat sink and valve body	

Connect shield to PE on the supply side only!

<sup>1)</sup> Litz wire colour of connecting cable for cable socket with cable set (see Accessories)

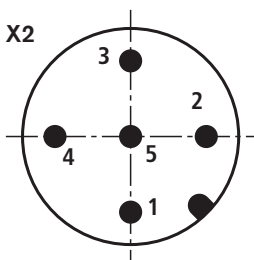


## Electrical connections, pin assignment

### Component plug assignment X2, CAN bus, (coding A), M12 x 1, 5-pin, male

Pin	Assignment
1	n.c.
2	n.c.
3	CAN_GND
4	CAN_H
5	CAN_L

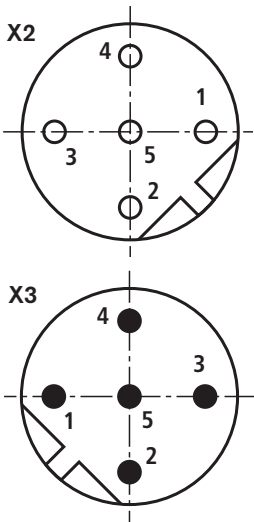
Baud rate                    kbit/s    20 to 1000  
Bus address                    1 to 127  
  
CAN-specific settings:  
The baud rate and the identifier must be set via the bus system.



### Component plug-in connector pin assignment for Profibus DP, “X2”/”X3” (coding B), M12 x 1, 5-pin, male/female

Pin	Assignment
1	+5V
2	RxD/TxD-N (A-cable)
3	D GND
4	RxD/TxD-P (B-cable)
5	Shield

Baud rate                    up to 12 MBaud  
Bus address                    1 to 126  
Setting via DIL switch



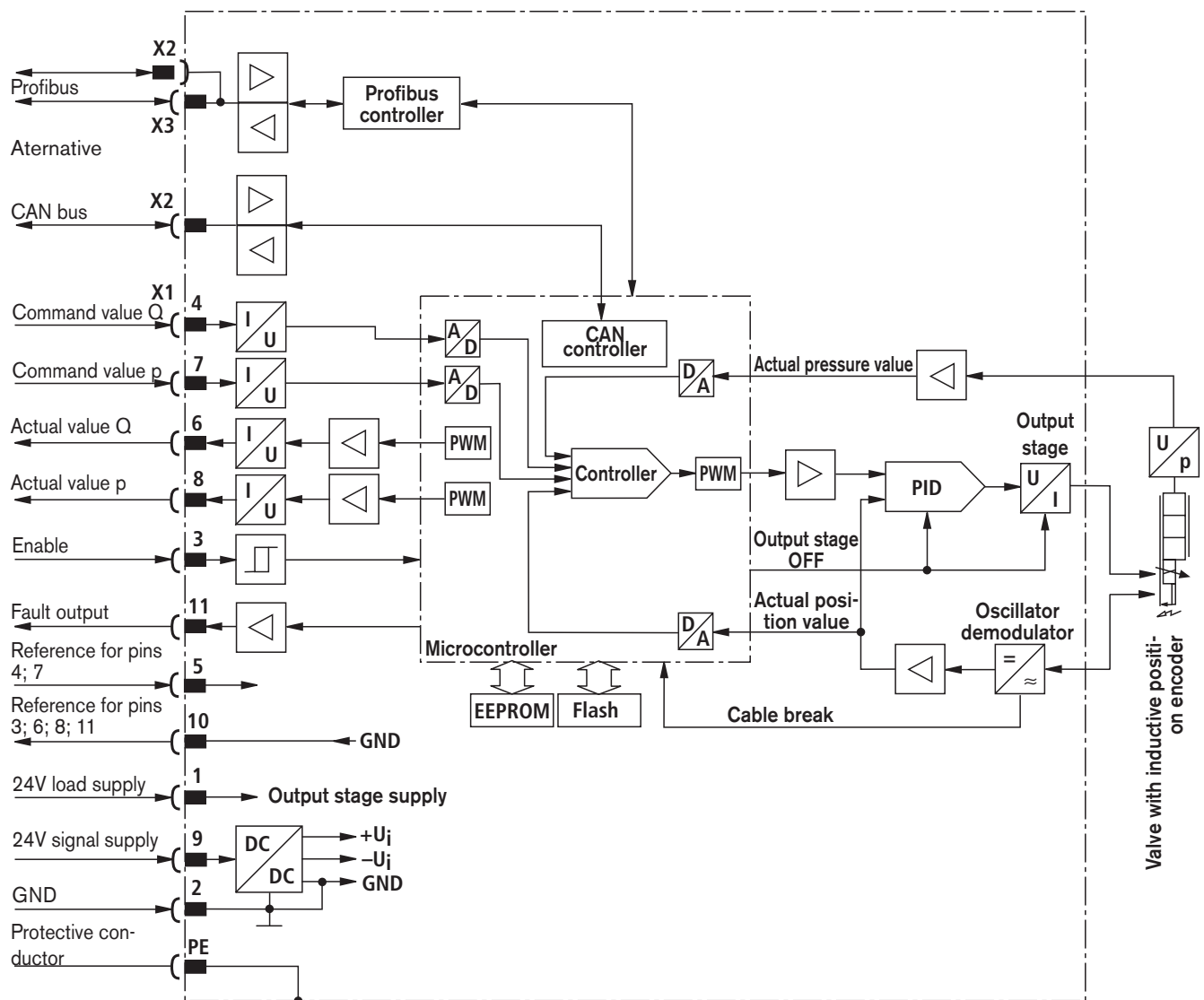
The +5-V voltage of the IAC-P is available for an external terminating resistor.

**Note:**

We recommend that the shields be connected on both sides via the metal housings of the plug-in connectors.  
The use of plug pins deteriorates the shield effect!  
Internal shields are not required.

## Electrical connections, pin assignment

### Block circuit diagram, integrated control electronics



**Command value:** Command value 12 to 20 mA at pin 4 and reference potential at pin 5 causes a flow from P → A.

Command value 4 to 12 mA at pin 4 and reference potential at pin 5 causes a flow from A → T.

**Actual value:** Actual value 12 to 20 mA at pin 6 and reference potential at pin 10 corresponds to a flow from P → A.

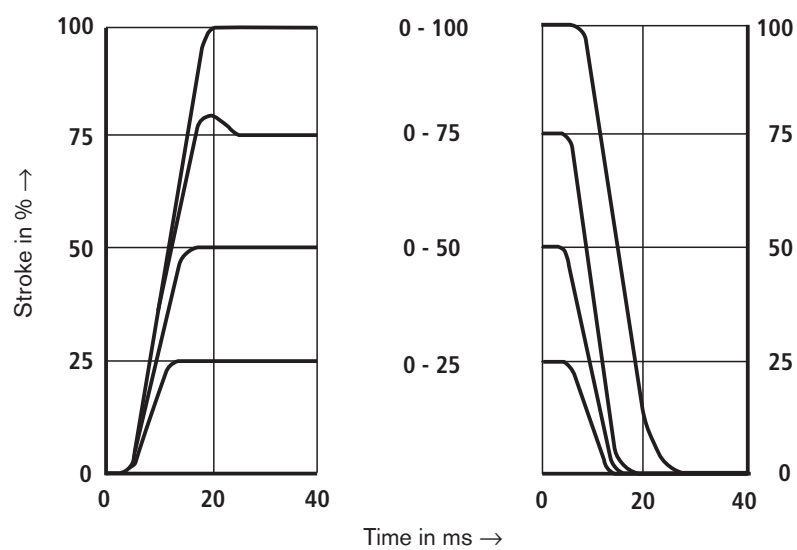
actual value 4 to 12 mA at pin 6 and reference potential at pin 10 corresponds to a flow from A → T.

**Connecting cable:** Recommendation: – up to 25 m cable length for pins 1; 2 and PE: 0.75mm<sup>2</sup>, otherwise 0.25mm<sup>2</sup>  
– up to 50 m cable length for pins 1; 2 and PE: 1.00mm<sup>2</sup>

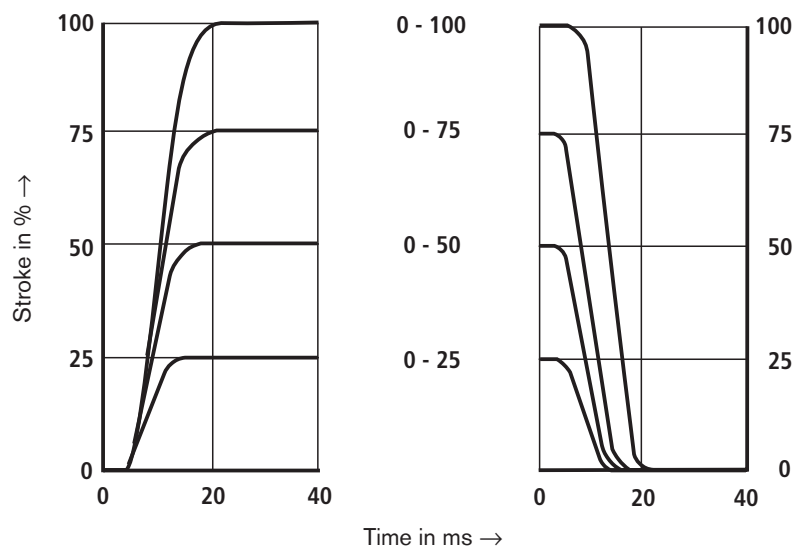
For outer diameters, see cable socket sketch

## Characteristic curves of STW 0195-2X/1...

Transient function, STW 0195-2X/1..., A → T



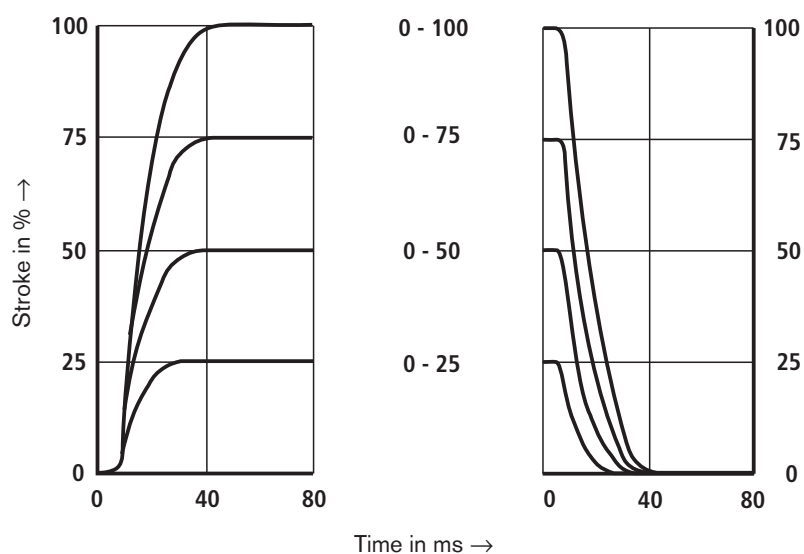
Transient function, STW 0195-2X/1..., P → A



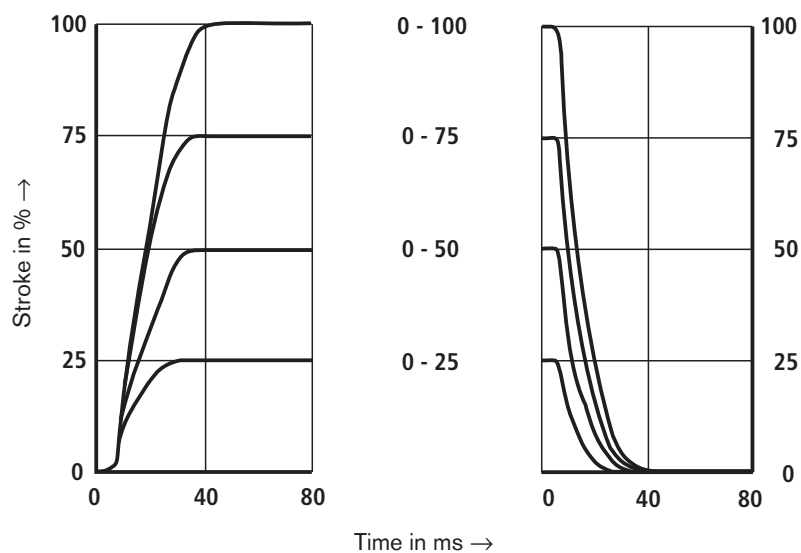


## Characteristic curves of STW 0196-1X/1...

Transient function, STW 0196-1X/1..., A → T, B → T

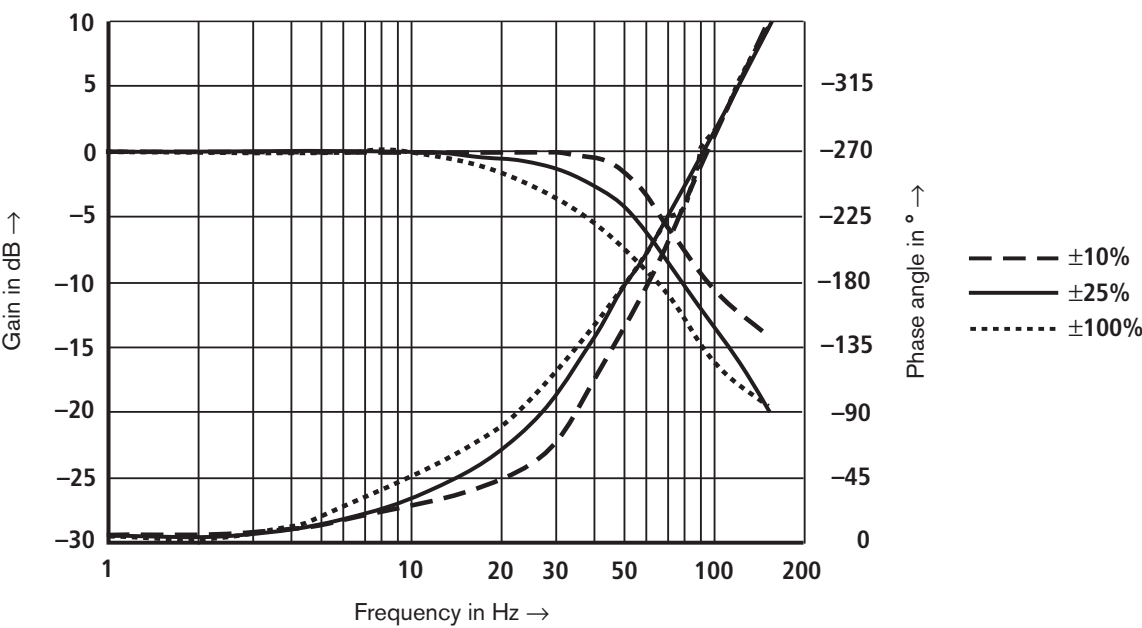


Transient function, STW 0196-1X/1..., P → A

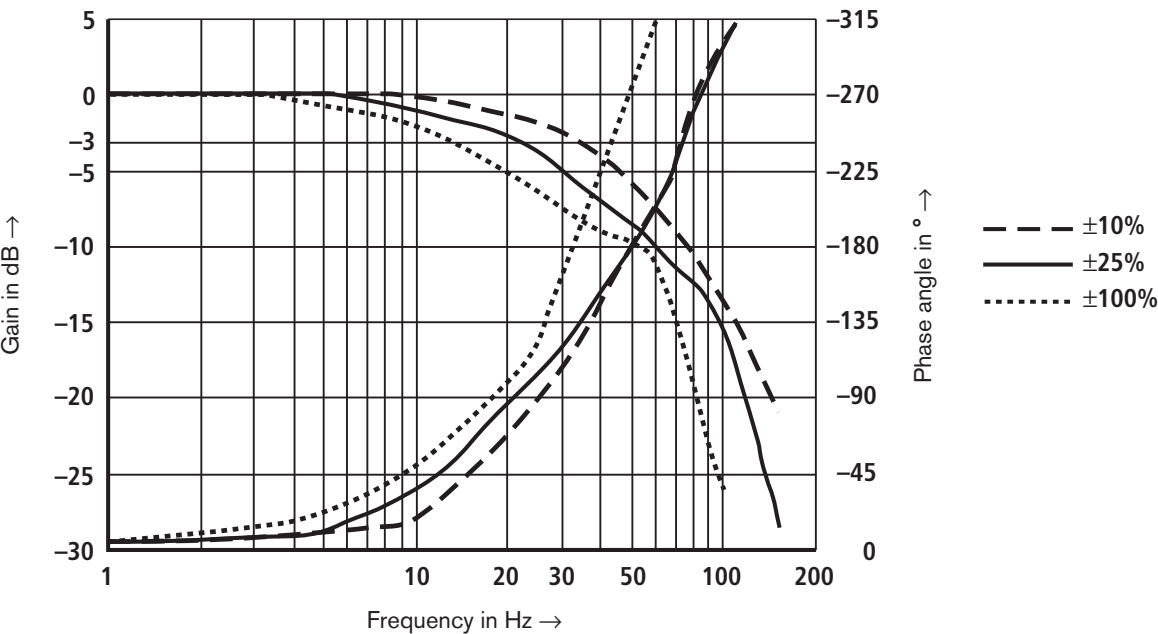


Characteristic curves of STW 0195-2X/1... and STW 0196-1X/1...

Frequency response, STW 0195-2X/1...

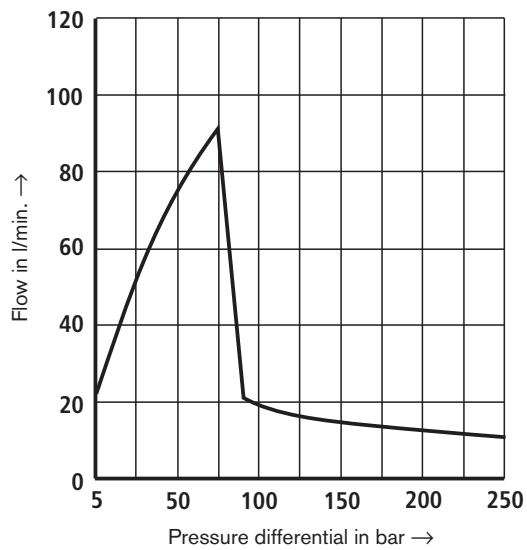


Frequency response, STW 0196-1X/1...

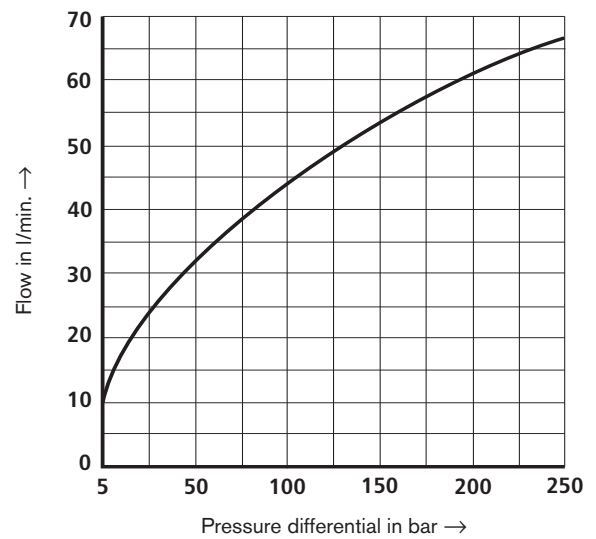
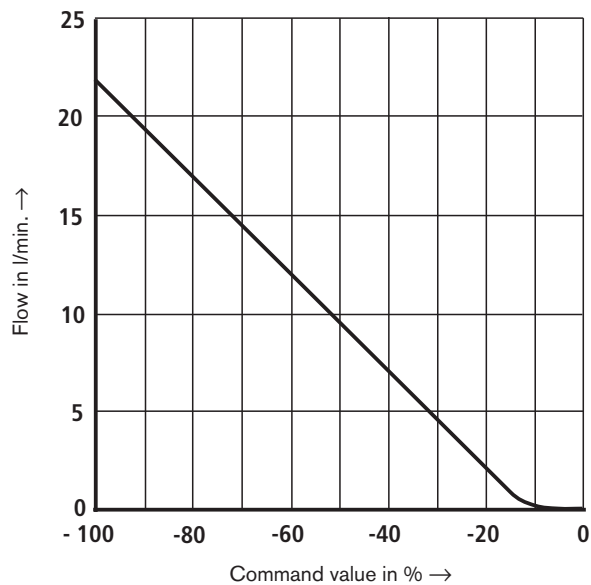
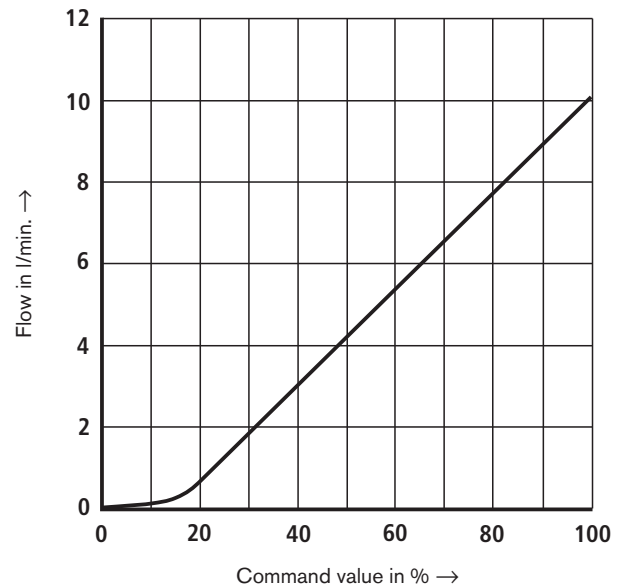


## Characteristic curves of STW 0195-2X/1...

Performance limit A → T, closed-loop position controlled

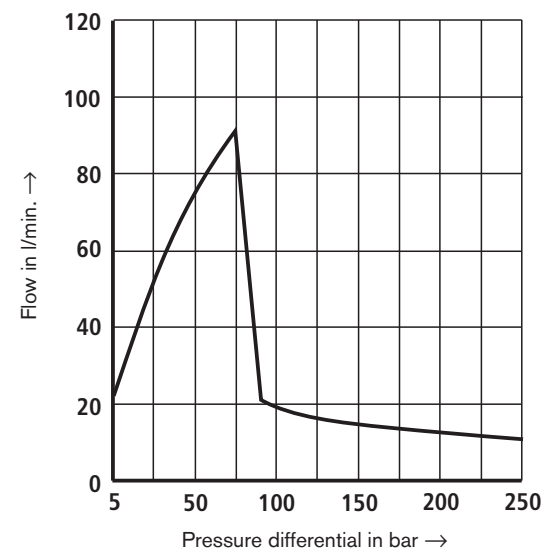


Performance limit P → A, closed-loop position controlled

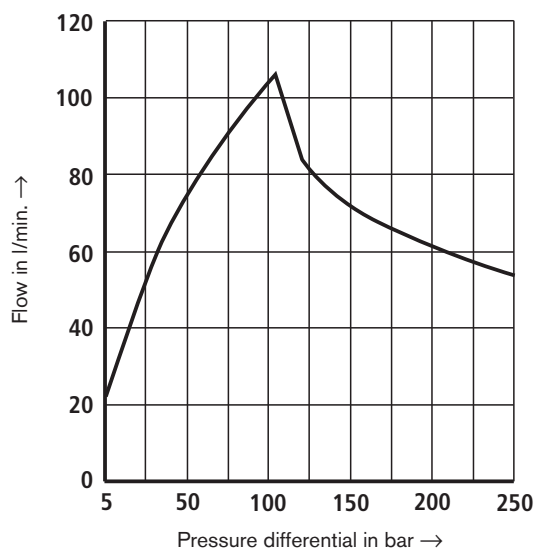
Flow characteristic curve A → T,  $\Delta p = 5$  barFlow characteristic curve P → A,  $\Delta p = 5$  bar

Characteristic curves of STW 0195-2X/2...

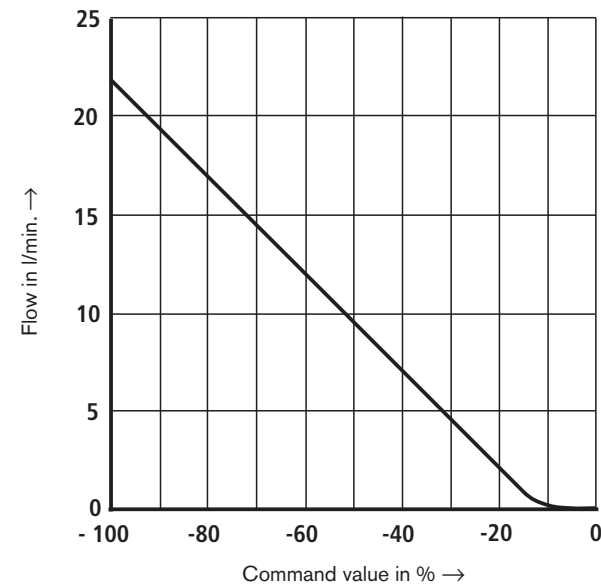
Performance limit A → T, closed-loop position controlled



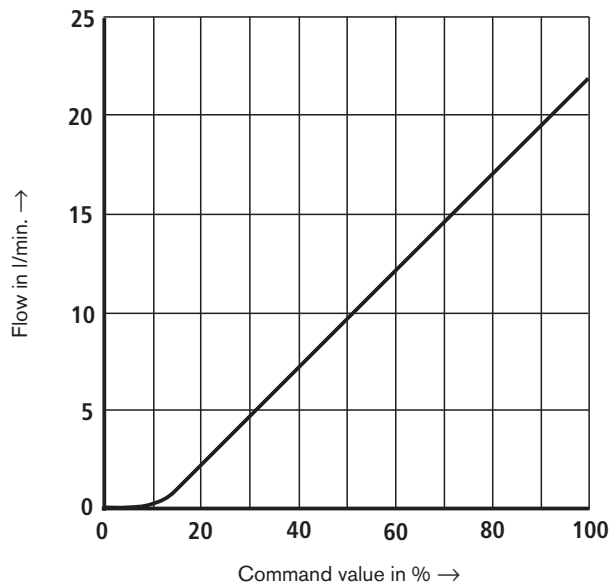
Performance limit P → A, closed-loop position controlled



Flow characteristic curve A → T, Δp = 5 bar

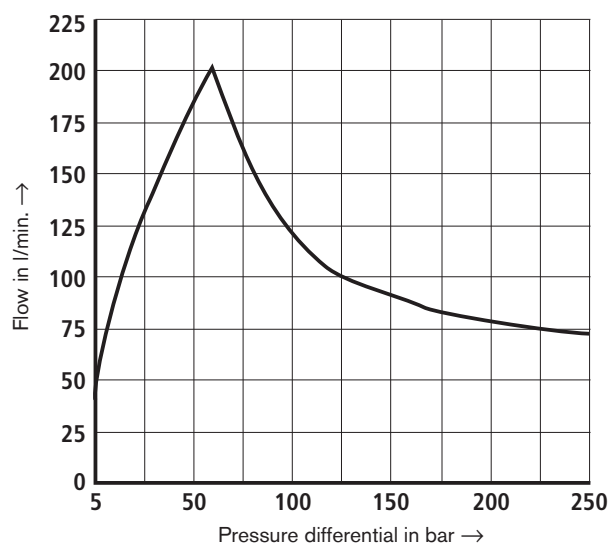


Flow characteristic curve P → A, Δp = 5 bar

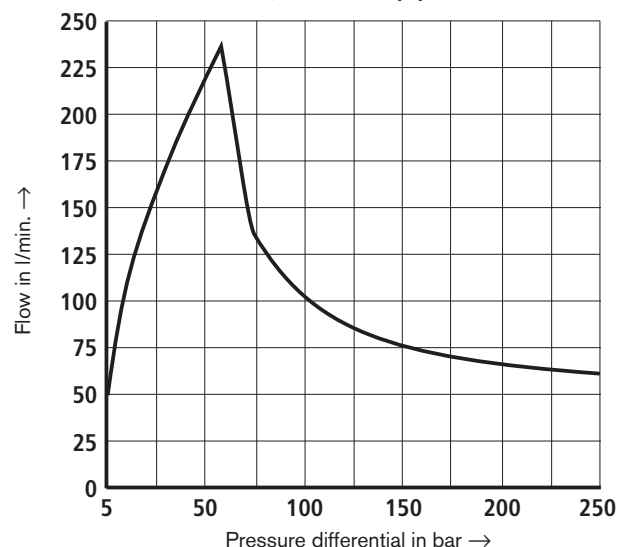


## Characteristic curves of STW 0196-1X/1...

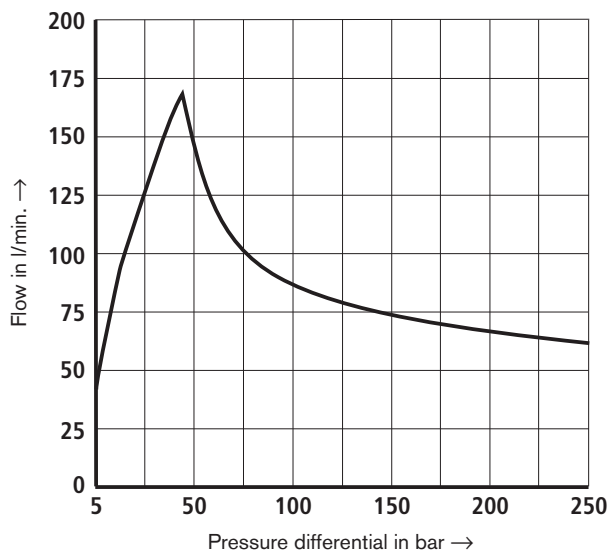
Performance limit A → T, closed-loop position controlled



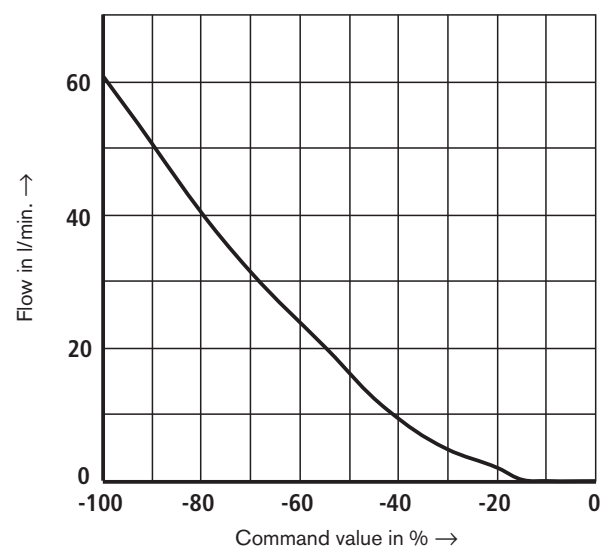
Performance limit P → A, closed-loop position controlled



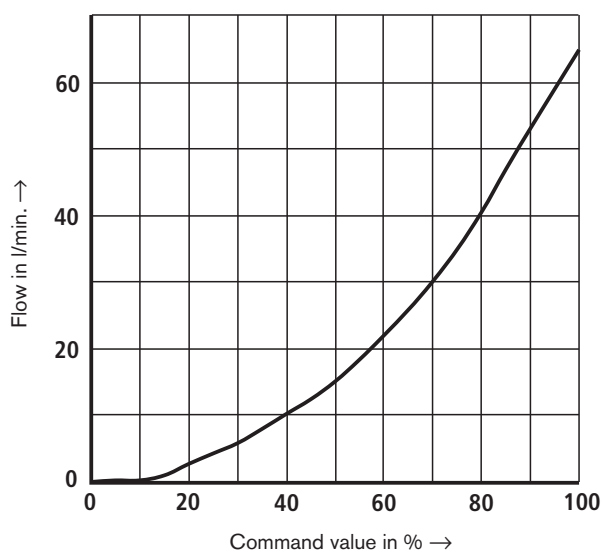
Performance limit B → T, closed-loop position controlled



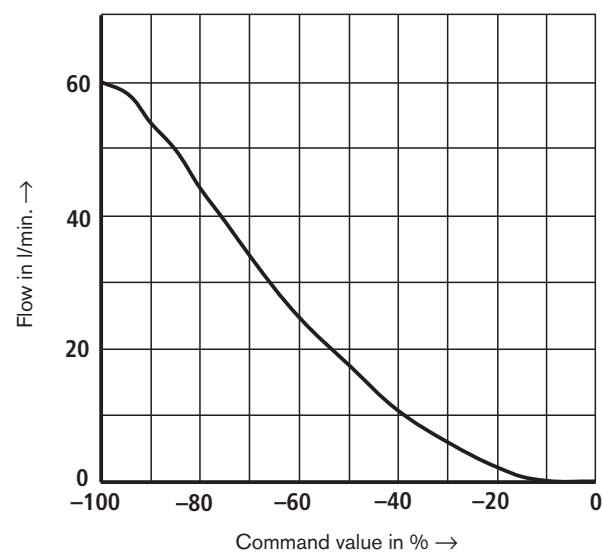
Flow characteristic curve A → T,  $\Delta p = 5$  bar



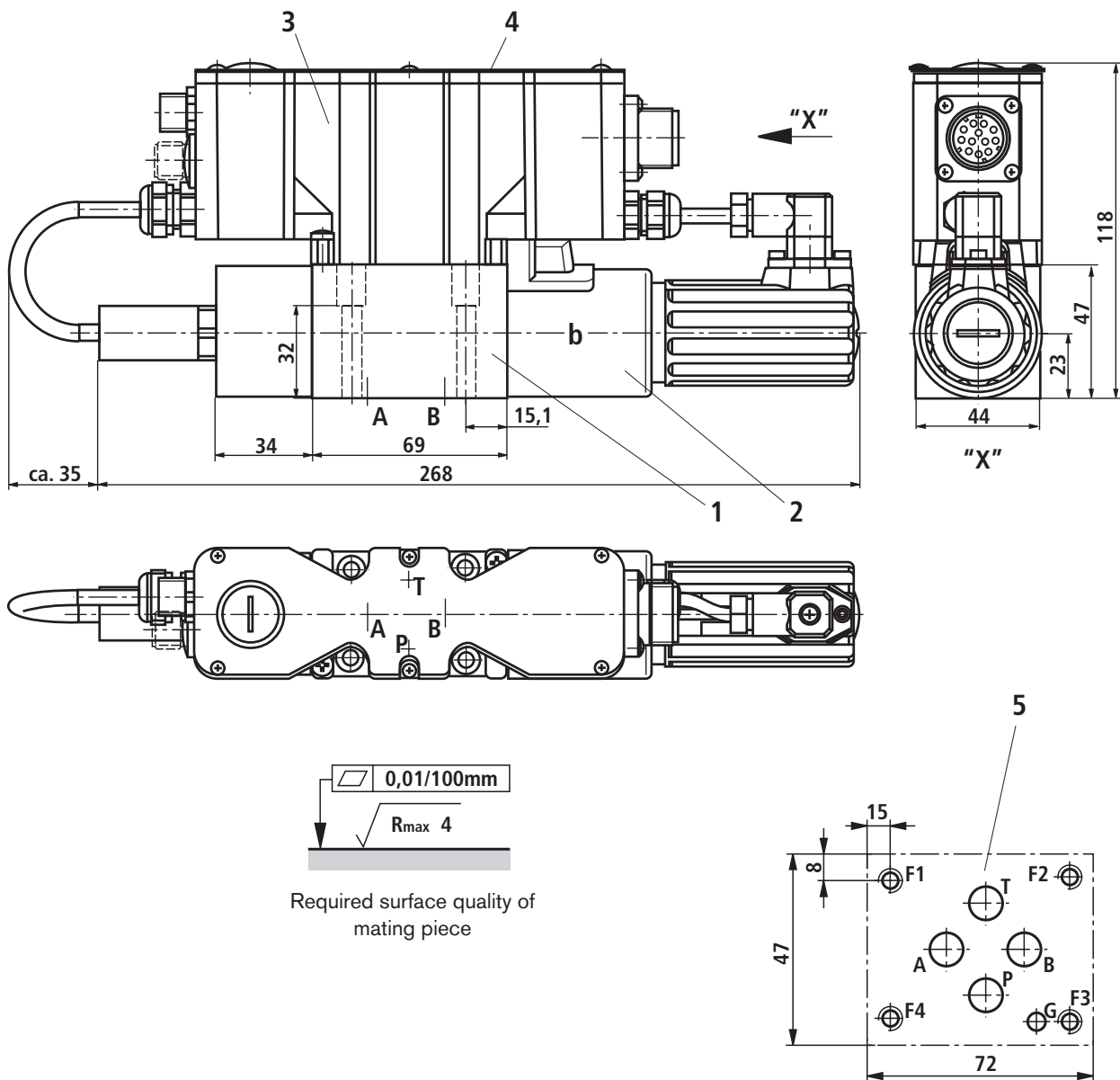
Flow characteristic curve P → A,  $\Delta p = 5$  bar



Flow characteristic curve B → T,  $\Delta p = 5$  bar



## Unit dimensions STW 0195-2X/1... (nominal dimensions in mm)



- 1 Valve housing
- 2 Proportional solenoid "b" with inductive position transducer
- 3 Integrated digital control electronics
- 4 Nameplate
- 5 Machined valve mounting face  
Position of ports to ISO 4401-03-02-0-94  
Deviating from standard:
  - Ports P, A, B and T Ø8 mm
  - Bore G is not required, since the valve is not fitted with a pin.

Subplates to data sheet RE 45052 and valve fixing screws must be ordered separately.

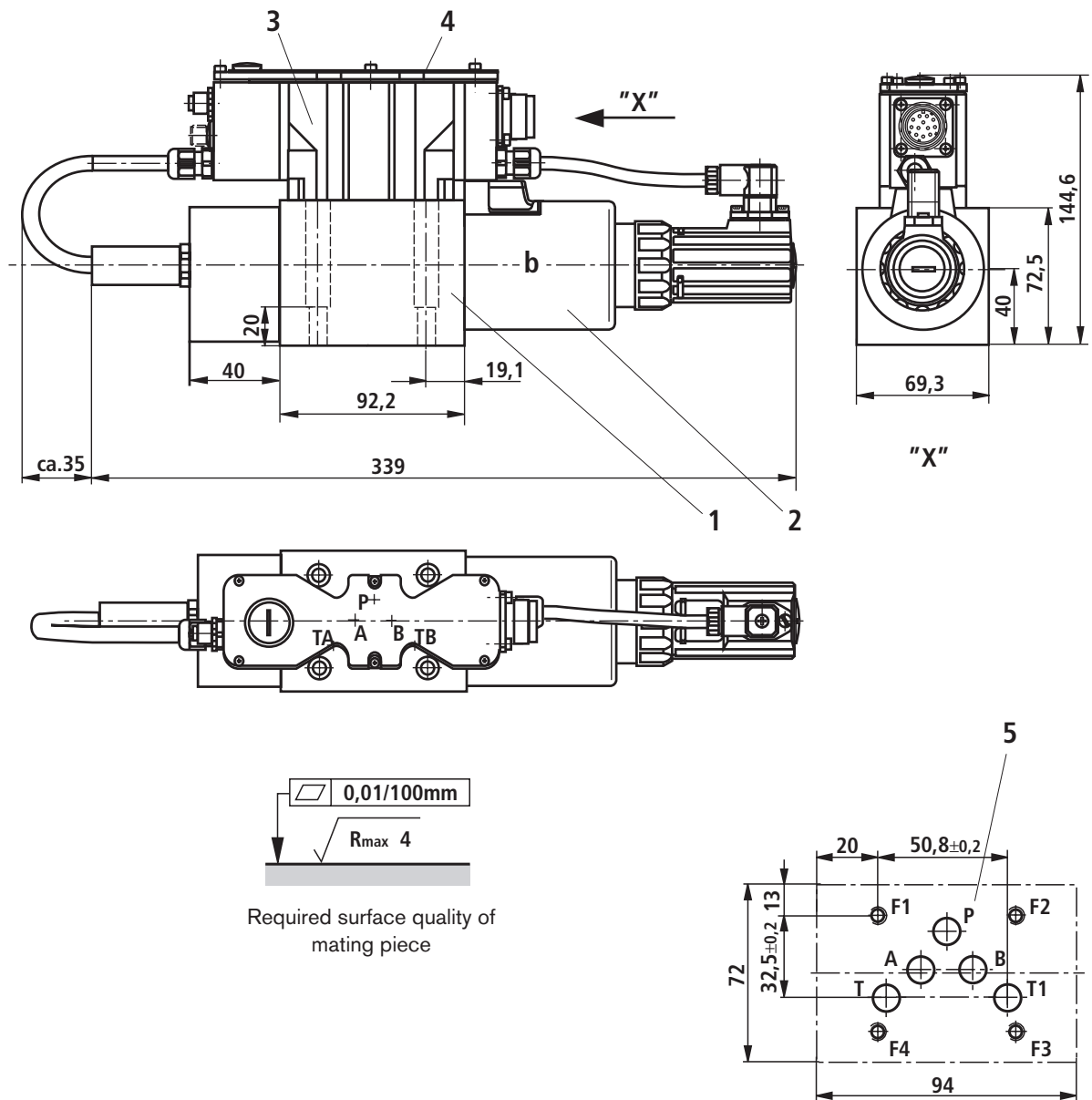
Subplates:

- G341/01 (G1/4)
- G342/01 (G3/8)
- G502/01 (G1/2)

Valve fixing screws:

- 4 off socket head cap screws
- ISO 4762-M5 x 50-10.9
- $M_T = 8.9 \text{ Nm}$

## Unit dimensions STW 0196-1X/1... (nominal dimensions in mm)



- 1 Valve housing
- 2 Proportional solenoid "b" with inductive position transducer
- 3 Integrated digital control electronics
- 4 Nameplate
- 5 Machined valve mounting face  
Position of ports to ISO 4401-05-04-0-94  
Deviating from standard:  
– Port T1 is provided additionally

Subplates to data sheet RE 45052 and valve fixing screws must be ordered separately.

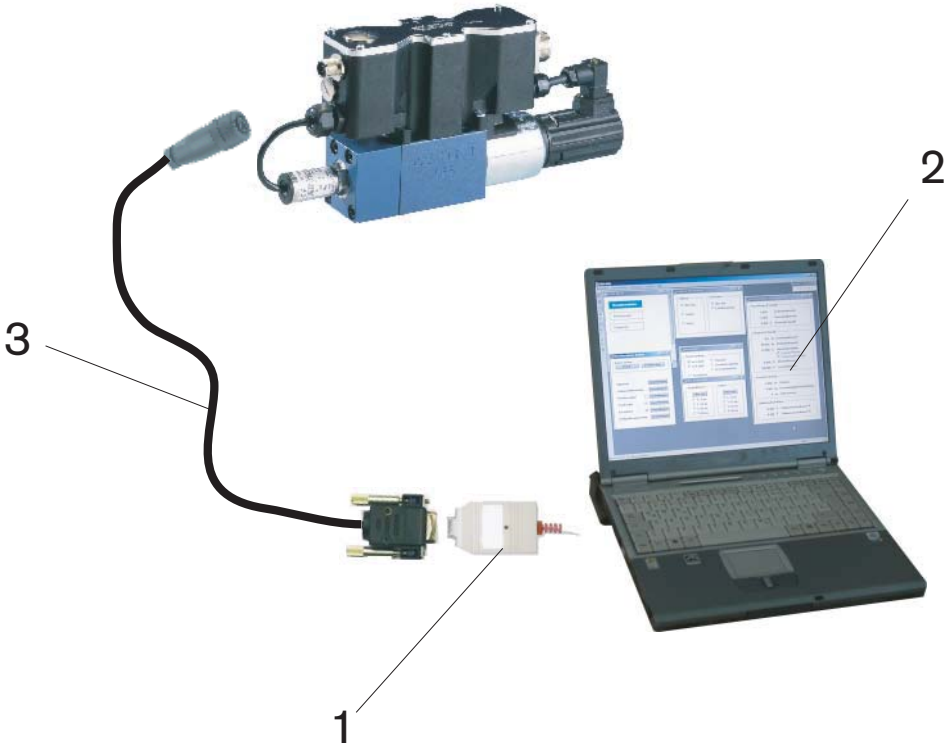
Subplates:

- G66/01(G3/8)
- G67/01(G1/2)
- G534/01(G3/4)

Valve fixing screws:  
4 off socket head cap screws  
ISO 4762-M6 x 40-10.9  
 $M_T = 15.5 \text{ Nm}$

Accessories (not included in the scope of supply)

The following is required for parameterisation by means of a PC:		CANopen	Profibus DP
1	Interface converter (USB)	VT-ZKO-USB/CA-1-1X/V0/0 Mat. no. <b>R901071963</b>	VT-ZKO-USB/P-1-1X/V0/0 Mat. no. <b>R901071962</b>
2	Commissioning software	WINPED Download at <a href="http://www.boschrexroth.de/IIAC">www.boschrexroth.de/IIAC</a>	
3	Connecting cable, 3 m	D-Sub / M12, coding A Mat. no. <b>R900751271</b>	D-Sub / M12, coding B Mat. no. <b>R901078053</b>





Accessories, port X1(not included in the scope of supply)

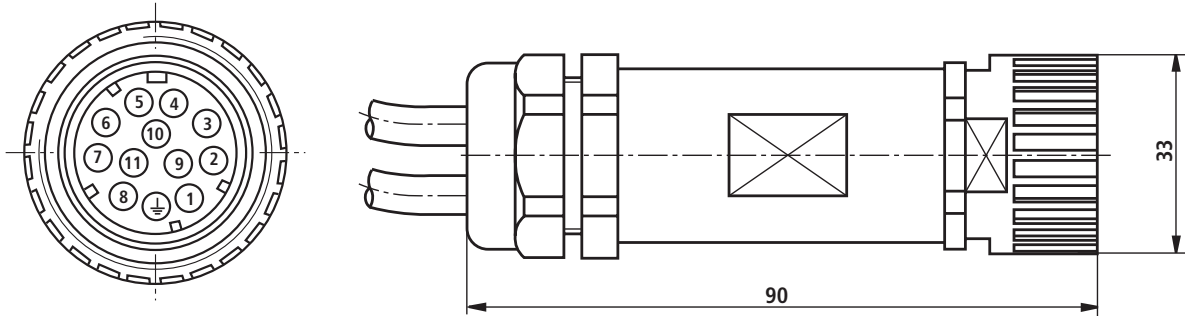
Cable socket for X1

Cable socket to DIN EN 17520-804  
(11-pin + PE), plastic version

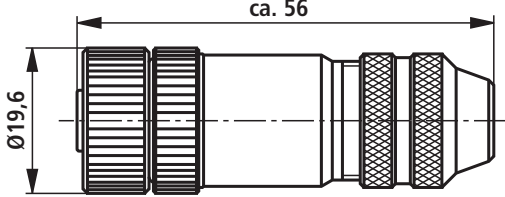
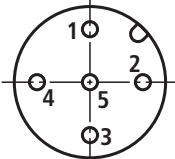
- Cable socket without cable (kit)
  - Cable socket with cable set 2 x 5 m 12-pin
  - Cable socket with cable set 2 x 20 m 12-pin
- Material no. **R900884671**

Material no. **R900032356**

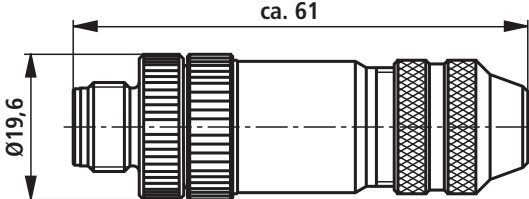
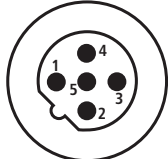
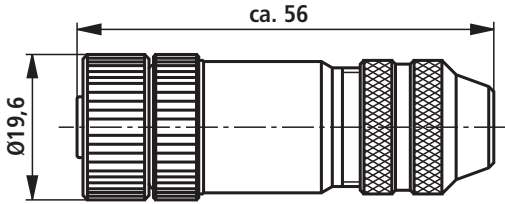
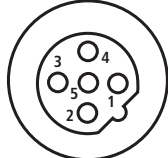

Material no. **R900860399**



Accessories, CAN bus (A coding) (not included in the scope of supply)

Description	Detail, dimensions	Pin pattern, order information
<b>X2</b> Round plug-in connector, wired by user, 5-pin, M12 x 1 Straight cable socket, metal version.		  Mat. no.: <b>R901076910</b> (cable diameter 6 - 8 mm)

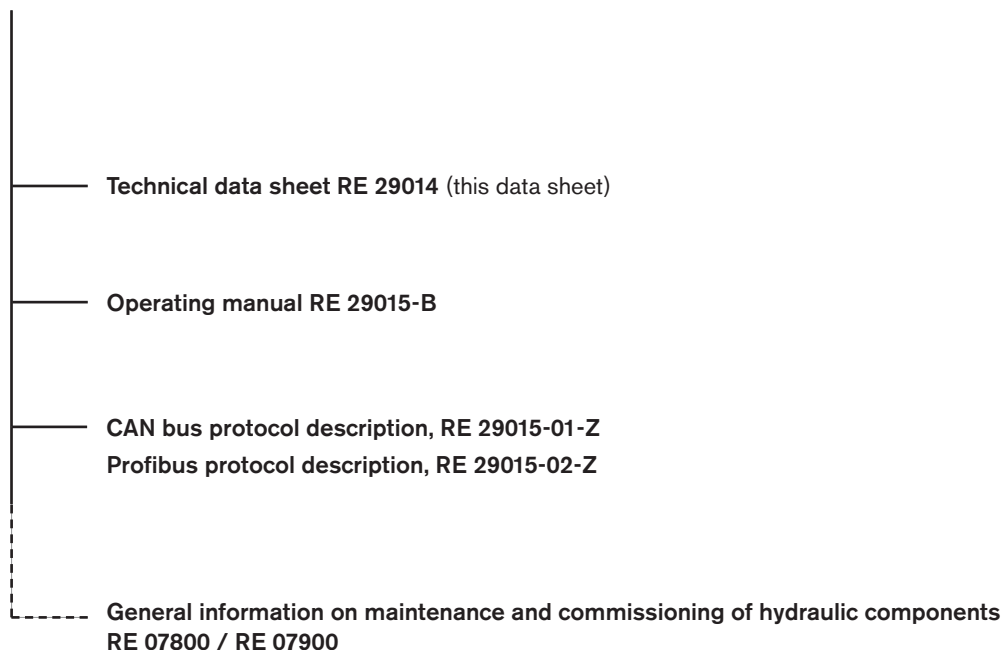
Accessories, Profibus (B coding) (not included in the scope of supply)

Description	Detail, diemnsions	Pin pattern, order information
<b>X2</b> Round plug-in connector, wired by user, 5-pin, M12 x 1 Straight cable plug, metal version.		  Mat. no.: <b>R901075545</b> (cable diameter 6 - 8 mm)
<b>X3</b> Round plug-in connector, wired by user, 5-pin, M12 x 1 Straight cable socket, metal version.		  Mat. no.: <b>R901075550</b> (cable diameter 6 - 8 mm)
M12 protective cap (for cable socket only)		Mat. no.: <b>R901075563</b>

## Engineering / maintenance notes / supplementary information

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### Product documentation for STW0195, STW0196



Commissioning software WINPED and documentation on the Internet: [www.boschrexroth.com/IAC](http://www.boschrexroth.com/IAC)

#### Maintenance notes:

- The units are tested in the factory and shipped with default settings.
- Only complete components can be repaired. The repaired components are returned again with the default settings. User settings are not retained or reloaded. The user is responsible for reloading the corresponding user parameters.

#### Notes:

- Cut the supply voltage to the valve only in when required for the functional sequence of the machine.
- Electrical signals brought out via control electronics (e.g. signal “ready for operation”) must not be used for switching safety-relevant machine functions! (See also European standard “safety requirements for fluid power systems and components - hydraulics“, EN 982.)
- If electromagnet interference is to be expected, take suitable measures to safeguard the function (depending on application, e.g. shield, filter)!

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## Notes

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## Notes

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