Rexroth
Bosch Group

Schiffstechnik
Marine Technique

Protective note

Disclaimer
The data specified above only serves to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The given information does not release the user from the obligation of own judgement and verification. It must be remembered that our products are subject to a natural process of wear and aging.

Schutzvermerk

Haftungsausschluss
Die angegebenen Daten dienen allein der Produktbeschreibung. Eine Aussage über eine bestimmte Beschaffenheit oder Eignung für einen bestimmten Einsatzweck kann aus unseren Angaben nicht abgeleitet werden. Die Angaben entbinden den Verwender nicht von eigenen Beurteilungen und Prüfungen. Es ist zu beachten, das unserer Produkte einem natürlichen Verschleiß- und Alterungsprozess unterliegen.

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Products

Pressure Reducing Station

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Products

Twin pressure reducing station with lever

See page 2

Single station

See page 4

Pressure Reducing Station

Twin pressure reducing station with lever

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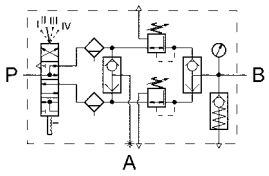
Bosch Group

Technical data

Type		Twin pressure reducing valve with filter and mechanical trip point
Ambient temperature range		0° to 70°C
Admissible medium		Compressed air
Flow (at supply pressure 30 bar and Δp = 1 bar)		1100 Nl/min
Nominal diameter	P, A	ND 7
	B	ND 12
Connection threads	P, A	M 14 x 1.5
	B	M 22 x 1.5
Weight		5.8 kg
Materials	Housing	Aluminium, sea water resistant
	Inside parts	Stainless

Type number

Symbol	Input pressure [bar]	Outlet pressure [bar]	Response pressure Safety valve [bar]	Response pressure*) Safety valve [bar]	Type number
	40	6 - 9.5	6 - 10	8	**335 320 000 0**

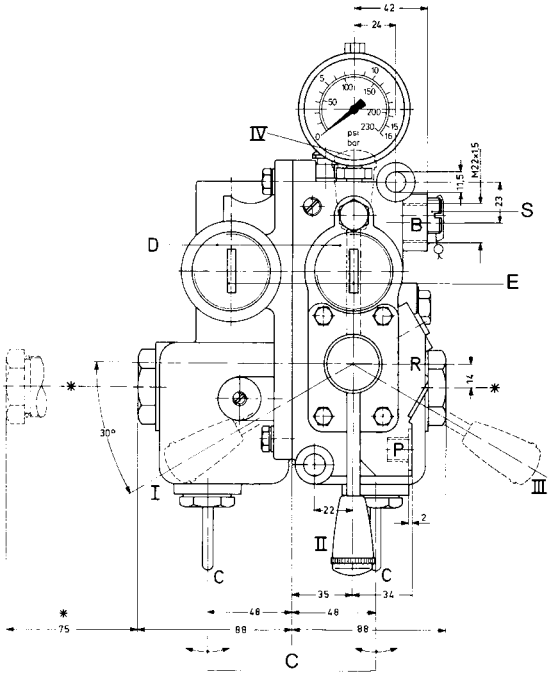
*) Adjusting ex works

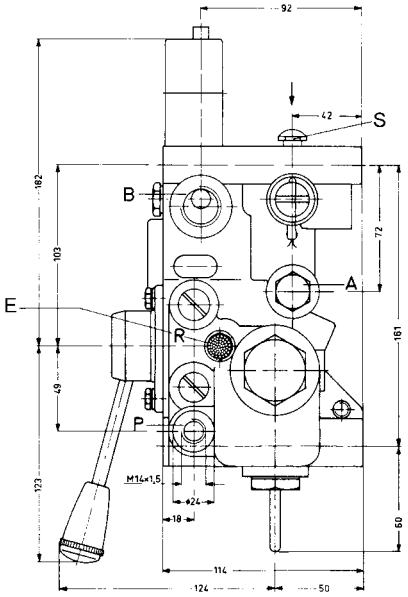
Accessories (to be ordered separately)

Accessories	Designation	Type number
	Repair kit	**335 320 002 2**

Pressure Reducing Station

Twin pressure reducing station with lever





The device has to be mounted vertically as shown and will be fastened by two screws M 10 x 120.
*) Space required for filter disassembly D) Adjusting cap for pressure reducing valve, E) Exhaust,
H) Lever for safety valve, S) Safety valve, C) Condensate drain

Pressure Reducing Station

Single station

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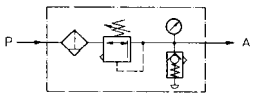
Technical data

Type	Pressure reducing valve with filter and safety valve
Ambient temperature range	-20° to 70°C
Admissible medium	Compressed air
Flow	1100 Nl/min
Nominal diameter (at input pressure 30 bar and Δp = 1 bar)	ND7
Connection threads	M 14 x 1.5
Weight	2.9 kg
Materials	Stainless
Porosity of filter	25 - 40 µm

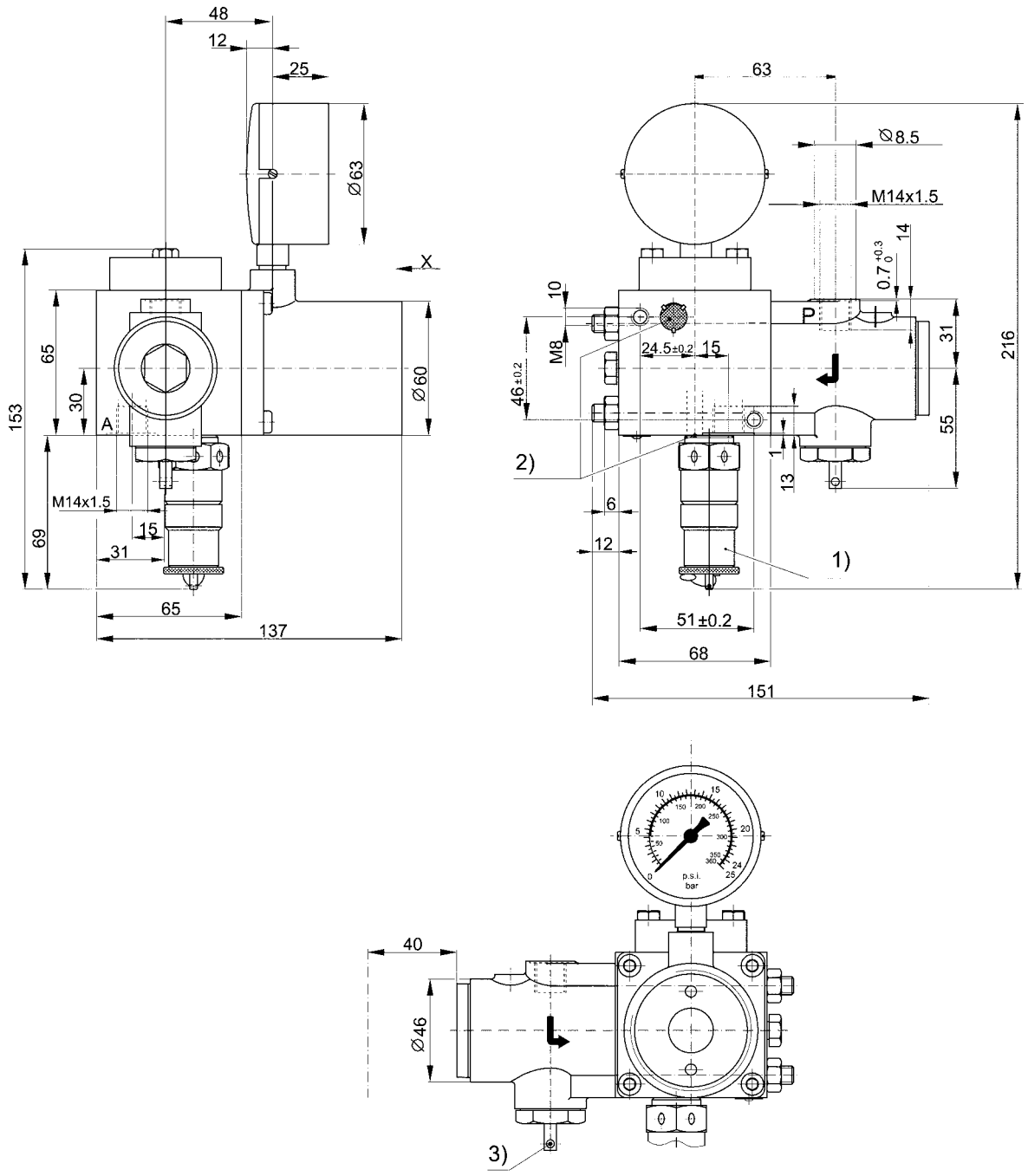
Type number

Symbol	Input pressure [bar]	Outlet pressure [bar]	Outlet pressure*) [bar]	Response pressure*) Safety valve [bar]	Type number
	40	0.5 - 6.5	1.5	2.5	**335 379 100 0**
	40	0.5 - 6.5	6	7	**335 379 101 0**
	42	7	7	8	**335 379 110 0**

*) Adjusting ex works

Accessories (to be ordered separately)

Accessories	Designation	Type number
	Repair kit	**335 379 001 2**



The device has to be mounted vertically as shown. Admissible deviation ±45° to drawn position.
1) Safety valve, 2) Exhaust, 3) Drain valve

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Products

Pressure regulator, G3/8

See page 7

Pressure regulator, M22x1.5

See page 8

Pressure regulator modul production series C4i, G 3/8

See page 9

Filter, 50 bar, G3/8

See page 10

Filter, 30 bar, G3/8

See page 12

Filter, G1/2

See page 14

Filter modul production series C4i, G 3/8

See page 16

Filter

See page 18

Air dryer, M22x1.5

See page 20

Antifreezer, M22x1.5

See page 22

Compressed Air Preparation

Pressure regulator, G3/8

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Technical data

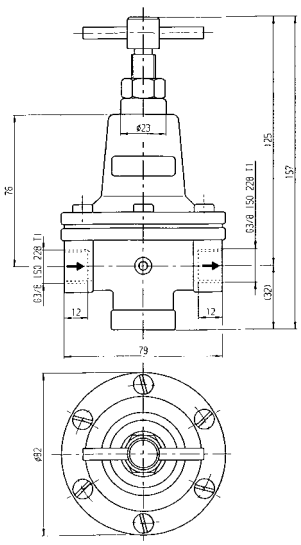
Type		Diaphragm pressure regulator with secondary ventilation
Ambient temperature range		-20° to +80°C
Admissible medium		Compressed air
Pressure range	Input pressure	Max. 30 bar
	Outlet pressure	0.35 - 8.5 bar
Flow (at input pressure 6 bar and Δp = 1 bar)		1333 Nl/min
Weight		1.2 kg

Type number

Symbol	Input pressure [bar]	Outlet pressure [bar]	Connecting thread	Type number
	30	0.35 to 8.5	G 3/8	**375 001 030 0**

Accessories (to be ordered separately)

Accessories	Designation	Type number
	Repair kit	**375 001 007 2**



Assembly position is open.

Compressed Air Preparation

Pressure regulator, M22x1.5

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Technical data

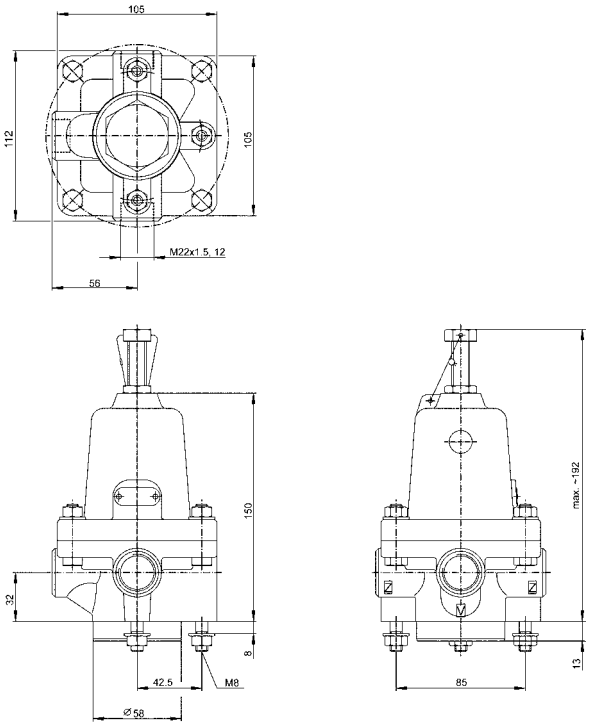
Type		Diaphragm pressure regulator with secondary ventilation
Ambient temperature range		-25° to +70°C
Admissible medium		Compressed air
Pressure range	Input pressure	Max. 40 bar
	Outlet pressure	See table
Flow (at input pressure 30 bar and Δp = 1 bar)		2000 Nl/min
Weight		
Materials	Housing	Aluminium

Type number

Symbol	Input pressure [bar]	Outlet pressure [bar]	Connecting thread	Type number
	4-40	1 - 8	M 22 x 1.5	**375 003 100 0**
	40	1 - 15	M 22 x 1.5	**375 003 200 0**

Accessories (to be ordered separately)

Accessories	Designation	Type number
	Repair kit for 375 003 100 0	**375 003 000 2**
	Repair kit for 375 003 200 0	**375 003 001 2**



Assembly position is open.

Technical data

Type		Diaphragm regulating valve with secondary ventilation
Max. supply pressure		12 bar
Secondary pressure range		0.5 - 10 bar or 0.1 - 3 bar (optional)
Nominal flow Qn at primary pressure = 7 bar secondary pressure = 6 bar and Δp = 1 bar		See table
Ambient temperature range		+5° C to +50° C 0° C to +50° C (with dry air)
Admissible medium		Compressed air
Weight		0.3 kg
Material:	Housing	Zn-diecasting

Type number

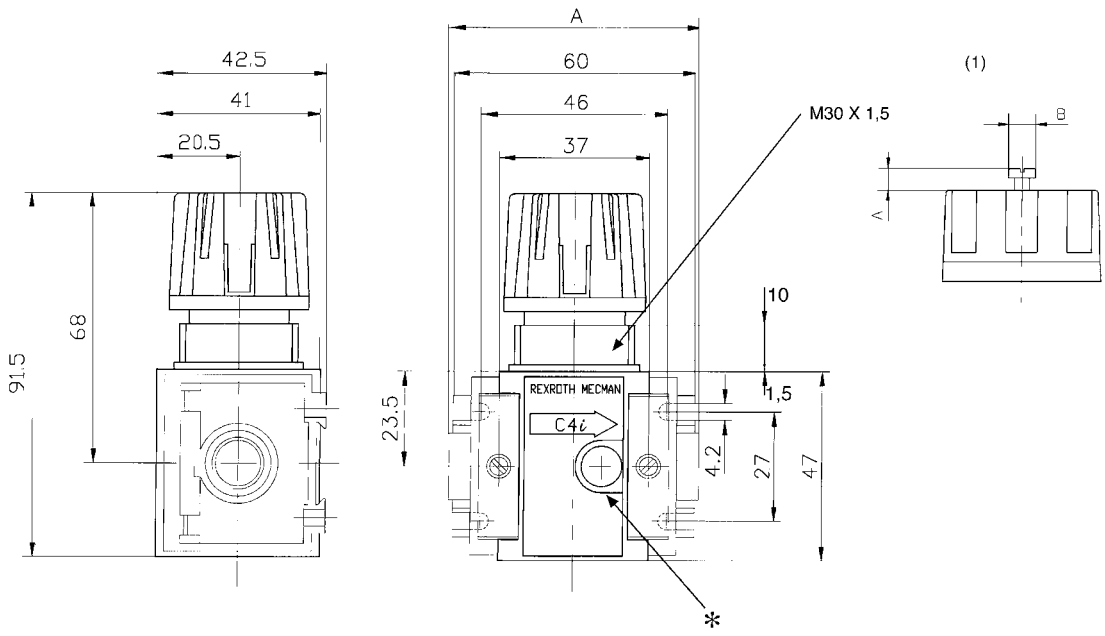
Symbol	Threaded ports ISO 228/1	Nominal flow Qn [Nl/min.]	With options	Type number
	G 3/8	1400	-	**535 140 320 0**

-

Accessories (to be ordered separately)

(1) Lock 535 100 530 2
- Pressure gauge see accessories.
- Spare parts kit, 535 140 000 2.

Threaded ports ISO 228/1	A
G 1/8	58
G 1/4	62
G 3/8	62



* Connection for pressure gauge G 1/8 ISO 228/1.

Compressed Air Preparation

Filter, 50 bar, G3/8

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Technical data

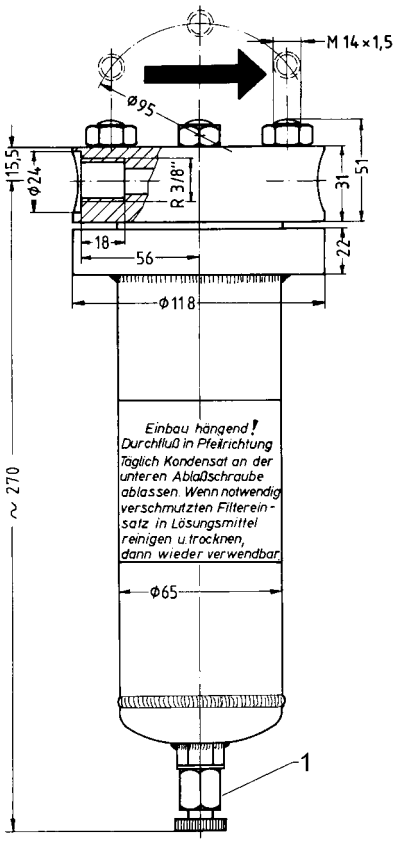
Type		Filter with condensate separator
Ambient temperature range		-20° to +80°C
Admissible medium		Compressed air
Operating pressure		Max. 50 bar
Flow		4100 Nl/min
Porosity		25 µm
Weight		6.3 kg
Materials	Housing	Steel (grey stove-enamel)
	Filter element	Ceramics (Aerolith)

Type number

Symbol	Input pressure [bar]	Connection thread	Type number
	50	G 3/8	**332 732 000 0**

Accessories (to be ordered separately)

Accessories	Designation	Type number
	Repair kit	**332 732 000 2**



Assembly position as drawn. Space for dismounting of container and draining of condensate has to be available.

Compressed Air Preparation

Filter, 30 bar, G3/8

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Technical data

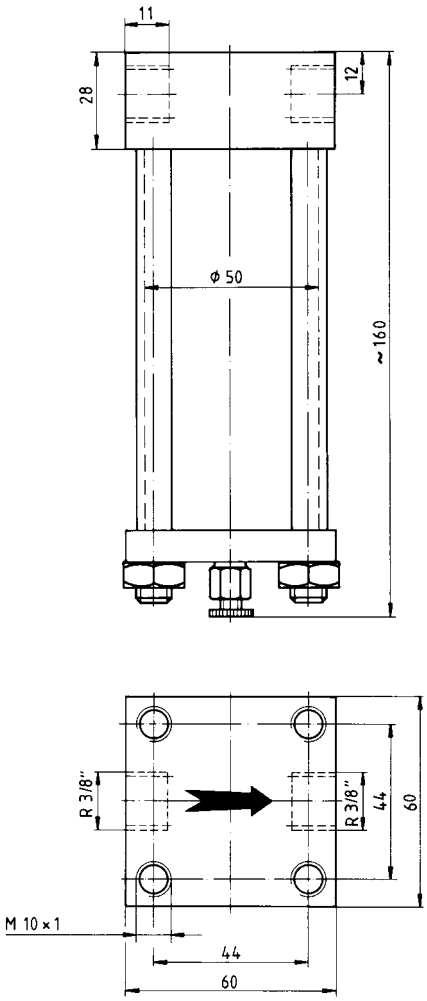
Type		Filter with condensate drain
Ambient temperature range		-20° to +70°C
Admissible medium		Compressed air
Operation pressure		Max. 30 bar
Flow		1500 Nl/min
Porosity		25 µm
Weight		1.7 kg
Materials	Housing	Steel (blue painted)
	Filter element	Ceramics (Aerolith)

Type number

Symbol	Input pressure [bar]	Connection thread	Type number
	30	G 3/8	**332 705 000 0**

Accessories (to be ordered separately)

Accessories	Designation	Type number
	Repair kit	**332 705 000 2**



Assembly position as drawn. Space for dismounting of container and draining of condensate (screw 1) has to be available.

Compressed Air Preparation

Filter, G1/2

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Technical data

Type		Filter with condensate drain
Ambient temperature range		0° to +70°C
Admissible medium		Compressed air
Operation pressure		Max. 40 bar
Flow		1750 Nl/min
Porosity		50 µm
Weight		1.1 kg
Materials	Housing	Steel (blue painted)

illustration similar

Type number

Symbol	Input pressure [bar]	Connection thread [bar]	Type number
	40	G 1/2	**R417000237**

Accessories (to be ordered separately)

Accessories	Designation	Type number
	Repair kit	**R417000263**

Outline drawing on request

1) Condensate drain, screw safeguarded against fall out
Assembly position as drawn. Space for dismounting of container and drain of condensate has to be available.

Compressed Air Preparation

Filter module production series C4i, G 3/8

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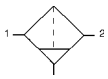
Technical data

Type		Vortex system with sintered filter and semi-automatic or automatic drain (optional)
Max. supply pressure		12 bar
Nominal flow Qn at 6 bar, Δp = 1 bar		See table
Ambient temperature range		+5° C to +50° C 0° C to +50° C (with dry air)
Admissible medium		Compressed air
Weight		0.3 kg
Materials	Housing	Zn-diecasting
	Bowl	Polyamide - with metal bowl guard Polycarbonate - without metal bowl guard
Filter porosity		25 µm or 5 µm (optional)
Bowl capacity		4 cl

Type number

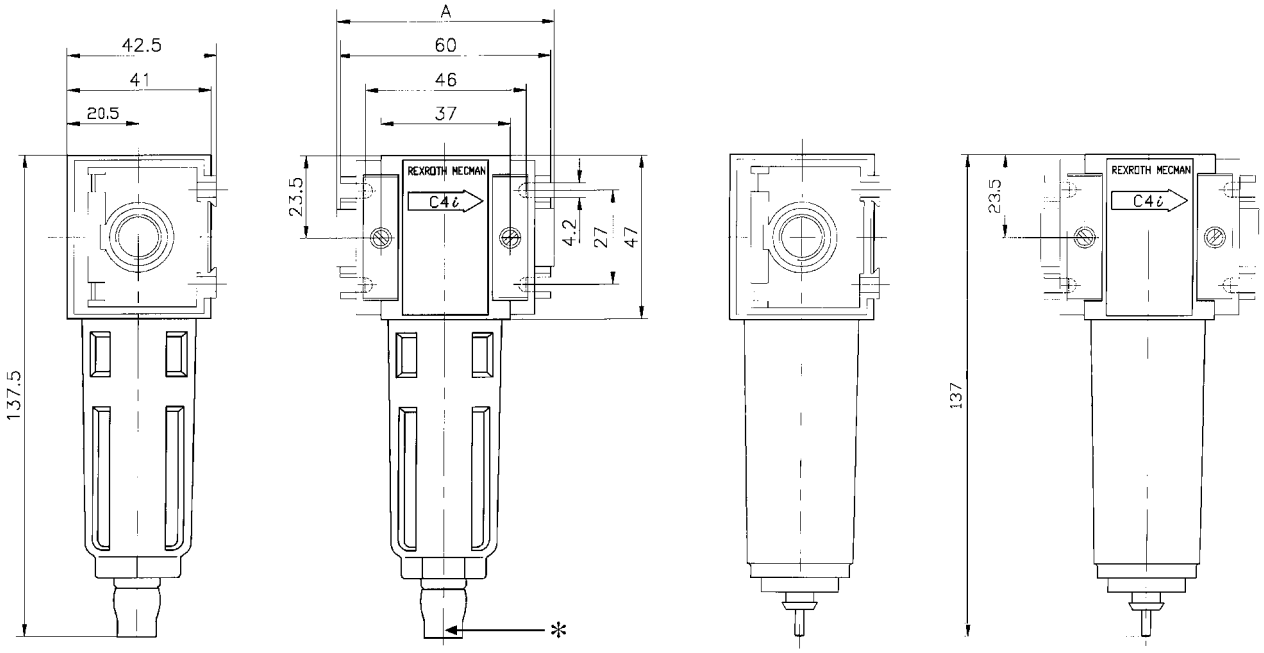
Symbol	Threaded ports ISO 228/1	Nominal flow Qn [Nl/min.]	With options	Type number
	G 3/8	1200	-	**535 120 300 0**

Accessories (to be ordered separately)

- Filter cartridge 25 µm, 535 120 001 2
- Plastic container with metal bowl guard, 535 120 002 2
- Automatic drain cartridge, 890 170 010 2
- Plastic container, 535 120 004 2
- Filter cartridge 5 µm, 535 120 003 2
- Metal bowl, 535 120 006 2
- Spare part kit, incl. filter cartridge 25 µm, 535 120 000 2
- Spare part kit, incl. filter cartridge 5 µm, 535 120 002 2

Threaded ports ISO 228/1	A
G 1/8	57
G 1/4	62
G 3/8	62

C4i Standard	C4i Basic



* Connection for tube dia. 10x1

Compressed Air Preparation
Filter

Rexroth
Bosch Group

Technical data

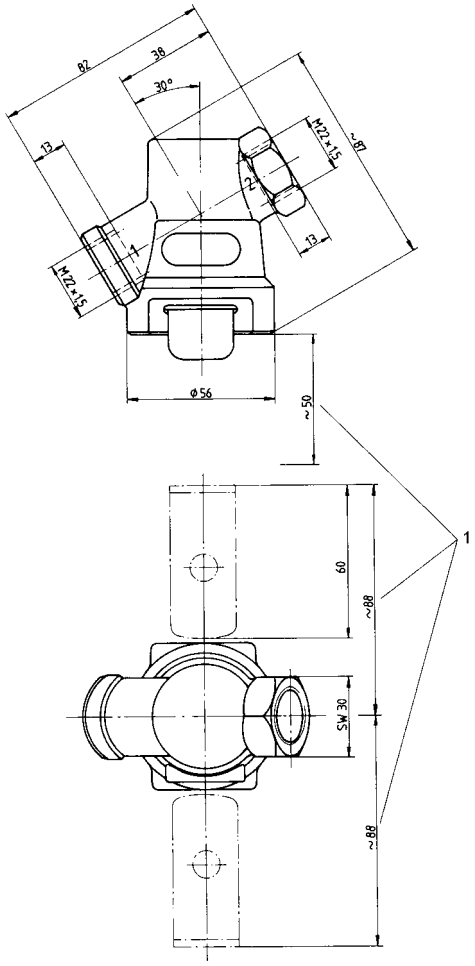
Type	Filter
Ambient temperature range	-40° to +80°C
Admissible medium	Compressed air
Porosity	See table
Weight	See table

Type number

Symbol	Input pressure [bar]	Connection thread	Porosity	Weight (kg)	Type number
	20	M 22 x 15	80 to 40 µm	0.44	**432 500 020 0**
	8	Without, pipe 10 x 1	25 to 50 µm	0.2	**332 703 001 0**

Accessories (to be ordered separately)

Accessories	Designation	Type number
	Repair kit	**132 016 000 2**



Assembly position is open. 1) Space for dismounting of filter element has to be available.

Compressed Air Preparation

Air dryer, M22x1.5

Rexroth
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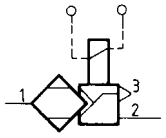
Technical data

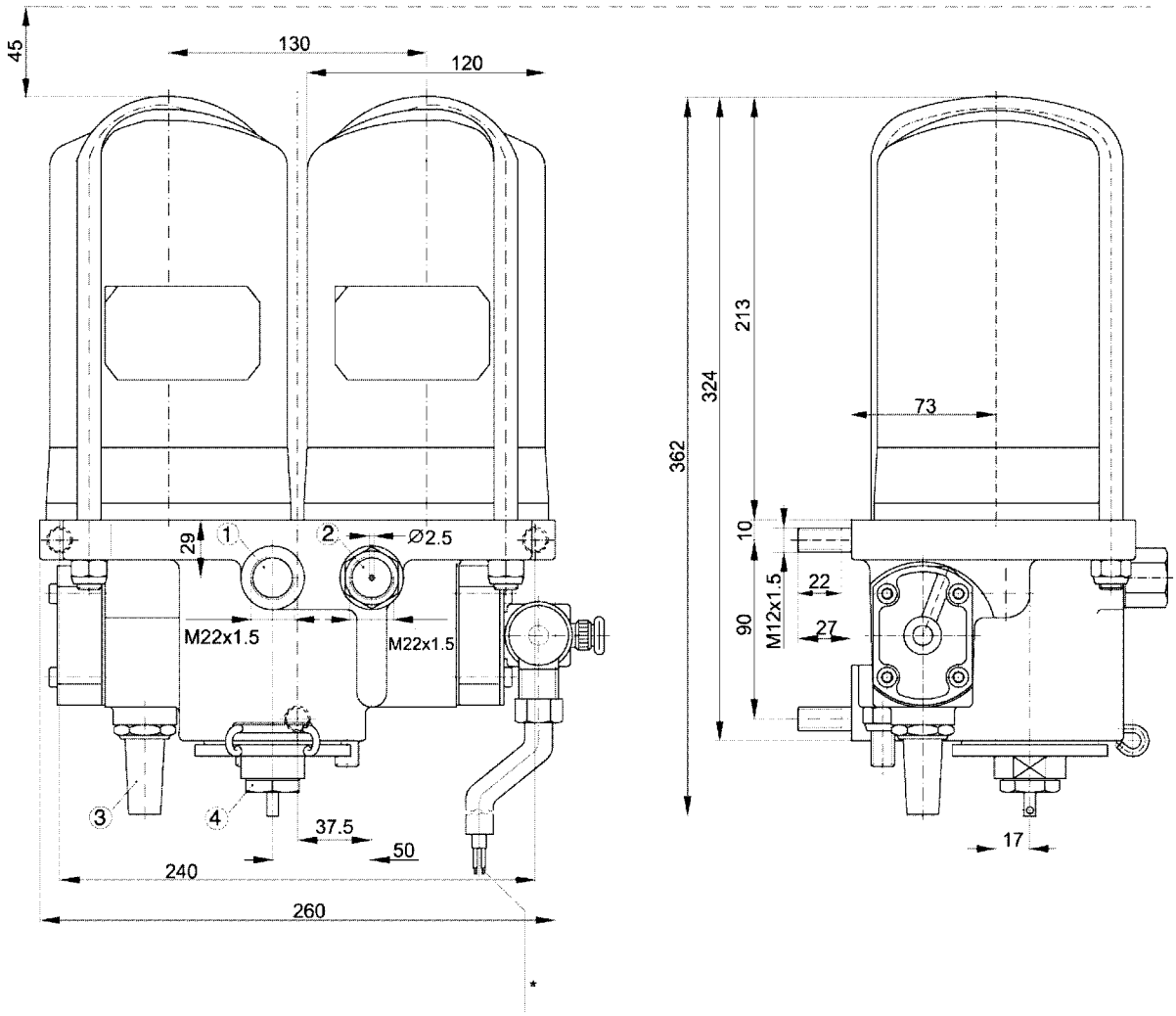
Type	Granulates dryer with twin cartouch
Ambient temperature range	5° to +70°C
Admissible medium	Compressed air
Operation pressure	Max. 10 bar
Flow	Max. 150 Nl/min
Air consumption	Max. 30 Nl/min
Weight	11.2 kg
Voltage	24 VDC ± 20 %
Current consumption	0.3 A
Isolation class	H
Protection class	IP 65 / DIN 40 050

Type number

Symbol	Operation pressure [bar]	Connection thread	Type number
	10	M 22 x 1.5	**332 404 000 0**

Accessories (to be ordered separately)

Accessories	Designation	Type number
	Repair kit	**332 404 000 2**
	Spare cartouch	**432 406 222 2**



Assembly position vertically as drawn. Space for replacement of cartouch has to be available.
1) Input, 2) Dryed air, 3) Exhaust, 4) Drainage
*) Polarity: blue +, brown -

Compressed Air Preparation

Antifreezer, M22x1.5

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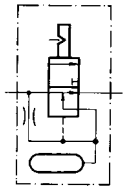
Technical data

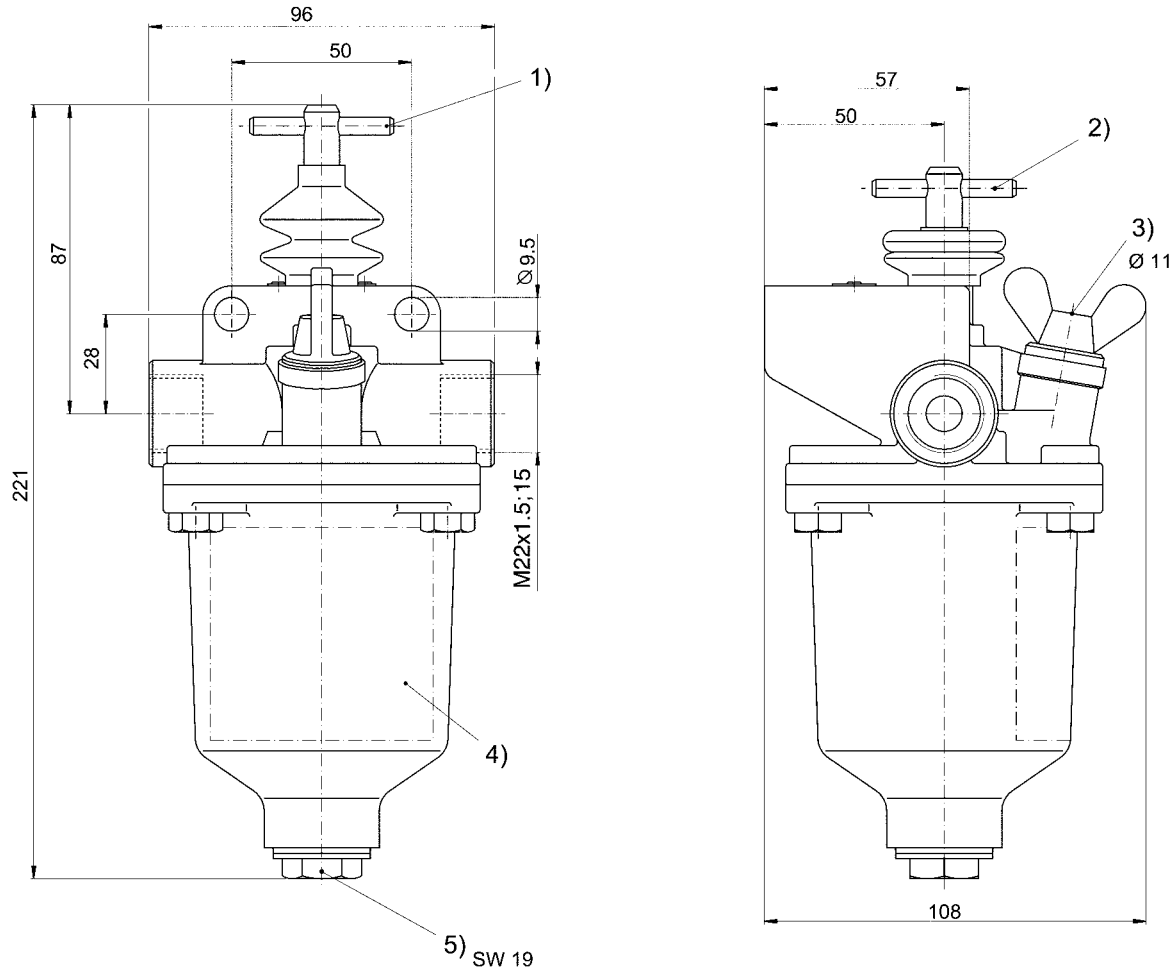
Type	Antifreezer
Ambient temperature range	-40° to +80°C
Admissible medium	Compressed air
Operation pressure	Max. 20 bar
Antifreeze	Ethyl alcohol, ethanol, tuel alcohol
Weight	1.1 kg
Capacity of container	200 cm³

Type number

Symbol	Input pressure [bar]	Connection thread	Type number
	20	M 22 x 1.5	**432 199 030 0**

Accessories (to be ordered separately)

Accessories	Designation	Type number
	Repair kit	**432 199 004 2**



Assembly position vertically as drawn. Space for topping-up antifreeze and activating the toggle handle has to be available.
1) Winter position (at temperatures below 278 K), 2) Summer- and topping-up position, 3) Filling aperture dia. 11, 4) Operating instruction, 5) Drain screw

Air Reservoirs

Rexroth
Bosch Group

Products

Without approval by classification societies

See page 2

With approval by classification societies

See page 3

Accessories

Drain valve

See page 5

Air Reservoirs

Without approval by classification societies

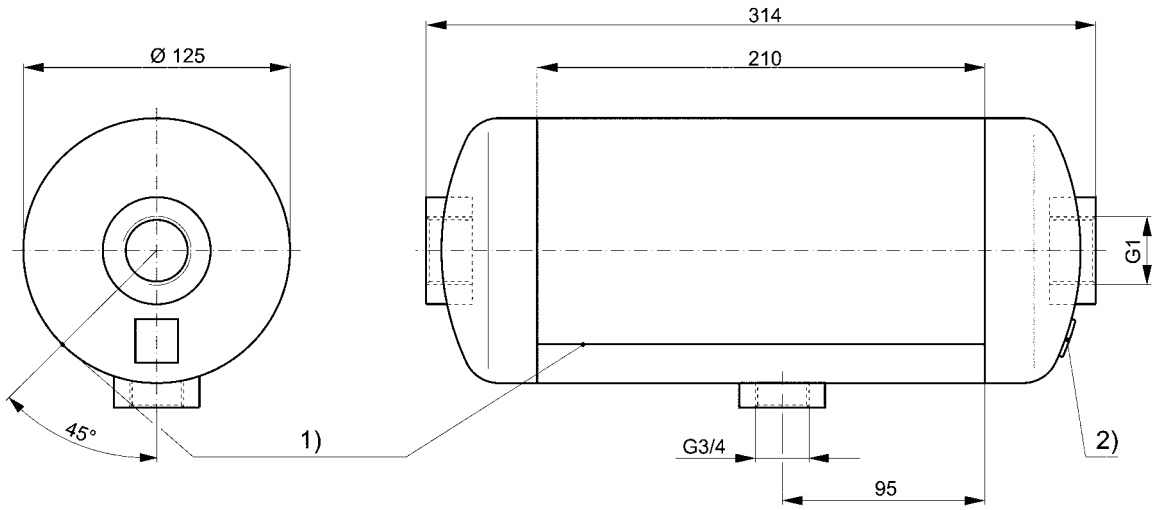
Rexroth
Bosch Group

Technical data

Ambient temperature range		-40° to -100°C
Admissible medium		Compressed air
Operating pressure		10 bar
Proof pressure		15 bar
Model		DIN 5590, DIN EN 286 T3
Material		Sheet steel SPH 235 (DIN 10 207)
Surface protection	Outside	Synthetic resin metal ground RAL 3012
	Inside	Anti-stain oil

Type number

Symbol	Volume [liter]	Connection thread	Connection thread for drain valve	Type number
	3	G1	G 3/4	**151 003 100 0**



1) Longitudinal seam, 2) Container shield

Air Reservoirs

With approval by classification societies

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Technical data

Ambient temperature range		-10° to +100°C
Admissible medium		Compressed air
Operating pressure		10 bar
Proof pressure		15 bar (16 bar for LR)
Materials	Casing, end plate	Sheet steel SPH 235, SPH 265 (DIN 10 207)
	Muffs	RSt 37-2 SH (N) DIN 17100
Surface protection	Outside	Synthetic resin primary colour
	Inside	Two-pot epoxy varnish

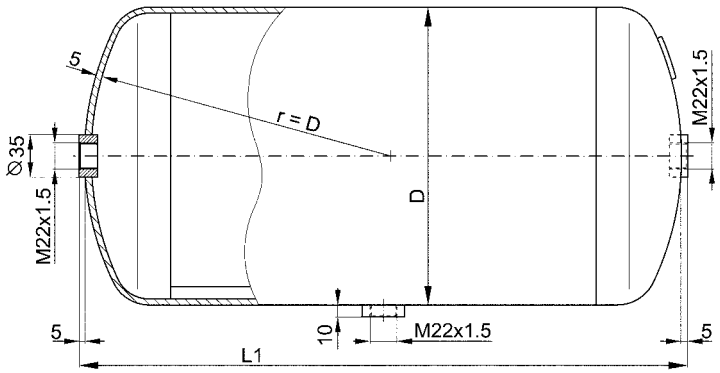
Type number

Symbol		Volume 1 l	Volume 20 l	Volume 40 l	Volume 60 l
	Weight [kg]	2.3	18	28.5	44.5
	Connection thread	M 22 x 1.5	M 22 x 1.5	M 22 x 1.5	M 22 x 1.5
	Approval by:				
	Det Norske Veritas (DNV)	**351 001 054 0**	**351 020 024 0**	**351 040 024 0**	**351 060 034 0**
	Bureau Veritas (BV)	**351 001 057 0**	**351 020 027 0**	**351 040 027 0**	**351 060 037 0**
	Germanischer Lloyd (GL)	**351 001 055 0**	**351 020 025 0**	**351 040 025 0**	**351 060 035 0**
	Factory approval (WA)	**351 001 050 0**	**351 020 020 0**	-	**351 060 030 0**
	Lloyd's Register of Shipping (LR)	**351 001 056 0**	**351 020 026 0**	**351 040 026 0**	**351 060 036 0**
	American Bureau of Shipping (ABS)	**351 001 502 0**	**351 020 030 0**	**351 040 030 0**	**351 060 040 0**
	Registro Italiano Navale (RINA)	-	-	-	**351 060 504 0**
	Register of Shipping of the USSR (USSR)	-	**351 020 506 0**	**351 040 506 0**	**351 060 506 0**

Accessories

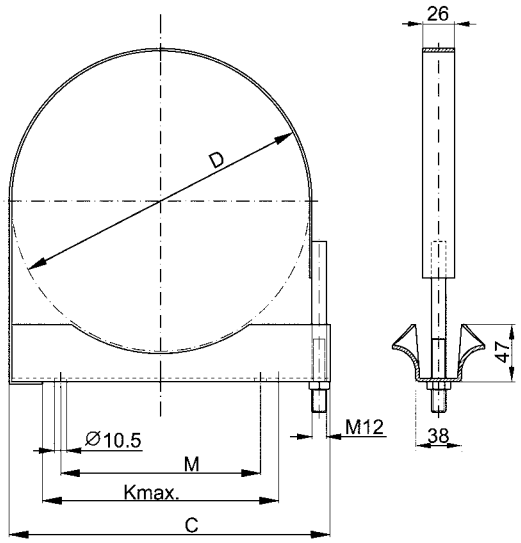
For volume [l]	Type number *
1	-
20	**451 901 101 2**
40	**451 901 102 2**
60	**451 901 102 2**

* 2 pieces necessary



Volume	D [mm]	L1 [mm]
1	125	110
20	246	500
40	276	750
60	276	1100

*) Not necessary with 1 l container

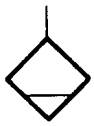


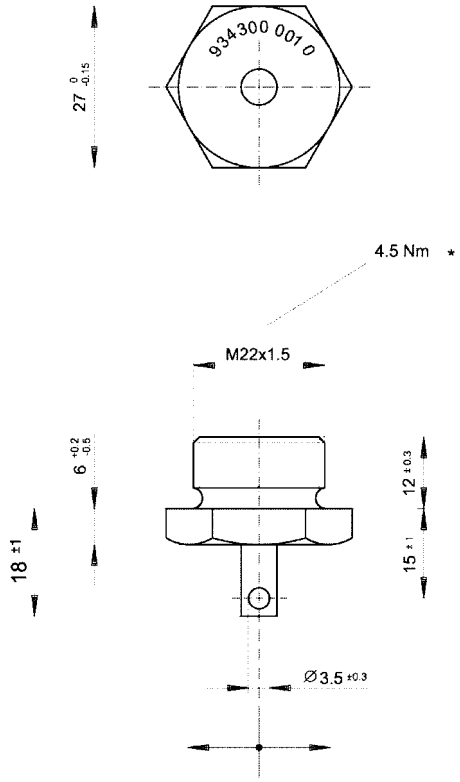
Volume	R	M	Kmax.	C
20	246	165	195	265
40	276	195	225	295
60	276	195	225	295

Drain valve

Type	According to DIN 74 292
Ambient temperature range	-40° to +80°C
Admissible medium	Compressed air
Operating pressure	Max. 22 bar
Weight	0.05 kg
Material	Brass

Type number

Symbol	Connection thread	Type number
	M 22 x 1.5	**934 300 001 0**



The valve has to be screwed in the end-plate connection of the container and sealed with sealing ring 810 401 079 4.
*) Max. tightening torque

Maneuvering Valves and Control Heads

Rexroth
Bosch Group

Products

Pneumatic control head, with lighting, V-characteristic line

See page 2

Pneumatic control head, with lighting, V-characteristic line

See page 4

Pneumatic control head, with lighting, V-characteristic line

See page 6

Pneumatic control head, with lighting, linear characteristic line

See page 8

Pneumatic control head, with lighting, linear characteristic line

See page 10

Pneumatic control head, without lighting, V-characteristic line

See page 12

Pneumatic control head, without lighting, linear characteristic line

See page 14

Maneuvering Valves and Control Heads

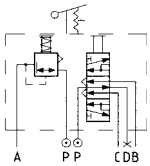
Pneumatic control head, with lighting, V-characteristic line

Rexroth
Bosch Group

Technical data

Type		Pneumatic control head with V- Characteristic line
Ambient temperature range		-20° to +70°C
Admissible medium		Compressed air
Operating pressure		Max. 10 bar
Nominal diameter	Pressure regulating valve	ND3
	Way-valve	ND5
Control pressure range		0.5 to 5.5 bar
Hysteresis		Max. 0.1 bar
Refilling sensitivity		0.07 bar
Lighting of scale		4 bulbs 30V / 0.08A
Electrical connection		Triple pole device plug PG9xA7
Protection	When panel mounted	IP 44
Weight		6 kg
Material	Scale	Plastic
	Housing	Aluminium
	Controlair valve	Aluminium, plastic-coated
	Inside parts	Stain protected steel, NBR, plastic

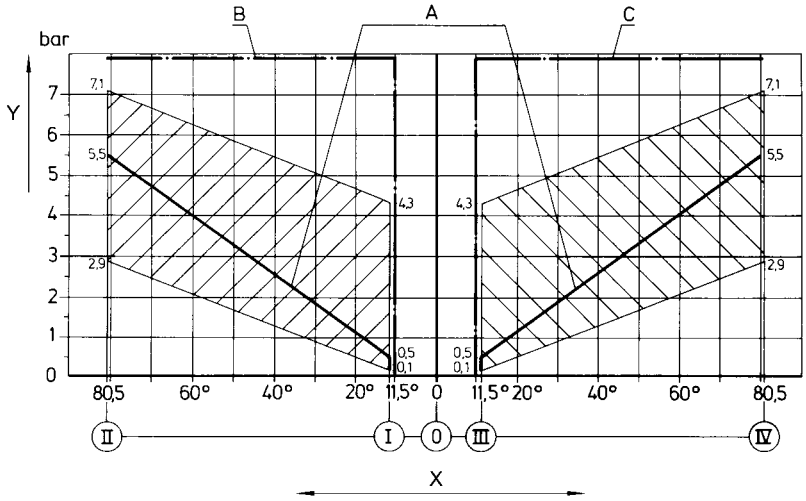
Type number

Symbol	Connection thread Regulating valve	Connection thread Way-valve	Type number
	M 14 x 1,5; 12 deep	M 14 x 1,5; 12 deep	**362 121 220 0**

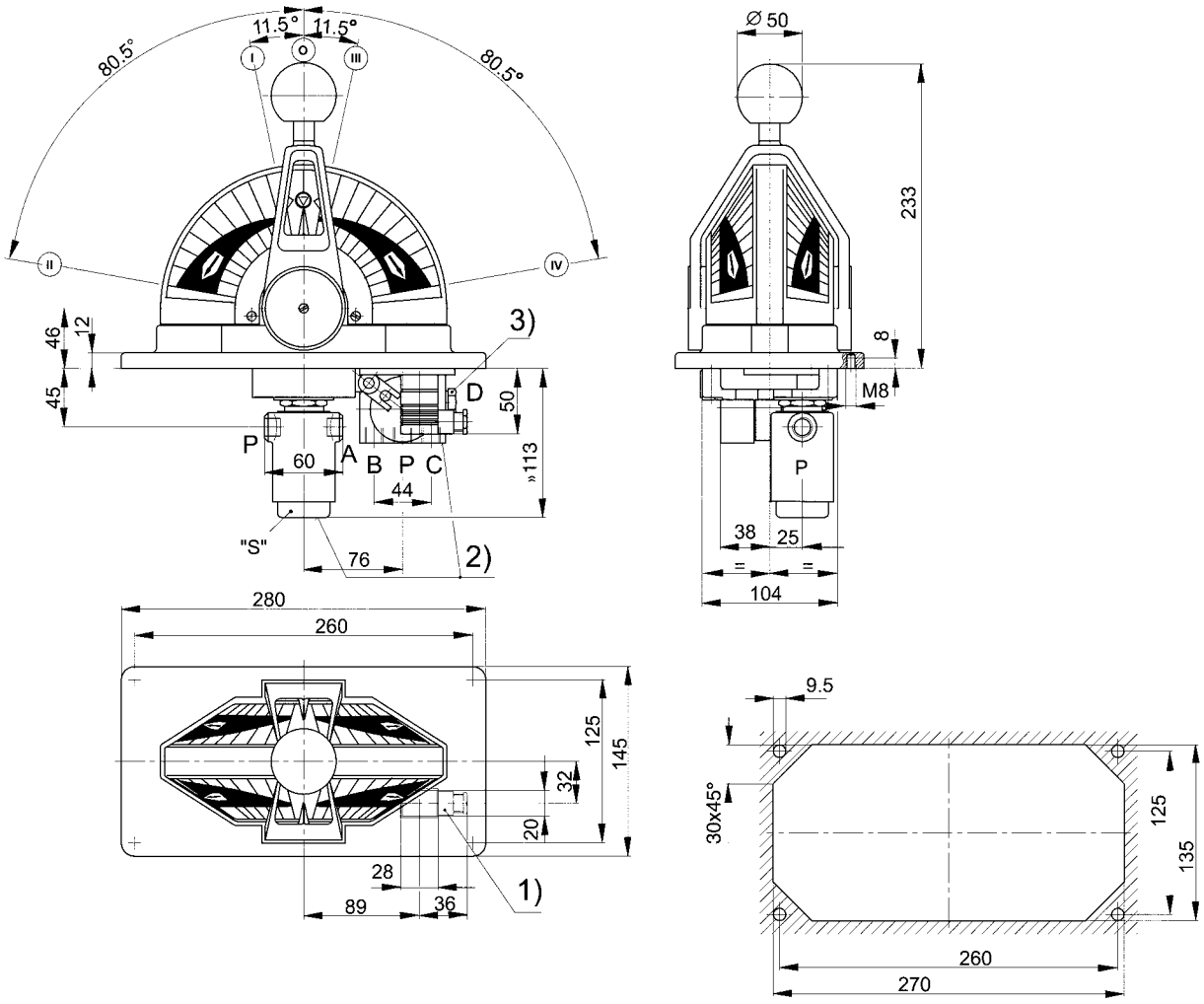
Accessories (to be ordered separately)

Accessories	Designation	Type number
	Repair kit	**362 126 001 2**

Pressure - travel - characteristic line



The characteristic line is infinitely adjustable in an parallel way within the shaded area and its gradient can be modified.
Observe, that the pressure difference between initial and final pressure must be more than 1.85 bar.
A, B, C) Connections, X) Actuating angle, Y) Pressure



1) Device plug, 2) Exhaust, 3) Plug screw

Maneuvering Valves and Control Heads

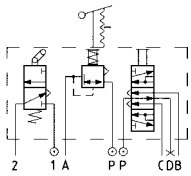
Pneumatic control head, with lighting, V-characteristic line

Rexroth
Bosch Group

Technical data

Bauart		Pneumatic control head with V- characteristic line
Ambient temperature range		-20° to +70°C
Admissible medium		Compressed air
Operating pressure		Max. 10 bar
Nominal diameter	Pressure regulating valve	ND7
	4/3- way-valve	ND5
	3/2- way-valve	ND7
Control pressure range	1.5 to 6 bar	
Hysteresis		Max. 0.15 bar
Refilling sensitivity		0.25 bar
Lighting of scale		4 bulbs 30V / 0.08A
Electrical connection		Triple pole device plug PG9xA7
Protection	when panel mounted	IP 44
Weight		6.4 kg
Material	Scale	Plastic
	Housing	Aluminium
	Controlair valve	Aluminium, plastic-coated
	Inside parts	Stain-protected steel, NBR, plastic

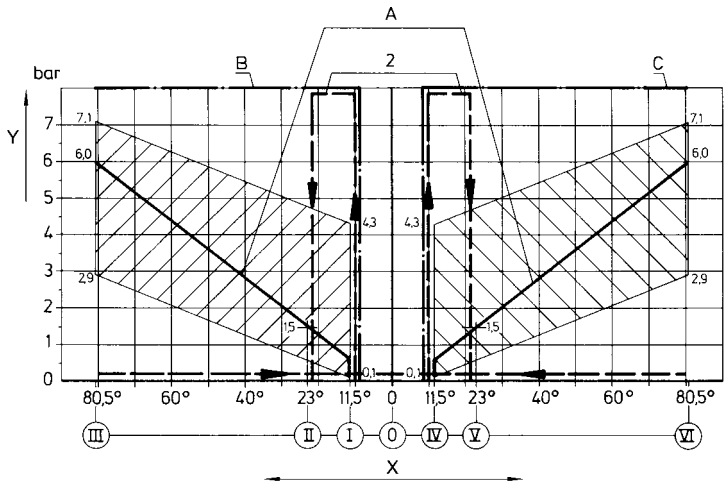
Type number

Symbol	Connection thread Regulating valve	Connection thread Way-valve	Type number
	M 14 x 1.5; 12 deep	M 14 x 1.5; 12 deep	**362 131 902 0**

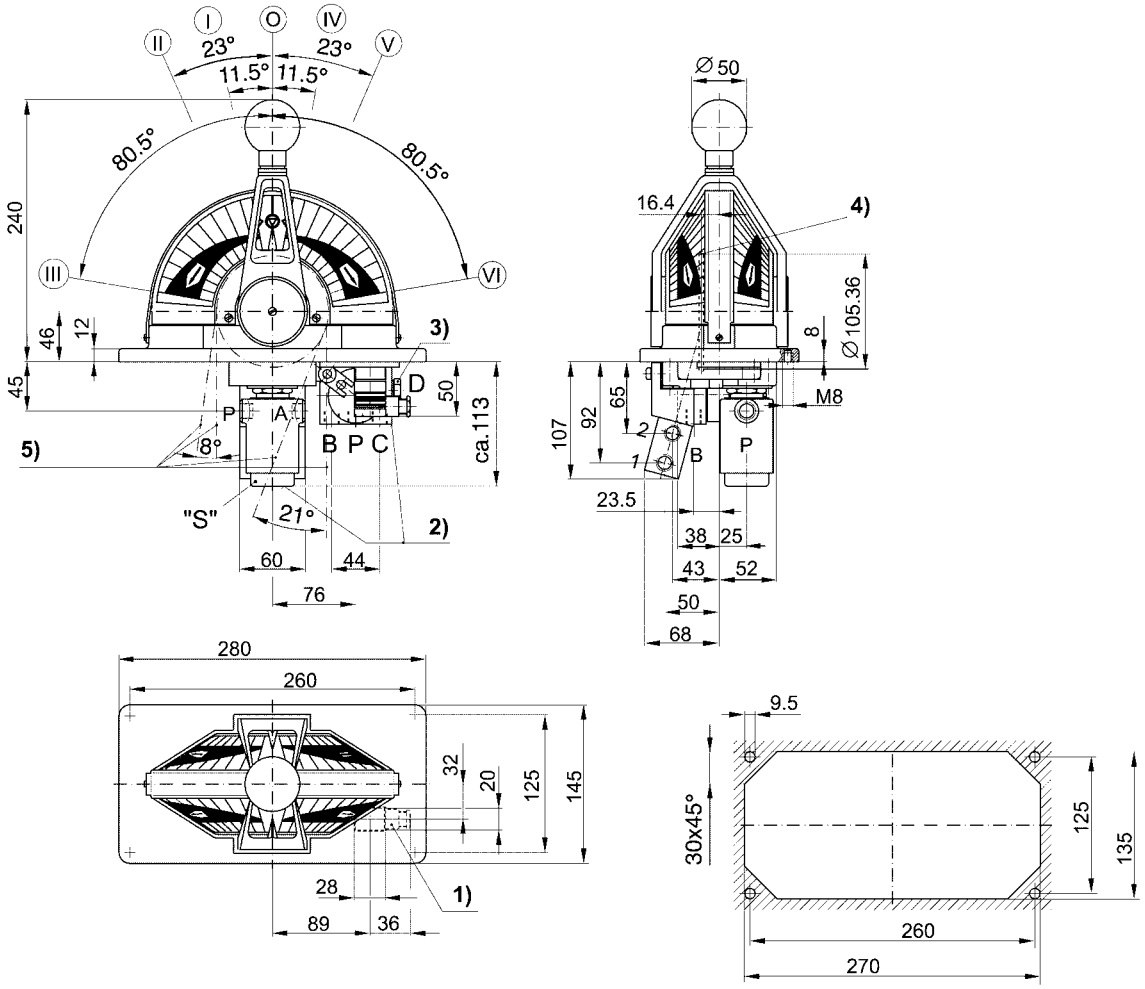
Accessories (to be ordered separately)

Accessories	Designation	Type number
	Repair kit	**362 126 001 2**

Pressure - travel - characteristic line



The characteristic line is infinitely adjustable in an parallel way within the shaded area and its gradient can be modified.
Observe, that the pressure difference between initial and final pressure must be more than 1.85 bar.
X) Handle travel, Y) Pressure, A, B, C, 2) Connections



1) Device plug, 2) Exhaust, 3) Plug screw, 4) Sprocket wheel (z=26, t=12,7) suitable for chain 083 DIN 8187, 5) Max. range for chain guide

Maneuvering Valves and Control Heads

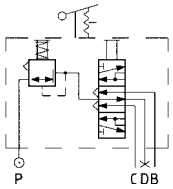
Pneumatic control head, with lighting, V-characteristic line

Rexroth
Bosch Group

Technical data

Type		Pneumatic control head with V-characteristic line
Ambient temperature range		-20° to +70°C
Admissible medium		Compressed air
Operating pressure		Max. 10 bar
Nominal diameter		ND3
Control pressure range		0.5 to 5.5 bar
Hysteresis		max. 0.1 bar
Refilling sensitivity		0.07 bar
Lighting of scale		4 bulbs 30V / 0.08A
Electrical connection		Triple pole device plug PG9xA7
Protection	when panel mounted	IP 44
Weight		6.3 kg
Material	Scale	Plastic
	Housing	Aluminium
	Controlair valve	Aluminium, plastic-coated
	Inside parts	Stain-protected steel, NBR, plastic

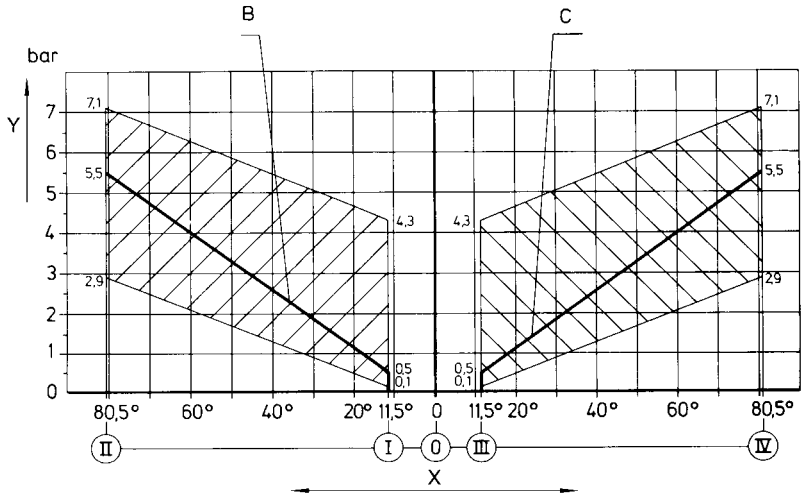
Type number

Symbol	Connection thread Regulating valve	Connection thread Way-valve	Type number
	M 14 x 1.5; 12 deep	M 14 x 1.5; 12 deep	**362 141 220 0**

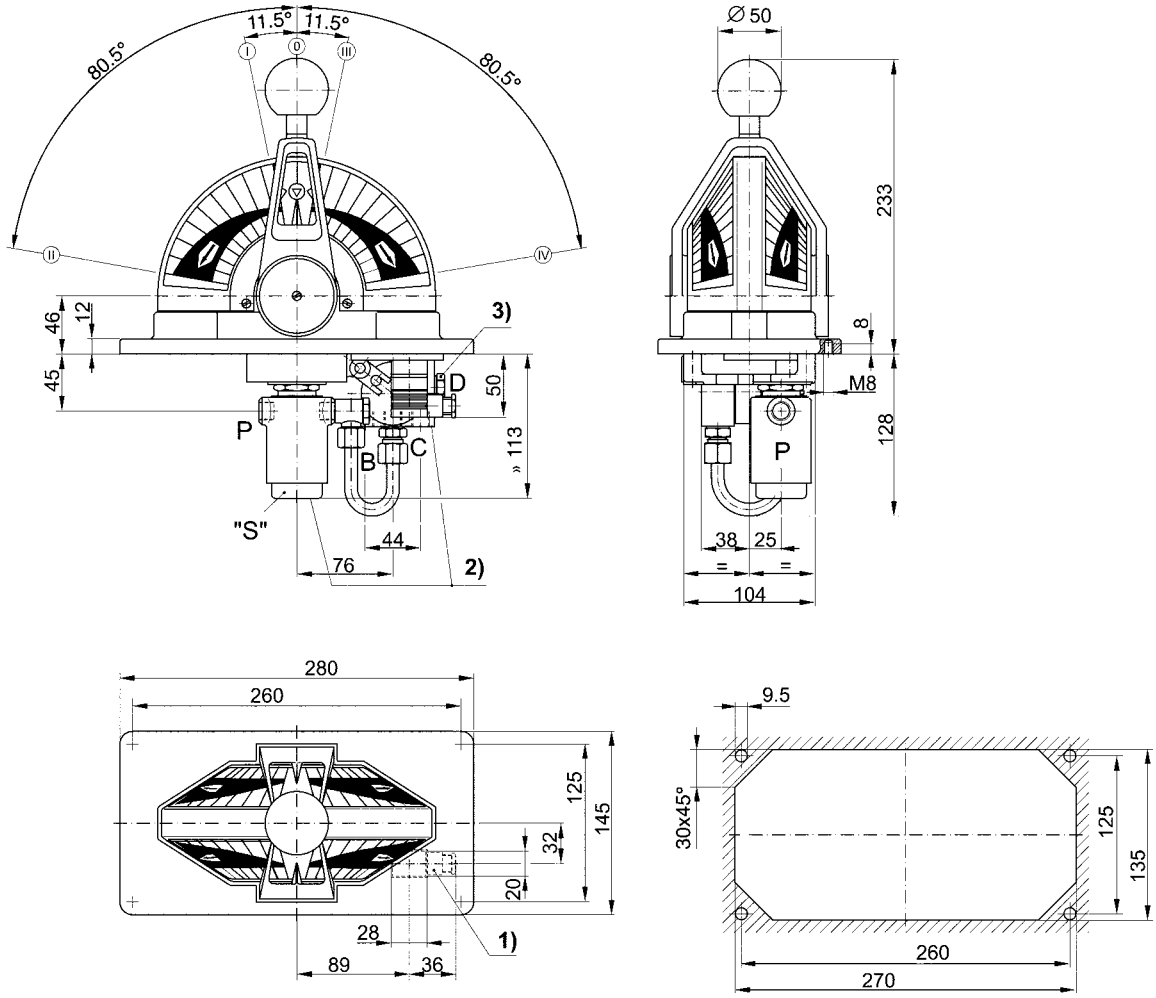
Accessories (to be ordered separately)

Accessories	Designation	Type number
	Repair kit	**362 126 001 2**

Pressure - travel - characteristic line



The characteristic line is infinitely adjustable in an parallel way within the shaded area and its gradient can be modified.
Observe, that the pressure difference between initial and final pressure must be more than 1.85 bar.
X) Handle travel, Y) Pressure, B, C) Connections



1) Device plug, 2) Exhaust, 3) Plug screw

Maneuvering Valves and Control Heads

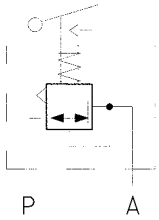
Pneumatic control head, with lighting, linear characteristic line

Rexroth
Bosch Group

Technical data

Type		Pneumatic control head with linear characteristic line
Ambient temperature range		-20° to +70°C
Admissible medium		Compressed air
Operating pressure		Max. 10 bar
Nominal diameter	Pressure regulating valve	ND2
Control pressure range		1 to 5.5 bar
Hysteresis		Max. 0.03 bar
Refilling sensitivity		0.03 bar
Lighting of scale		4 bulbs 30V / 0.08A
Electrical connection		Triple pole device plug PG9xA7
Protection	When panel mounted	IP 44
Weight		6.3 kg
Material	Scale	Plastic
	Housing	Aluminium
	Controlair valve	Aluminium, plastic-coated
	Inside parts	Stain-protected steel, NBR, plastic

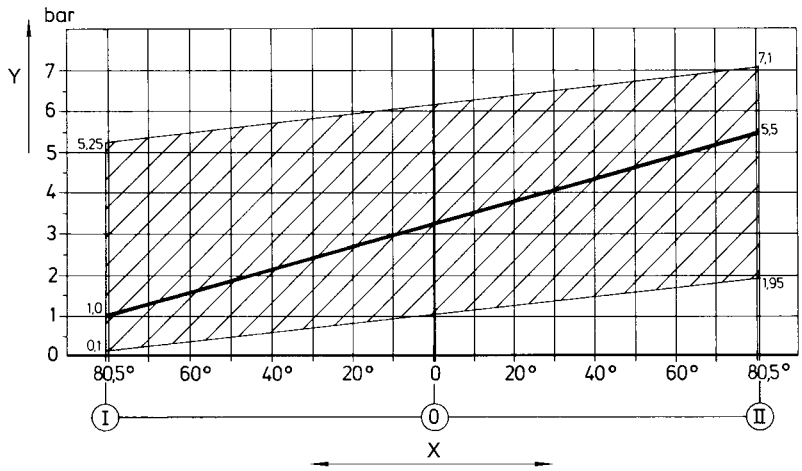
Type number

Symbol	Connection thread Regulating valve	Connection thread Way-valve	Type number
	M 14 x 1.5; 12 deep	M 14 x 1.5; 12 deep	**362 151 650 0**

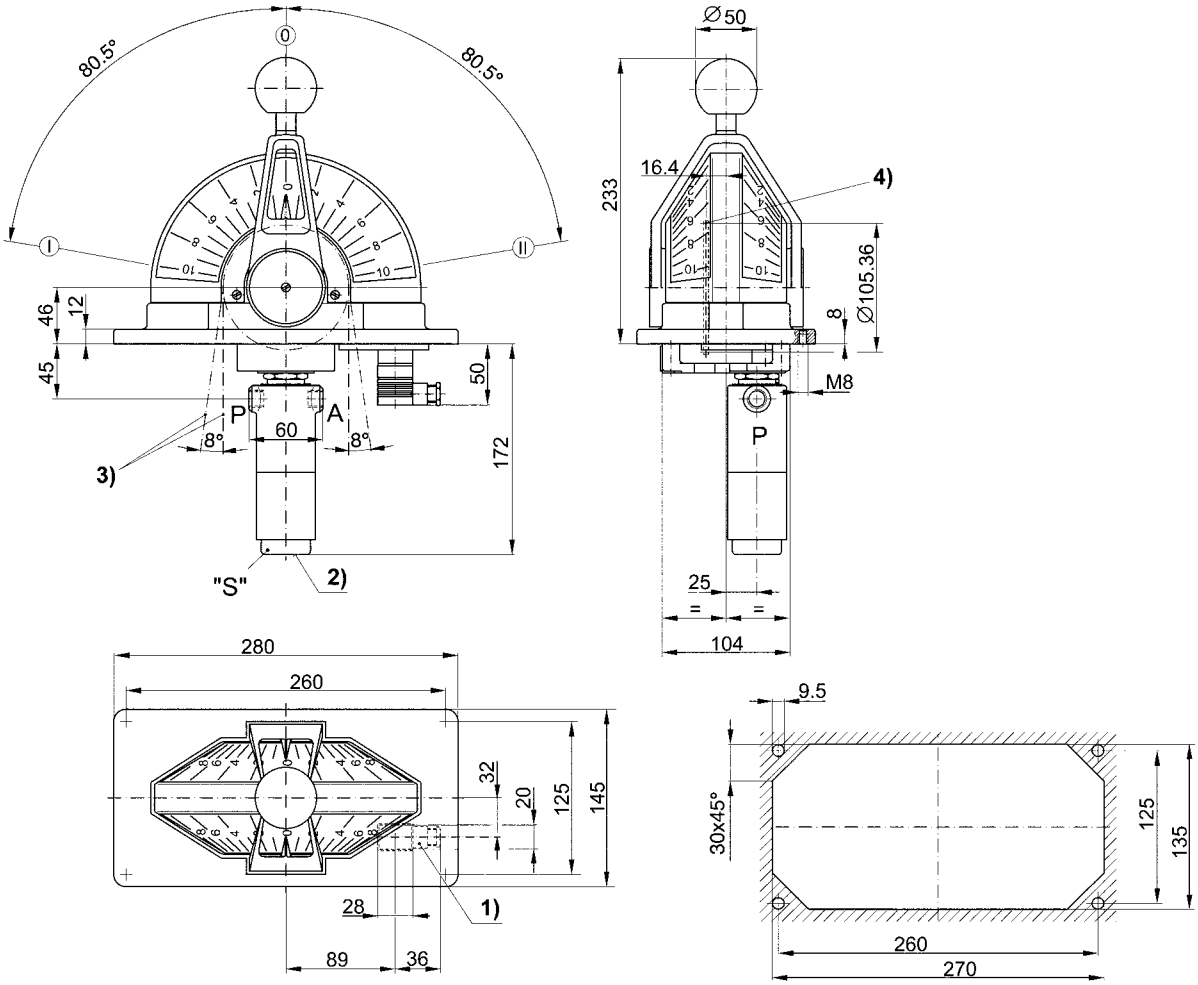
Accessories [to be ordered separately]

Accessories	Designation	Type number
	Repair kit	**362 171 000 2**

Pressure - travel - characteristic line



The characteristic line is infinitely adjustable in an parallel way within the shaded area and its gradient can be modified.
Observe, that the pressure difference between initial and final pressure must be more than 1.85 bar.
X) Handle travel, Y) Pressure in connection A



1) Device plug, 2) Exhaust, 3) Max. range for chain guide, 4) Sprocket wheel (z=26, t=12.7) suitable for chain 083 DIN 8187

Maneuvering Valves and Control Heads

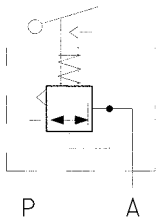
Pneumatic control head, with lighting, linear characteristic line

Rexroth
Bosch Group

Technical data

Type		Pneumatic control head with linear characteristic line
Ambient temperature range		-20° to +70°C
Admissible medium		Compressed air
Operating pressure		Max. 8 bar
Nominal diameter	Pressure regulating valve	ND7
Control pressure range		0.5 to 5.5 bar
Hysteresis		Max. 0.1 bar
Refilling sensitivity		0.1 bar
Lighting of scale		4 bulbs 30V / 0.08A
Electrical connection		Triple pole device plug PG9xA7
Protection	when panel mounted	IP 44; DIN 40 050
Weight		5.3 kg
Material	Scale	Plastic
	Housing	Aluminium
	Controlair valve	Aluminium, plastic-coated
	Inside parts	Stain-protected steel, NBR, plastic

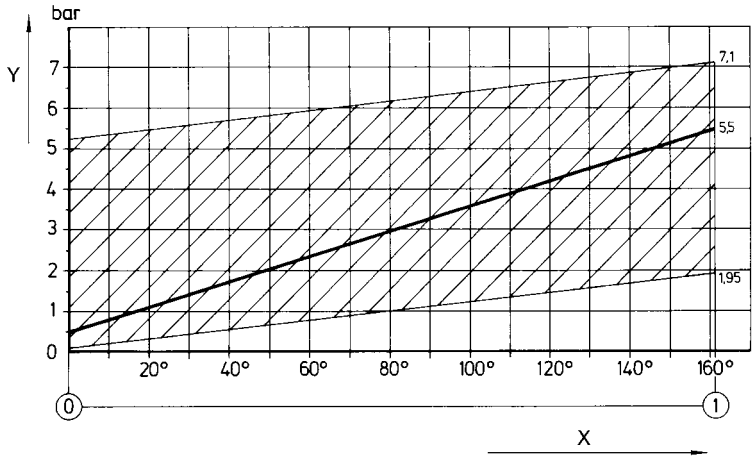
Type number

Symbol	Connection thread Regulating valve	Connection thread Way - valve	Type number
	M 14 x 1.5; 12 deep	M 14 x 1.5; 12 deep	**362 101 220 0**

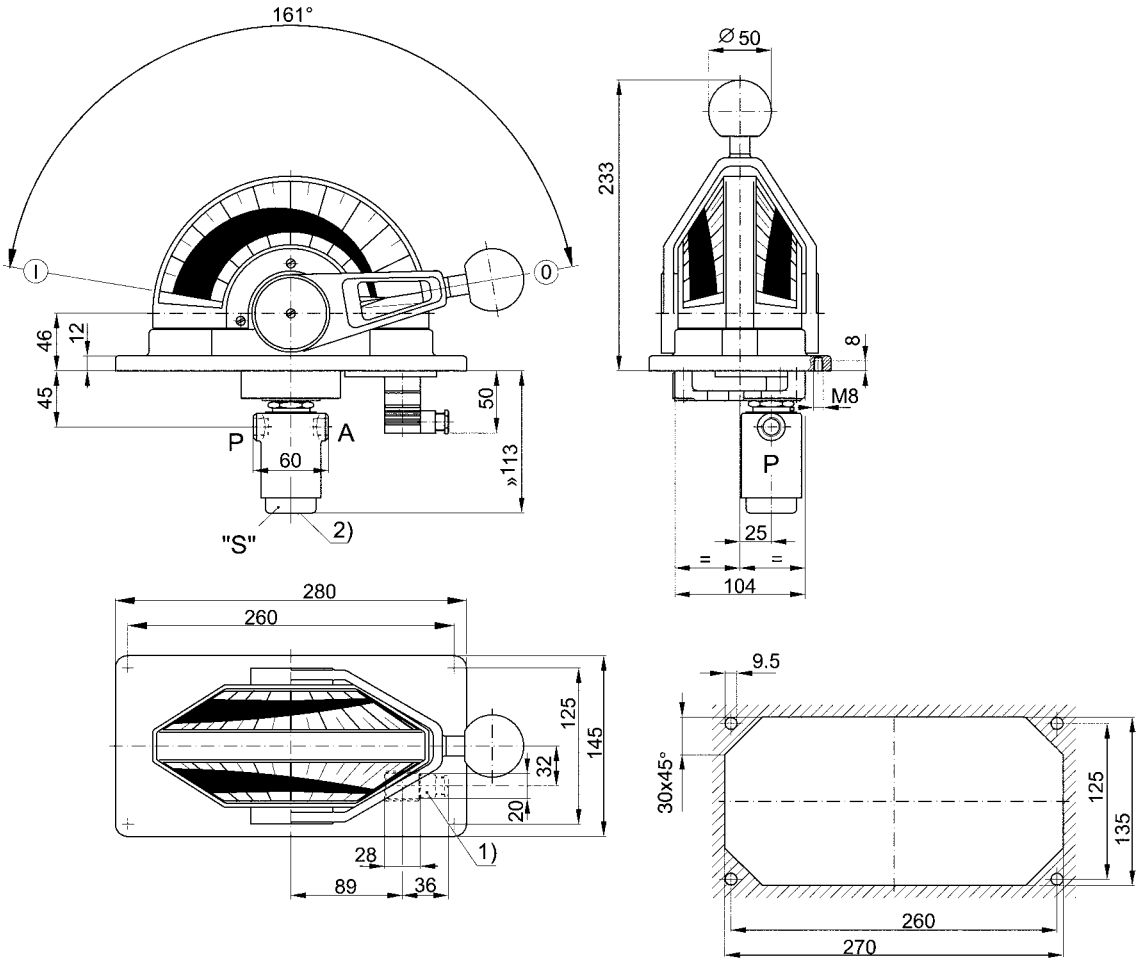
Accessories [to be ordered separately]

Accessories	Designation	Type number
	Repair kit	**362 171 000 2**

Pressure - travel - characteristic line



The characteristic line is infinitely adjustable in an parallel way within the shaded area and its gradient can be modified.
Observe, that the pressure difference between initial and final pressure must be more than 1.85 bar.
X) Handle travel, Y) Pressure in connection A



1) Device plug, 2) Exhaust

Maneuvering Valves and Control Heads

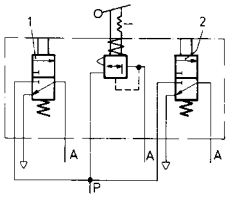
Pneumatic control head, without lighting, V-characteristic line

Rexroth
Bosch Group

Technical data

Type		Pneumatic control head with V-characteristic line
Ambient temperature range		-20° to +70°C
Admissible medium		Compressed air
Operating pressure		Max. 10 bar
Nominal diameter	Pressure regulating valve	ND7
	Way-valve	ND4
Control pressure range		0.5 to 5.5 bar
Hysteresis		Max. 0.15 bar
Refilling sensitivity		0.25 bar
Weight		3.5 kg
Material	Scale	Aluminium, plastic-coated
	Housing	Aluminium
	Controlair valve	Aluminium, plastic-coated
	Inside parts	Stain-protected steel, NBR, plastic
Colour		Anthracite black

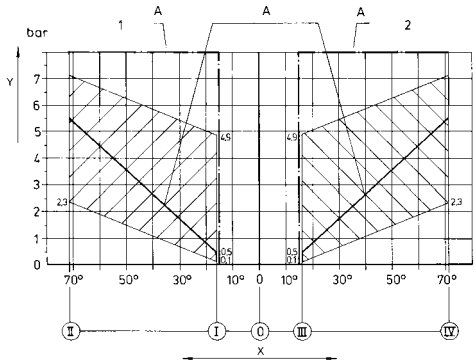
Type number

Symbol	Connection thread Regulating valve	Connection thread Way-valve	Type number
	M 14 x 1.5; 12 deep	G 1/8, 8 deep	**362 128 020 0**
	G 1/4	G 1/8, 8 deep	**362 128 022 0**

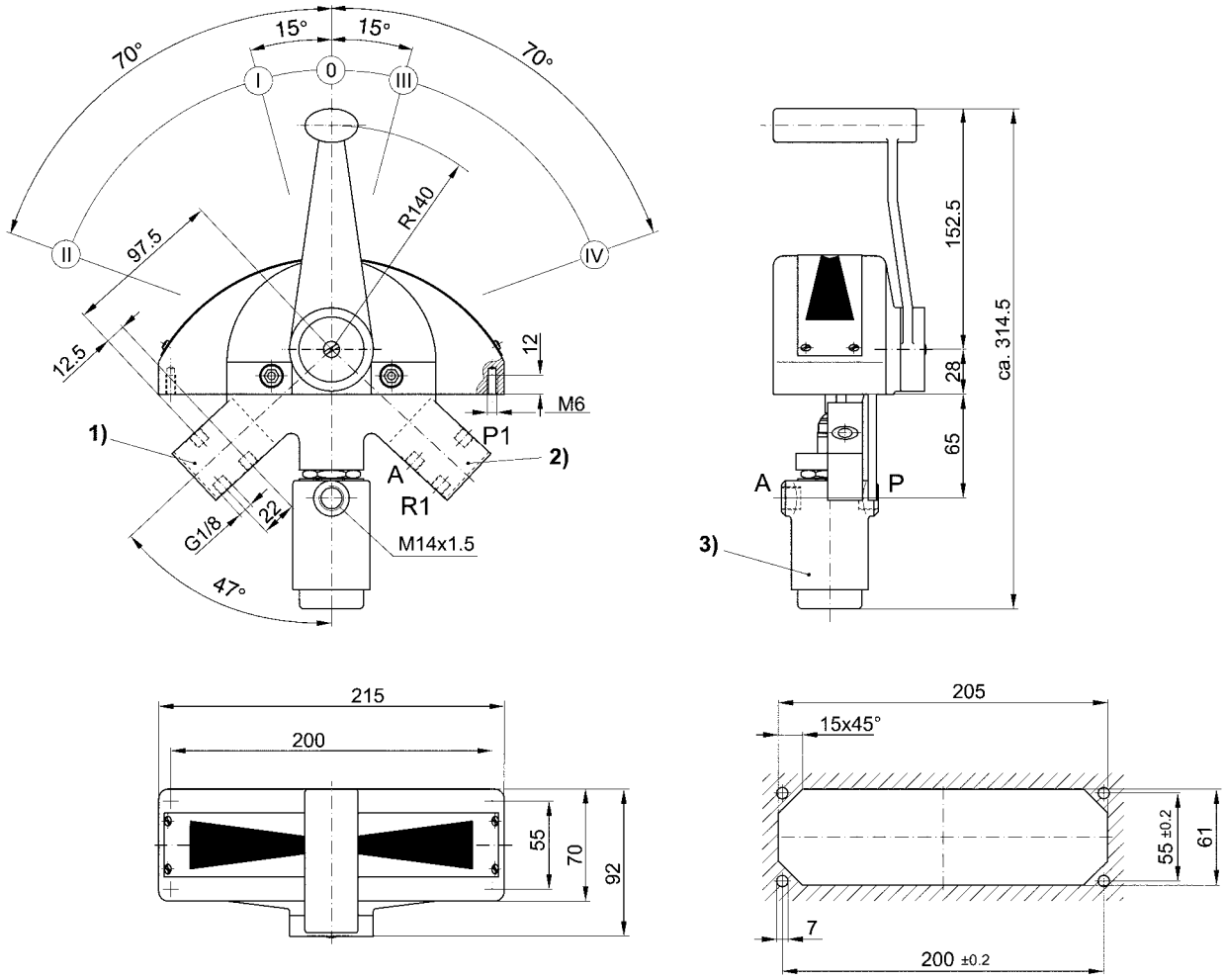
Accessories (to be ordered separately)

Accessories	Designation	Type number
	Repair kit	**362 128 000 2**
	Swivel fitting G 1/8	**893 900 890 0**

Pressure - travel - characteristic line



The characteristic line is infinitely adjustable in an parallel way within the shaded area and its gradient can be modified.
Observe, that the pressure difference between initial and final pressure must be more than 2.2 bar.
X) Handle travel, Y) Pressure in connection A, 1, 2) Valves 1 and 2



1) Valve 1, 2) Valve 2, 3) Pressure regulating valve

Maneuvering Valves and Control Heads

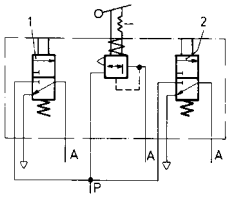
Pneumatic control head, without lighting, linear characteristic line

Rexroth
Bosch Group

Technical data

Type		Pneumatic control head with linear characteristic line
Ambient temperature range		-20° to +70°C
Admissible medium		Compressed air
Operating pressure		max. 8 bar
Nominal diameter	Pressure regulating valve	ND3
Control pressure range		0.5 to 5.5 bar
Hysteresis		max. 0,1 bar
Refilling sensitivity		0.07 bar
Weight		3.5 kg
Material	Scale	Aluminium, plastic-coated
	Housing	Aluminium
	Controlair valve	Aluminium, plastic-coated
	Inside parts	Stain-protected steel, NBR, plastic
Colour		Black

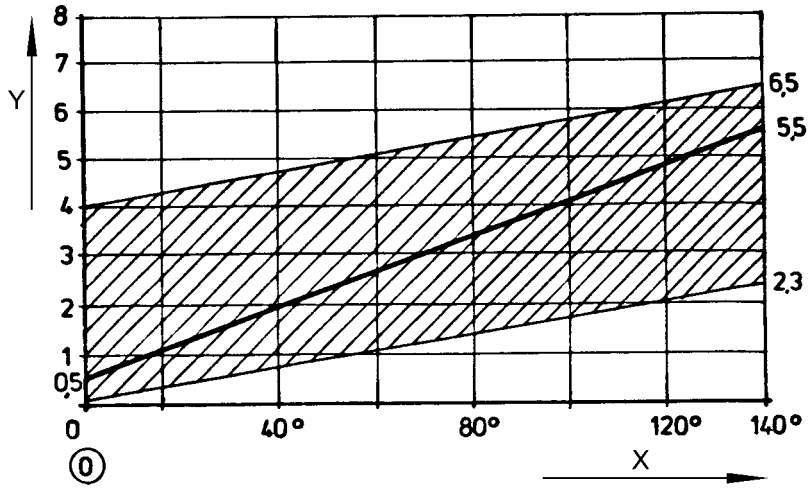
Type number

Symbol	Connection thread Regulating valve	Type number
	M 14 x 1.5; 12 deep	**362 108 220 0**

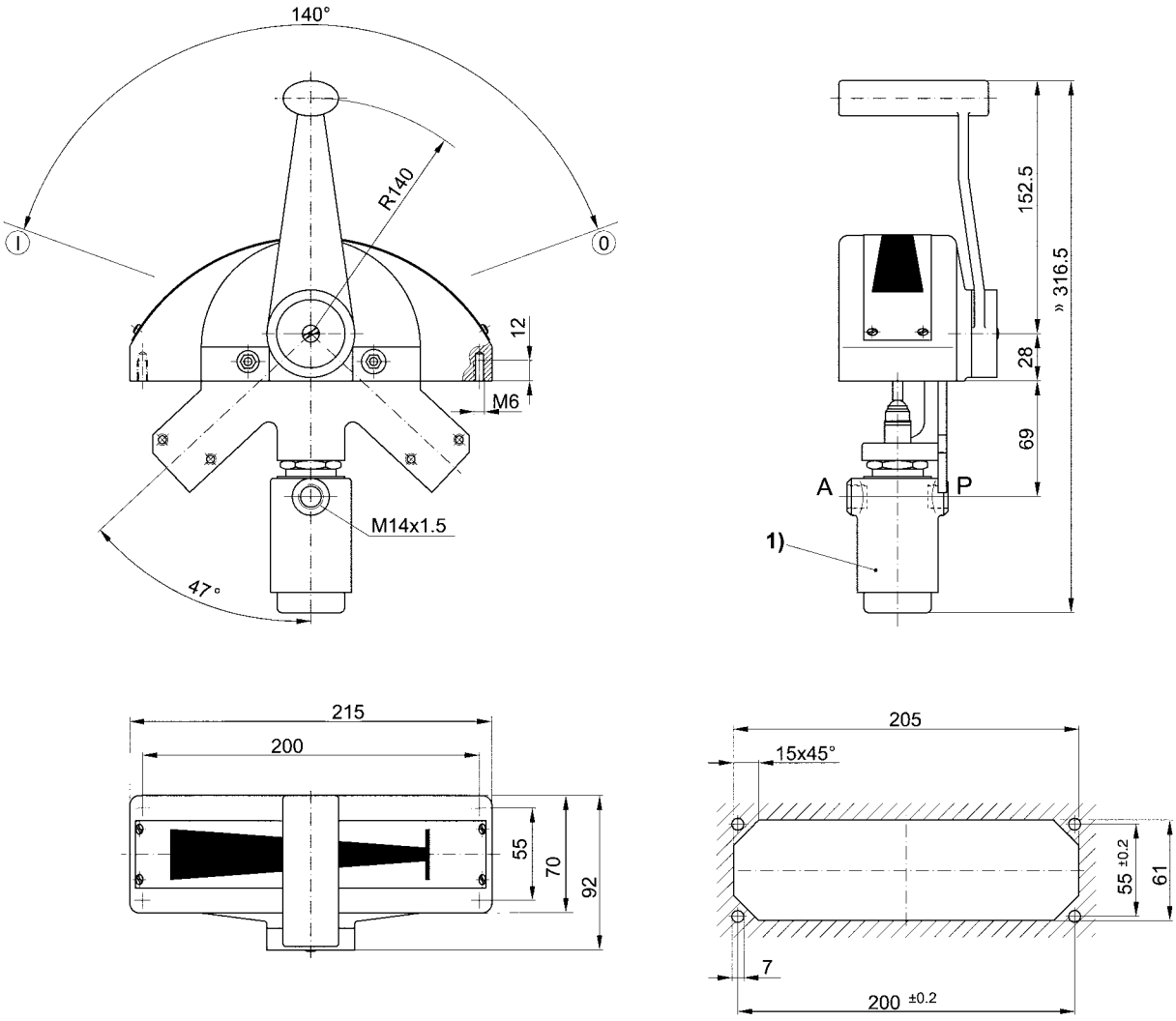
Accessories (to be ordered separately)

Accessories	Designation	Type number
	Repair kit	**362 128 000 2**

Pressure - travel - characteristic line



The characteristic line is infinitely adjustable in a parallel way within the shaded area, and its gradient can be modified.
Observe that the pressure difference between initial and final pressure must be more than 2.2 bar.



1) Pressure regulating valve

Rexroth
Bosch Group

Products

Electric control head, V-characteristic line

See page 17

Electric control head, linear characteristic line

See page 20

Electric control head, linear characteristice line

See page 23

Technical data

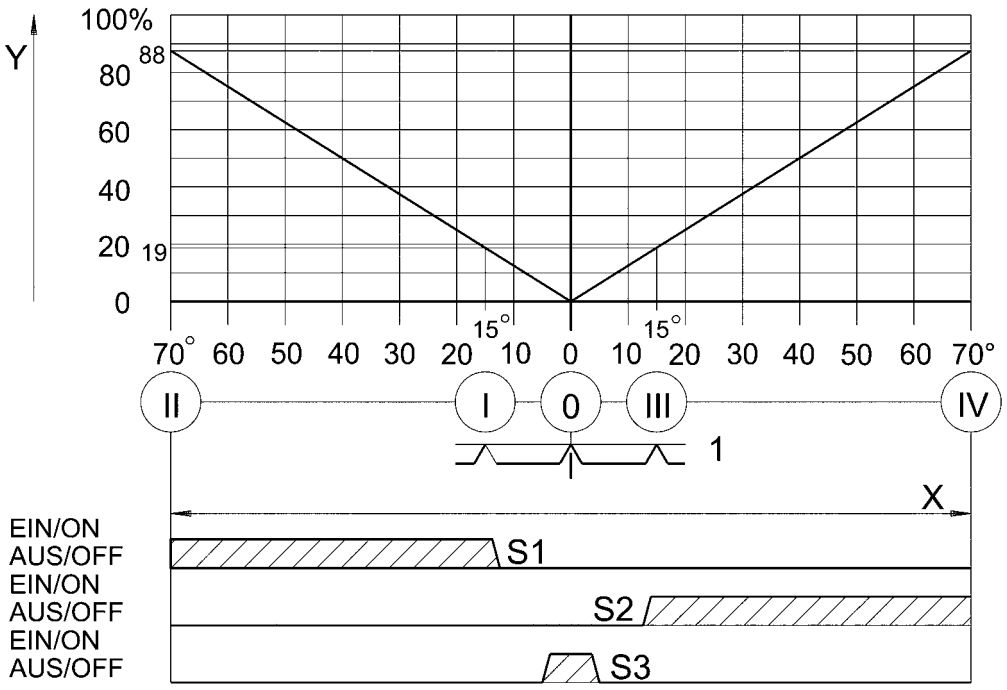
Type		Electric control head with V-characteristic line
Ambient temperature range		-20° to +70°C
Operating voltage		24 VDC ± 20%
Lighting of scale		4 bulbs 24 VDC / 0.56 W
Protection	Above panel plate	IP 66 DIN 40 050
Switching capacity	Switches S1 to S4	30 VDC / 0.1 A
Potentiometer	Resistance	5000 Ω
	Resistance tolerance	±3% (±150Ω)
	Linearity tolerance	±0.5% (±25Ω)
	Load rating	1.5W
Weight		0.6 kg
Material	Scale	Plastic
	Housing	Aluminium
Colour	Scale	White, light-transmissive
	Housing	Black, RAL 9005

Locked in gear maneuvering positions ahead, neutral, astern

Type number

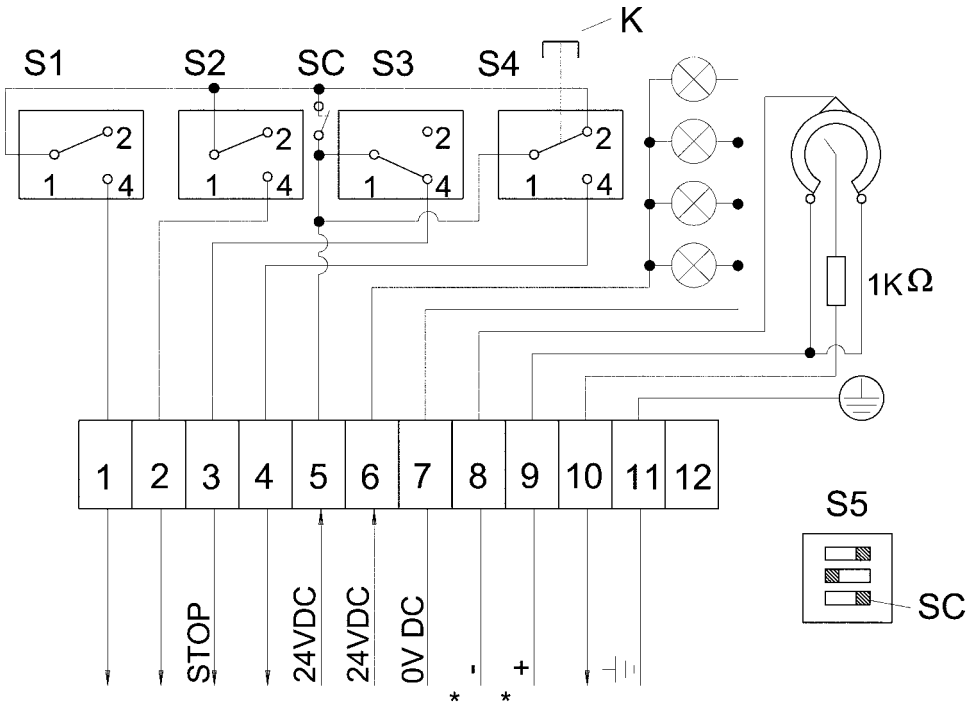
	Version	Type number
	Neutral [right or left]	**362 300 000 0**

Voltage - travel - characteristic line

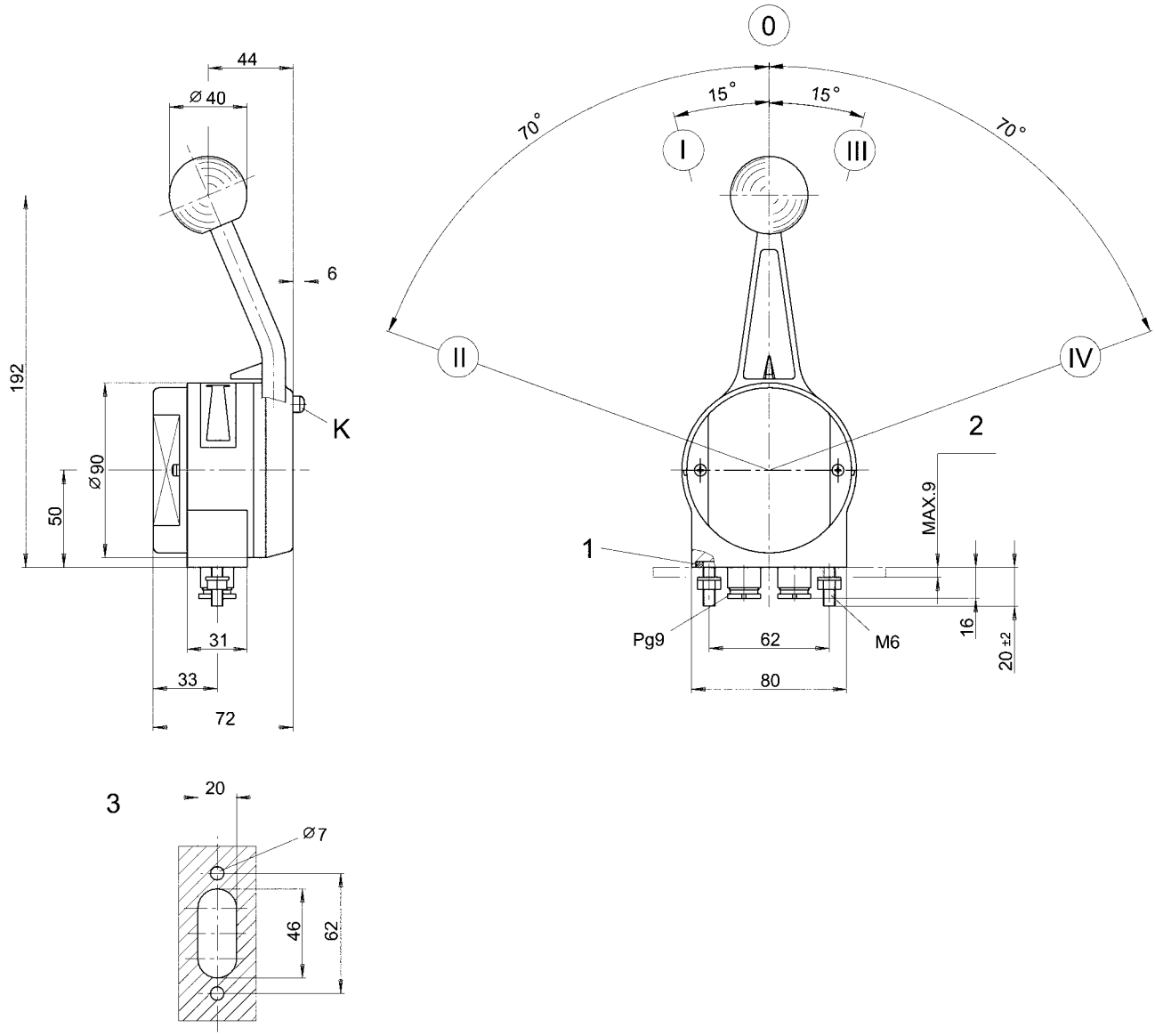


1) Lock position, X) Handle travel, Y) Voltage, S1-S3) Switches 1-3

Connection diagram



Speed increase / Gear interlock (warming-up function): by pressing button K and moving the lever over STOP in direction AHEAD or ASTERN the engine speed will be increased without engaging the clutch. When moving the lever back to STOP-position the gear function will be automatically active again. ATTENTION: Note switch C in the connection diagram!
*) Stabilized voltage



K) Speed increase - Gear interlock, 1) Seal, 2) Mounting plate, 3) Cutout of mounting plate
Assembly position is open

Maneuvering Valves and Control Heads

Electric control head, linear characteristic line

Rexroth
Bosch Group

Technical data

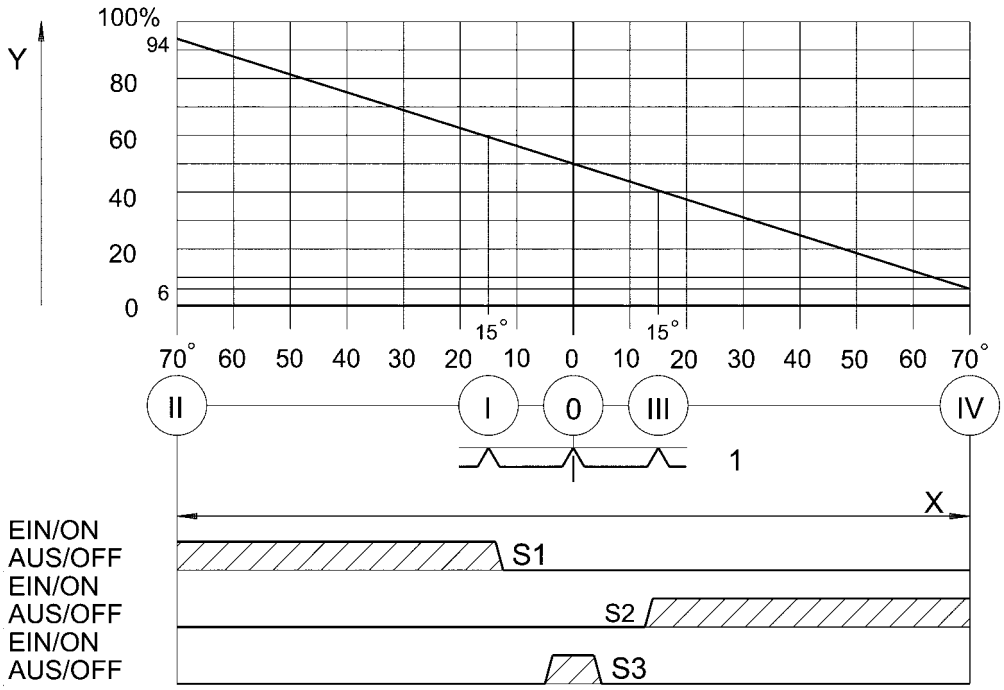
Type		Electric control head with linear characteristic line
Admissible temperature range		-20° to +70°C
Operating voltage		24 VDC ± 20%
Lighting of scale		4 bulbs 24 VDC / 0.56 W
Protection	Above panel plate	IP 66 DIN 40 050
Switching capacity	Switches S1 to S4	30 VDC / 0.1 A
Potentiometer	Resistance	5000 Ω
	Resistance tolerance	±3% (±150Ω)
	Linearity tolerance	±0,5% (±25Ω)
	Load rating	1.5W
Weight		0.6 kg
Material	Scale	Plastic
	Housing	Aluminium
Colour	Scale	White, light-transmissive
	Housing	Black, RAL 9005

Locked in gear maneuvering positions ahead, neutral, astern

Type number

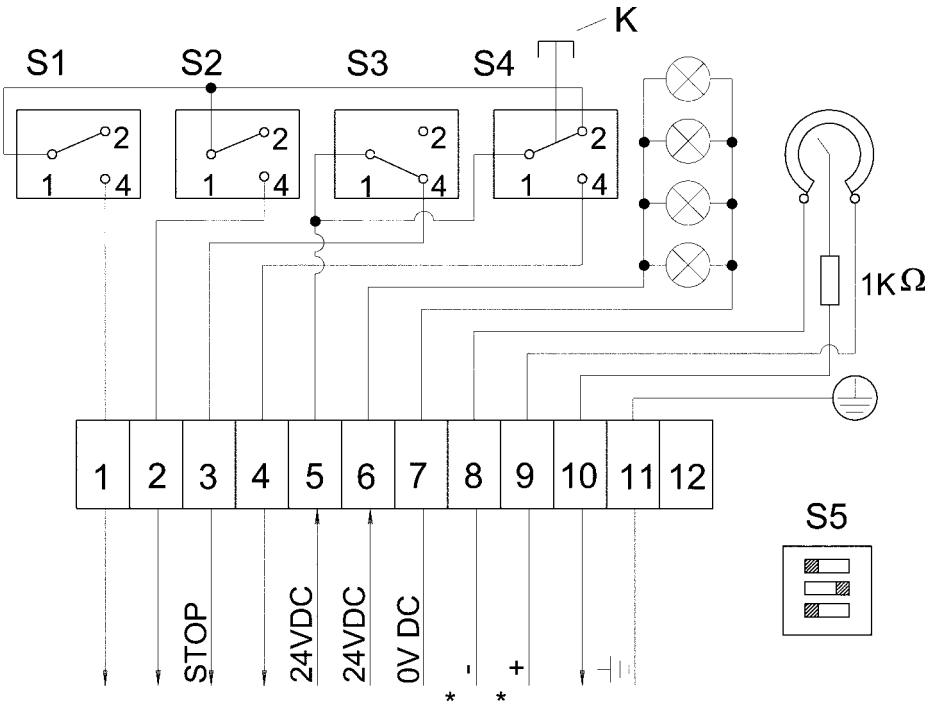
	Version	Type number
	Neutral [right or left]	**362 300 500 0**

Voltage - travel - characteristic line

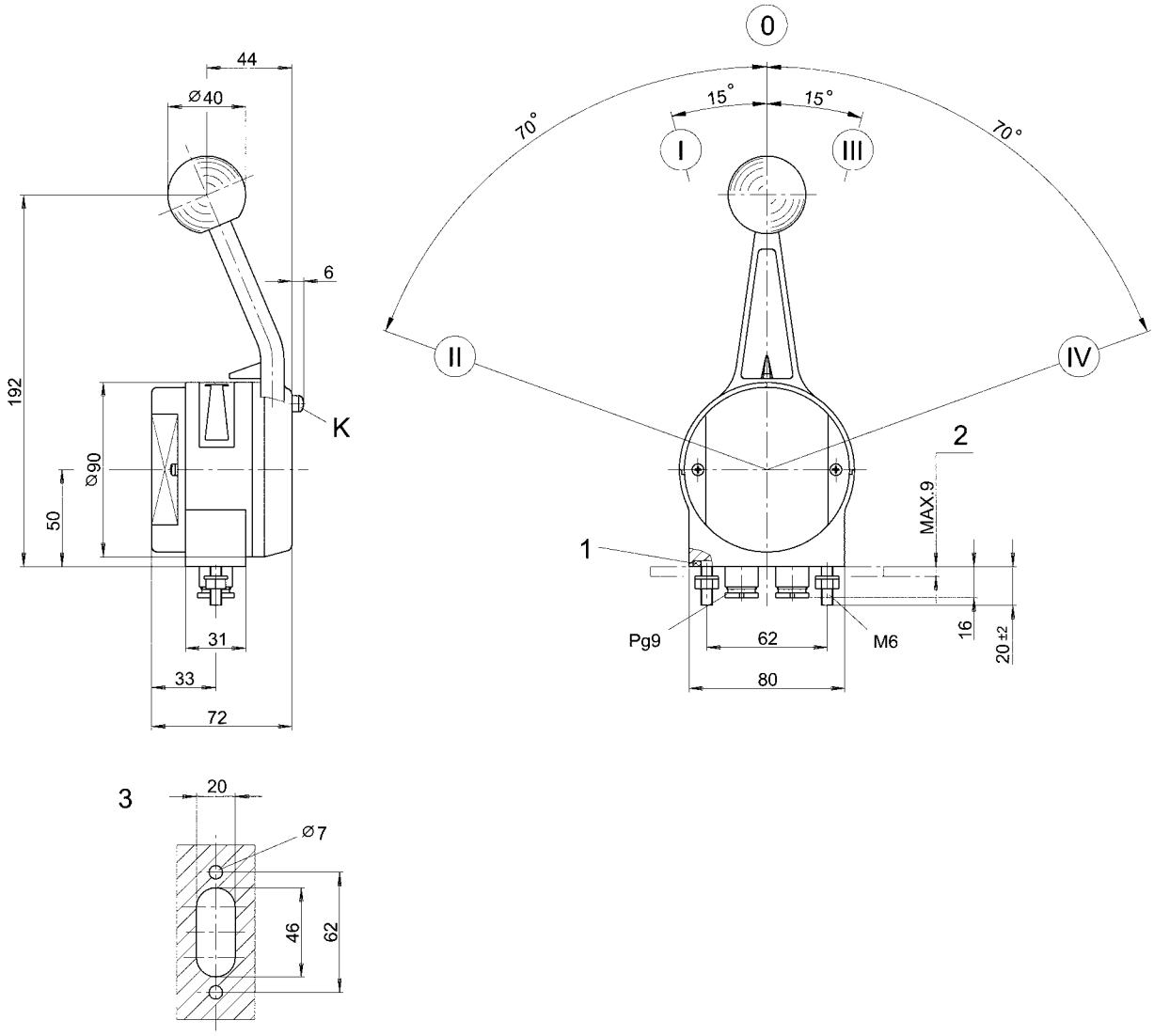


1) Lock position, X) Handle travel, Y) Voltage, S1-S3) Switches 1-3

Connection diagram



Speed increase / Gear interlock (warming-up function): by pressing button K and moving the lever over STOP in direction AHEAD or ASTERN the engine speed will be increased without engaging the clutch. When moving the lever back to STOP-position the gear function will be automatically active again. ATTENTION: Note switch C in the connection diagram!
*) Stabilized voltage



K) Speed increase-Gear interlock, 1) Seal, 2) Mounting plate, 3) Cutout of mounting plate
Assembly position is open

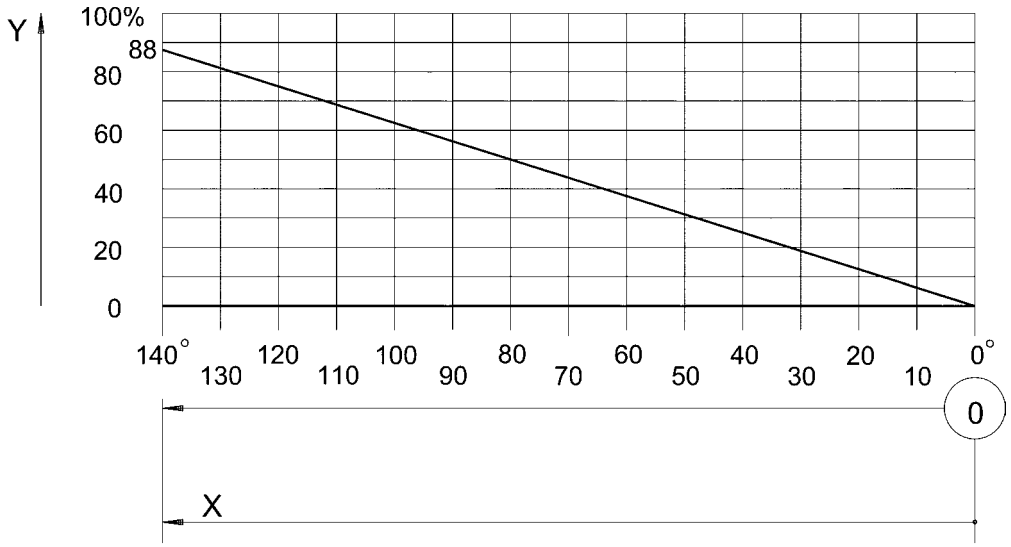
Technical data

Type		Electric control head with V- characteristic line
Admissible temperature range		-20° to +70°C
Operating voltage		24 VDC ± 20%
Lighting of scale		4 bulbs 24 VDC / 0.56 W
Protection	Above the panel plate	IP 66 DIN 40 050
Potentiometer	Resistance	5000 Ω
	Resistance tolerance	±3% (±150Ω)
	Linearity tolerance	±0.5% (±25Ω)
	Load rate	1.5W
Weight		0.6 kg
Material	Scale	Plastic
	Housing	Aluminium
Colour	Scale	White, light-transmissive
	Housing	Black, RAL 9005

Type number

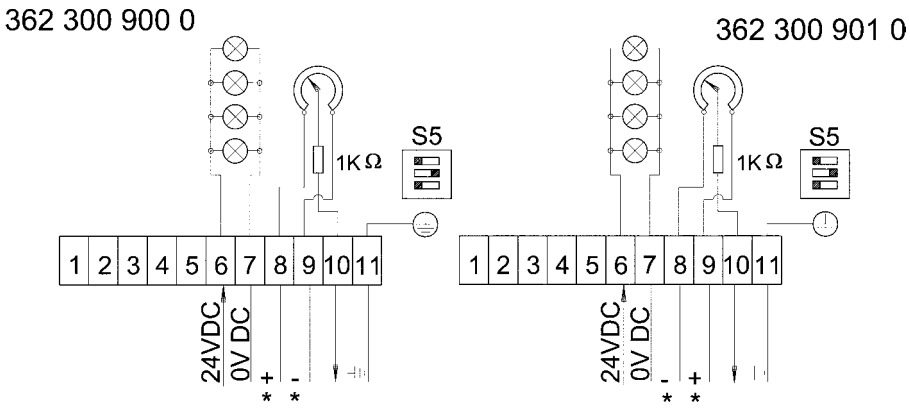
	Version	Type number
	Right	**362 300 900 0**
	Left	**362 300 901 0**

Voltage - travel - characteristic line

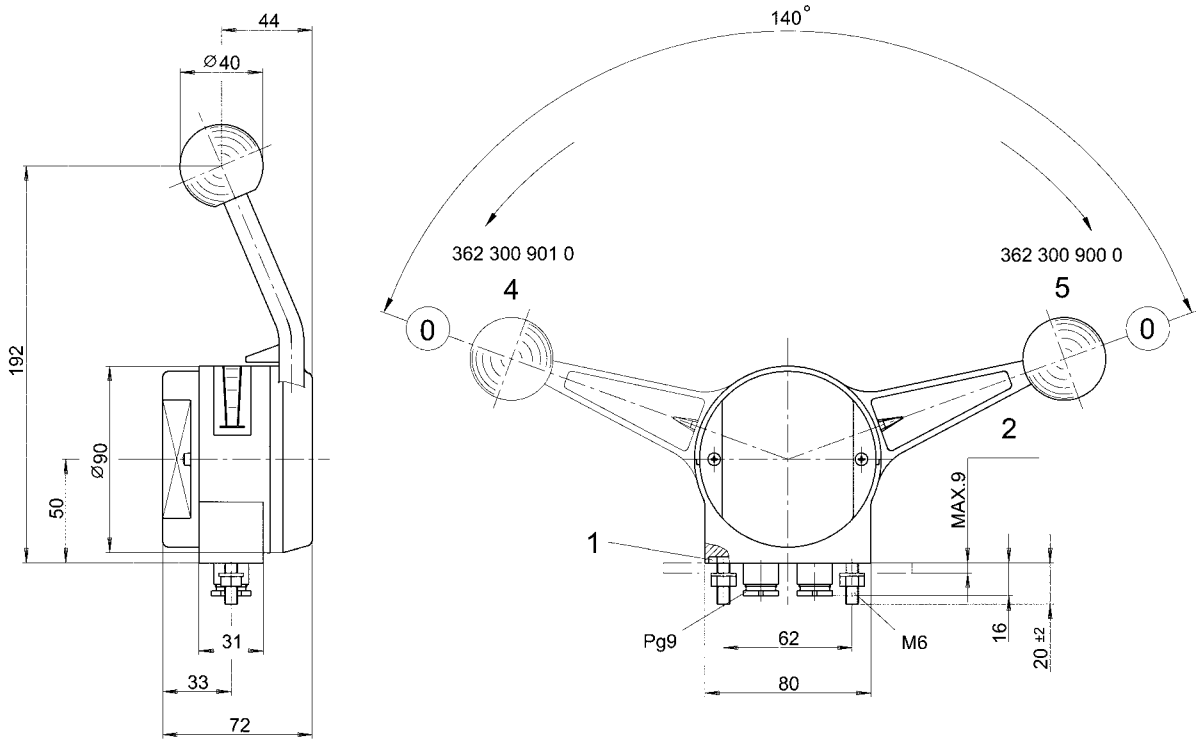


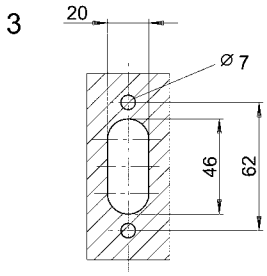
X) Handle travel, Y) Voltage

Connection diagram



*) Stabilized voltage





1) Seal, 2) Mounting plate, 3) Cutout of mounting plate, 4) Left-hand version, 5) Right-hand version
Assembly position is open

3/2- and 5/2-Way-Valves Manually Operated

Rexroth
Bosch Group

Products

3/2-way-valve, ND4, normally closed or normally open, G1/8

See page 2

3/2-and 5/2-way-valve, ND7, M14 x 1.5

See page 6

3/2-way-valve, ND7, M14 x 1.5

See page 9

3/2-way-valve, ND7, M14 x 1.5

See page 11

3/2 and 5/2 -Way-Valve Manually Operated

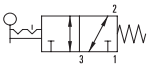
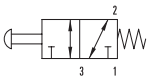
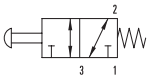
3/2-way-valve, ND4, normally closed or normally open, G1/8

Rexroth
Bosch Group

Technical data

Type		Poppet valve
Operating pressure	p max.	10 bar
Nominal flow rate Qn at 6 bar, Δp = 1 bar		400 Nl/min.
Operating force		See table
Ambient temperature range		- 25 to + 80°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.32 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N

Type number

Symbol	Figure	Designation	Operating force Ventilating	Operating force Exhausting *	Connection thread	Type number
	1	Rotary knob/black	20 N	20 - 40 N	G 1/8	**563 020 120 0**
	2	Push button/black	30 N	30 - 60 N	G 1/8	**563 020 122 0**
	3	Panel push button/ yellow	30 N	30 - 60 N	G 1/8	**563 020 124 0**

* Dependent on pressure supply

Accessories (to be ordered separately)

Accessories	Type	Type number
	Hex. nut M 22 x 1.5 for fig. 2	**891 500 455 4**
	Spare part kit	**563 020 000 2**

Fig. 1

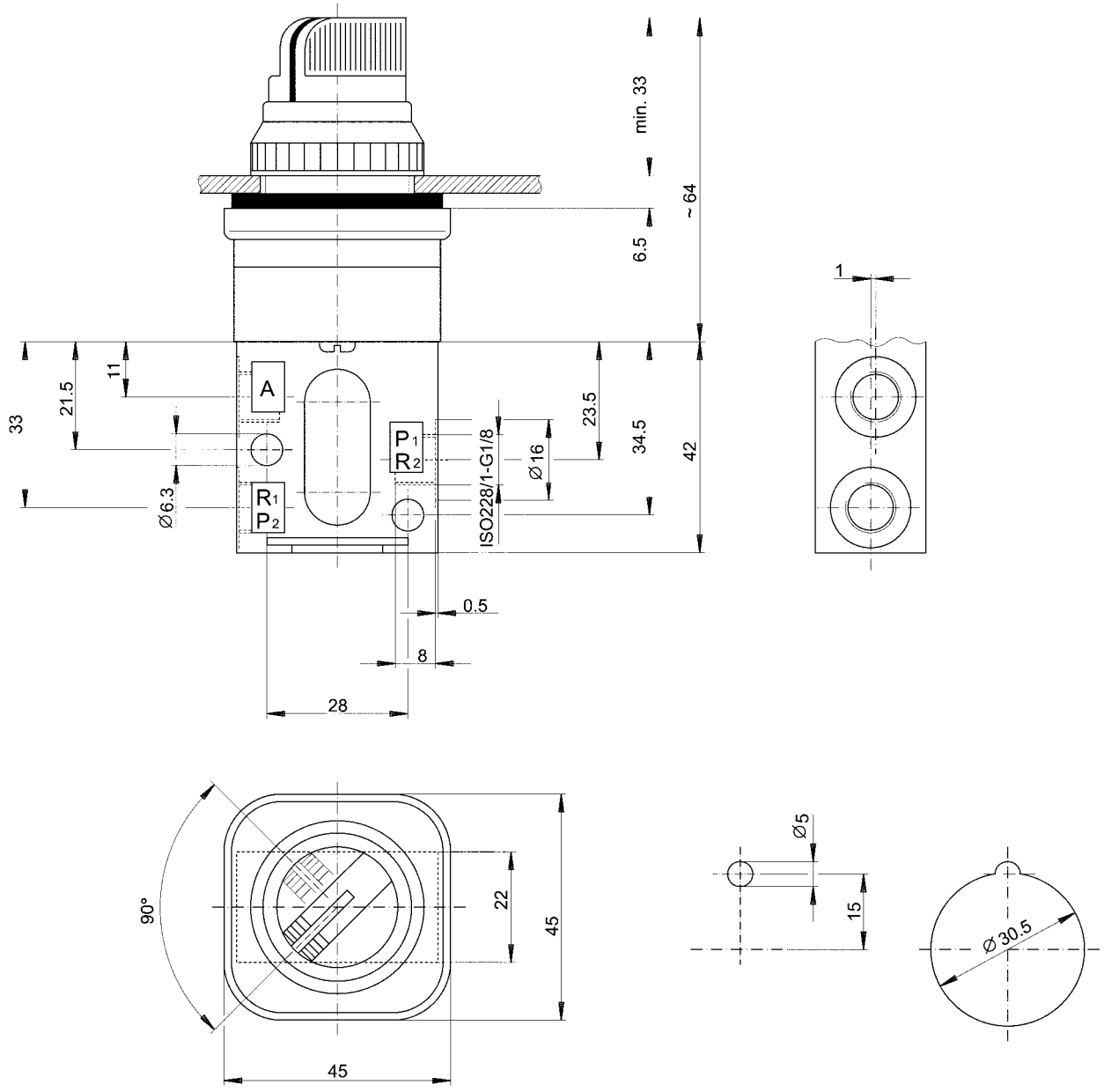
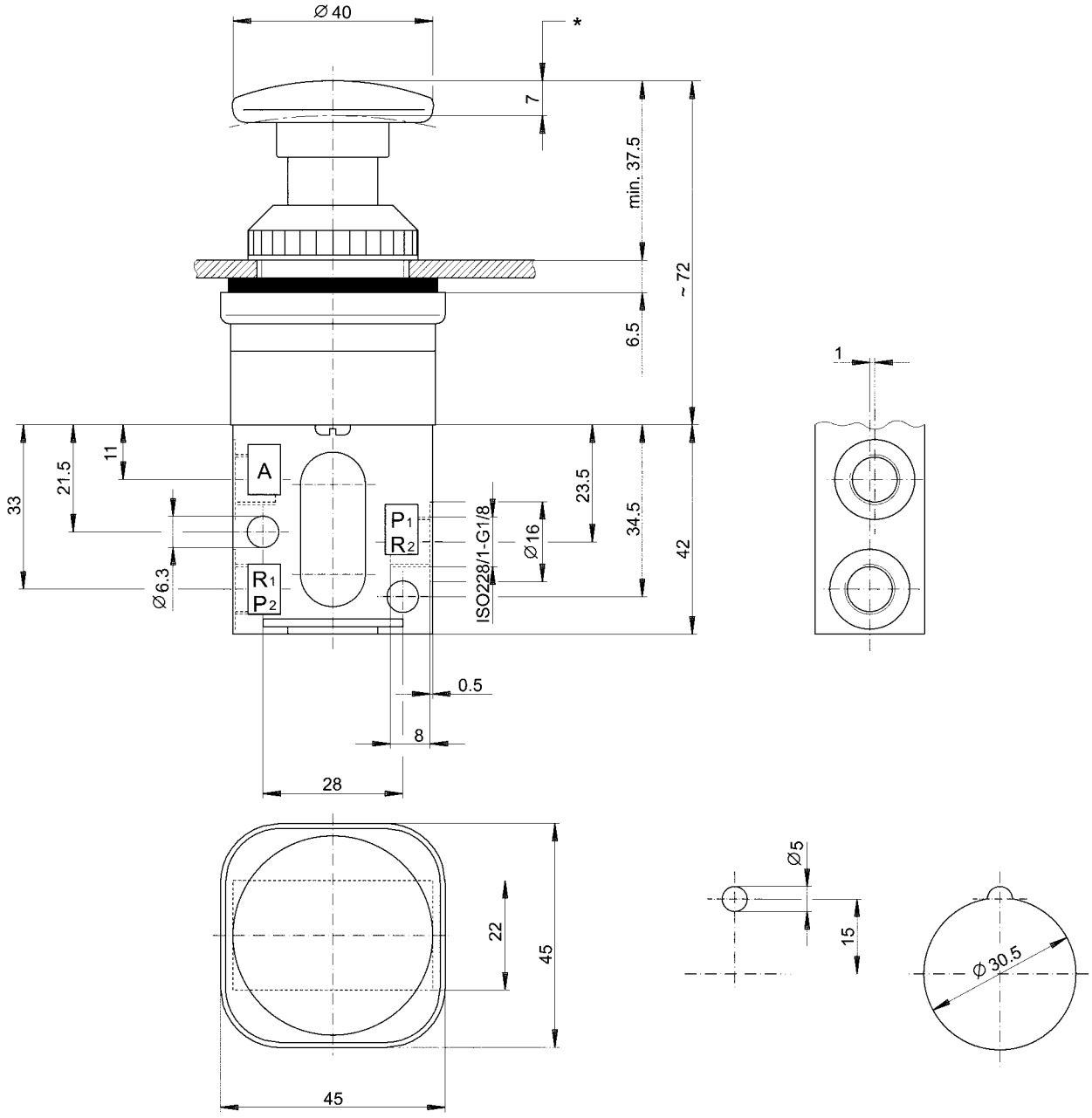
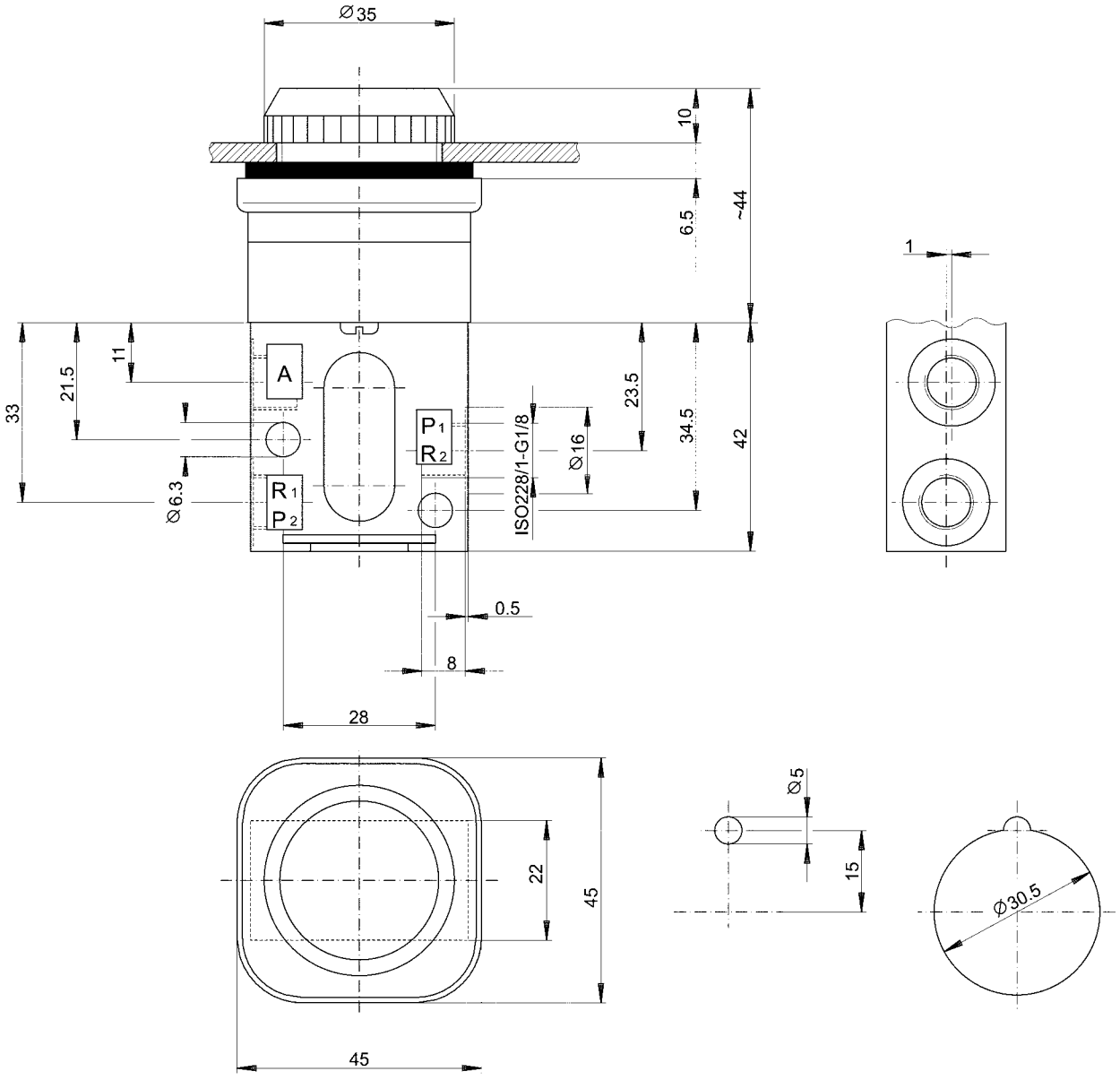

min. 33
~ 64
6.5
1
33
21.5
11
A
P1
R2
R1
P2
Ø6.3
23.5
34.5
42
Ø16
ISO228/1-G1/8
0.5
8
28
90°
22
45
45
Ø5
15
Ø 30.5

Fig. 2


Ø 40
*
7
min. 37.5
~ 72
6.5
1
11
21.5
33
A
P1
R2
R1
P2
Ø6.3
ISO228/1-G1/8
Ø16
23.5
34.5
42
0.5
8
28
22
45
45
Ø5
15
Ø 30.5

*) Stroke

Fig. 3


Ø35
10
6.5
~44
1
11
21.5
33
A
P1
R2
R1
P2
Ø6.3
ISO228/1-G1/8
Ø16
23.5
34.5
42
0.5
8
28
22
45
45
Ø5
15
Ø30.5

3/2 and 5/2-Way-Valve Manually Operated

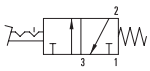
3/2 and 5/2-way-valve, ND7, M14 x 1.5

Rexroth
Bosch Group

Technical data

Type		Slide valve
Operating pressure	p max.	10 bar
Nominal flow rate	Qn	
at 6 bar, Δp = 1 bar		350 Nl/min.
Operating force	N	See table
Ambient temperature range		- 15 to + 80°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.4 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N

Type number

Symbol	Fig.	Designation	Operating force	Connection-thread	Type number
	1	3/2-Way-valve	15 N	M 14 x 1.5	**363 130 000 0**
	2	5/2-Way-valve	15 N	M 14 x 1.5	**363 129 000 0**

Accessories (to be ordered separately)

Accessories	Type	Valve	Type number
	Spare part kit	**363 130 000 0**	**363 129 000 2**
	Spare part kit	**363 129 000 0**	**363 129 000 2**

Fig. 1

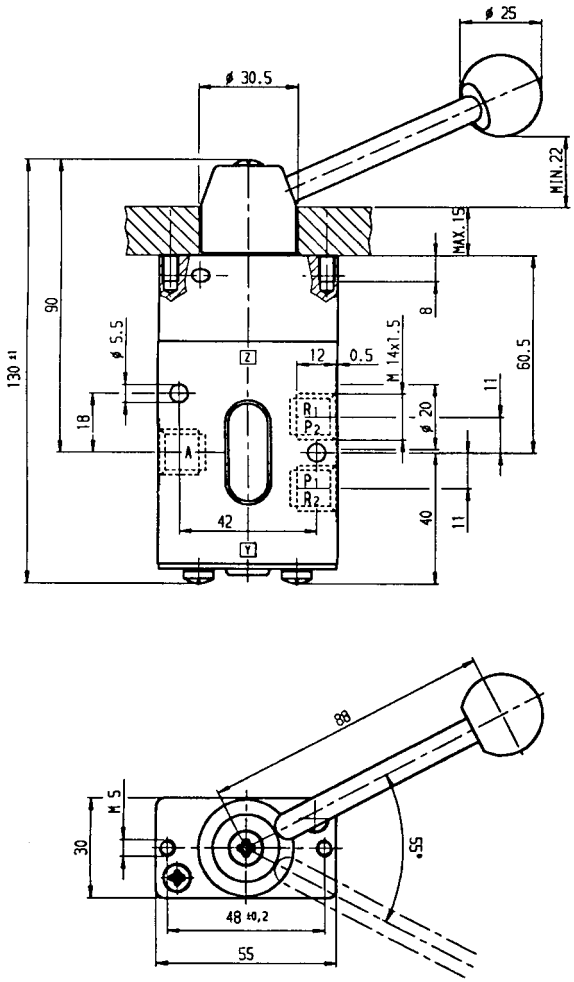
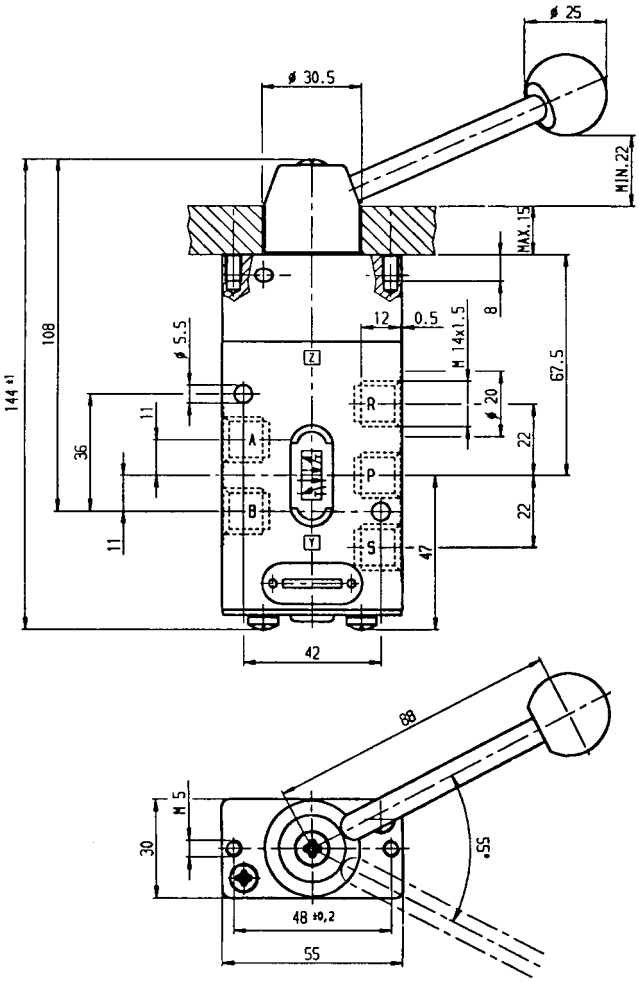
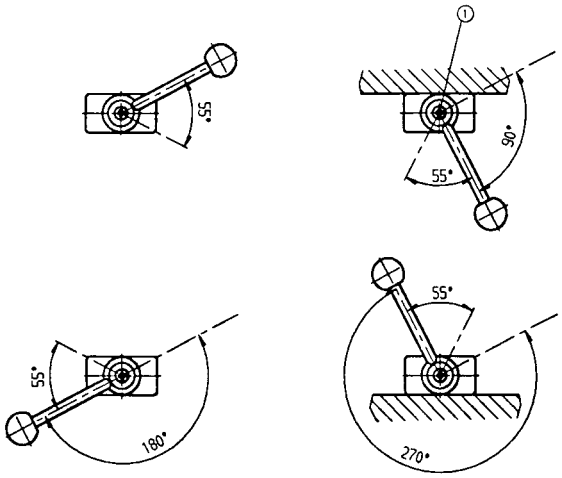

ø 25
ø 30.5
MIN.22
MAX.15
8
90
130 ±1
ø 5.5
12
0.5
M 14x1.5
60.5
11
18
ø 20
A
P
R2
42
40
11
88
M 5
30
55°
48 ±0,2
55

Fig. 2



Possible initial positions of the lever



1) Loosen the screw to adjust the initial position

3/2- and 5/2-Way-Valve Manually Operated

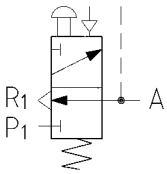
3/2-way-valve, ND7, M14 x 1.5

Rexroth
Bosch Group

Technical data

Type		Slide valve
Operating pressure	p max.	10 bar
Nominal diameter		ND 7
Operating force		40 N
Ambient temperature range		- 20°C to + 80°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.6 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Colour	Push-button	Yellow
	Threaded ring	Black
	Housing	Blue

Type number

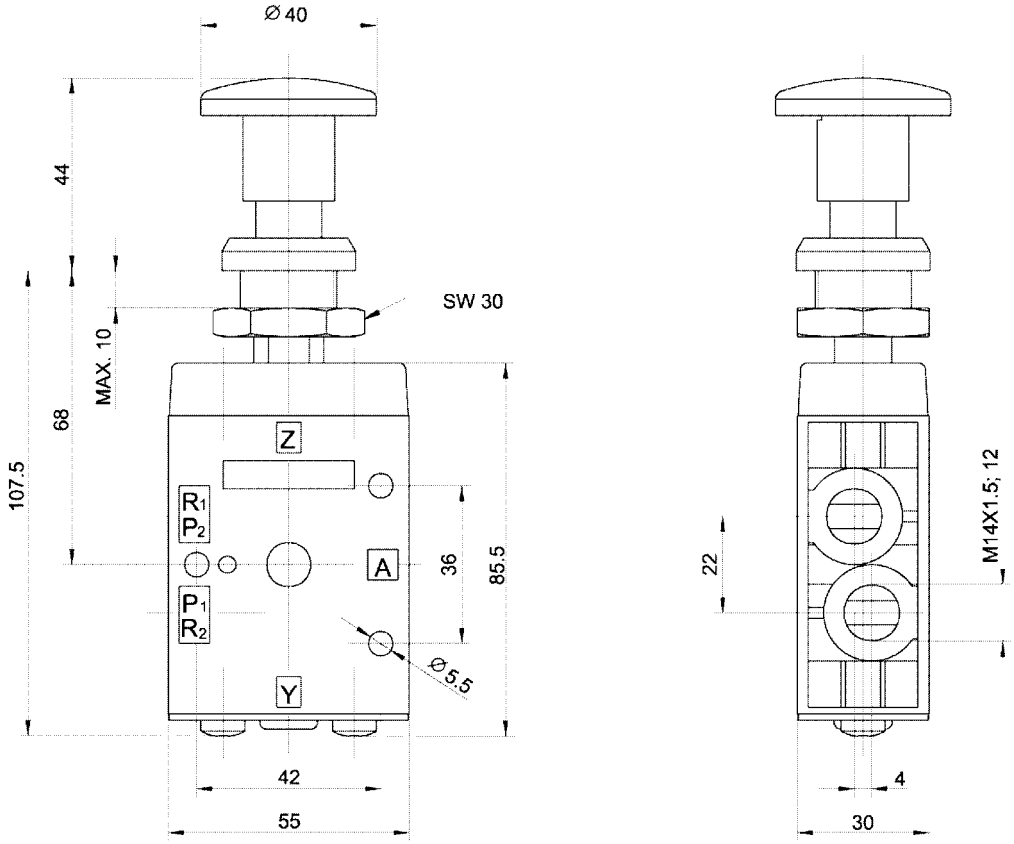
Symbol	Designation	Connection thread	Type number
	3/2-Way-valve	M 14 x 1.5	**363 042 900 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Spare part kit	**363 042 002 2**

3/2- and 5/2-Way-Valve Manually Operated

3/2-way-valve, ND7, M14 x 1.5



Assembly position is open
Control panel bore diameter 23 mm

3/2- and 5/2-Way-Valve Manually Operated

3/2-way-valve, ND7, M14 x 1.5

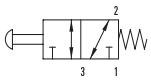
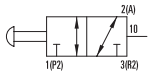
Rexroth
Bosch Group

Technical data

Type		Slide valve
Operating pressure	p max.	10 bar
Nominal diameter		ND 7
Operating force		70 N
Ambient temperature range		- 25°C to + 80°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.6 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Colour	Push-button	See table
	Threaded ring	Black
	Housing	Blue

4

Type number

Symbol	Designation	Actuation	Connection thread	Type number
	3/2-way-valve	Push button, black	M 14 x 1.5	**563 446 910 0**
	3/2-way-valve	Push button, red	M 14 x 1.5	**563 446 912 0**

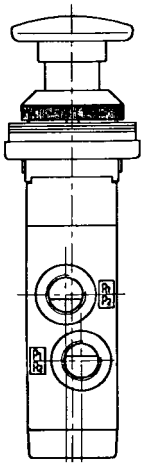
Accessories (to be ordered separately)

Accessories	Type	Type number
	Spare part kit	**363 042 002 2**

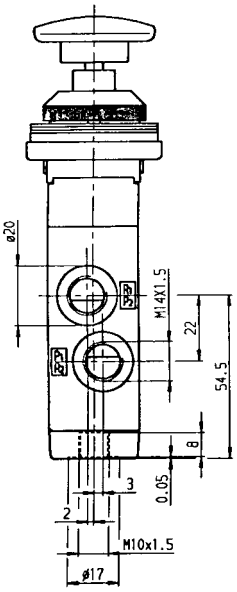
3/2- and 5/2-Way-Valve Manually Operated

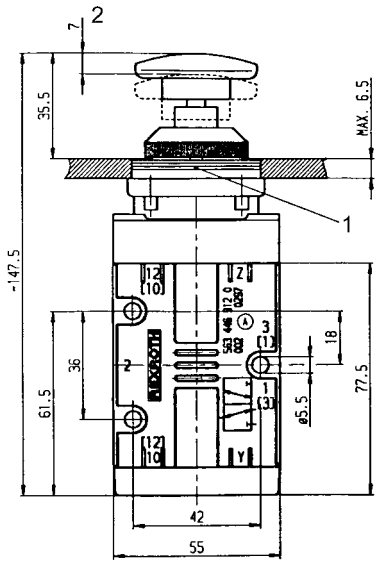
3/2-way-valve, ND7, M14 x 1.5

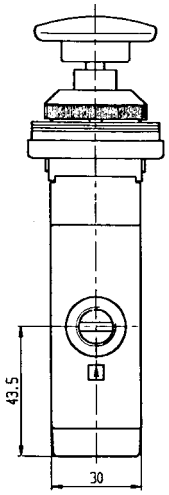
563 446 910 0

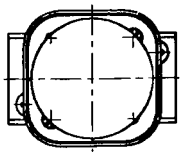


563 446 912 0









Assembly position is open, panel bore diameter 30.5 mm
1) Distance disks 2) Stroke

3/2-Way-Valves Mechanically Operated

Rexroth
Bosch Group

Products

3/2-way-valve, ND7, normally closed or normally open, 10 bar, M14 x 1.5

See page 14

3/2-way-valve, ND7, normally closed, 30 bar, M14 x 1.5

See page 16

3/2-way-valve, ND7, normally closed or normally open, 30 bar, M14 x 1.5, with pneumatic emergency operator

See page 19

3/2- Way-Valve Mechanically Operated

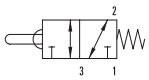
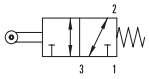
3/2-way-valve, ND7, normally closed or normally open,
10 bar, M14 x 1.5

Rexroth
Bosch Group

Technical data

Type		Poppet valve
Operating pressure	p max.	10 bar
Nominal diameter		ND 7
Nominal flow rate Qn at 6 bar, Δp = 1 bar		350 Nl/min.
Operating force		See table
Ambient temperature range		-15 °C to +80 °C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.5 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N

Type number

Symbol	Figure	Designation	Operating force ventilating	Operating force exhausting	Connection-thread	Type number
	1	Push-button	50 N	max. 100 N	M 14 x 1.5	**363 003 000 0**
	2	Rolling lever	25 N	max. 50 N	M 14 x 1.5	**363 007 000 0**

Accessories (to be ordered separately)

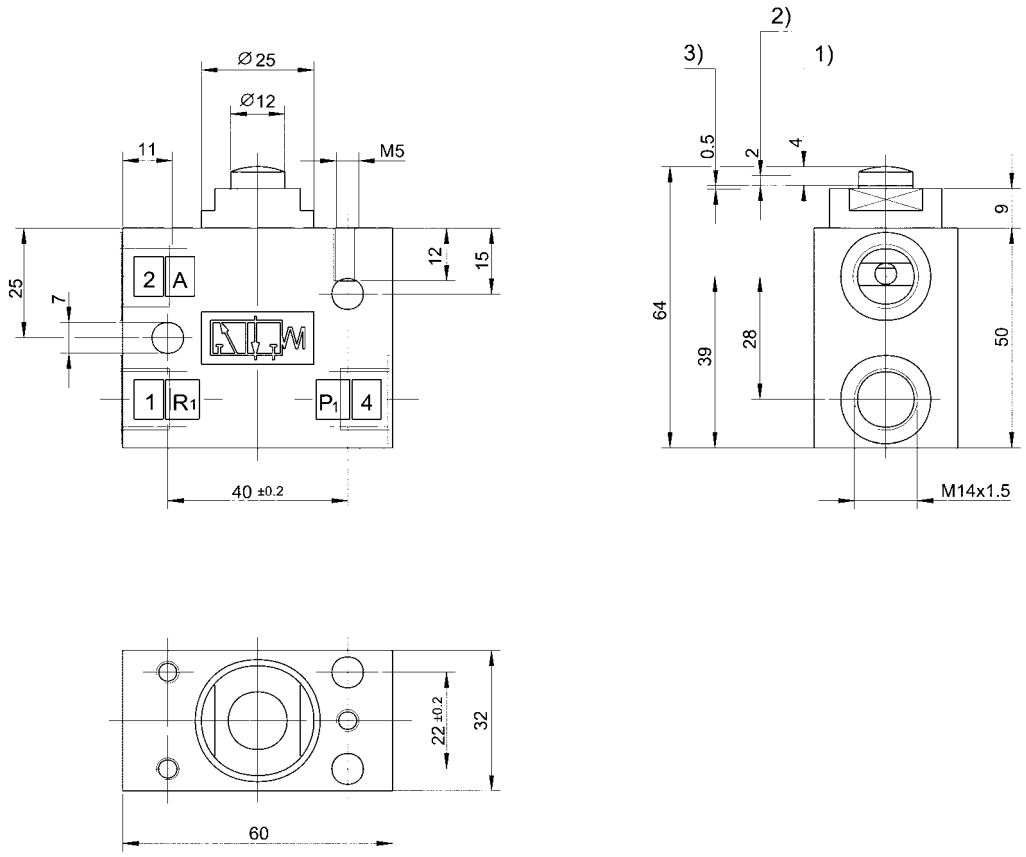
Accessories	Type	Type number
	Spare part kit	**363 003 002 2**

3/2- Way-Valve Mechanically Operated

3/2-way-valve, ND7, normally closed or normally open,
10 bar, M14 x 1.5

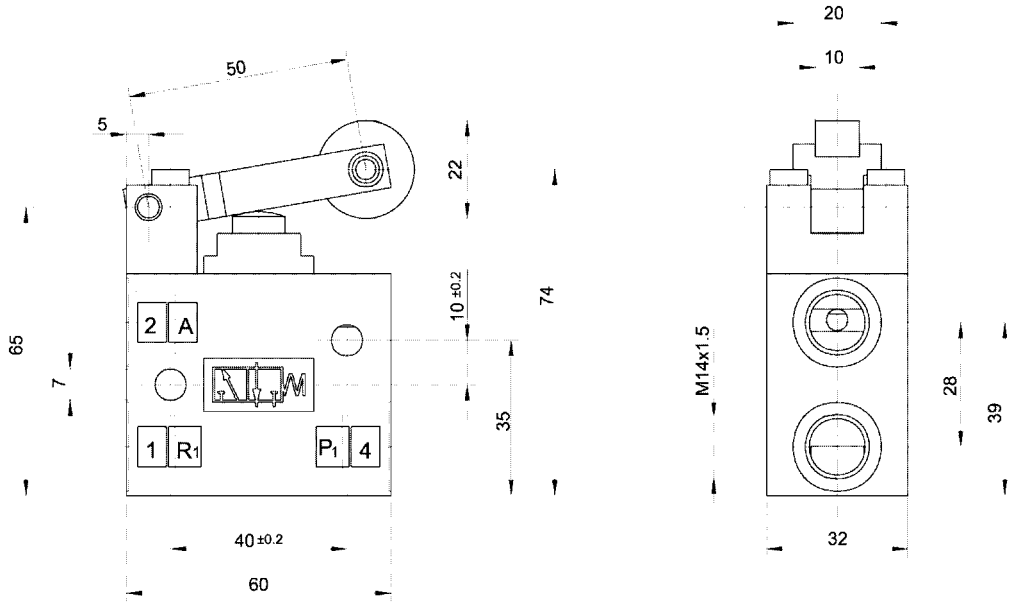
Rexroth
Bosch Group

Fig. 1



1) Stroke, 2) Ventilation resp. exhaust stroke, 3) Excess stroke

Fig. 2



3/2-Way-Valve Mechanically Operated

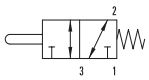
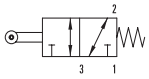
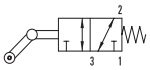
3/2-way-valve, ND7, normally closed, 30 bar, M14 x 1.5

Rexroth
Bosch Group

Technical data

Type		Poppet valve
Operating pressure	p max.	30 bar
Nominal diameter		ND 7
Nominal flow rate Qn at 6 bar, Δp = 1 bar		350 Nl/min.
Operating force		See table
Ambient temperature range		-15 °C to +80 °C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		1.5 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N

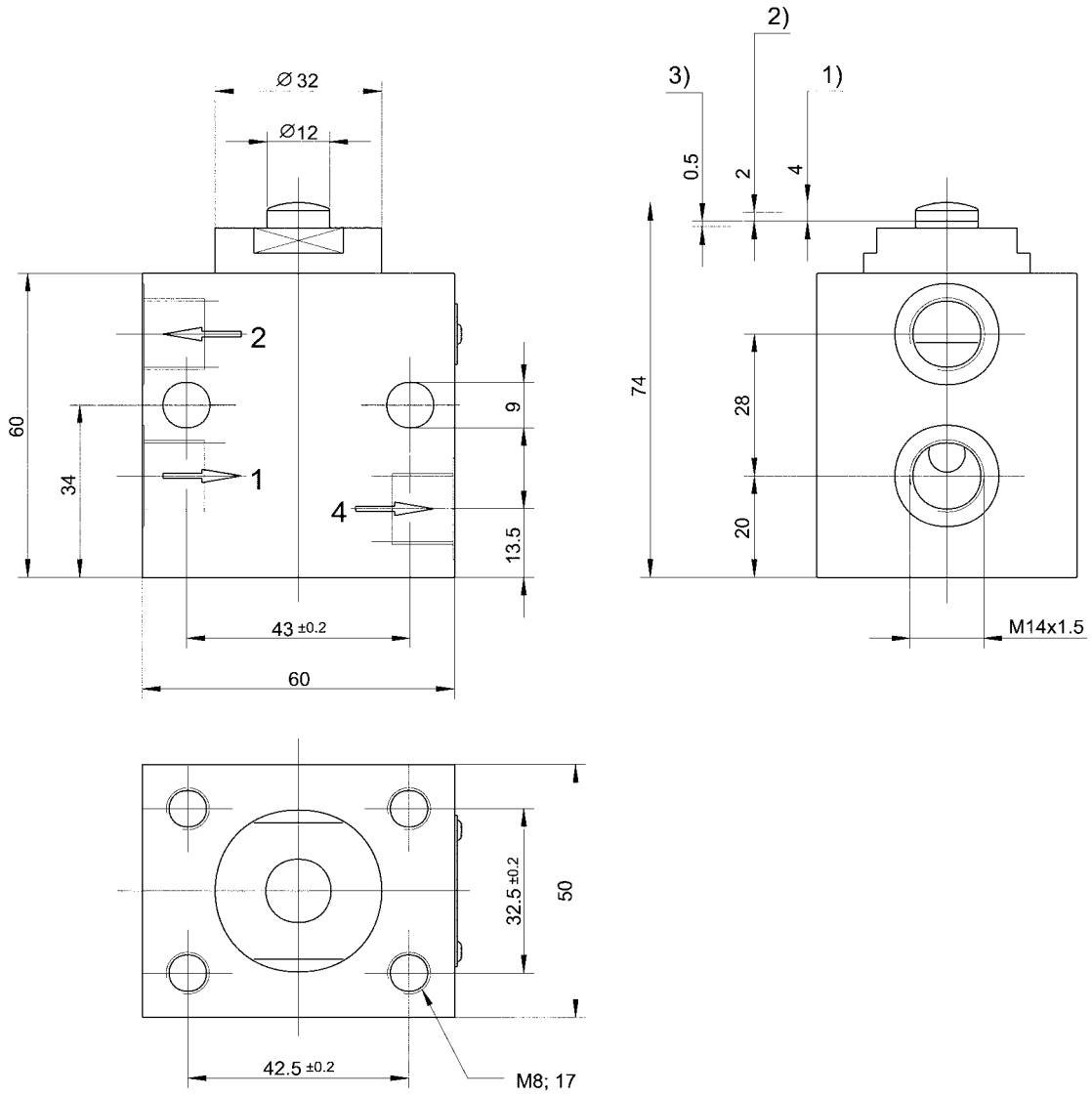
Type number

Symbol	Figure	Designation	Operating force ventilating	Operating force exhausting	Connection thread	Type number
	1	Push button	200 N	350 N	M 14 x 1.5	**363 063 000 0**
	2	Rolling lever	120 N	260 N	M 14 x 1.5	**363 043 100 0**
	3	Roller buckling lever	90 N	240 N	M 14 x 1.5	**363 057 100 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Spare part kit	**363 063 000 2**

Fig. 1



1) Stroke, 2) Ventilation resp. exhaust stroke, 3) Excess stroke

3/2-Way-Valve Mechanically Operated

3/2-way-valve, ND7, normally closed, 30 bar, M14 x 1.5

Rexroth
Bosch Group

Fig. 2

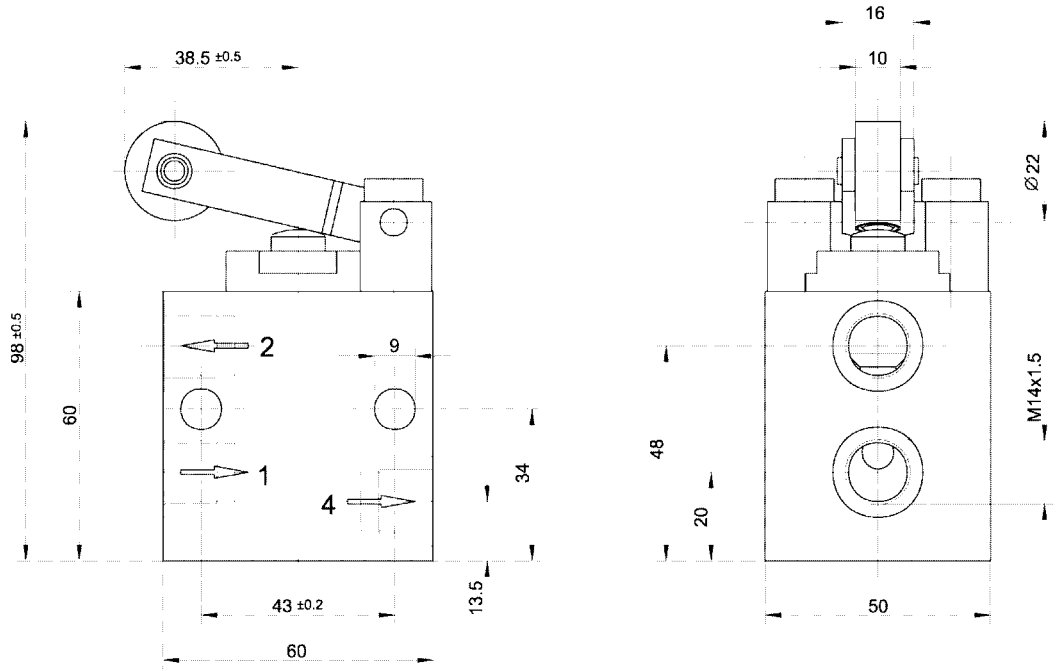
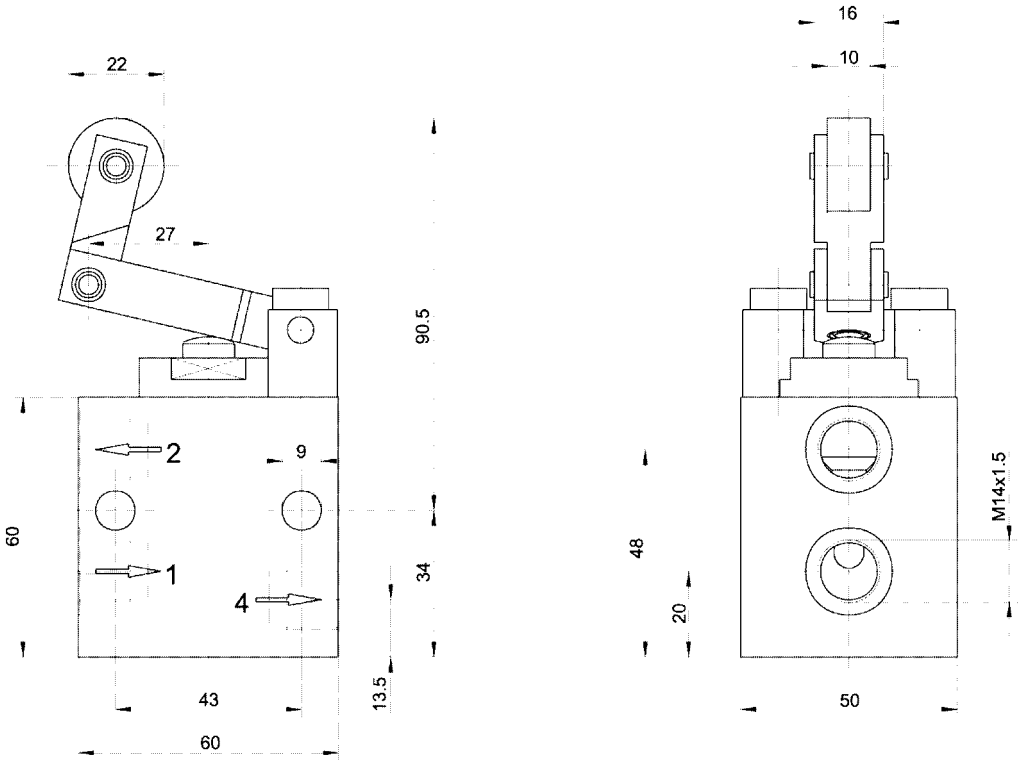


Fig. 3



3/2-Way-Valve Mechanically Operated

3/2-way-valve, ND7, normally closed or normally open, 30 bar,
M14 x 1.5, with pneumatic emergency operator

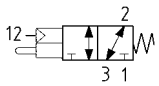
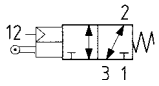
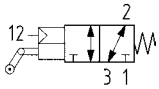
Rexroth
Bosch Group

Technical data

Type		Poppet valve
Operating pressure	p max.	30 bar
Nominal diameter		ND 7
Nominal flow rate Qn at 6 bar, Δp = 1 bar		350 Nl/min.
Operating force		See table
Ambient temperature range		-20 °C to +70 °C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight	Housing	Zn-diecasting
	Seals	BUNA-N

4

Type number

Symbol	Figure	Designation	Operating force ventilating	Operating force exhausting *	Connection thread	Type number
	1	Push button	400 N	max. 500 N	M 14 x 1.5	**371 030 000 0**
	2	Rolling lever	200 N	max. 250 N	M 14 x 1.5	**363 043 010 0**
	3	Roller buckling lever	240 N	max. 280 N	M 14 x 1.5	**363 057 010 0**

* Dependent on pressure supply

Accessories (to be ordered separately)

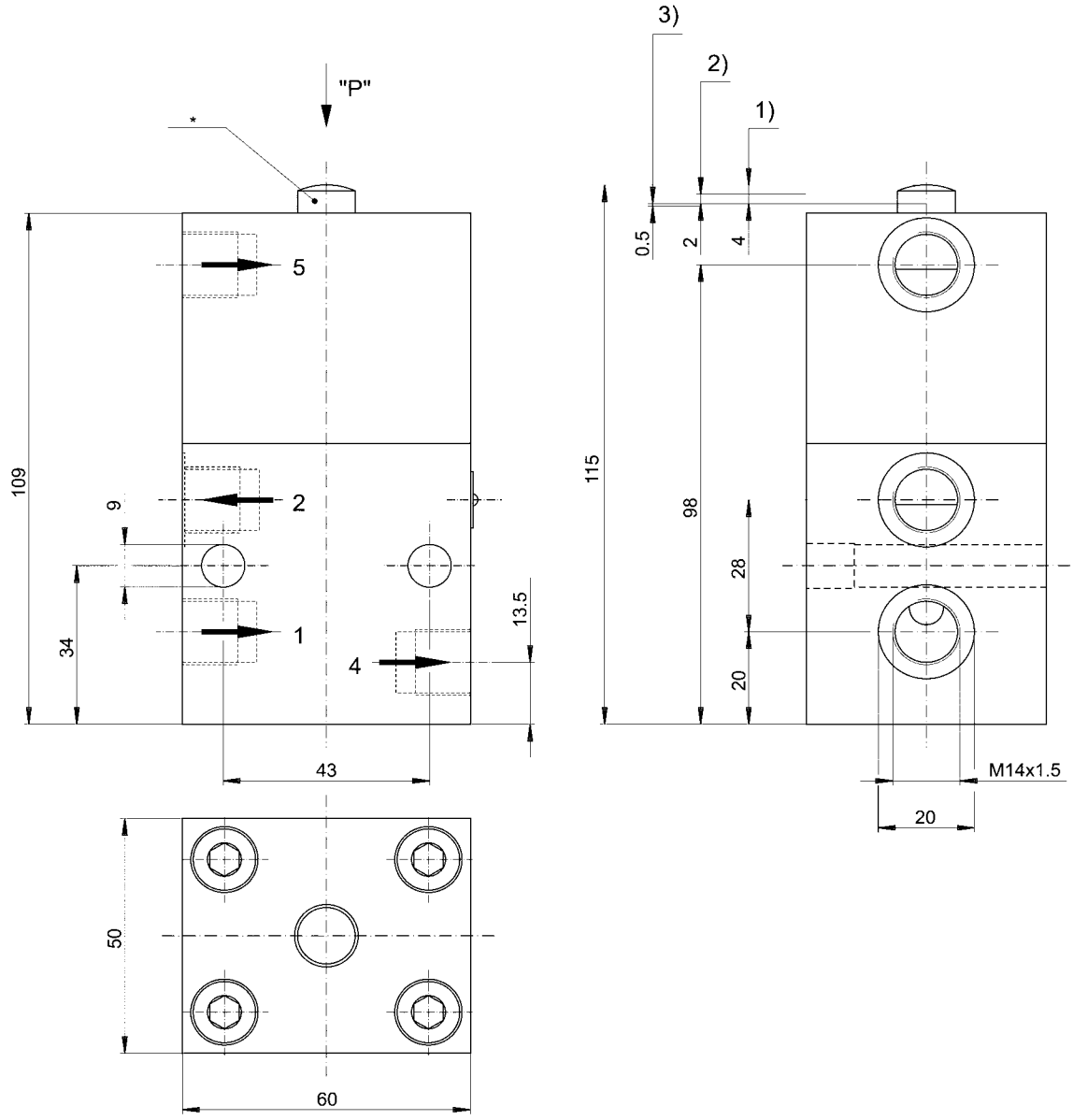
Accessories	Type	Valve	Type number
	Spare part kit	**371 030 000 0**	**371 030 000 2**
	Spare part kit	**363 043 010 0**	**371 030 001 2**
	Spare part kit	**363 057 010 0**	**371 030 000 2**

3/2-Way-Valve Mechanically Operated

3/2-way-valve, ND7, normally closed or normally open, 30 bar,
M14 x 1.5, with pneumatic emergency operator

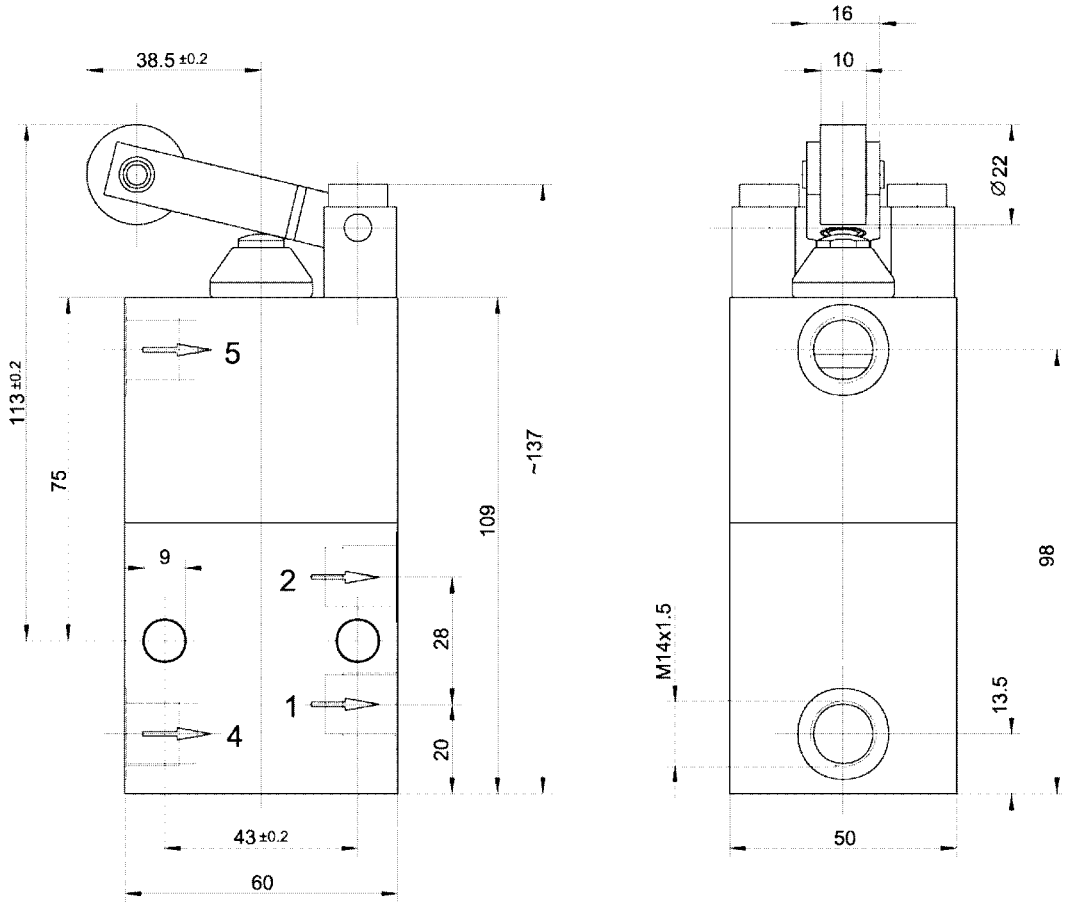
Rexroth
Bosch Group

Fig. 1



1) Stroke, 2) Ventilation resp. exhaust stroke, 3) Excess stroke
*) Emergency operator

Fig. 2

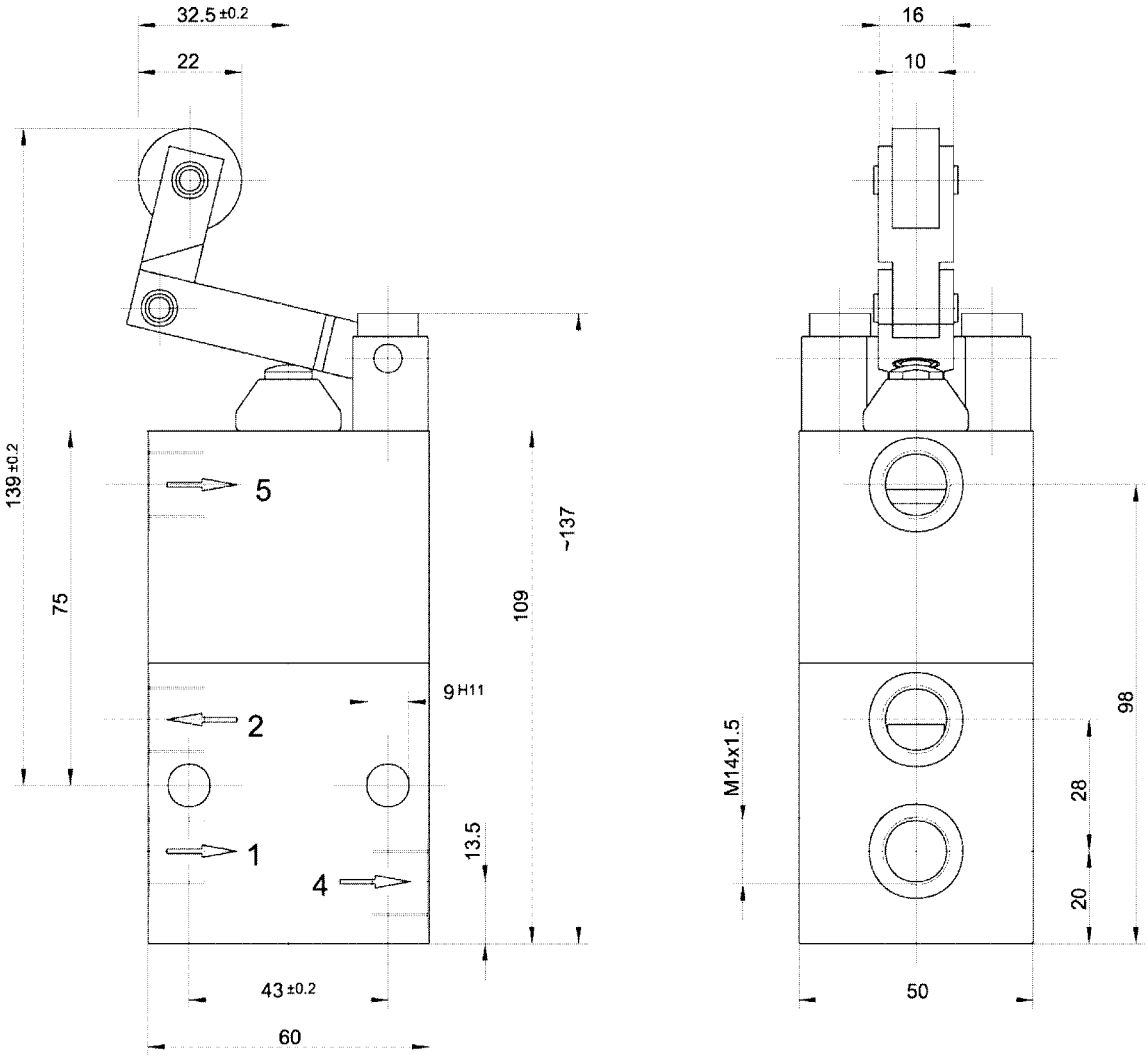

38.5 ±0.2
113 ±0.2
75
~137
109
9
5
2
1
4
28
20
43 ±0.2
60
16
10
Ø 22
98
M14x1.5
13.5
50

3/2-Way-Valve Mechanically Operated

3/2-way-valve, ND7, normally closed or normally open, 30 bar,
M14 x 1.5, with pneumatic emergency operator

Rexroth
Bosch Group

Fig. 3



3/2-Way-Valves Pneumatically Operated

Rexroth
Bosch Group

Products

3/2-way-valve, normally closed or normally open, ND7, M14x1.5

See page 24

3/2-way-valve, normally closed or normally open, ND4, M10x1

See page 25

3/2-way-valve, normally closed or normally open, ND7, M14x1.5

See page 26

3/2-way-valve, normally closed or normally open, ND7, M14x1.5

See page 28

3/2-Way-Valve, Pneumatically Operated

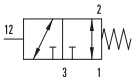
3/2-way-valve, normally closed or normally open, ND7, M14x1.5

Rexroth
Bosch Group

Technical data

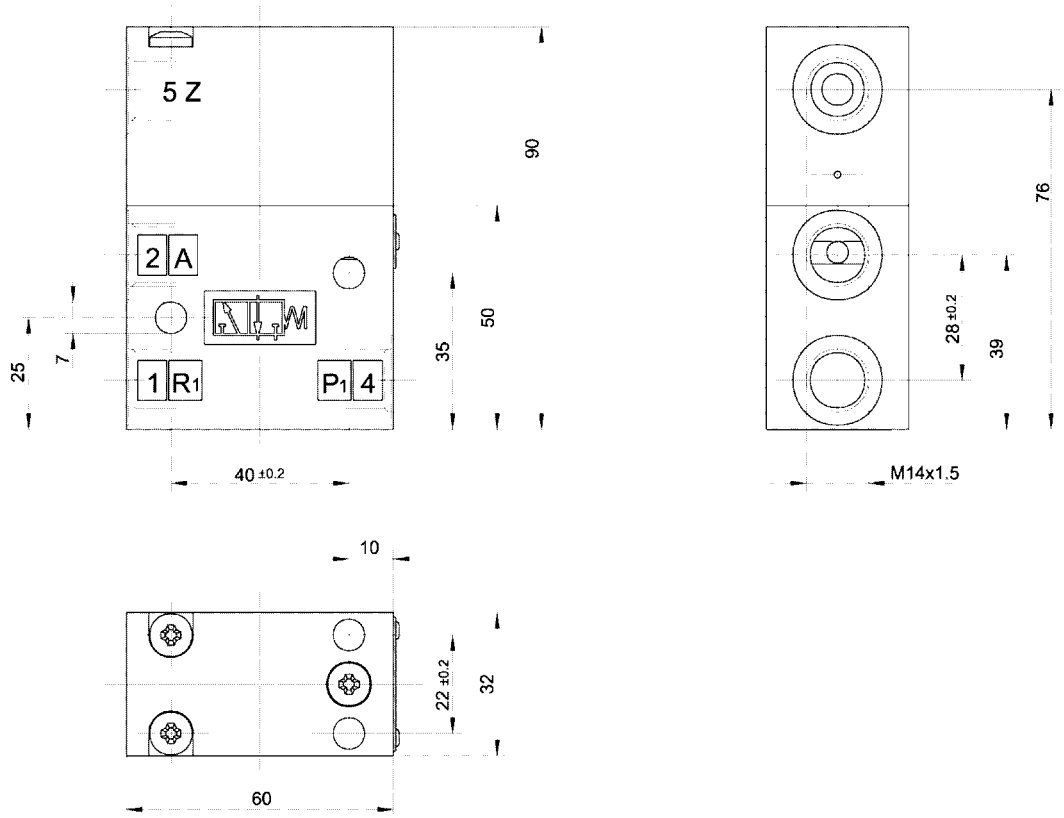
Type		Poppet valve
Operating pressure range		Max.10 bar
Control pressure range		3.5 bis 10 bar
Nominal flow rate Qn at 6 bar, Δp=1 bar		350 Nl/min
Ambient temperature range		- 20°C to + 70°C - 15 to + 40°C (at max. 10 bar)
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.5 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N

Type number

	Connection thread	Type number
	M 14 x 1.5	**371 020 000 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**371 020 000 2**



3/2-Way-Valve, Pneumatically Operated

3/2-way-valve, normally closed or normally open, ND4, M10x1

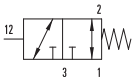
Rexroth
Bosch Group

Technical data

Type		Poppet valve
Operating pressure range	P1, A, R1	Max.10 bar
	Z	Max. 30 bar
Trip point pressure	Normally closed (NC)	Min. 5.5 bar
	Normally open (NO)	Min. 6.5 bar
	Hysteresis	2 bar
Nominal flow rate Qn at 6 bar, Δp = 1 bar		350 Nl/min
Ambient temperature range		- 25°C to + 80°C
Admissible medium	P1, A, R1	Compressed air, lubricated or non-lubricated
	Z	Compressed air, lubricated or non-lubricated, mineral oil
Weight		0.3 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N

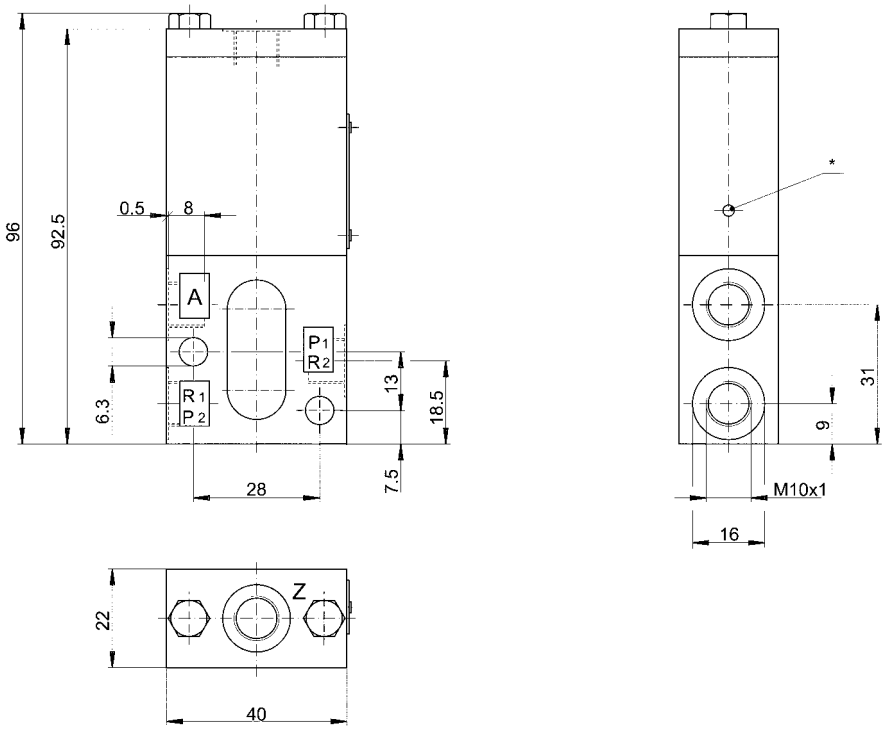
4

Type number

	Connection thread	Type number
	M 10 x 1	**371 111 010 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**371 111 000 2**



*) Exhaust

3/2-Way-valve, Pneumatically Operated

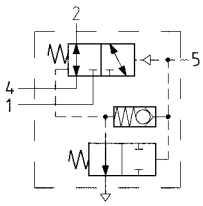
3/2-way-valve, normally closed or normally open, ND7, M14x1.5

Rexroth
Bosch Group

Technical data

Type		Poppet valve
Operating pressure range	1, 2, 4	Max.10 bar
	5	Max. 8 bar
Control pressure range		See diagram
Nominal flow rate Qn at 6 bar, Δp = 1 bar		350 Nl/min
Ambient temperature range		- 20°C to + 80°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		1.2 kg
Materials	Housing	Al-diecasting
	Seals	BUNA-N

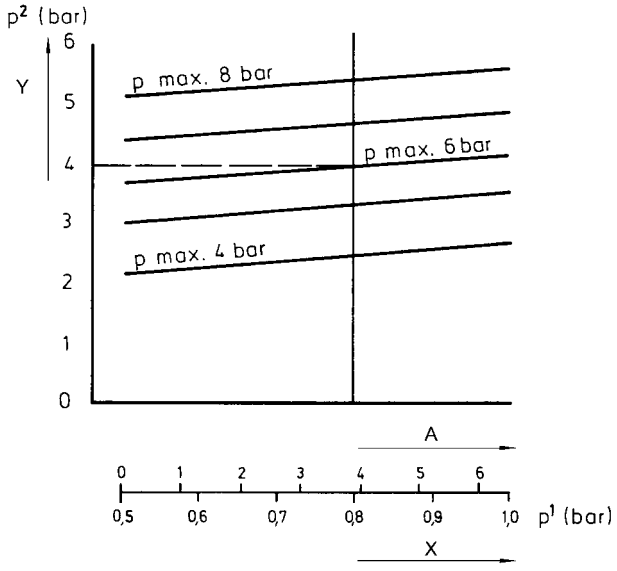
Type number

	Connection thread	Type number
	M 14 x 1.5	**371 055 000 0**

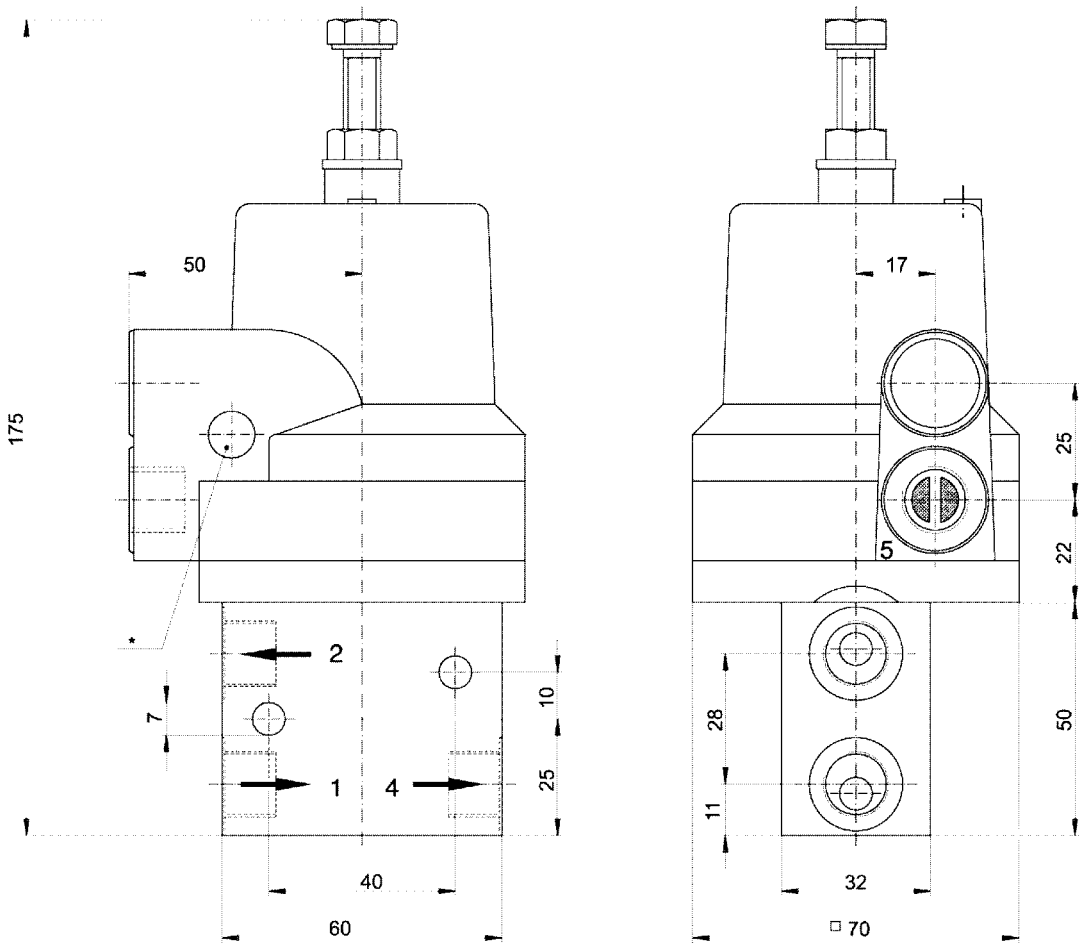
Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**371 055 000 2**

Diagram trip point pressure



X) Trip point pressure, A) Rotations at adjusting screw, Y) Reset pressure, B) Final control adjustment
Trip point pressure can be changed by ±0.3 bar by means of the adjusting screw. In this way also the reset pressure will be changed.



*) Exhaust

3/2-Way-Valve, Pneumatically Operated

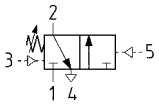
3/2-way-valve, normally closed or normally open, ND7, M14x1.5

Rexroth
Bosch Group

Technical data

Type		Poppet valve
Operating pressure range	1, 2, 4	Max.10 bar
	3	Max. 12 bar
	5	Max. 20 bar
Control pressure		See table
Nominal flow rate Qn at 6 bar, Δp = 1 bar		350 Nl/min
Ambient temperature range		- 20°C to + 70°C
Admissible medium		Compressed air, lubricated or non-lubricated,
Mineral oil		
Weight		1.2 kg
Materials	Housing	Al-diecasting
	Seals	BUNA-N

Type number

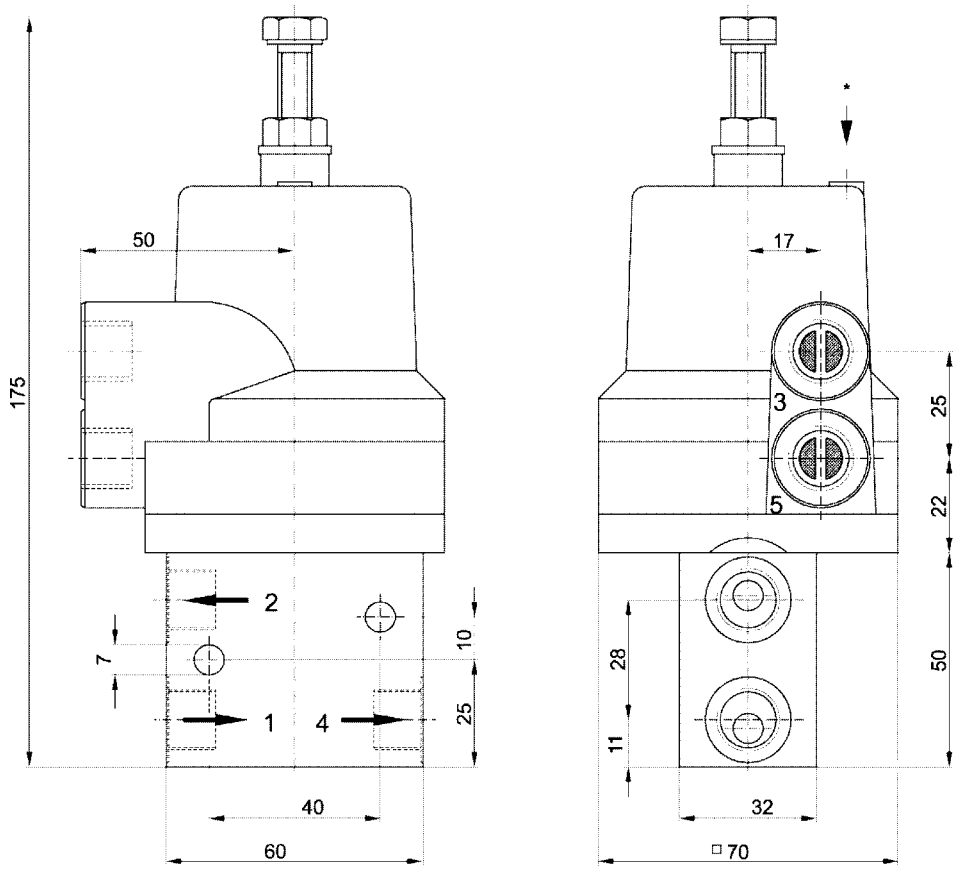
Symbol	Starting pressure Connection 5 [bar]	Switch-off pressure Connection 5 [bar]	Switch-off pressure Connection 3 [bar]	Type number
	0.4	0.2	as P5	**371 029 000 0**
	0.9	0.6	P5 - 0.1	**371 029 001 0**
	1.4	1.1	P5 - 0.6	**371 029 002 0**
	1.9	1.5	P5 - 1.1	**371 029 003 0**
	2.4	2.0	P5 - 1.6	**371 029 004 0**
	2.9	2.5	P5 - 2.1	**371 029 005 0**
	3.4	3.0	P5 - 2.6	**371 029 006 0**
	3.9	3.4	P5 - 3.1	**371 029 007 0**
	4.4	3.9	P5 - 3.6	**371 029 008 0**
	4.9	4.3	P5 - 4.1	**371 029 009 0**
	5.4	4.8	P5 - 4.6	**371 029 010 0**
	5.9	5.3	P5 - 5.1	**371 029 011 0**
	6.4	5.8	P5 - 5.6	**371 029 012 0**
	6.9	6.3	P5 - 6.1	**371 029 013 0**
	7.4	6.8	P5 - 6.6	**371 029 014 0**
	7.9	7.3	P5 - 7.1	**371 029 015 0**
	12.4	11.5	P5 - 11.4	**371 029 019 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**371 029 000 2**

3/2-Way-Valve, Pneumatically Operated

3/2-way-valve, normally closed or normally open, ND7, M14x1.5



*) Starting pressure stamped

Rexroth
Bosch Group

Products

3/2-way-valve, electromagnetically operated, normally closed or open, monostable, ND7, M14x1.5

See page 31

5/2-way-valve, electromagnetically operated, monostable, ND7, M14x1.5

See page 33

5/2-way-valve, electromagnetically operated, bistable, ND7, M14x1.5

See page 35

3/2-way-valve, electromagnetically operated, normally closed or open, monostable, ND12, G1/2

See page 37

5/2-way-valve, electromagnetically operated, monostable, ND12, G 1/2

See page 39

3/2-way-valve, electromagnetically operated, normally closed or open, monostable, ND12, G 1/2

See page 41

5/2-way-valve, electromagnetically operated, monostable, ND12, G1/2

See page 43

3/2-and 5/2-Way-Solenoid Valves

3/2-way-valve, electromagnetically operated,
normally closed or open, monostable, ND7, M14x1.5

Rexroth
Bosch Group

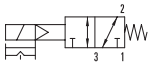
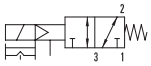
Technical data

Type		Slide valve
Operating pressure range		See table
Nominal flow rate	Qn	
at 6 bar, Δp = 1 bar		1100 Nl/min
Ambient temperature range		-15°C to upper limit see diagram
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.75 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Operating voltages		24 V DC - 20 % to upper limit see diagram
Current consumption	DC 24V	190 mA
Insulation class		F to VDE 0580
Protection with el. connector		IP 65 according to DIN VDE 0470 *
Duty cycle	ED	100%

Application area

Suitable for all applications. Valve is non-overlapping.
* Plugs to be ordered separately

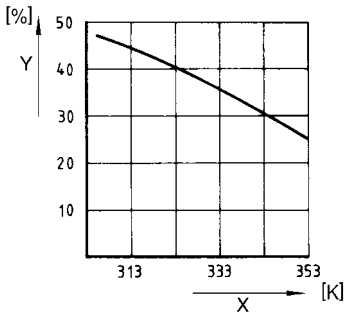
Type number

	Function pilot control	Operating pressure range	Connection thread	Type number
	NC-valve without separate pilot control	3 to 10 bar	M 14 x 1.5	**372 352 222 0**
	NO-valve without separate pilot control	3 to 10 bar	M 14 x 1.5	**372 354 222 0**
	NC-/NO-valve with separate pilot control	-0.95 to +10 bar Pilot pressure ≥ 3 bar	M 14 x 1.5	**372 353 222 0**

Accessories (to be ordered separately)

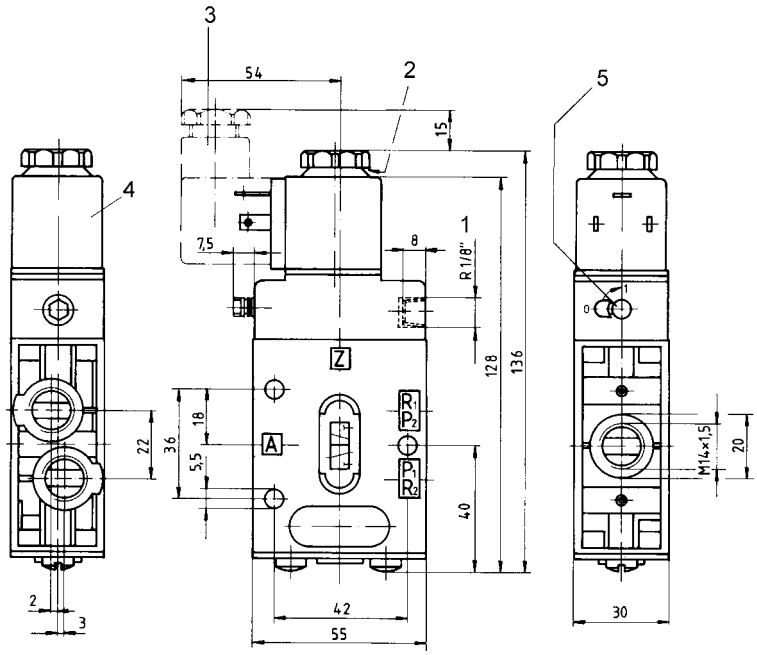
Symbol	Type	Type number
	Spare part kit	**372 352 000 2**
	Plug	**894 100 030 2**
	Voltage	24 V DC ±20%
	Coil	**542 070 702 2**

Ambient temperature range-voltage tolerance-diagram



X) Ambient temperature range , Y) Tolerance

Installation dimensions



1) Only with separate pilot control G 1/8 2) After removal of cap M5 internal thread 3) Plug can be fixed at 180° intervals
4) Coil can be fixed at 45° intervals 5) Manual override

3/2 and 5/2-Way-Solenoid-Valves

5/2-way-valve, electromagnetically operated, monostable,
ND7, M14x1.5

Rexroth
Bosch Group

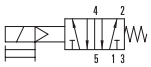
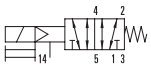
Technical data

Type		Slide valve
Operating pressure range		See table
Nominal flow rate	Qn	
at 6 bar, Δp = 1 bar		1100 Nl/min
Ambient temperature range		-15°C to upper limit see table
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.85 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Operating voltages		24 V DC - 20 % to upper limit see table
Current consumption	DC 24V	190 mA
Insulation class		F according to VDE 0580
Protection with el. connector		IP 65 according to DIN VDE 0470 *
Duty cycle	ED	100%

Application area

Suitable for all applications. Valve is non-overlapping.
* Plugs to be ordered separately

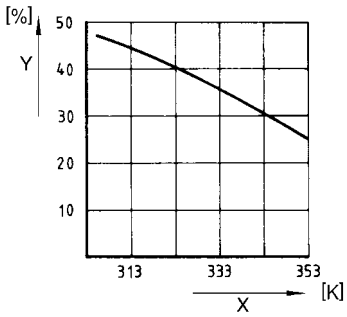
Type number

	Function Pilot control	Operating pressure range	Type number
	Without separate pilot control	3 to 10 bar	**372 652 222 0**
	With separate pilot control	-0.95 to +10 bar Pilot pressure ≥ 3 bar	**372 653 222 0**

Accessories (to be ordered separately)

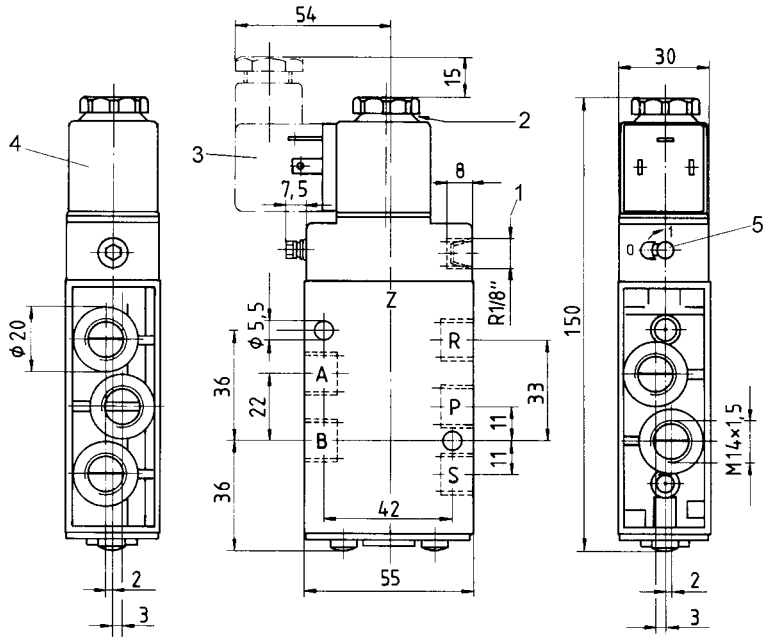
Symbol	Type	Type number
	Spare part kit	**372 352 000 2**
	Plug	**894 100 030 2**
	Voltage	24 V DC ±20%
	Coil	**542 070 702 2**

Ambient temperature range-voltage tolerance-diagram



X) Ambient temperature range, Y) Tolerance

Installation dimensions



1) Only with separate pilot control G 1/8 2) After removal of cap M5 internal thread 3) Plug can be fixed at 180° intervals
4) Coil can be fixed at 45° intervals 5) Manual override

3/2- and 5/2-Way-Solenoid-Valves

5/2-way-valve, electromagnetically operated, bistable,
ND7, M14x1.5

Rexroth
Bosch Group

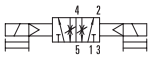
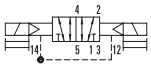
Technical data

Type		Slide valve
Operating pressure range		See table
Nominal flow rate	Qn	
at 6 bar, Δp = 1 bar		1100 Nl/min
Ambient temperature range		-15°C to upper limit see table
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		1.1 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Operating voltages		24 V DC - 20 % to upper limit see table
Current consumption	DC 24V	190 mA
Insulation class		F according to VDE 0580
Protection with plug		IP 65 according to DIN VDE 0470 *
Duty cycle	ED	100%

Application area

Suitable for all applications. Valve is non-overlapping.
* Plugs to be ordered separately

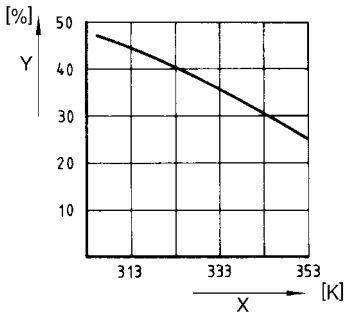
Type number

	Function Pilot control	Operating pressure range	Type number
	Without separate pilot control	3 to 10 bar	**372 656 222 0**
	With separate pilot control	-0.95 to +10 bar Pilot pressure ≥ 3 bar	**372 657 222 0**

Accessories (to be ordered separately)

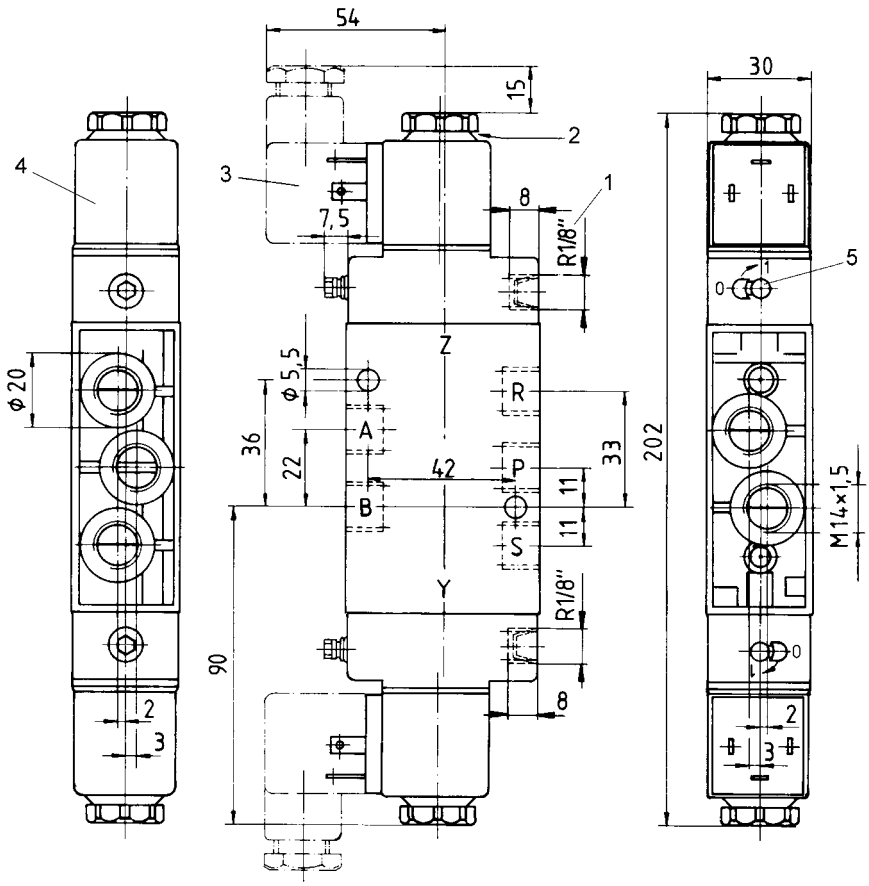
Symbol	Type	Type number
	Spare part kit	**372 352 000 2**
	Plug	**894 100 030 2**
	Voltage	24 V DC ±20%
	Coil	**542 070 702 2**

Ambient temperature range-voltage tolerance-diagram



X) Ambient temperature range , Y) Tolerance

Installation dimensions



1) Only with separate pilot control G 1/8 2) After removal of cap M5 internal thread 3) Plug can be fixed at 180° intervals
4) Coil can be fixed at 45° intervals 5) Manual override

3/2- and 5/2-Way-Solenoid Valves

3/2-way-valve, electromagnetically operated,
normally closed or open, monostable, ND12, G1/2

Rexroth
Bosch Group

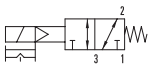
Technical data

Type		Slide valve
Operating pressure range		See table
Nominal flow rate	Qn	
at 6 bar, Δp = 1 bar		1100 Nl/min
Ambient temperature range		-15°C to +70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		1.15 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Operating voltages		24 V DC ± 20 % -20% to upper limit see diagram
Current consumption		190 mA
Insulation class		F according to VDE 0580
Protection with plug		IP 65 according to DIN VDE 0470 *
Duty cycle	ED	100%

Application area

Suitable for all applications. The valve is non-overlapping.
* Plugs to be ordered separately

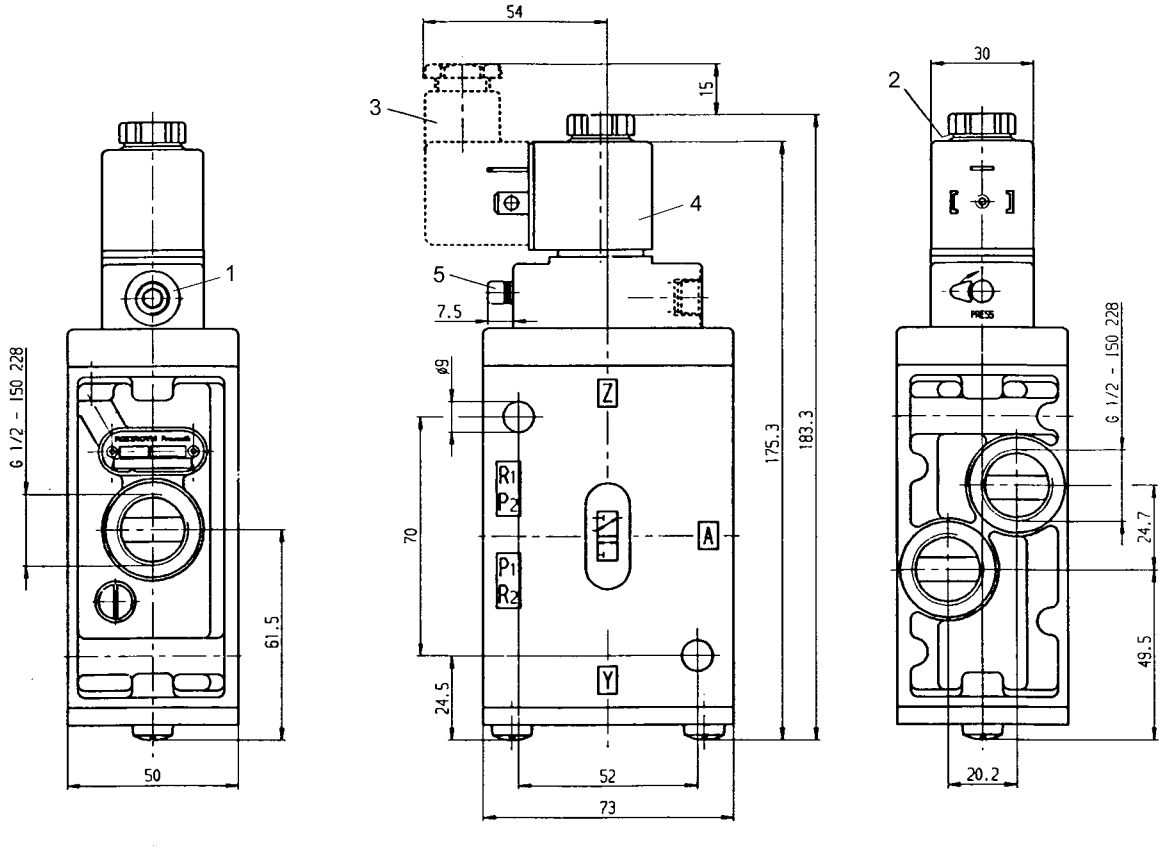
Type number

	Function Pilot control	Operating pressure range	Type number
	NC-valve Without separate pilot control	2 to 10 bar	**372 356 222 0**
	NO-valve Without separate pilot control	2 to 10 bar	**372 355 222 0**

Accessories (to be ordered separately)

Symbol	Type	Type number
	Spare part kit	**372 355 000 2**
	Plug	**894 100 030 2**
	Voltage	24 V DC ±20%
	Coil	**542 070 702 2**

Installation dimensions



1) Only with separate pilot control G 1/8 2) After removal of cap internal thread M5 3) Plug can be fixed at 180° intervals
4) Coil can be fixed at 45° intervals 5) Manual override

3/2- and 5/2-Way-Solenoid Valves

5/2-way-valve, electromagnetically operated, monostable,
ND12, G1/2

Rexroth
Bosch Group

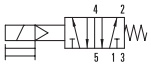
Technical data

Type		Slide valve
Operating pressure range		See table
Nominal flow rate	Qn	
at 6 bar, Δp = 1 bar		1100 Nl/min
Ambient temperature range		-15°C to + 70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		1.3 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Operating voltages		24 V DC ± 20 %
Current consumption	DC 24V	190 mA
Insulation class		F according to VDE 0580
Protection with plug		IP 65 according to DIN VDE 0470 *
Duty cycle	ED	100%

Application area

Suitable for all applications. The valve is non-overlapping.
* Plugs to be ordered separately

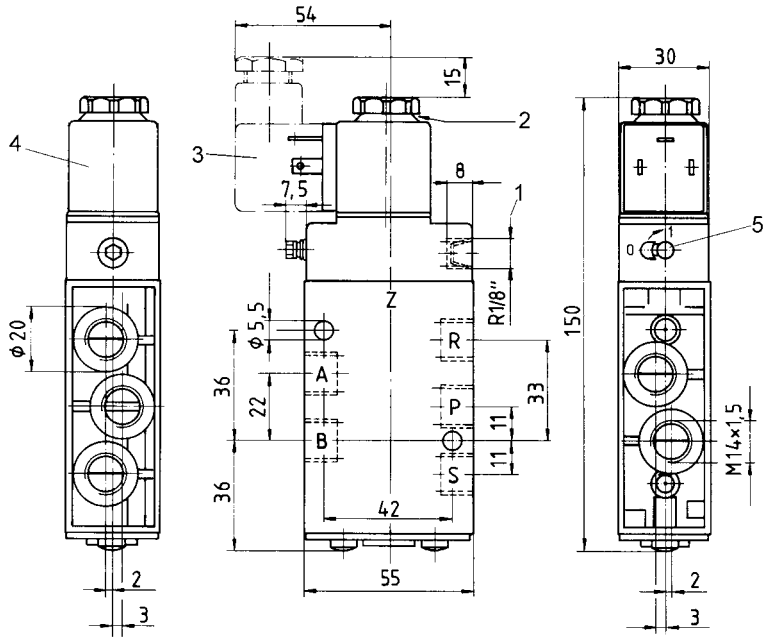
Type number.

	Function Pilot control	Operating pressure range	Type number
	Without separate pilot control	2 to 10 bar	**372 662 222 0**

Accessories (to be ordered separately)

Symbol	Type	Type number
	Spare part kit	**372 222 000 2**
	Plug	**894 100 030 2**
	Voltage	24 V DC ±20%
	Coil	**542 070 702 2**

Installation dimensions



1) Only with separate pilot control G 1/8 2) After removal of cap internal thread M5 3) Plug can be fixed at 180° intervals
4) Coil can be fixed at 45° intervals 5) Manual override

3/2- and 5/2-Way-Solenoid Valves

3/2-way-valve, electromagnetically operated,
normally closed or open, monostable, ND12, G1/2

Rexroth
Bosch Group

Technical data

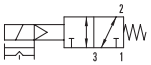
Type		Slide valve
Operating pressure range		See table
Nominal flow rate	Qn	
at 6 bar, Δp = 1 bar		1100 Nl/min
Ambient temperature range		-15°C to +70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		1.15 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Operating voltages		24 V DC ± 20 % -20% to upper limit see diagram
Current consumption		190 mA
Insulation class		F according to VDE 0580
Protection with plug		IP 65 according to DIN VDE 0470 *
Duty cycle	ED	100%

4

Application area

Suitable for all applications. The valve is non-overlapping.
* Plugs to be ordered separately

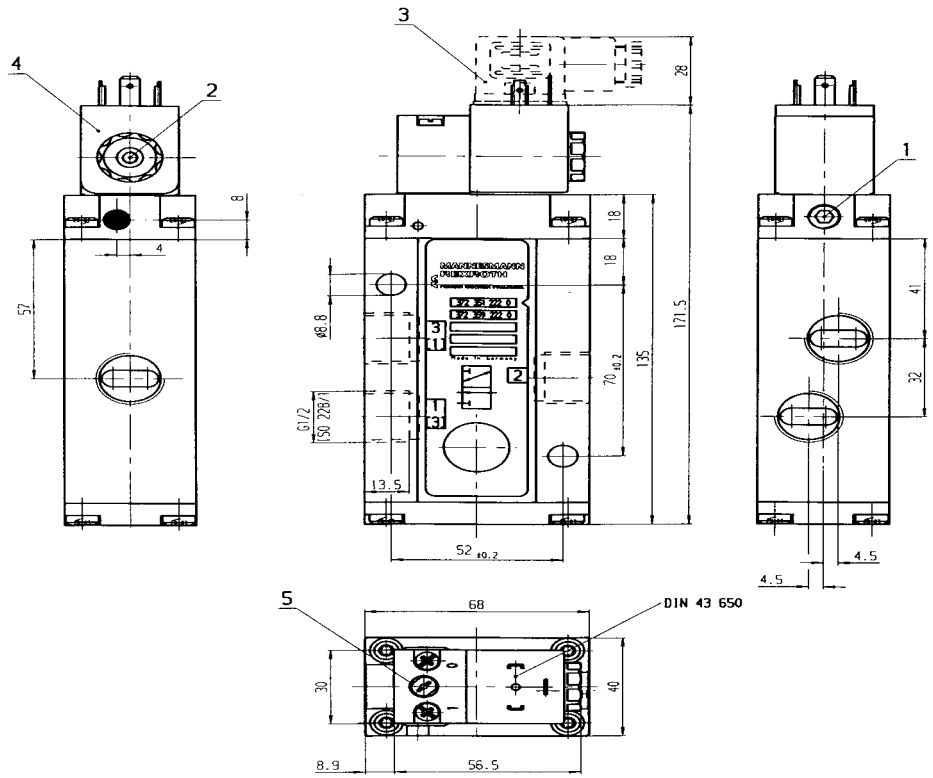
Type number

	Function Pilot control	Operating pressure range	Type number
	NC / NO-valve Without separate pilot control	2 to 10 bar	**372 351 222 0**
	NC / NO-valve With separate pilot control	2 to 10 bar	**372 359 222 0**

Accessories (to be ordered separately)

Symbol	Type	Type number
	Spare part kit	**372 351 000 2**
	Plug	**894 100 030 2**
	Voltage	24 V DC ±20%
	Coil	**542 070 702 2**

Installation dimensions



1) Only with separate pilot control G 1/8 2) After removal of cap internal thread M5 3) Plug can be fixed at 180° intervals
4) Coil can be fixed at 45° intervals 5) Manual override

3/2- and 5/2-Way-Solenoid Valves

5/2-way-valve, electromagnetically operated,
monostable, ND12, G1/2

Rexroth
Bosch Group

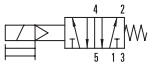
Technical data

Type		Slide valve
Operating pressure range		See table
Nominal flow rate	Qn	
at 6 bar, Δp = 1 bar		1100 Nl/min
Ambient temperature range		-15°C to + 70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		1.3 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Operating voltages		24 V DC ± 20 %
Current consumption	DC 24V	190 mA
Insulation class		F according to VDE 0580
Protection with plug		IP 65 according to DIN VDE 0470 *
Duty cycle	ED	100%

Application area

Suitable for all applications. The valve is non-overlapping.
* plugs to be ordered separately

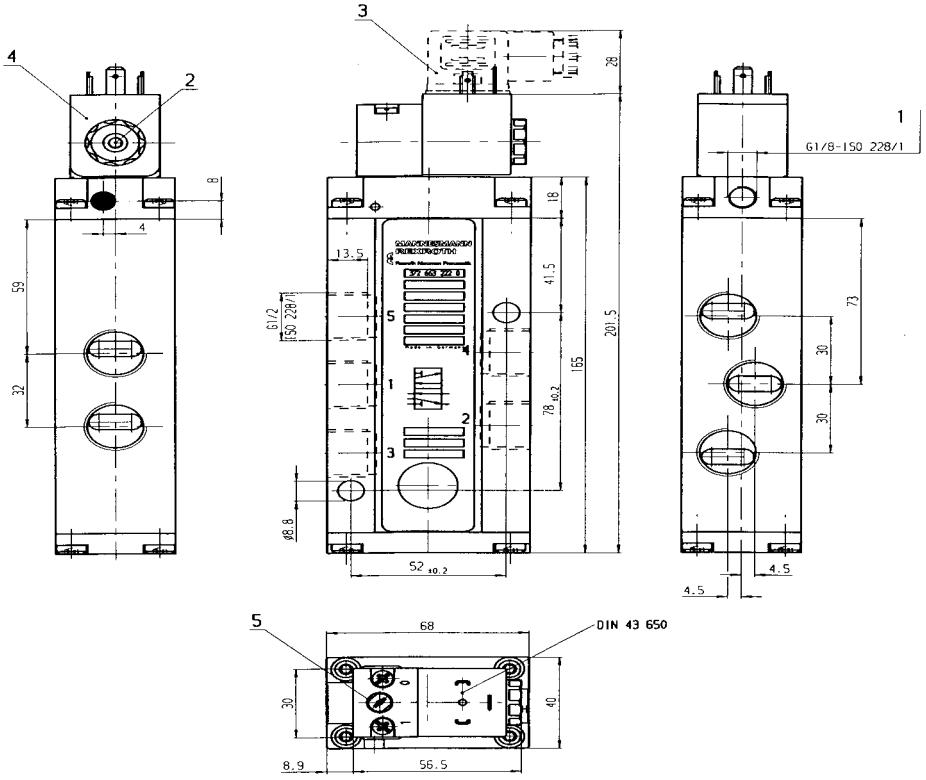
Type number.

	Function Pilot control	Operating pressure range	Type number
	Without separate pilot control	2 to 10 bar	**372 663 222 0**

Accessories (to be ordered separately)

Symbol	Type	Type number
	Spare part kit	**372 663 000 2**
	Plug	**894 100 030 2**
	Voltage	24 V DC ±20%
	Coil	**542 070 702 2**

Installation dimensions



1) Only with separate pilot control G 1/8 2) After removal of cap internal thread M5 3) Plug can be fixed at 180° intervals
4) Coil can be fixed at 45° intervals 5) Manual override

Rexroth
Bosch Group

Products

Safety Valve, threaded

See page 46

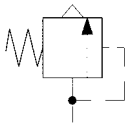
Other Valves
Safety valve, threaded

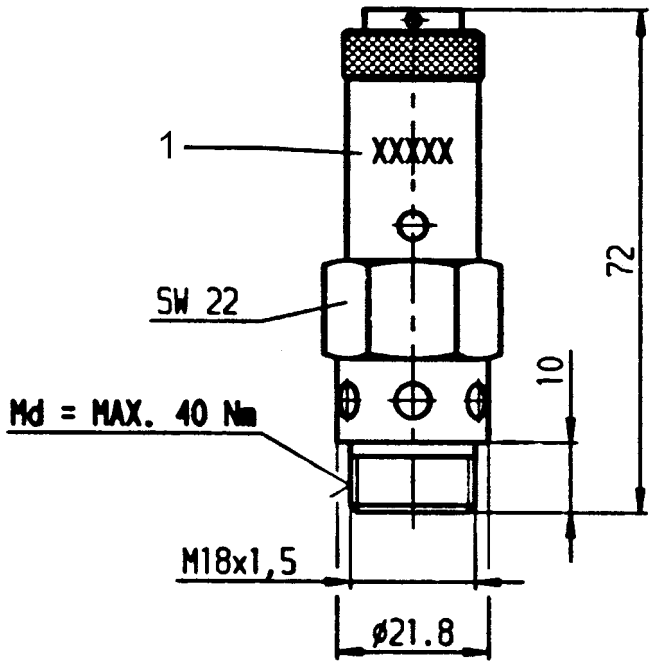
Rexroth
Bosch Group

Technical data

Type		Safety valve
Operating pressure range		See table
Exhausting capacity		See table
Ambient temperature range		-10°C to +180°C
Admissible medium		Compressed air
Weight		0.4 kg
Materials	Housing	Brass
	Seal	Viton
	Spring	X 5 CrNi 17.7

Type number

Symbol	Response pressure [bar]	Bleed capacity [l/min]	Type number
	2.0 ± 0.3	1200	**334 306 100 0**
	3.8 ± 0.38	1960	**334 306 101 0**
	8.0 ± 0.8	3700	**334 306 102 0**
	10.0 ± 1.0	4550	**334 306 103 0**
	15.0 ± 1.5	6660	**334 306 104 0**
	12.0 ± 1.2	5350	**334 306 105 0**



1) Response pressure stamped

Rexroth
Bosch Group

Products

Shuttle valve for oil and air

See page 48

Check valves, G1/8 - G 3/4

See page 50

Check choke valves, G1/4, G3/8, M14x1.5

See page 51

Quick-action NO-valve G1/4

See page 53

Quick-action NO-valve M22x1.5

See page 54

Quick-action NO-valve, G1 NPT

See page 55

Other Valves

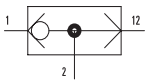
Shuttle valve for oil and air

Rexroth
Bosch Group

Technical data

Type		Poppet valve
Operating pressure range		See table
Ambient temperature range		-20° C to +70° C
Admissible medium		Compressed air, lubricated or non-lubricated
	For 338 500 000 0	Hydraulic oil
Weight		See table
Materials	Housing	Brass
	Seals	NBR

Type number

	ND	Fig.	Connections *	Operating pressure range	Weight	Type number
	7	1	M 14 x 1.5	to 150 bar	0.5 kg	**338 500 000 0**
	7	1	M 14 x 1.5	to 40 bar	0.5 kg	**338 500 001 0**
	10	2	M 22 x 1.5	0.2 to 15 bar	0.2 kg	**434 202 100 0**
	7	3	M 14 x 1.5	0.3 to 10 bar	0.08 kg	**534 017 000 0**

* According to ISO 228/1

Fig. 1

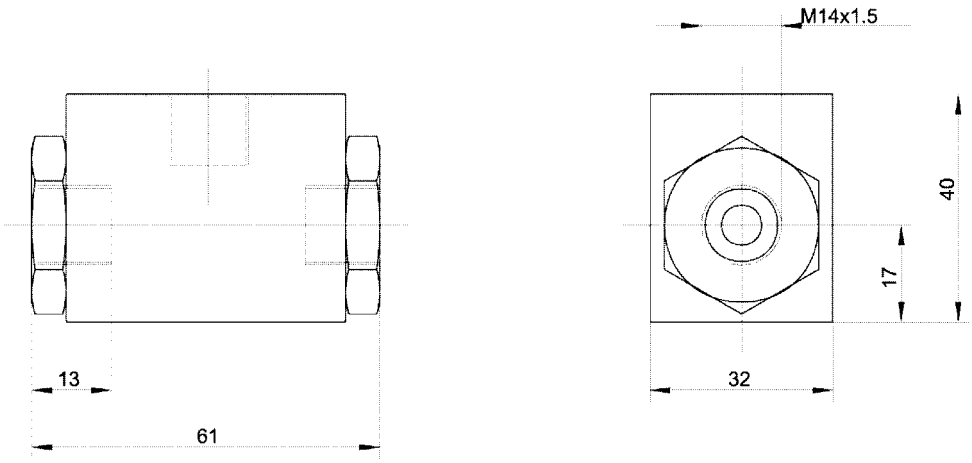


Fig. 2

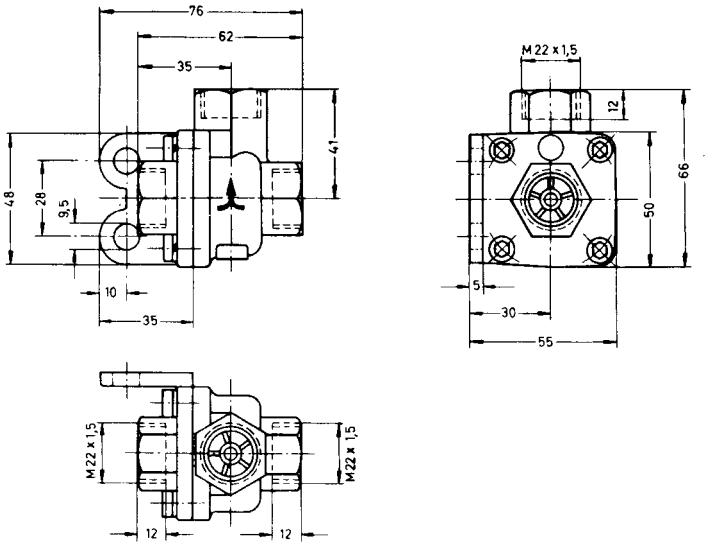
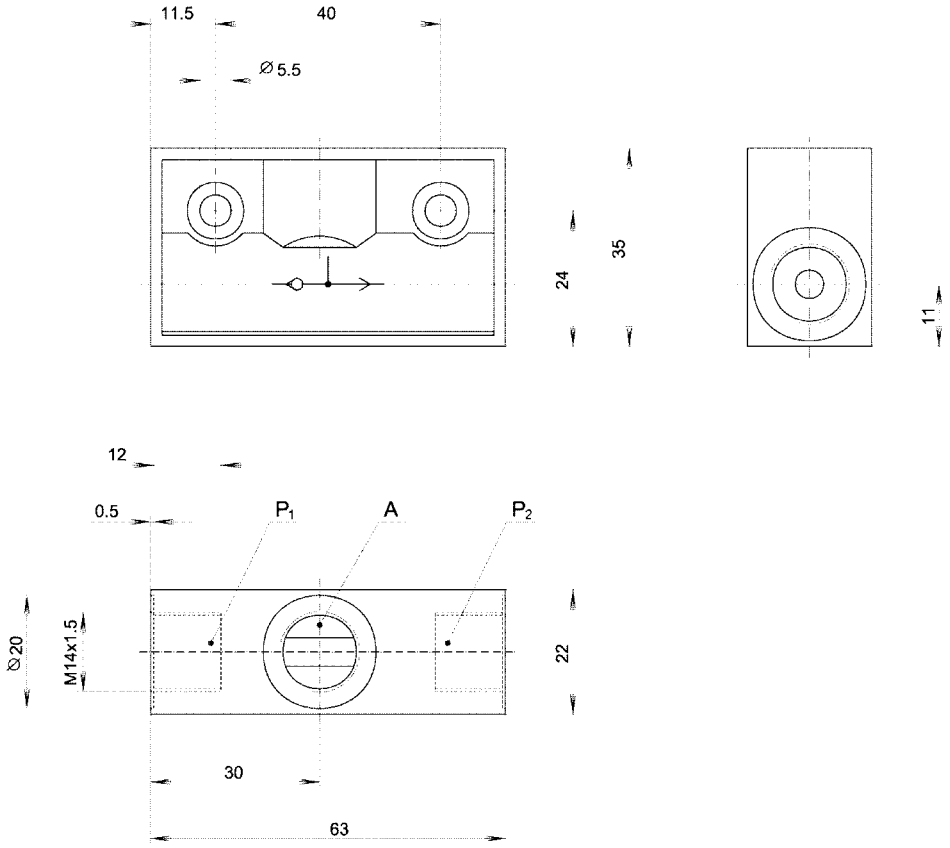

76
62
35
41
48
28
9,5
10
35
M 22 x 1,5
12
66
50
5
30
55
M 22 x 1,5
M 22 x 1,5
12
12

Fig. 3


11.5
40
Ø 5.5
35
24
11
12
0.5
P1
A
P2
Ø 20
M14x1.5
22
30
63

Other Valves

Check valves, G1/8 - G3/4

Rexroth
Bosch Group

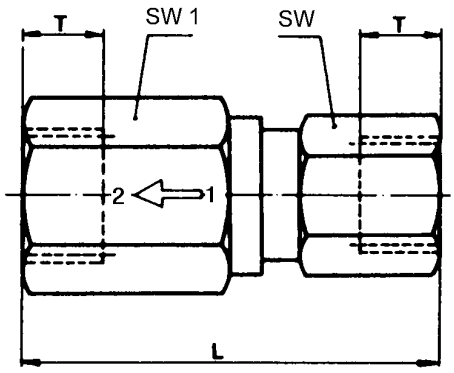
Technical data

Type		Poppet valve
Operating pressure range		See table
Nominal flow rate	Qn	
at 6 bar, Δp = 1 bar		See table
Ambient temperature range		See table
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		See table
Materials	Housing	Brass
	Seals	NBR

Type number

	ND	Connections *	Ambient temperature range	Operating pressure range	Qn	Weight	Type number
	4	G 1/8	-15°C to +60°C	0.5 to 15 bar	230 Nl/min	0.072	**534 098 100 0**
	8	G 1/4	-15°C to +60°C	0.5 to 15 bar	1050 Nl/min	0.168	**534 098 110 0**
	10	G 3/8	-15°C to +60°C	0.5 to 15 bar	1650 Nl/min	0.263	**534 098 120 0**
	12	G 1/2	-15°C to +60°C	0.5 to 15 bar	2200 Nl/min	0.283	**534 098 130 0**
	20	G 3/4	-15°C to +60°C	0.5 to 15 bar	6200 Nl/min	0.62	**534 098 140 0**

* According to ISO 228/1



ND	L	T	SW	SW1
4	44	8	17	17
8	57	10	22	24
10	66	10	27	30
12	76	14	27	30
20	89.5	16	36	41

Other Valves

Check choke valves, G1/4, G3/8, M14x1.5

Rexroth
Bosch Group

Technical data

Type		Cone choke
Operating pressure	p max.	10 bar
Nominal flow rate	Qn	
at 6 bar, Δp = 1 bar		See table
Ambient temperature range		-25° C to +80° C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		See table
Materials	Housing	Aluminium, black anodized
	Seals	NBR

Type number

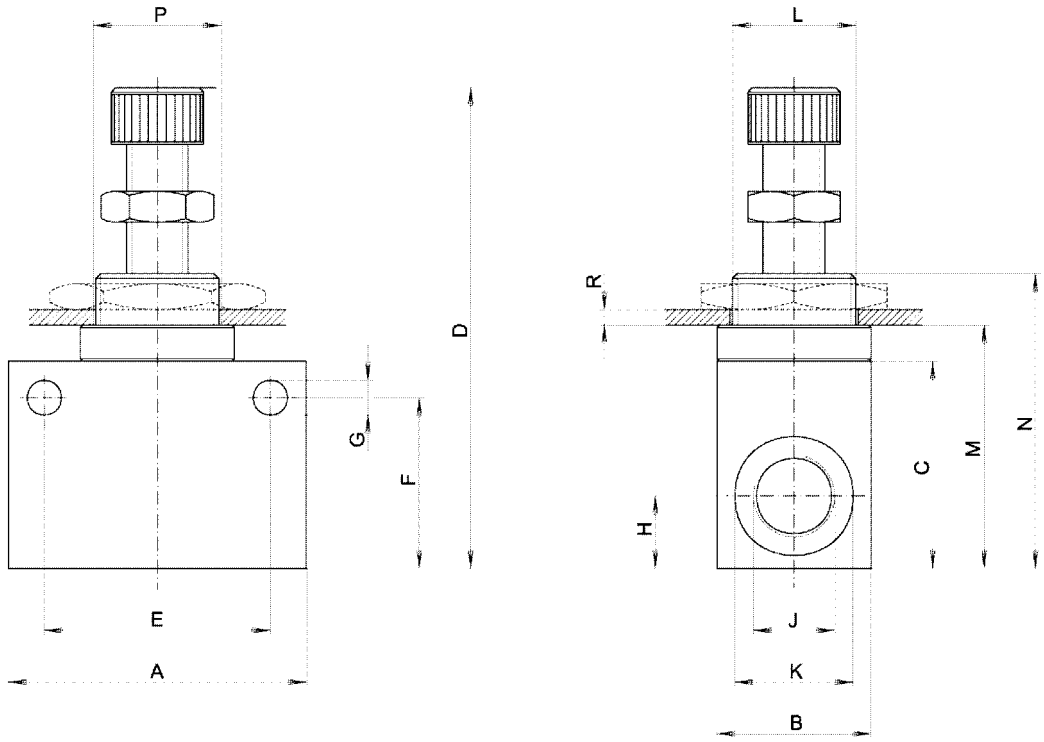
	ND	Fig.	Connections	Qn in direction of flow control max.	Qn in kick-back-direction	Return line pressure	Weight	Type number
	4	1	G 1/4 *	500 Nl/min	750 Nl/min	< 0.02 bar	0.07 kg	**534 112 210 0**
	6	1	G 3/8 *	1300 Nl/min	1350 Nl/min	< 0.01 bar	0.08 kg	**534 112 310 0**
	6	2	M14 x 1.5	1300 Nl/min	1350 Nl/min	< 0.01 bar	0.085 kg	**534 108 000 0**

* According to ISO 228/1

Accessories (to be ordered separately)

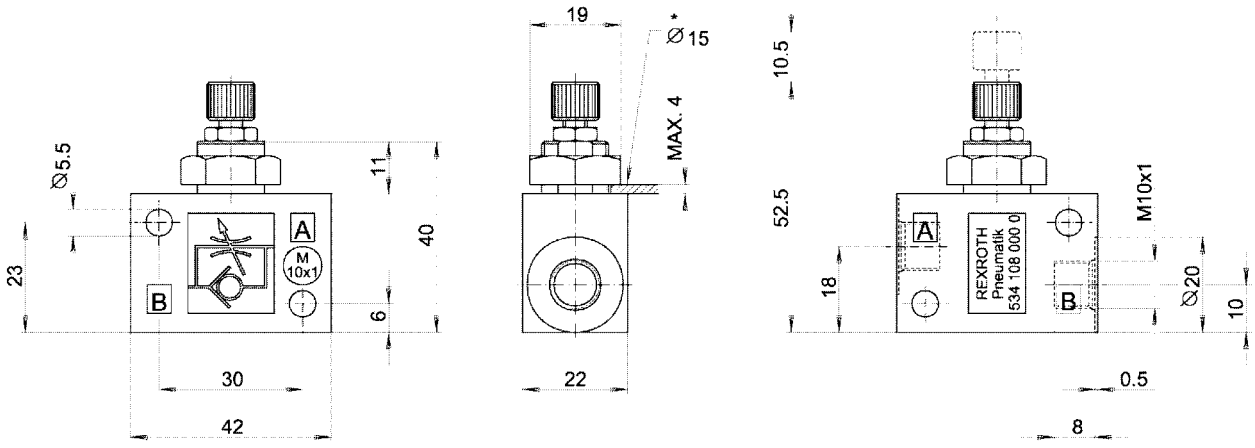
Accessories	Type	For device	Size	Type number
	Hex. nut for installation in control cabinet	**534 112 210 0**	M 20 x 1.5	**810 306 023 4**
		534 112 310 0	M 24 x 1.5	**810 306 025 4**
	Spare part kit	**534 108 000 0**		**534 106 000 2**

Fig. 1



J	A	B	C	D	E	F	∅ G	H	∅ K	L	M	N	O	∅ P
G1/4	55	25	32	66 - 74	35	25	6,4	12	19,5	M20x1.5	37.8	47.9	3	20.5
G3/8	58	30	40	78 - 93	44	33	6,6	14	23	M24x1.5	47	57	3	25

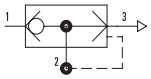
Fig. 2



Technical data

Type		Poppet valve
Operating pressure range		0.2 to 10 bar
Nominal flow rate Qn at 6 bar, Δ = 1 bar		See table
Ambient temperature range		-25° C to +80° C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		See table
Materials ND 3 - 15	Housing	Brass, nickel plated
	Seals	NBR
Materials ND 25	Housing	Al
	Seals	NBR

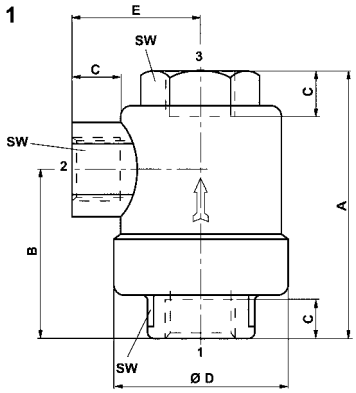
Type number

	ND	Fig.	Connections*	Qn 1 --> 2	Qn 2 --> 3	Weight	Type number
	7	1	G 1/4	1200 Nl/min.	2250 Nl/min.	0.17 kg	**573 504 010 0**

* According to ISO 228/1

Fig. 1

Fig. 1



1) For push-in fitting G 1

ND	Fig.	A	B	C	D	E	SW
7	1	54	35	9.5	33	25	19

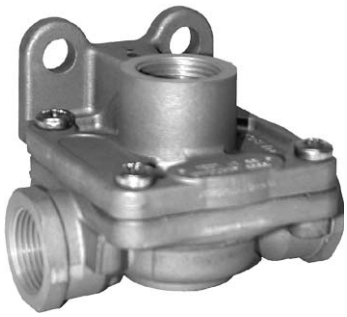
Other Valves

Fast ventilation valve M22x1.5

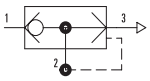
Rexroth
Bosch Group

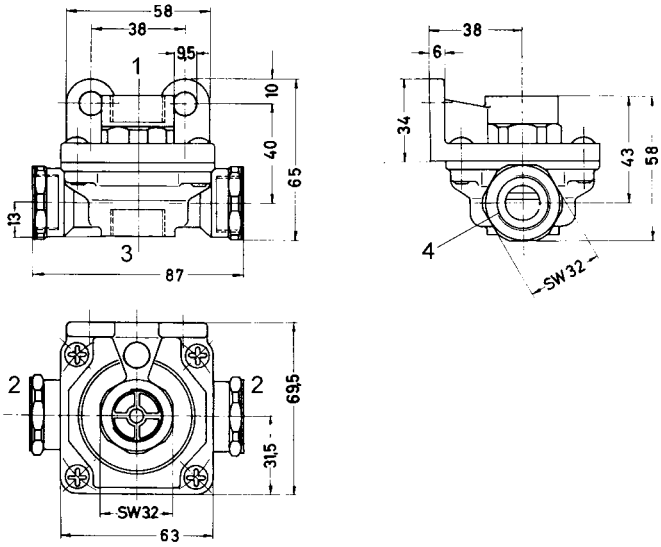
Technical data

Type	Poppet valve
Operating pressure range	0.2 to 10 bar
Nominal diameter	ND14
Ambient temperature range	-40° C to +80° C
Admissible medium	Compressed air, lubricated or non-lubricated
Weight	0.3 kg



Type number

	Connections	Type number
	M22 x 1.5	**973 500 000 0**



1) Working line of controlair valve, 2) Working line of volume, 3) Exhaust
4) All threaded connections M22 x 1.5

Other Valves

Fast ventilation valve, G1 NPT

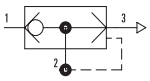
Rexroth
Bosch Group

Technical data

Type	Diaphragm-Poppet valve
Operating pressure range	0.2 to 10 bar
Ambient temperature range	-40° C to +70° C
Admissible medium	Compressed air, lubricated or non-lubricated
Weight	0.5 kg

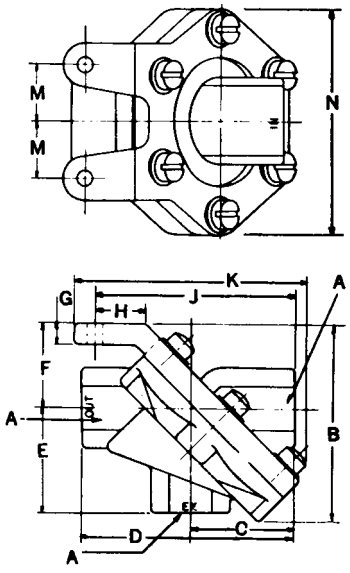
4

Type number

	Connections	Type number
	G1 NPT	**373 505 000 0**

Accessories (to be ordered separately)

Symbol	Designation	Type number
	Spare part kit	**373 505 000 2**



1) For push-in fitting G1

Dimen. A	B	C	D	E	F	G	H	J	K	M	N
R 1	121	69	133	68	52	11	26	127	140	38	140

Rexroth
Bosch Group

Products

Electrically operated, G1

See page 57

Accessories

Technical data

See page 60

Starting Valves
Electrically operated, G1

Rexroth
Bosch Group

Technical data

Type		Poppet valve
Operating pressure range		6 to 30 bar
Control pressure range		5 to 30 bar
Nominal diameter		ND 25
Ambient temperature range		-20°C to +70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		9.5 kg
Operating voltages		24 V DC ± 20%
Current consumption	DC 24V	0.7 A
Insulation class		F according to VDE 0580
Protection with plug		IP 65 according to DIN VDE 0470
Duty cycle	ED	100%

Application area
Suitable for all applications. The valve is non-overlapping.

4

Type number

Connection	Connection thread	Type number*
1, 2, 3	G1	**371 110 020 0**
4, Z	M 14 x 1.5	

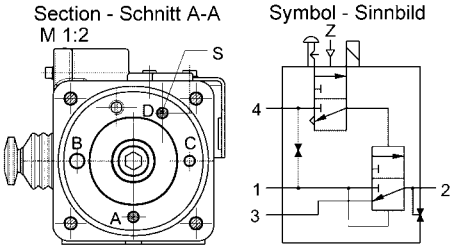
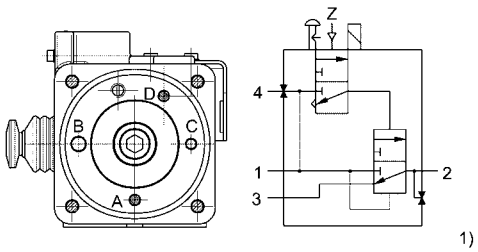
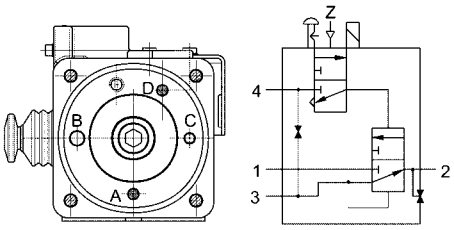
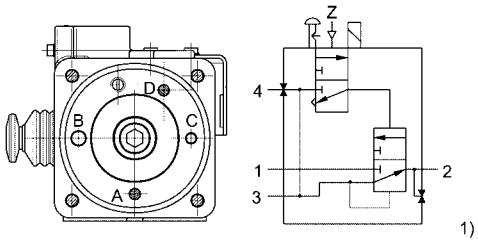
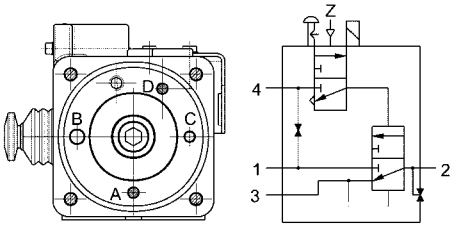
* With plug

Accessories (to be ordered separately)

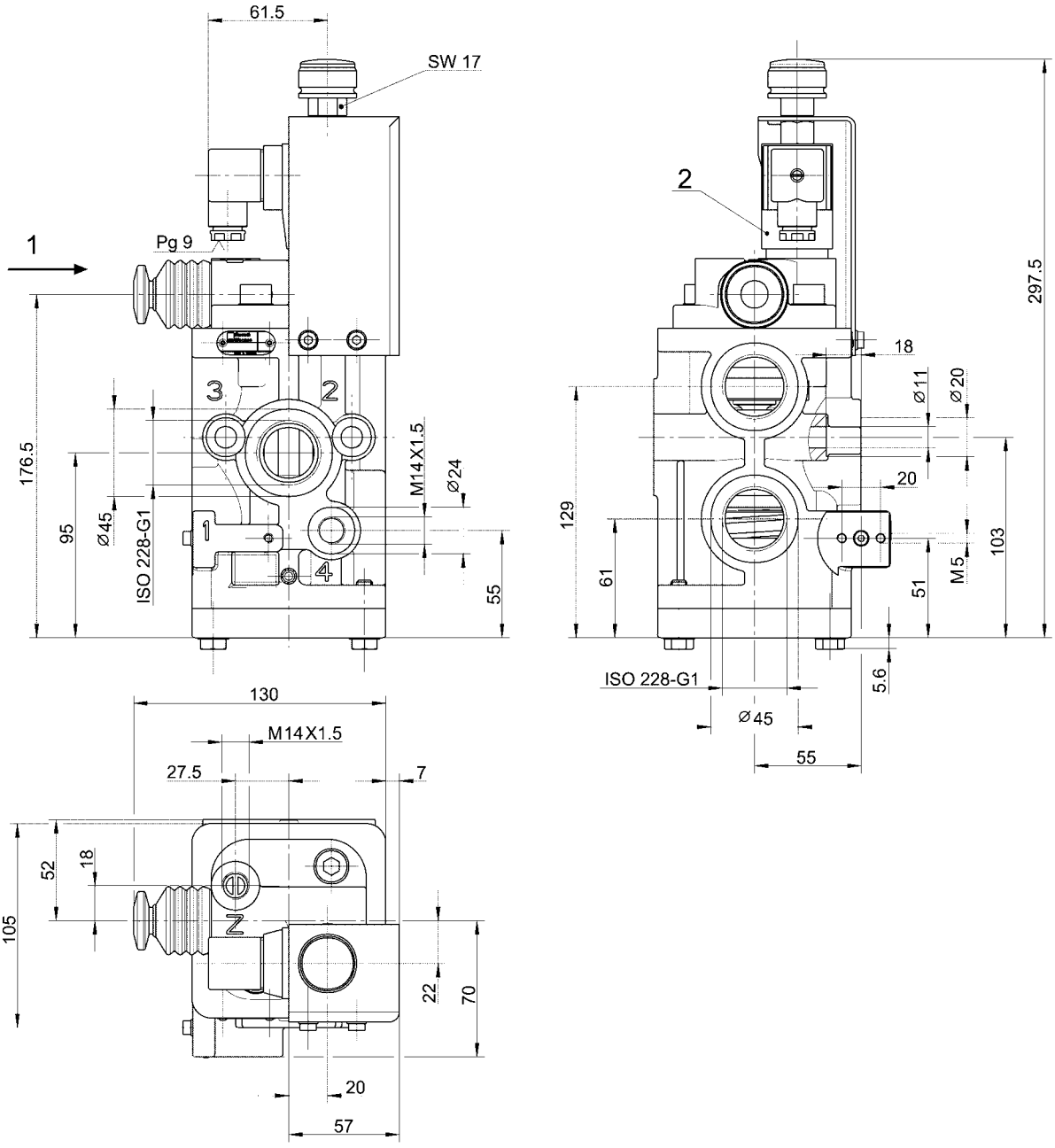
Symbol	Type	Type number
	Spare part kit	**371 110 003 2**
	Plug	**894 100 030 2**
	Voltage	24 V DC ±20%
	Coil	**342 052 712 2**

Connection types of the valve

Pressure supply of servo valve - Druckversorgung der Vorsteuereinheit

	external - extern	internal - intern
Charging valve Belüftungsventil (NC)	Section - Schnitt A-A M 1:2 Symbol - Sinnbild  Delivered assembly - Auslieferungszustand	 1)
Venting valve Entlüftungsventil (NO)		 1)
Reversing valve Umschaltventil		

1) Additionally: connection 4 has to be closed by plug 893 010 011 4 and sealing ring 811 401 045 4 (by separate order)
Zusätzlich: Anschluss 4 mit Verschluß-Schraube 894 010 011 4 und Dichtring 811 401 045 4 (gesondert bestellen) verschliessen



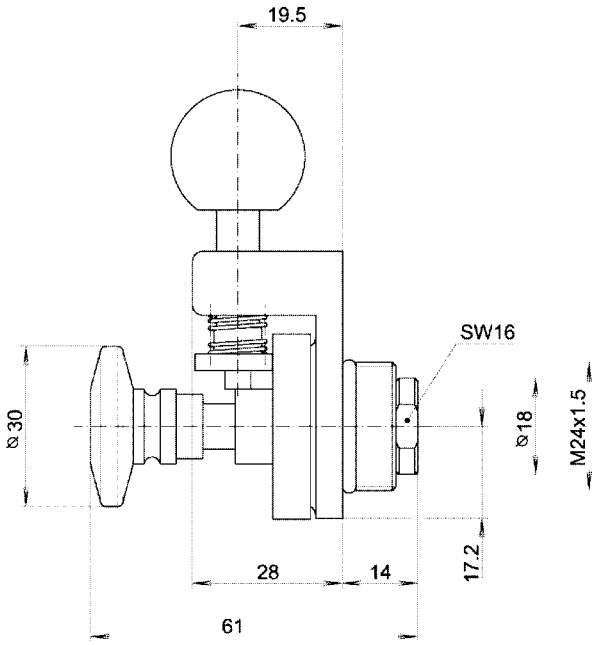
Plug can be fixed at 180° intervals

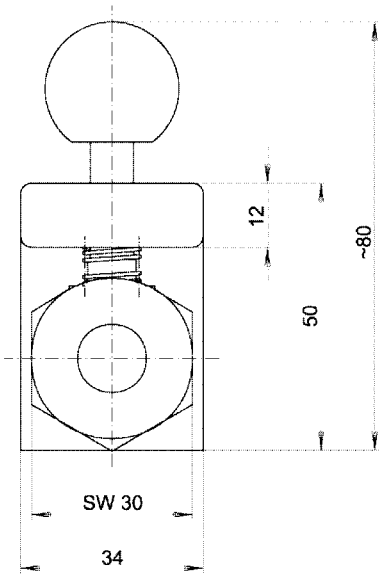
Technical data

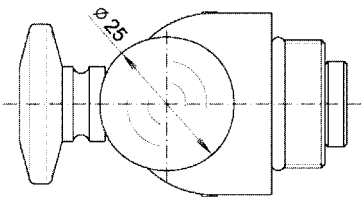
Application area
Lock for starting valve 371 110 020 0

Type number

	Designation	Type number
	Lock	**371 110 641 2**







Precision Controlair Valve

Rexroth
Bosch Group

Products

ND 2 - ND 7, with button

See page 2

ND 7, with rotary knob ∅ 24 mm

See page 5

ND 7, with hand lever

See page 7

ND 7, twin valve with hand lever

See page 9

ND 2 - ND 3, with roller lever actuator

See page 12

Controlair Valve

ND 2 - ND 7, with button

Rexroth
Bosch Group

Technical data

Type		Poppet valve
Operating pressure	p max.	10 bar
Regulating range		See table
Parallel shifting [1])	V max.	See table
Hysteresis	H	< 0.10 bar
Class		See table
Regulating stroke		7.5 mm
Nominal flow rate	Qn	See diagram
Operating force		See table
Ambient temperature range		- 25° C to + 70° C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.5 kg
Materials	Housing	Zn-diecasting
	Seals	NBR

Technical information

[1]) The pressure-travel characteristic line can be shifted in a parallel way by means of a screw cap, that means initial and final pressure as well as all pressures between these limiting values will be increased or decreased to the same extent. The range of adjustment is shown by the grey-shaded zone above the characteristic line (example see pressure-travel-characteristic-line). Turning the cap clockwise = pressure increase.

Type number

	Fig.	ND	Pressure range	Hysteresis [bar]	Refilling sensitivity [bar]	Vmax.[1]) [bar]	Operating force [N]	Type number *)
	1	7	0.1 - 5.1	0.15	0.25	1.4	19	**361 051 050 0**
	1	3	0.1 - 5.1	0.1	0.07	1.4	19	**361 071 050 0**
	2	2	0.1 - 5.1	0.03	0.03	1.4	19	**361 151 050 0**
	2	2	0.1 - 7.1	0.03	0.03	0.8	25	**361 151 060 0**

*) For connection thread M14x1.5

Accessories (to be ordered separately)

Accessories	Type	Type number	Pos. (Fig. 3)
	Fastening nut	**891 990 291 4**	1
	Plunger (flat version)	**892 030 651 4**	2
	Plunger (spherical version)	**892 030 650 4**	3
	Plunger (ball version)	**892 030 670 2**	4
	Plunger	**892 030 660 2**	5
	Bellows	**897 750 290 4**	6
	Threaded ring	**361 050 430 4**	7
	Shim (0.2 mm thick)	**895 104 420 4**	8
	Shim (0.5 mm thick) for plunger items (2) to (5)	**895 100 410 4**	8
	Hood for limiting stroke of plunger items (2) to (5)	**895 070 300 4**	9
	Spare part kit	**361 050 000 2**	
	Spare parts	See separate spare part catalogue	

Fig. 1

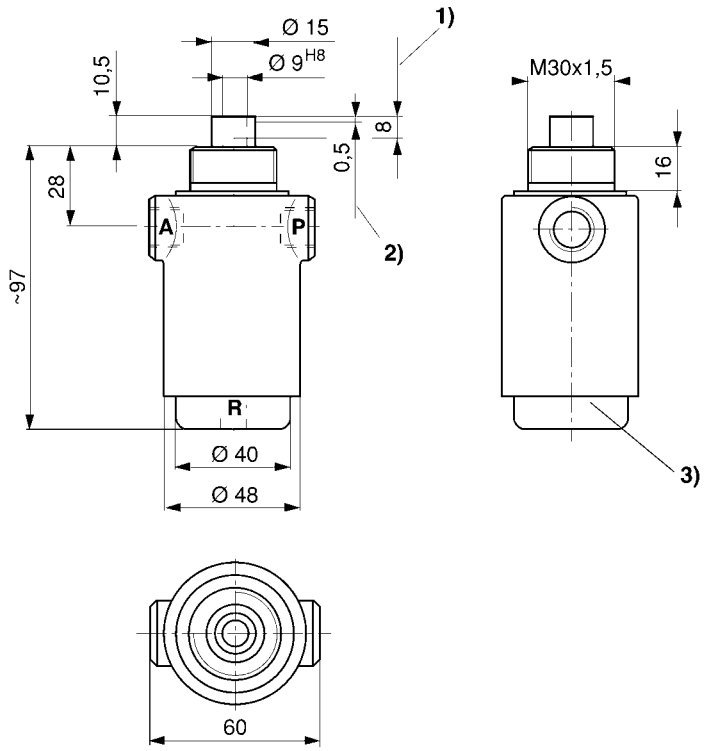


Fig. 1

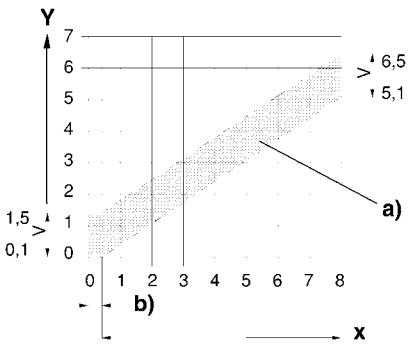
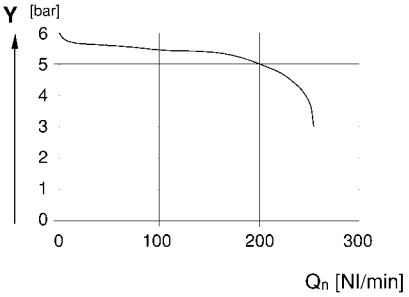
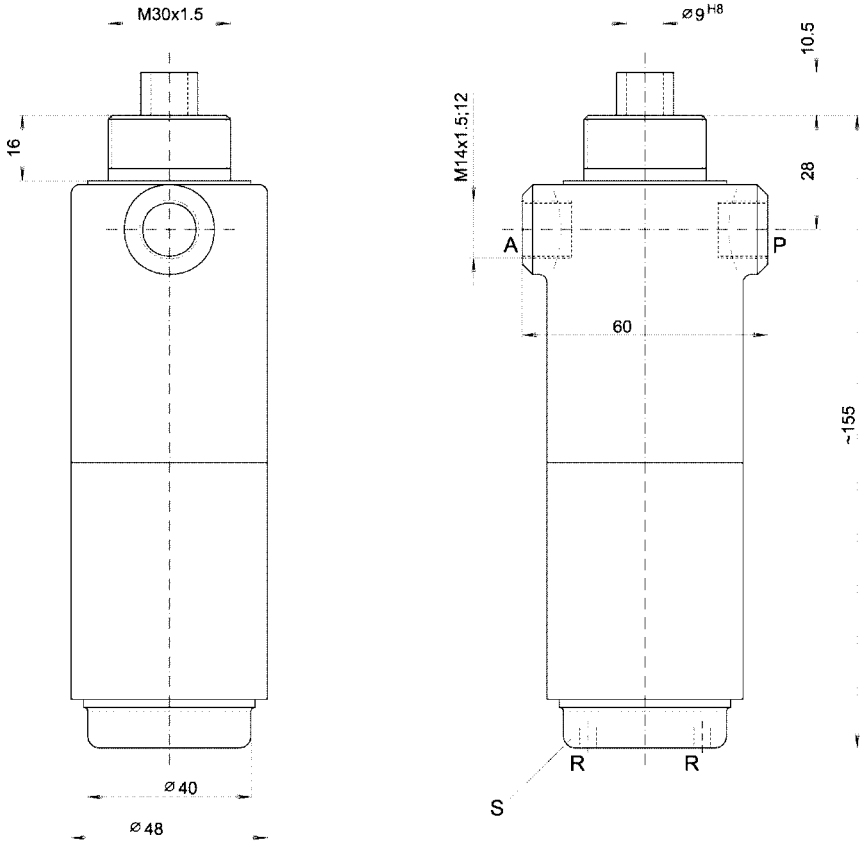


Fig. 2



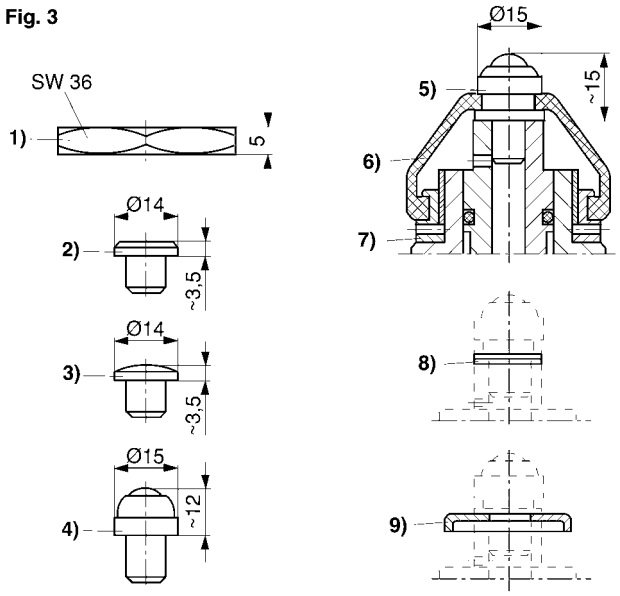
1) Stroke 2) Closing or exhaust stroke 3) Screw cap
Fig.1 Pressure-travel-characteristic line
x: Regulating stroke [mm] y: Pressure at port A [bar] a: Characteristic line b: Exhaust stroke
Example: regulating range 0.1 - 5.1 bar V = max. parallel shifting: 1.4 bar
Fig. 2 Nominal flow rate
Input pressure: 8 bar; supply pressure: 6 bar y: Pressure at port A [bar]

Fig. 2



S) Screw cap

Fig. 3



Controlair Valve

ND 7, with rotary knob Ø 24 mm

Rexroth
Bosch Group

Technical data

Type		Poppet valve
Operating pressure	p max.	10 bar
Regulating range		See table
Parallel shifting ¹)	V max.	See table
Hysteresis	H	< 0.1 bar
Refilling sensitivity		0.07
Nominal flow rate	Qn	See diagram
Ambient temperature range		- 25° C to + 70° C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.6 kg
Materials	Housing	Zn-diecasting
	Seals	NBR

Technical Information

¹) The pressure-travel-characteristic line can be adjusted in a parallel way by means of a screw cap,that means initial and final pressure as well as all pressures between these limiting values will be increased or decreased to the same extent. The range of adjustment is shown by the grey shaded zone above the characteristic line (example see pressure-travel-characteristic line).

Type number

	Fig.	Locking ring	Regulating range	V max. ¹)	Type number *
	1	∅ 24 mm	0.1 - 5.1 bar	1.4 bar	**361 081 050 0**

* For thread connections M 14 x 1.5

Accessories (to be ordered separately)

Accessories	Type	Type number
	Spare part kit	**361 050 000 2**

Controlair Valve

ND 7, with rotary knob Ø 24 mm

Rexroth
Bosch Group

Fig. 1

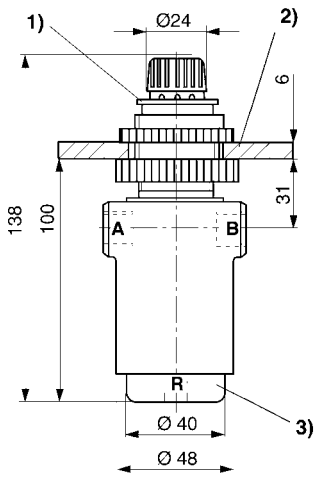


Fig. 3

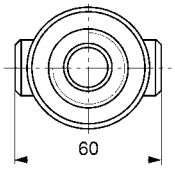


Fig. 1

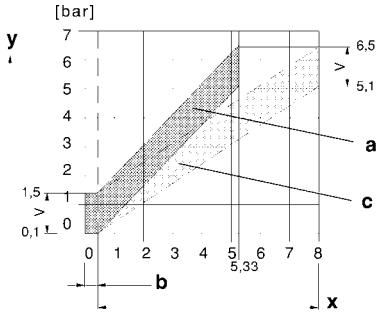
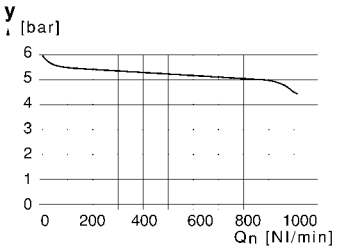


Fig. 2



1) Lift locking ring to release rotary knob. 2) Hole for mounting panel 33 mm dia. 3) Screw cap
Fig.1 Pressure travel characteristic line
x: Regulating stroke [mm] (rotations of rotary knob) y: Pressure at port A [bar] a: Characteristic line of fig. 1 b: Exhaust stroke
Example: regulating range 0.1 - 5.1 bar V = max. parallel shifting: 1.4 bar
Fig. 2 Nominal flow rate
Input pressure: 8 bar; supply pressure: 6 bar y: Pressure at port A [bar]

Controlair Valve

ND 7, with hand lever

Rexroth
Bosch Group

Technical data

Type		Poppet valve
Operating pressure	p max.	10 bar
Regulating range		See table
Parallel displacement ¹)	V max.	See table
Hysteresis	H	< 0.15 bar
Refill sensitivity		< 0.25 bar
Nominal flow rate	Qn	See diagram
Ambient temperature range		- 25° C to + 70° C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		1.2 kg
Materials	Housing	Zn-diecasting
	Seals	NBR

Technical information

¹) The pressure-travel-characteristic line can be shifted in a parallel way by means of a screw cap, that means initial and final pressure as well as all pressures between these limiting values will be increased or decreased to the same extent. The adjustment range is shown by the grey-shaded zone above the characteristic line (example see pressure-travel-characteristic line). Turning the cap clockwise = pressure increase.

5

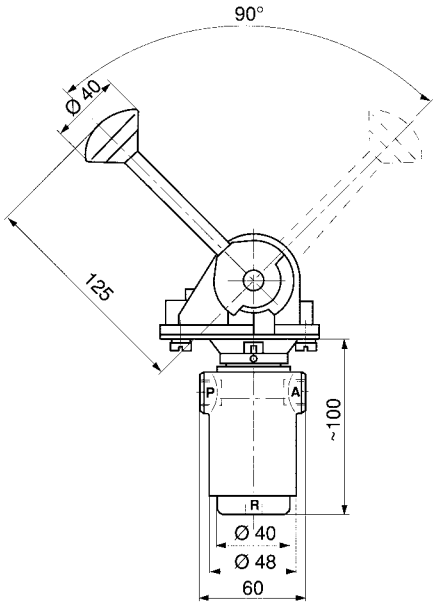
Type number

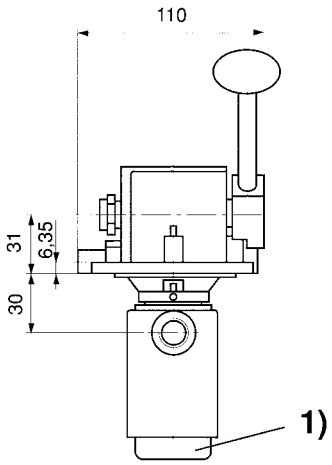
	Regulating range	V max. ¹)	Type number *
	0.1 - 5.1 bar	1.4 bar	**361 062 850 0**

* for threaded ports G 1/4 ISO 228/1

Accessories (to be ordered separately)

Accessories	Type	Type number
	Spare part kit	**361 050 000 2**
	Spare parts	See separate spare part catalogue





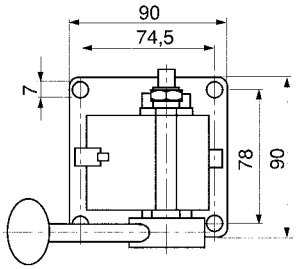


Fig. 1

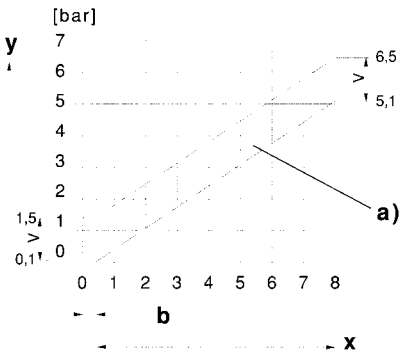


Fig. 2

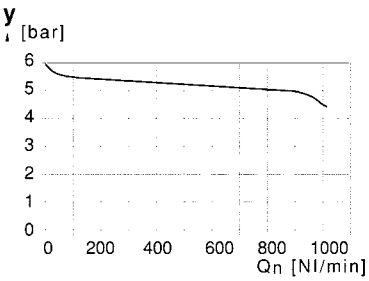
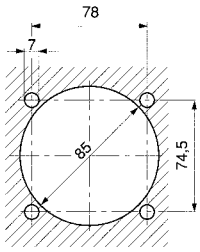


Fig. 3



1) Screw cap
Fig.1 Pressure travel-characteristic line
x: Regulating stroke [mm] (rotations of rotary knob) y: Pressure at port A [bar] a: Characteristic line of fig. 1 b: Exhaust stroke
Example: regulating range 0.1 - 5.1 bar V = max. parallel shifting: 1.4 bar
Fig. 2 Nominal flow rate
Input pressure: 8 bar; supply pressure: 6 bar y: Pressure at port A [bar]
Fig. 3 Cutout of mounting panel, max. thickness of panel 10 mm

Controlair Valve

ND 7, twin valve with hand lever

Rexroth
Bosch Group

Technical data

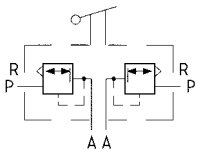
Type		Poppet valve
Operating pressure	p max.	10 bar
Regulating range		See table
Parallel shifting ¹)	V max.	See table
Hysteresis	H	< 0.15 bar
Refilling sensitivity		< 0.25 bar
Nominal flow rate	Qn	See diagram
Ambient temperature range		- 25° C to + 70° C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		1.2 kg
Materials	Housing	Zn-diecasting
	Seals	NBR

Technical information

¹) The pressure-travel-characteristic line can be shifted in a parallel way by means of a screw cap, that means initial and final pressure as well as all pressures between these limiting values will be increased or decreased to the same extent. The adjustment range is shown by the grey-shaded zone above the characteristic line (example see pressure-travel-characteristic line). Turning the cap clockwise = pressure increase.

5

Type number

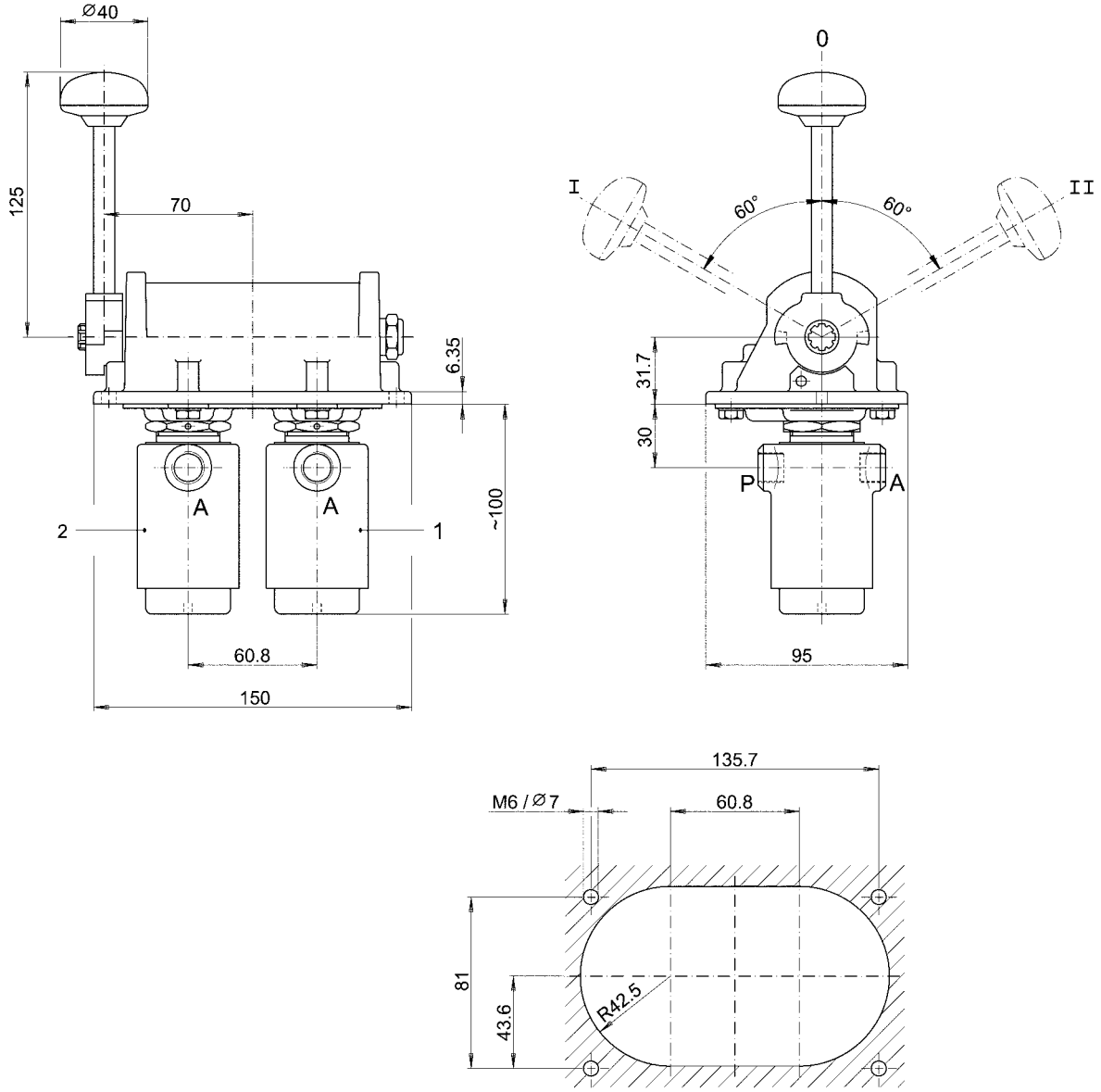
	Regulating range	V max. ¹)	Type number*
	0.1 - 7.1 bar	1.4 bar	**361 091 160 0**

* for threaded ports G 1/4 ISO 228/1

Accessories (to be ordered separately)

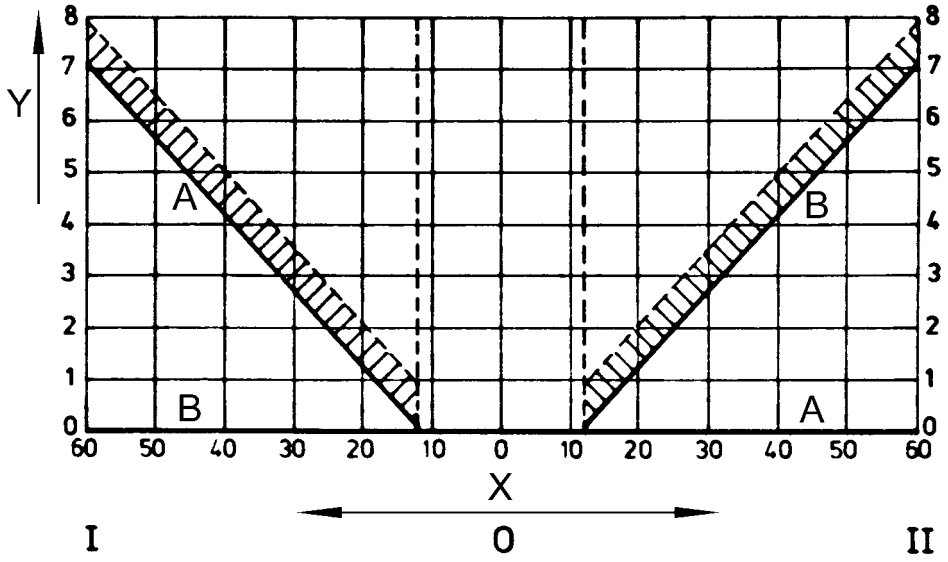
Accessories	Type	Type number
	Spare part kit	**361 050 000 2**

Fig. 1



1) Valve 1, 2) Valve 2

Fig. 2



x) Lever travel [°], y) Pressure in port A [bar]
In area 0 - I pressure A in valve 2 = 0 bar, in area 0 - II pressure A in valve 1 = 0 bar

Controlair Valve

ND 2 - ND 3, with roller lever actuator

Rexroth
Bosch Group

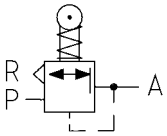
Technical data

Type		Poppet valve
Operating pressure	p max.	10 bar
Regulating range		See table
Parallel shifting ¹)	V max.	See table
Hysteresis	H	< 0.10 bar
Class		See table
Regulating stroke		7.5 mm
Nominal flow rate	Qn	See diagram
Operating force		See table
Ambient temperature range		- 25° C to + 70° C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.5 kg
Materials	Housing	Zn-diecasting
	Seals	NBR

Technical information

¹) The pressure-travel-characteristic line can be shifted in a parallel way by means of a screw cap, that means initial and final pressure as well as all pressures between these limiting values can be increased or decreased to the same extent. The adjustment range is shown by the grey-shaded zone above the characteristic line (example see pressure-travel-characteristic line). Turning the cap clockwise = pressure increase.

Type number

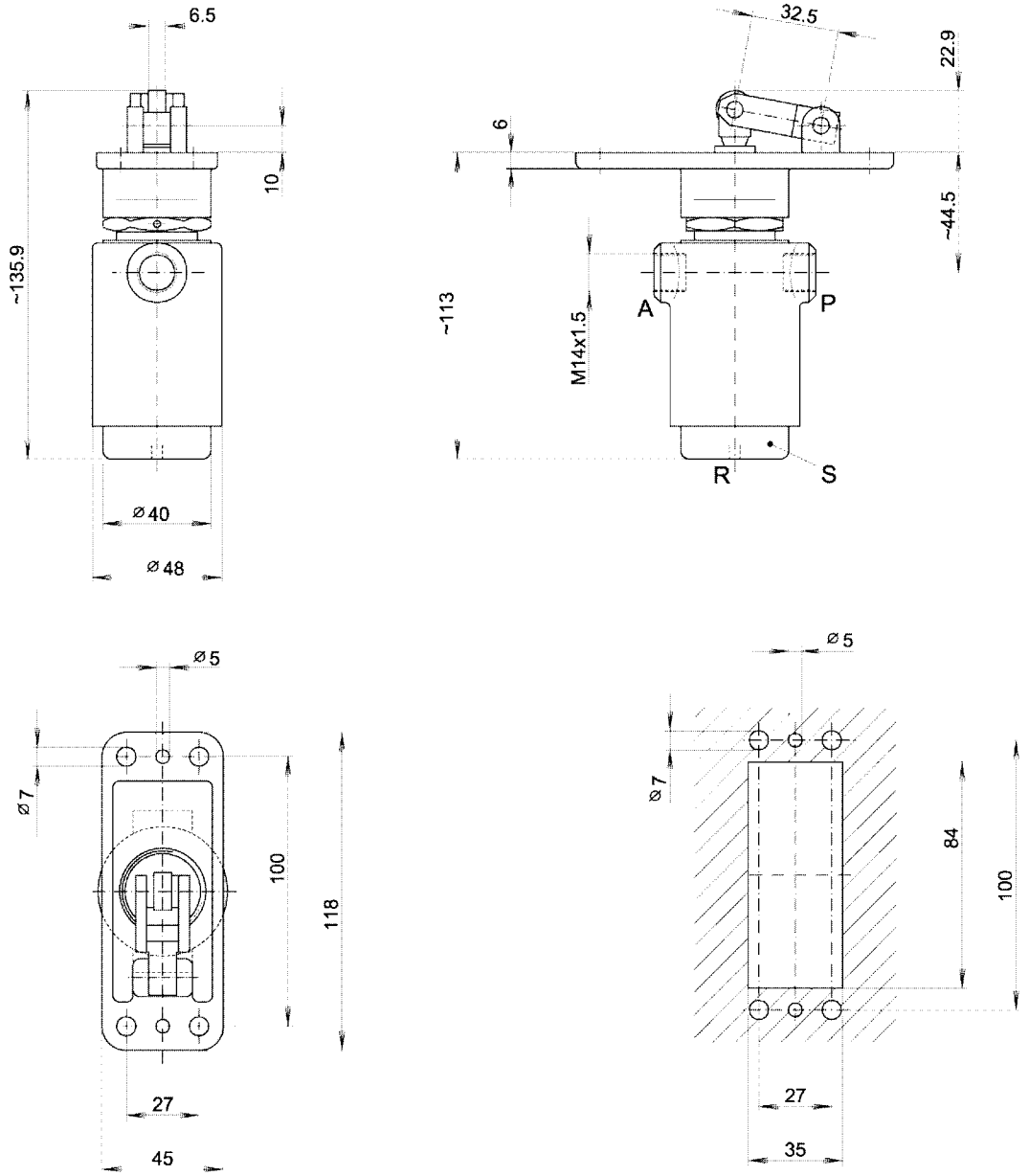
	Dim. "A"	ND	Pressure range	Hysteresis [bar]	Refilling sensitivity [bar]	Vmax.¹) [bar]	Operating force [N]	Type number *)
	113	3	0.1 - 5.1	0.1	0.07	1.4	19	**361 089 050 0**
	169	2	0.1 - 5.1	0.03	0.03	1.4	19	**361 169 050 0**

*) For connection thread M14x1.5

Accessories (to be ordered separately)

Accessories	Type	Type number
	Spare part kit	**361 050 000 2**
	Spare parts	See separate spare part catalogue

Fig. 1



S) Screw cap

Fig .2

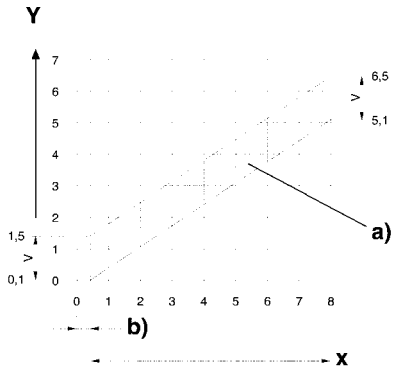


Fig. 2

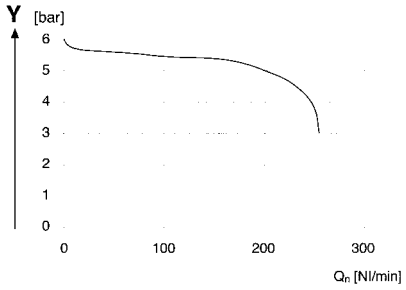


Fig.1 Pressure travel characteristic line
x: Regulating stroke [mm] y: Pressure at port A [bar] a: Characteristic line b: Exhaust stroke
Example: regulating range 0.1 - 5.1 bar V = max. parallel shifting: 1.4 bar
Fig. 2 Nominal flow rate
Input pressure: 8 bar; supply pressure: 6 bar y: Pressure at port A [bar]

Rexroth
Bosch Group

Products

ND 7, M 14x1.5

See page 16

ND 7, M 14x1.5, adjustable

See page 18

ND 15, M 22x1.5

See page 21

ND 15, NPTF-Thread

See page 23

ND 2, M 14x1.5

See page 25

Relay Valve
ND 7, M 14x1.5

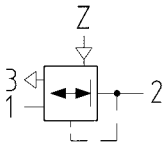
Rexroth
Bosch Group

Technical data

Type		Diaphragm poppet valve
Operating pressure	Max.	10 bar
Hysteresis		< 0.06 bar
Refilling sensitivity		0.01 bar
Nominal flow rate	Qn	
at 6 bar, Δp = 1 bar		1050 Nl/min.
Ambient temperature range		-20° C to +70 °C
Admissible medium		Air, lubricated or non-lubricated
Weight		0.73 kg
Materials	Housing	Al-diecasting
	Seals	NBR

Application area
Especially suitable as a power valve with low hysteresis. Pilot control is effected by means of either electropneumatic regulating valves or controlair valves with small ND.

Type number

	Type number for threaded ports G 1/4 ISO 228/1
	**373 017 100 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Spare part kit	**373 017 000 2**
	Spare parts	See separate spare part catalogue

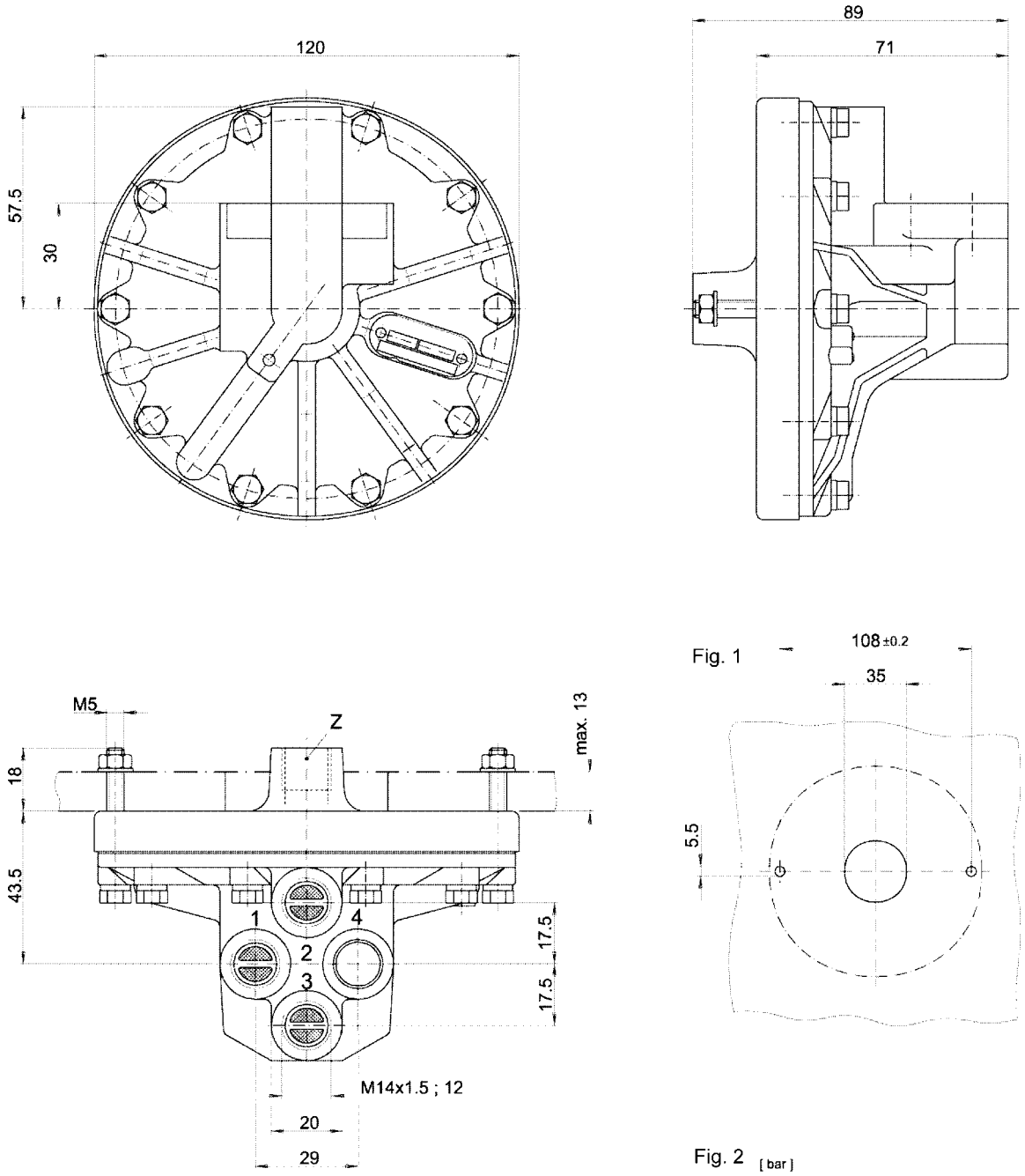


Fig. 1

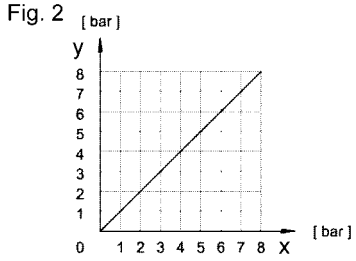


Fig. 2

Fig. 1 Cutout of panel mounting
Fig. 2 x: pressure in control line 12 y: pressure in working line 2

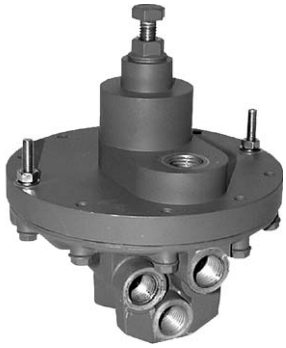
Relay Valve

ND 7, M 14x1.5, adjustable

Rexroth
Bosch Group

Technical data

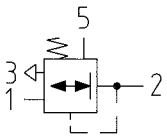
Type		Diaphragm poppet valve
Operating pressure	Max.	10 bar
Hysteresis		< 0.1 bar
Refilling sensitivity		0.01 bar
Nominal flow rate	Qn	
at 6 bar, Δp = 1 bar		1050 Nl/min.
Ambient temperature range		-20° C to +70 °C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.73 kg
Materials	Housing	Al-diecasting
	Seals	NBR



Application area

Especially suitable as a power valve with low hysteresis. Pilot control is effected by means of either electropneumatic regulating valves or controlair valves.

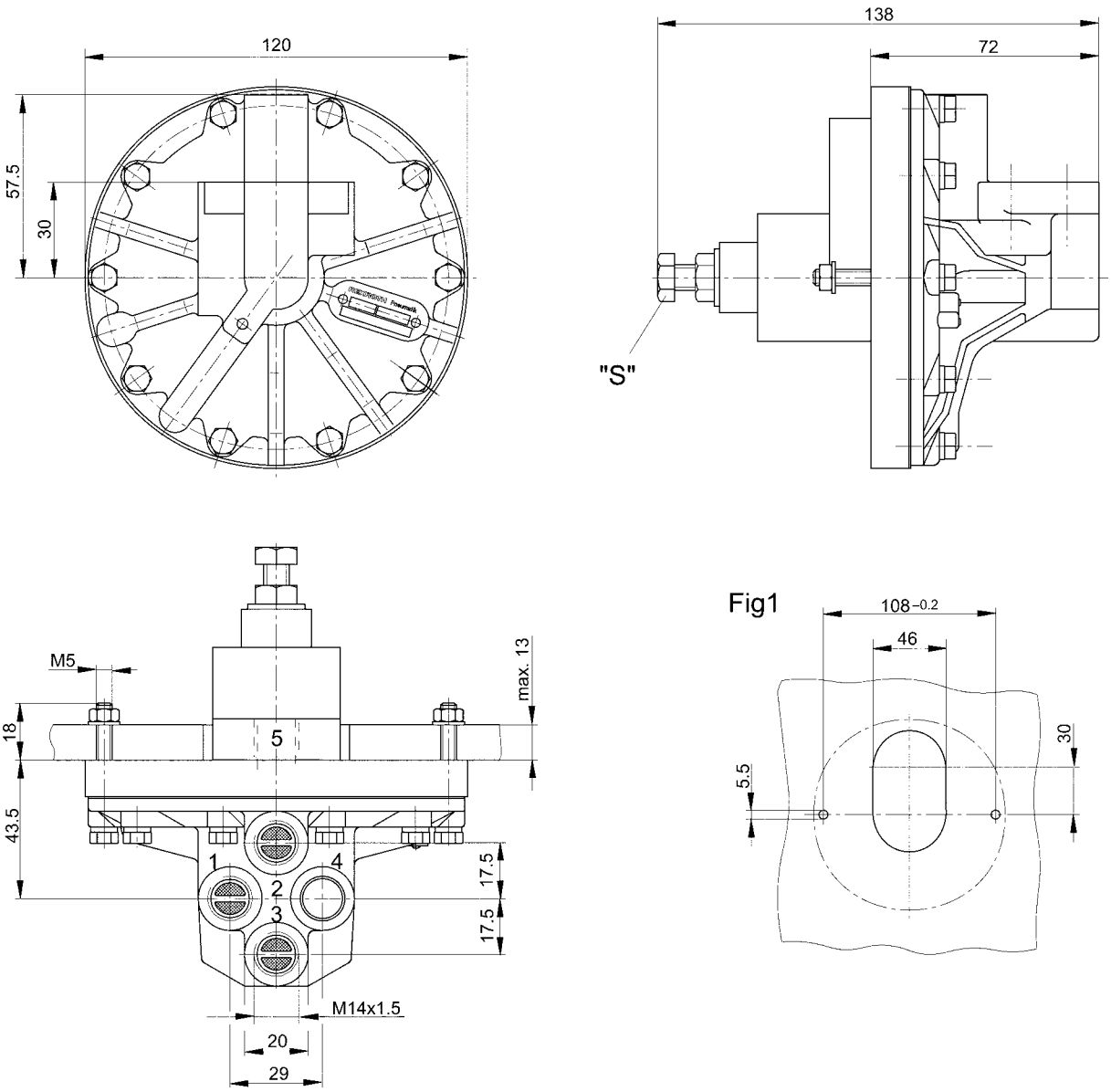
Type number

	Type number for threaded ports M14x1.5
	**373 017 121 0**

Accessories (to be ordered separately)

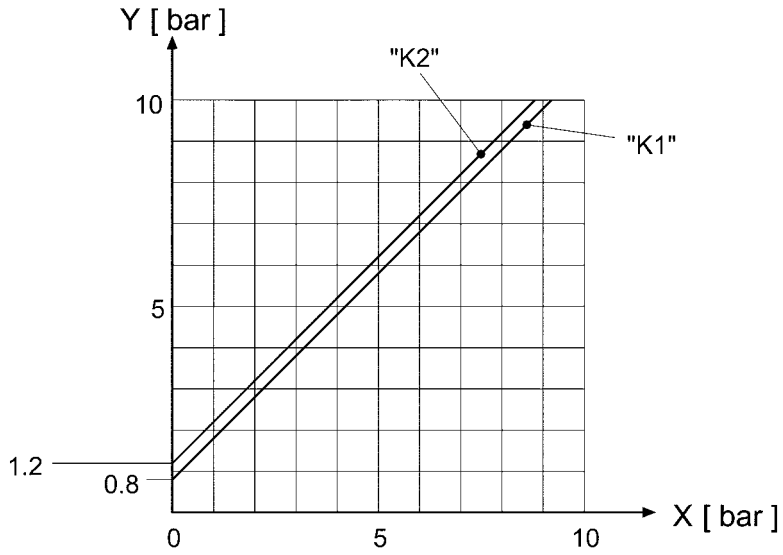
Accessories	Type	Type number
	Spare part kit	**373 017 000 2**
	Spare parts	See separate spare part catalogue

Fig. 1



S) Adjusting screw
Fig. 1 Cutout of panel mounting

Fig. 2



x) Control pressure p5, y) Working pressure p2

Relay Valve
ND 15, M 22x1.5

Rexroth
Bosch Group

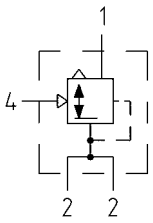
Technical data

Type		Diaphragm poppet valve
Operating pressure	Max.	8 bar
Response pressure		0.5 bar
Ambient temperature range		-20° C to +80 °C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		1.1 kg
Materials	Housing	Al-diecasting
	Seals	NBR

Application area

Especially suitable as a power valve with low hysteresis. Pilot control is effected by means of either electropneumatic regulating valves or controlair valves.

Type number

	Type number for threaded ports M22x1.5
	**973 001 110 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Spare part kit	**973 001 000 2**
	Spare parts	See separate spare part catalogue

Fig. 1

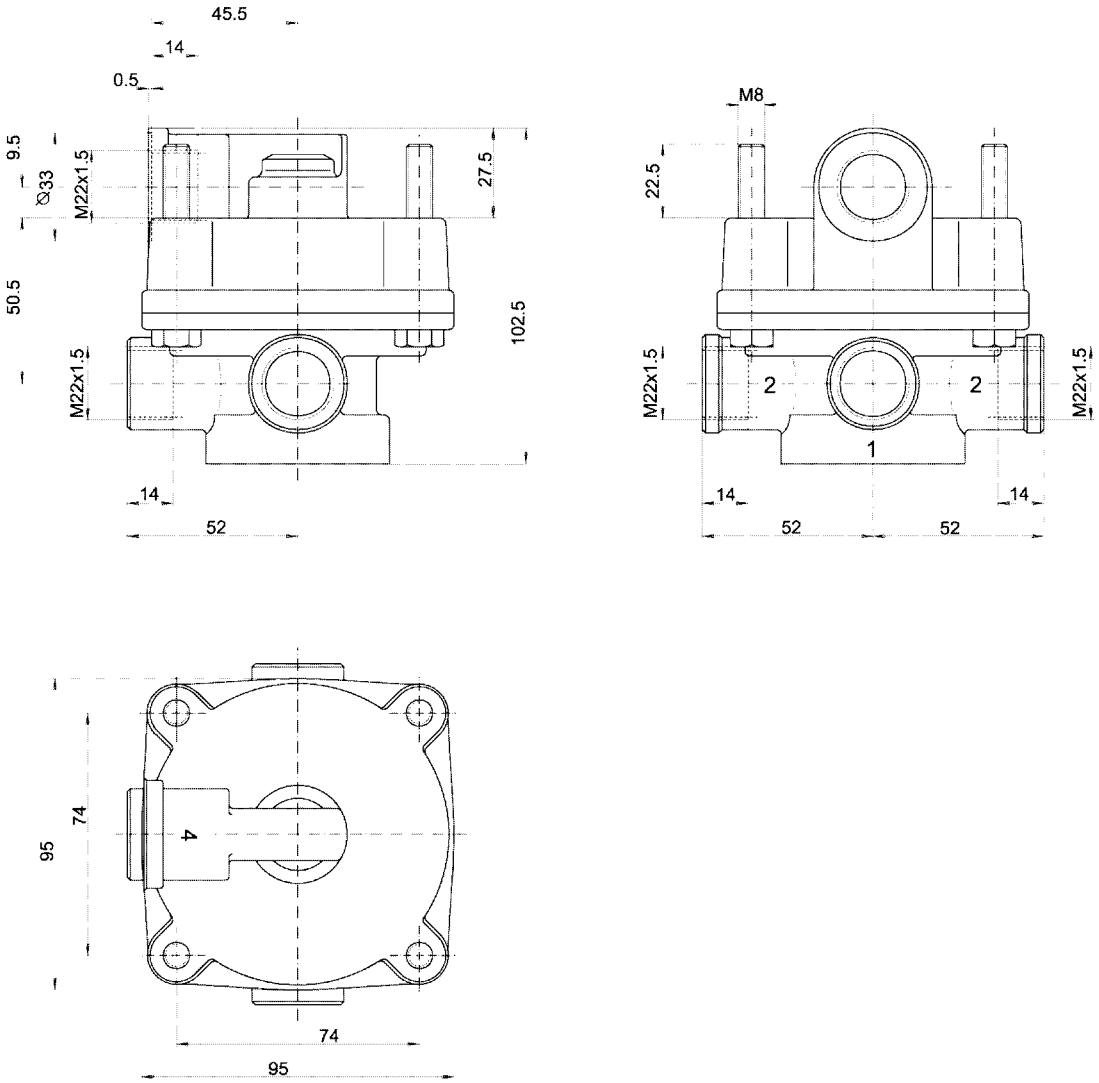
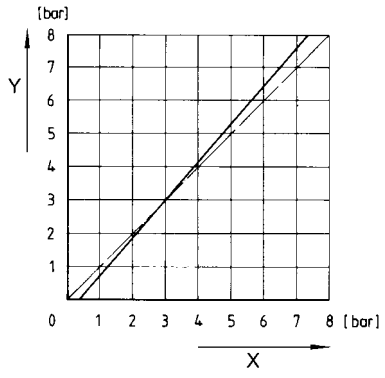


Fig. 2



x) Input pressure p4, y) Outlet pressure p2

Relay Valve
ND 15, NPTF-Thread

Rexroth
Bosch Group

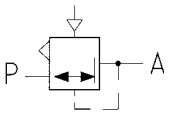
Technical data

Type		Diaphragm poppet valve
Operating pressure	Max.	10 bar
Hysteresis		< 0.35 bar
Ambient temperature range		-20° C to +70 °C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		2.6 kg
Materials	Housing	Al-diecasting
	Seals	NBR

Application area

Especially suitable as a power valve with low hysteresis. Pilot control is effected by means of either electropneumatic regulating valves or controlair valves.

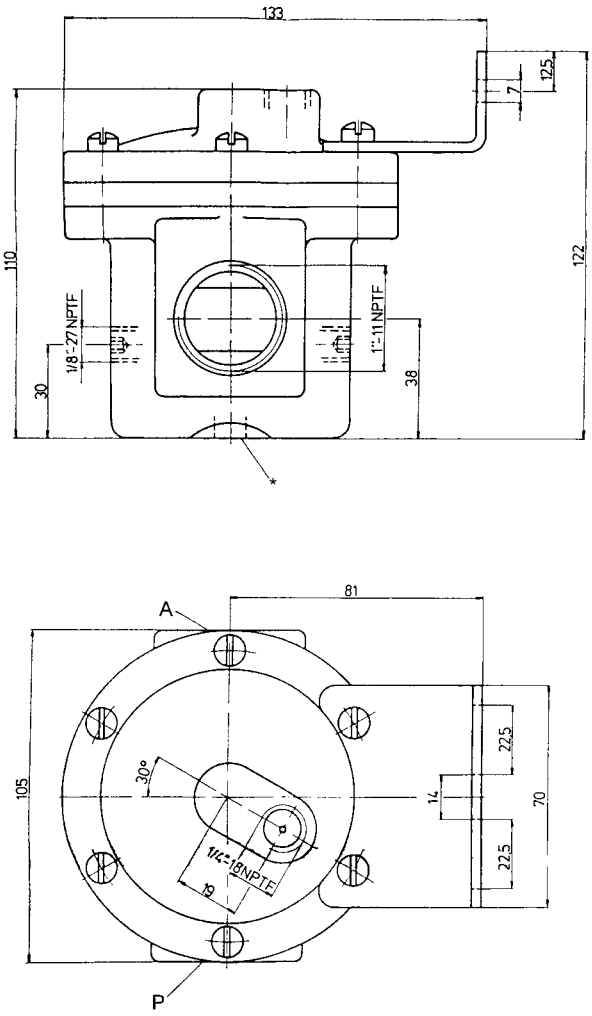
Type number

	Type number
	**373 016 000 0**

Accessories (to be ordered separately)

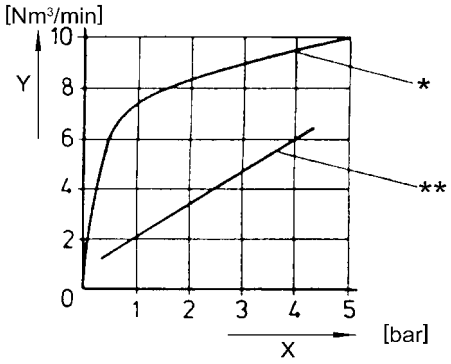
Accessories	Type	Type number
	Spare part kit	**373 016 000 2**
	Spare parts	See separate spare part catalogue

Fig. 1



*) Exhaust

Flow rate (primary pressure 8.5 bar, pilot pressure 7 bar)



x) Pressure drop, y) Flow rate, *) NC-valve, **) NO-valve

Pressure Transformer

ND 2, M 14x1.5

Rexroth
Bosch Group

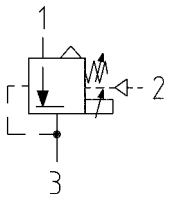
Technical data

Type		Diaphragm poppet valve
Operating pressure	Max.	10 bar
Hysteresis		0.03 bar
Ambient temperature range		-20° C to +70 °C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		4.3 kg
Materials	Housing	Al-diecasting
	Seals	NBR

Application area

Especially suitable as a power valve with low hysteresis. Pilot control is effected by means of either electropneumatic regulating valves or controlair valves.
Characteristic line can be adjusted in the shaded zone.

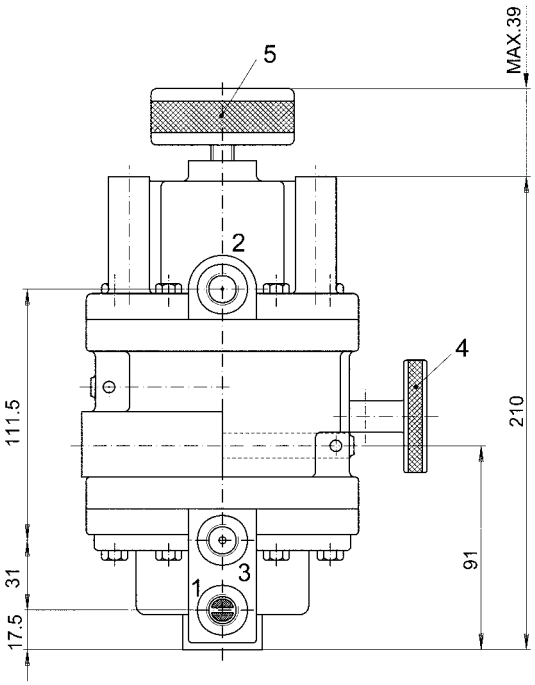
Type number

	Type number for threaded ports M14x1.5
	**375 210 000 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Spare part kit	**375 210 000 2**
	Spare parts	See separate spare part catalogue

Fig. 1



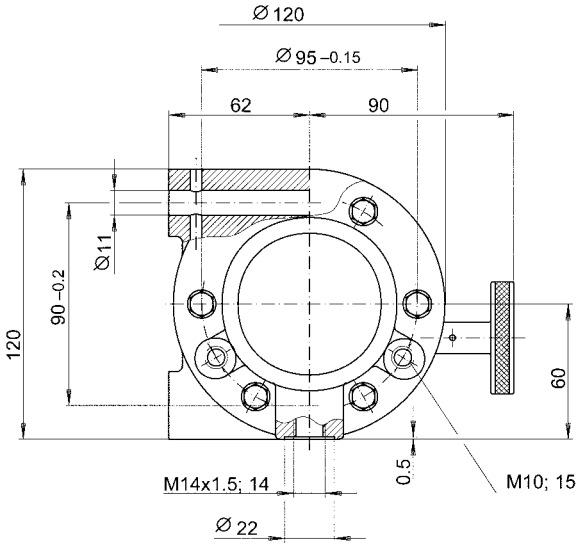
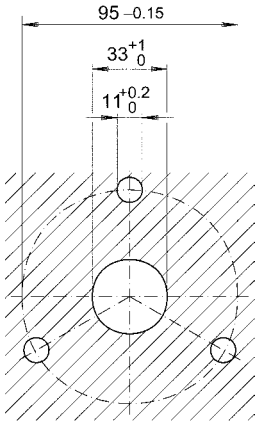
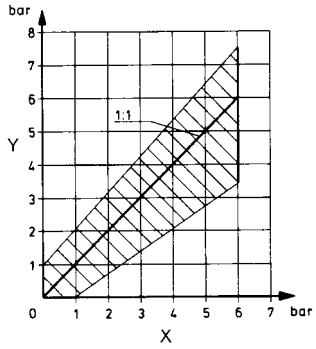


Fig.1



4) Adjusting wheel for increase (do not adjust under pressure) - Anti-clockwise rotation = higher characteristic line
5) Adjusting wheel for parallel shifting of characteristic line - clockwise rotation = higher pressure
Fig. 1 Cutout of panel mounting

Fig. 2



x) Control pressure connection 2, y) Working pressure connection 3

Rexroth
Bosch Group

Products

Pressure control valves ND 3, M 14x1.5, analogue actuation

See page 29

Electro-Pneumatic Regulating Valve

Pressure control valves ND 3, M14x1.5, analogue actuation

Rexroth
Bosch Group

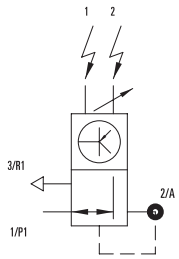
Technical data

Type		Poppet valve
Operating pressure		max. 8 bar *
Output pressure		0 ... 6 bar
Hysteresis		0.02 bar
Nominal flow	Qn	300 Nl/min.
At supply pressure = 7 bar Output pressure = 6 bar and Δp = 0,2 bar		
Ambient temperature range		-20° bis + 60° C
Admissible medium		Condensate-free and non-lubricated compressed air, filtered 50 µm
Weight		3.0 kg
Materials	Housing / Seals	Al-diecasting / NBR
Supply voltage		DC 24 V ± 20 %
Admissible ripple		5%
Current consumption max.		0.3 A
Protection with plug		IP 65 according to DIN VDE 0470
Assembly position		Vertical
Strength of vibration		4g / 2...100Hz

Application Area

Electro-pneumatic pressure control valves convert an electrical signal (current, voltage, resistance) proportionally into pneumatic pressure. They are used where electrical control is required to act directly on a change of pressure or force.

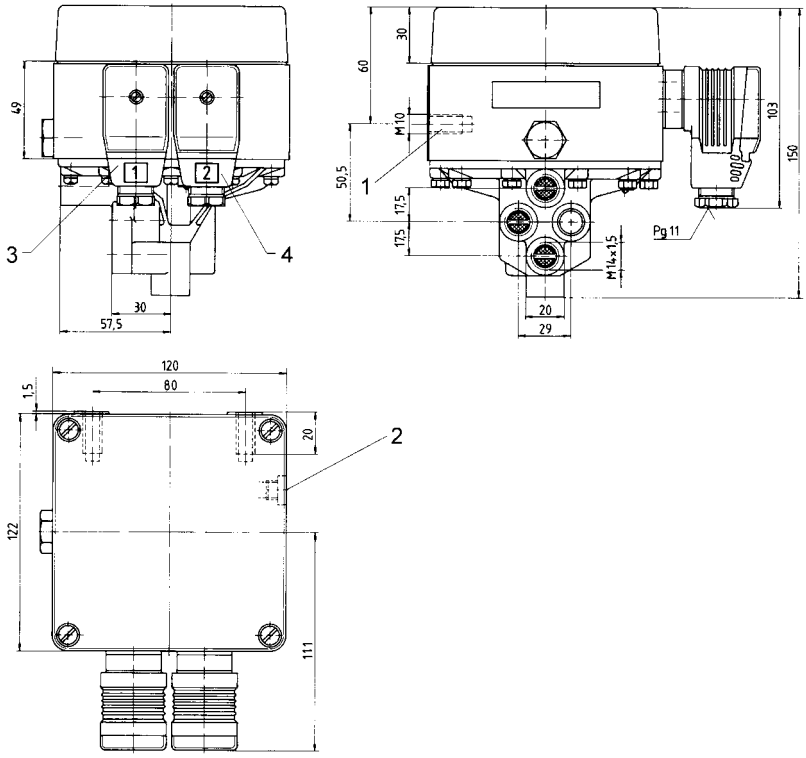
Type number

	Nominal input value **	Nominal input value ** alternative	Type number
	4 - 20 mA 0 - 10 V DC 2 - 10 kOhm	0 - 20 mA 2 - 10 V DC	**346 056 550 0**

*Min. supply pressure: 0.5 bar + max. required output pressure
** Adjusting of characteristic line by means of switch "S" on the electronic card. 4 - 20 mA characteristic line adjusted ex works.

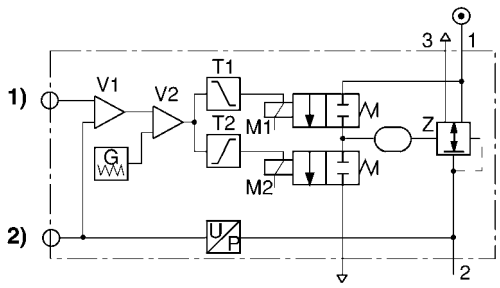
Accessories (to be ordered separately)

	Spare part	Type number
	Electronic card	**546 007 681 2**
	Pressure converter	**894 045 012 2**
	Repair kit (pneumatic part)	**346 056 001 2**



1) Mounting thread
2) Loosen plug screw to clean filter
3) Plug 1
4) Plug 2

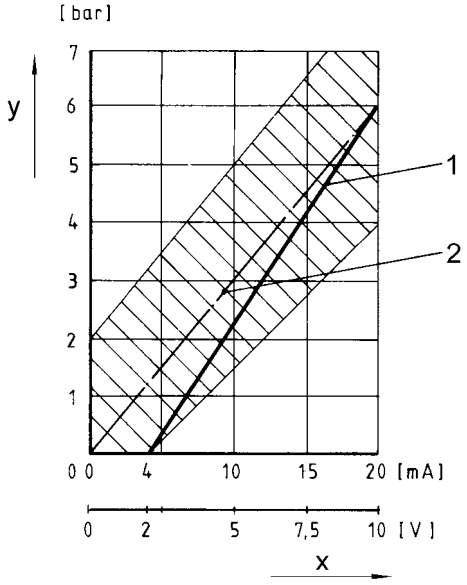
Functional diagram



1) Nominal input value
2) Actual output value

The E/P pressure control valve modulates pressure corresponding to an analogue electrical nominal input value. The integrated electronics make a comparison between the nominal value and the pressure in the working line (actual value), which is measured by a piezo-resistive pressure sensor. The controller generates electrical positioning signals, which either charge or vent control area Z of the relay valve by means of two pilot valves (M 1, M 2) in order to obtain the required pressure in the working line.

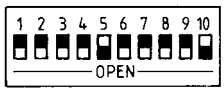
Characteristic line



x) Input current or input voltage, y) Energized pressure
1) Characteristic line 1, 2) Characteristic line 2

Switch position and pin assignment for current-activation

Abb. 1/Fig. 1



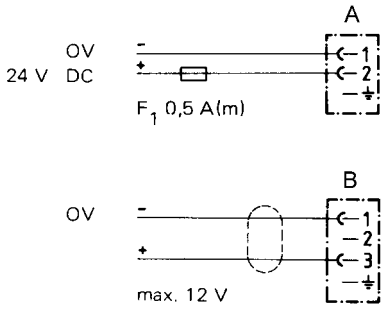
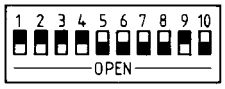
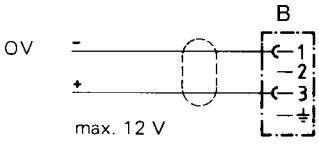


Abb. 2/Fig. 2

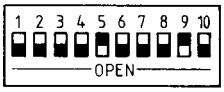




1) Supply voltage 2) Nominal input current (Ohmic load 100 Ω max. 50mA; max. 12 V; to plug 1; pin 1)
3) Actual output value (Max. total resistance of downstream devices < 300 Ω.
The actual value is measured between plug 2, pin 3 and plug 1, pin 1. The actual value is short circuit resistant for a limited time.)
4) The supply voltage must be protected by an external M 0.5 A fuse.
5) Shielding must comply with local limiting conditions. In extreme cases the power supply must also be shielded.
A) Plug 1 B) Plug 2
Fig. 1: Delivery status 4 - 20 mA, Fig. 2: Alternative 0 - 20 mA

Switch position and pin assignment for voltage activation

Abb. 1/Fig. 1



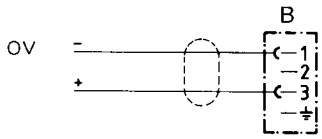
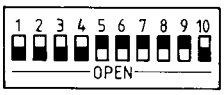
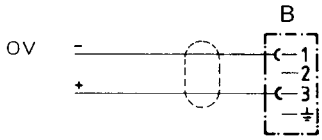


Abb. 2/Fig. 2

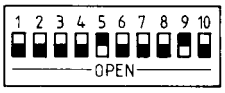


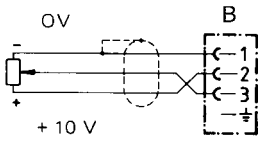


To ensure the EMV plug 2 (B) has to be connected through a screened cable.
Fig. 1: Voltage control 0 - 10 V, Fig. 2: Voltage control 2 - 10 V

Switch position and pin assignment for potentiometer activation

Abb. 1/Fig. 1





To ensure the EMV plug 2 has to be connected through a screened cable.
Fig. 1: Potentiometer activation 2 - 10 k Ohm
B) Plug 2

Way-Valves

Rexroth
Bosch Group

Products

3/2-way-valves, pneumatically energized, monostable

See page 2

3/2-way-valve, pneumatically energized, monostable

See page 4

3/2-way-valve, pneumatically energized, monostable, adjustable trip point pressure

See page 6

3/2- way-valve, pneumatically energized, monostable, low trip point pressure

See page 9

3/2-way-valve, pneumatically energized

See page 11

4/2-way-valve, pneumatically energized

See page 13

3/2-way-valve, pneumatically energized, monostable, with shuttle valve

See page 15

3/2-way-valve, pneumatically energized, monostable, with time delay

See page 17

3/2-way-valve, electromagnetically operated, monostable

See page 19

3/2-way-valve, electromagnetically operated, monostable, for higher temperatures

See page 21

3/2-way-valve, electromagnetically operated, monostable

See page 23

3/2-way-valve, electromagnetically operated, bistable

See page 25

Way-Valves

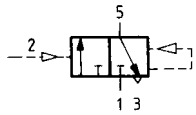
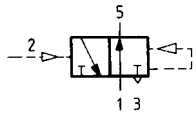
3/2-way-valve, pneumatically energized, monostable

Rexroth
Bosch Group

Technical data

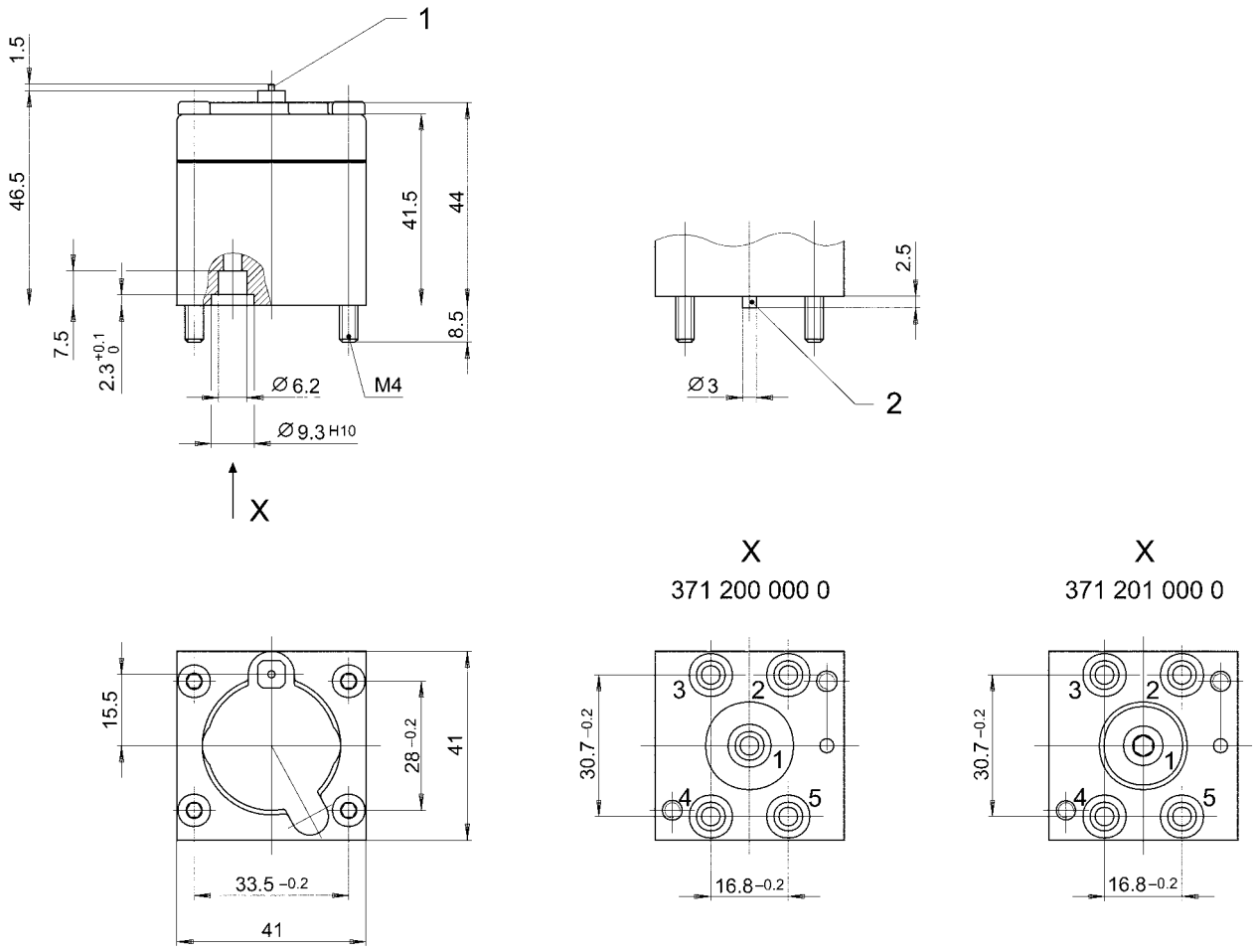
Type		Poppet valve
Operating pressure range		0.5 to 10 bar
Hysteresis		10% of pressure in connection 1
Nominal diameter		ND 4
Ambient temperature range		- 20°C to + 70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.27 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Tightening torque of mounting screws		3 Nm

Type number

	Valve function	Trip point pressurefor connection 2	Type number
	NC-valve	50 % of pressure in connection 1	**371 200 000 0**
	NO-valve	60 % of pressure in connection 1	**371 201 000 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**371 200 002 2**



1) Control pin, 2) Dowel pin

Way-Valves

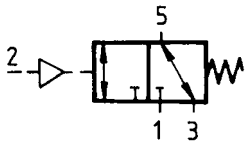
3/2-way-valve, pneumatically energized, monostable

Rexroth
Bosch Group

Technical data

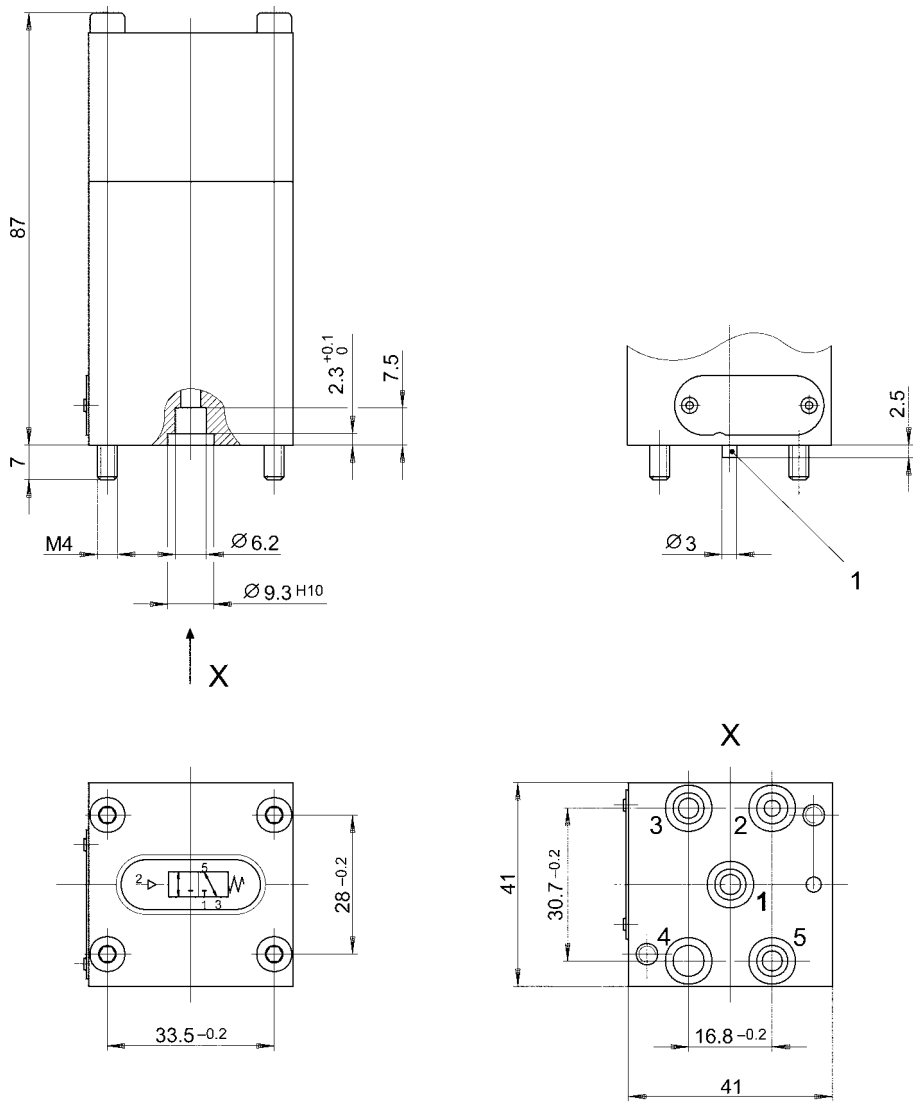
Type		Poppet valve
Operating pressure range	Connection 1, 3, 5	Max. 10 bar
	Connection 2	Max. 30 bar
Hysteresis		10% of pressure in connection 1
Nominal diameter		ND 4
Ambient temperature range		- 20°C to + 70°C
Admissible medium	Connection 1, 3, 5	Compressed air, lubricated or non-lubricated
	Connection 2	Compressed air, mineral oil
Weight		0.4 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Tightening torque of mounting screws		3 Nm

Type number

	Valve function	Trip point pressure for connection 2	Type number
	NC and NO-valve	3 ± 1 bar	**371 200 110 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**371 200 003 2**


87
7
2.3 +0.1 0
7.5
M4
Ø6.2
Ø9.3 H10
X
2.5
Ø3
1
28 –0.2
33.5 –0.2
X
41
30.7 –0.2
3
2
1
4
5
16.8 –0.2
41

1) Dowel pin

Way-Valves

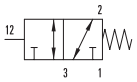
3/2-way-valve, pneumatically energized, monostable,
adjustable trip point pressure

Rexroth
Bosch Group

Technical data

Type		Poppet valve
Operating pressure range		Max. 10 bar
Hysteresis		See diagram
Nominal diameter		ND 4
Ambient temperature range		- 20°C to + 70°C
Admissible medium	Connection 1, 3, 4, 5	Compressed air, lubricated or non-lubricated
	Connection 2	Compressed air, mineral oil
Weight		0.5 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Tightening torque of mounting screws		3 Nm

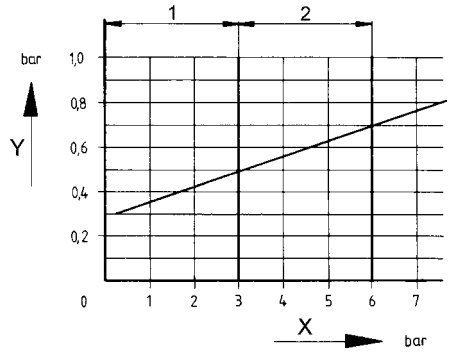
Type number

	Valve function	Trip point pressure for connection 2	Type number
	NC and NO-valve	0.4 - 3 bar	**371 203 000 0**
	NC and NO-valve	3 - 6 bar	**371 203 006 0**

Accessories (to be ordered separately)

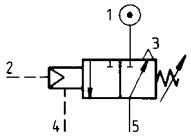
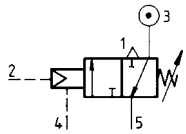
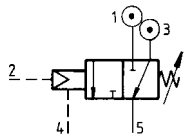
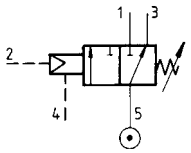
Accessories	Type	Type number
	Repair kit	**371 203 002 2**

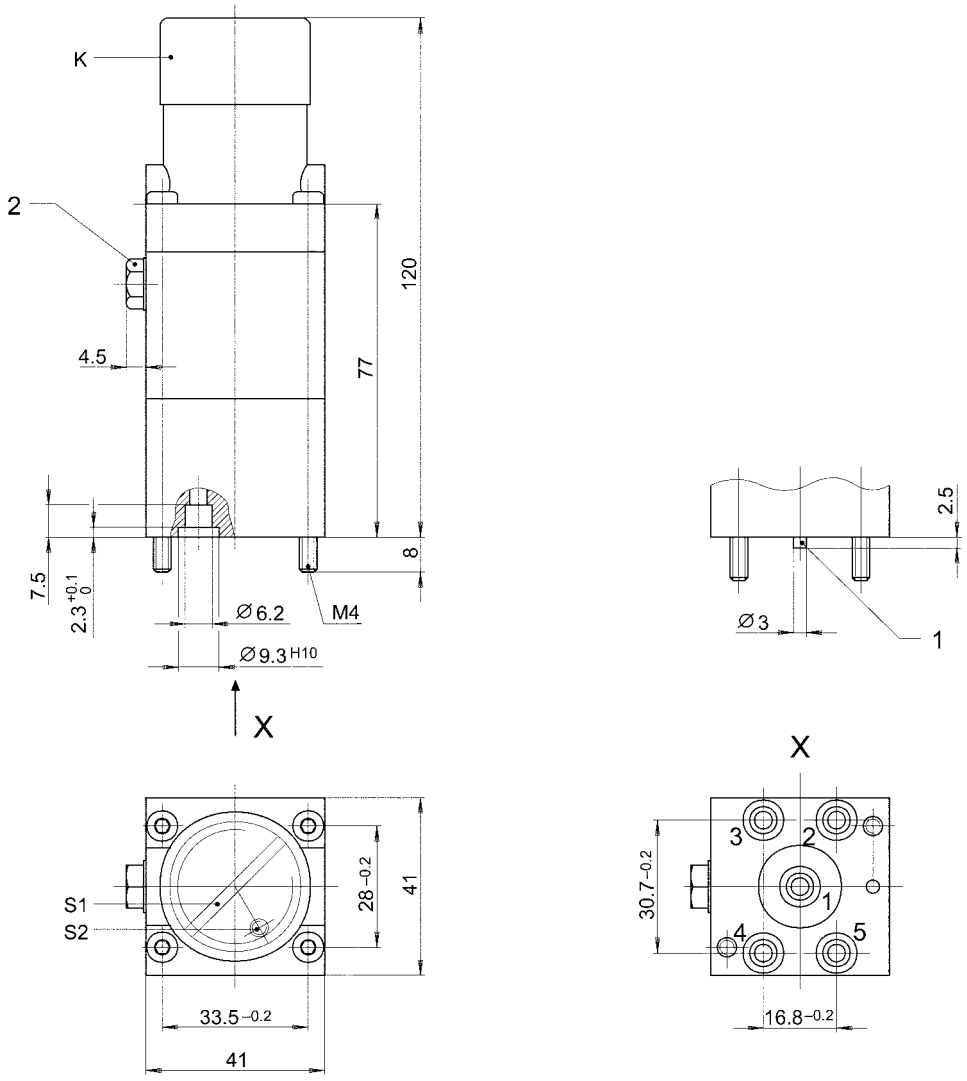
Pressure - hysteresis - diagram



1) Valve 371 203 000 0 2) Valve 371 203 006 0

Valve functions

Symbol	Valve function	Min. pressure in connection 4
	Normally closed valve	P4 ≥ 0.5 * P1
	Normally open valve	P4 ≥ 0.6 * P3
	Shuttle valve	P4 ≥ 0.5 bar + P1
	Distribution valve	P4 ≥ 0.5 bar + P5



K) Protective cap, S1) Adjusting screw, S2) Safety screw
1) Dowel pin 2) Exhaust screw

Way-Valves

3/2- way-valve, pneumatically energized, monostable,
low trip point pressure

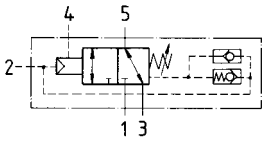
Rexroth
Bosch Group

Technical data

Type		Poppet valve
Operating pressure range		1.5 to 10 bar
Nominal diameter		ND 4
Ambient temperature range		- 20°C to + 70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.5 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Tightening torque of mounting screws		3 Nm

Long time delays result from ventilating and exhausting long control lines.
Due to low trip point pressures switching times are kept small.

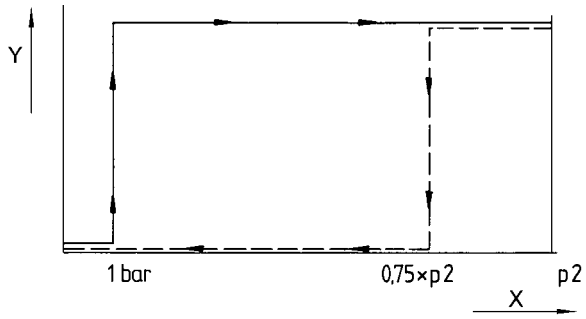
Type number

	Valve function	Trip point pressurel for connection 2	Type number
	NC and NO-valve	See diagram	**371 203 055 0**

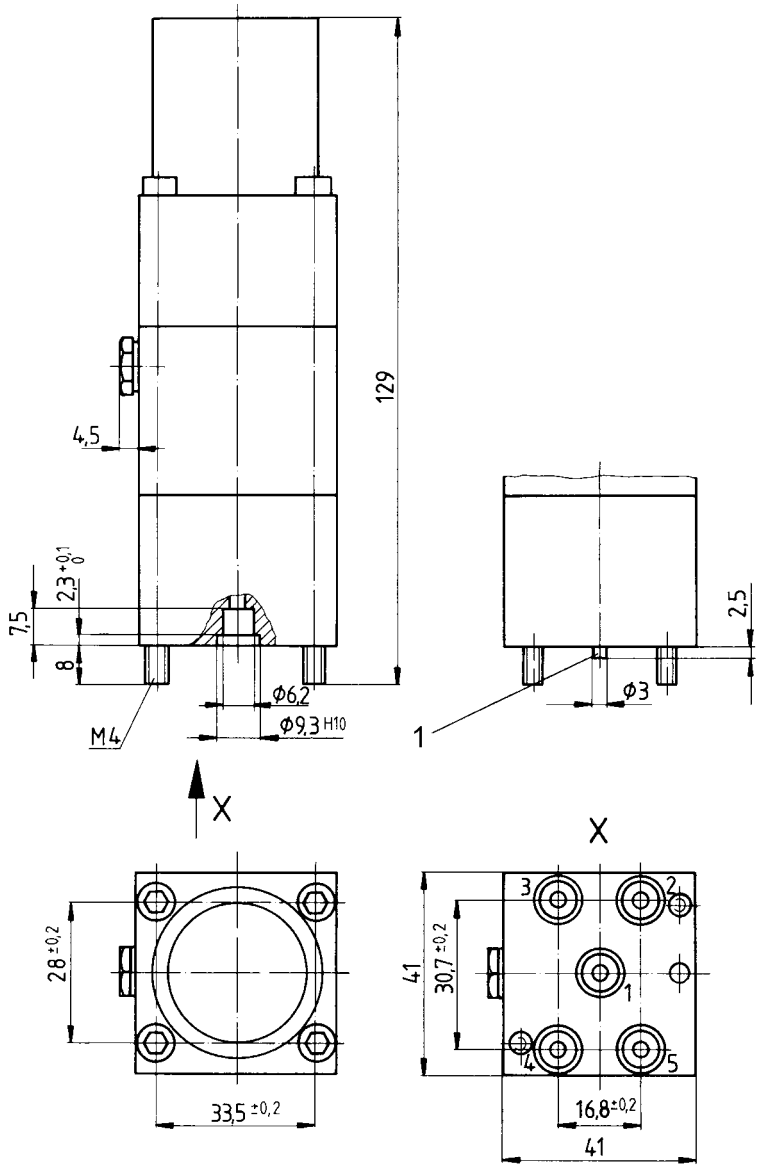
Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**371 203 002 2**

Pressure - diagram



x) Pressure in connection 2, y) Pressure in connection 5


129
4,5
7,5
2,3 +0,1 0
8
M4
Φ6,2
Φ9,3 H10
X
2,5
Φ3
1
28 ±0,2
33,5 ±0,2
41
30,7 ±0,2
16,8 ±0,2
41
3
2
1
4
5

1) Dowel pin

Way-Valves

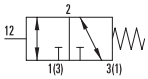
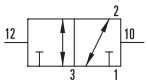
3/2-way-valve, pneumatically energized

Rexroth
Bosch Group

Technical data

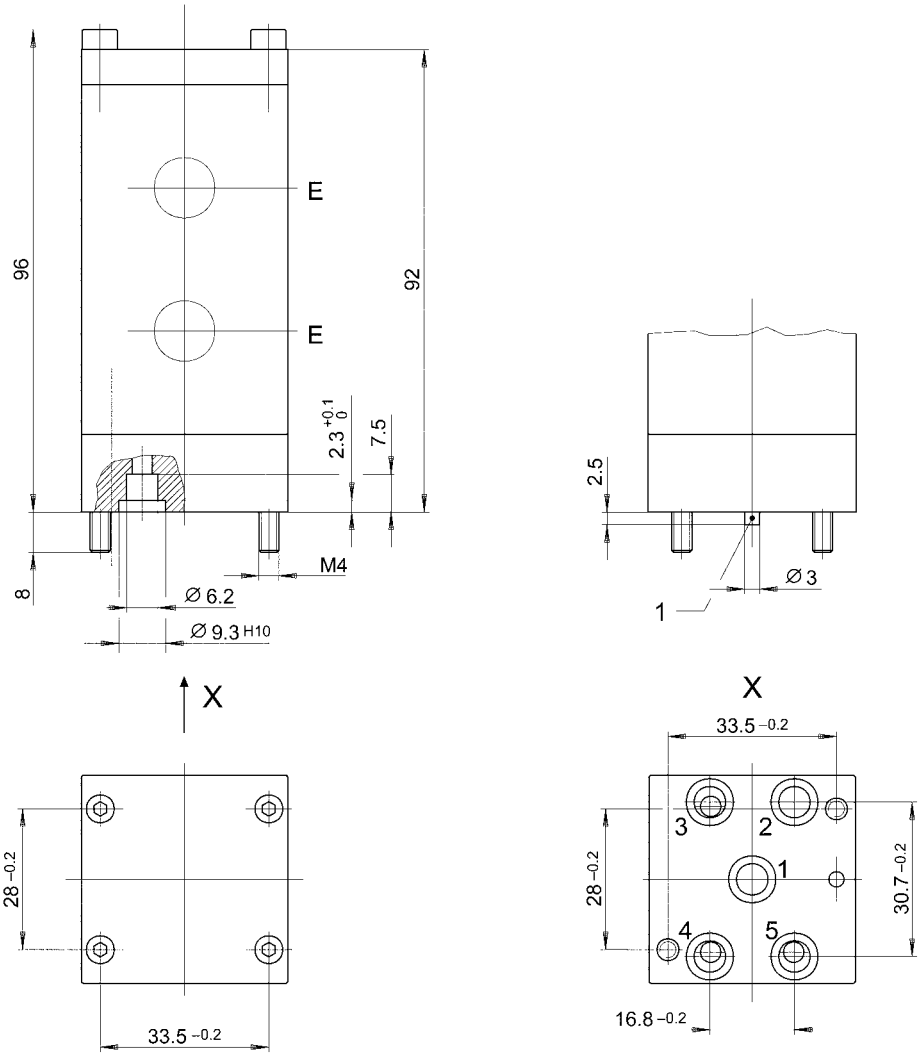
Type		Slide valve
Operating pressure range		Max. 10 bar
Nominal diameter		ND 4
Ambient temperature range		- 20°C to + 70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.37 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Tightening torque of mounting screws		3 Nm

Type number

	Trip point pressure	Hysteresis	Type number
	≥ 4 bar	< 1.5 bar	**371 205 200 0**
	≥ 2.5 bar	-	**371 205 100 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**371 204 003 2**



E) Exhaust, 1) Dowel pin

Way-Valves

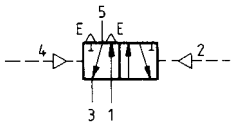
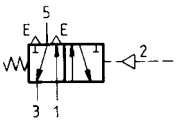
4/2-way-valve, pneumatically energized

Rexroth
Bosch Group

Technical data

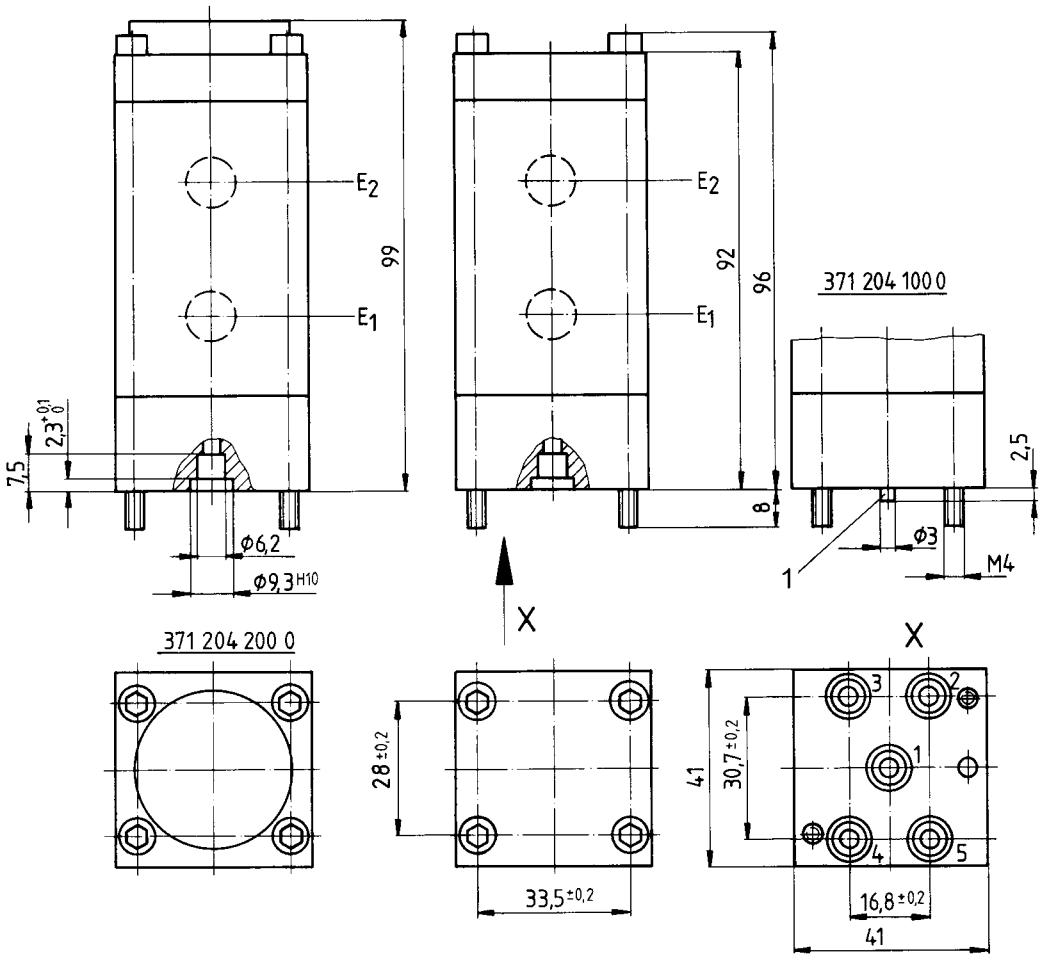
Type		Slide valve
Operating pressure range		Max. 10 bar
Nominal diameter		ND 4
Ambient temperature range		- 20°C to + 70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.37 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Tightening torque of mounting screws		3 Nm

Type number

	Trip point pressure	Hysteresis	Type number
	≥ 2.5 bar	-	**371 204 100 0**
	≥ 4 bar	< 1.5 bar	**371 204 200 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**371 204 003 2**


E2
E1
99
92
96
8
7,5
2,3
ϕ6,2
ϕ9,3 H10
371 204 100 0
2,5
ϕ3
M4
1
X
371 204 200 0
28 ±0,2
33,5 ±0,2
41
30,7 ±0,2
16,8 ±0,2
41
1
2
3
4
5

1) Exhaust

Way-Valves

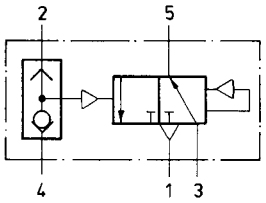
3/2-way-valve, pneumatically energized, monostable,
with shuttle valve

Rexroth
Bosch Group

Technical data

Type		Poppet valve
Operating pressure range		0.4 - 10 bar
Hysteresis		20% of the pressure in connection 3
Nominal diameter		ND 4
Ambient temperature range		- 20°C to + 70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.27 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Tightening torque of mounting screws		3 Nm

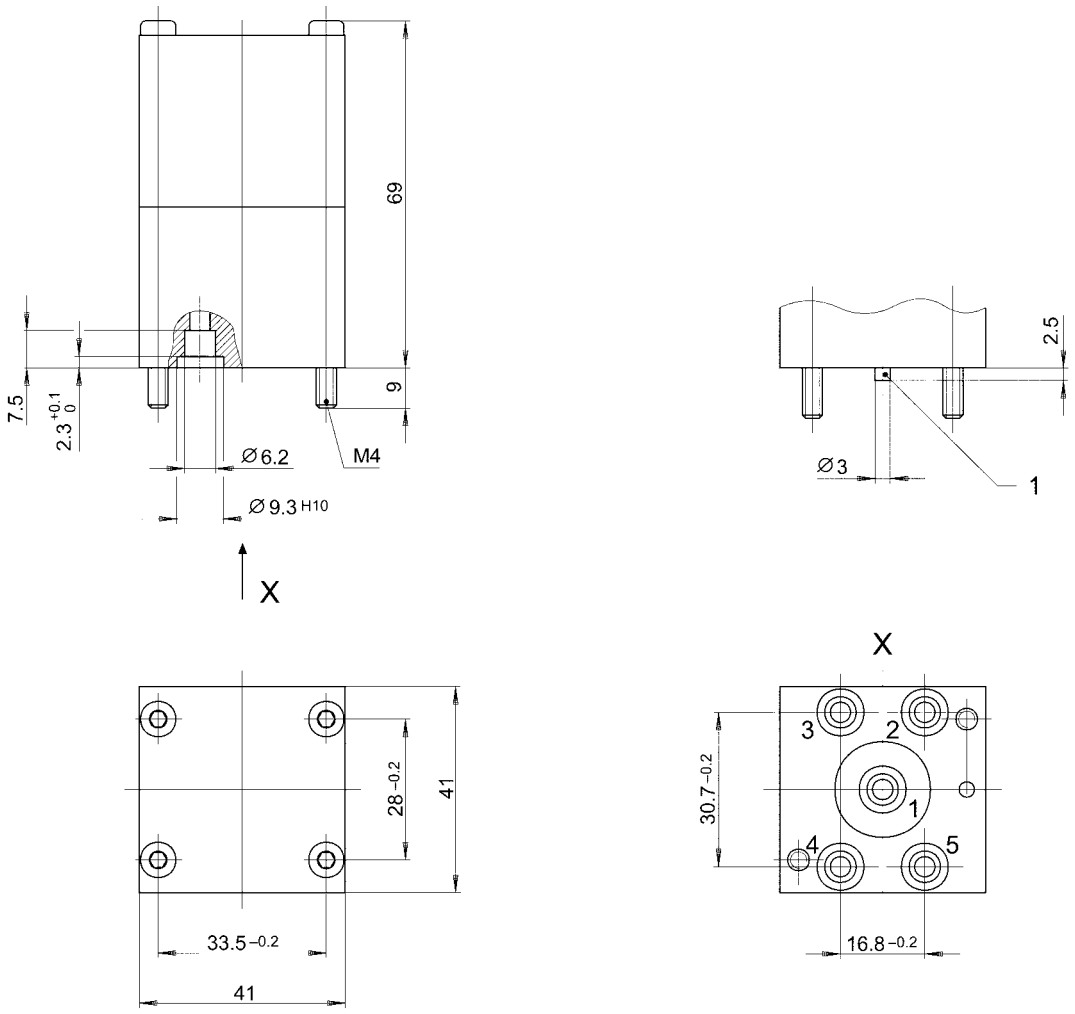
Type number

	Valve function	Trip point pressure for connection 2 and 4	Type number
	NC-valve	60 % of the pressure in connection 3	**371 208 050 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**371 208 001 2**

6


69
9
7.5
2.3 +0.1 0
Ø6.2
M4
Ø9.3 H10
X
2.5
Ø3
1
28 −0.2
41
33.5 −0.2
41
X
3
2
1
4
5
30.7 −0.2
16.8 −0.2

1) Dowel pin

Way-Valves

3/2-way-valve, pneumatically energized, monostable, with time delay

Rexroth
Bosch Group

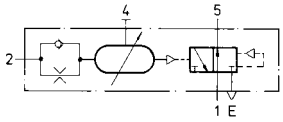
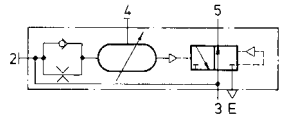
Technical data

Type		Poppet valve with timer
Operating pressure range		2 - 8 bar +2 0 %
Nominal diameter		ND 4
Ambient temperature range		- 20°C to + 80°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.5 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Tightening torque of mounting screws		3 Nm

Application Area

Suitable for all mechanical control systems, especially corrosion-proof or light-weight applications.

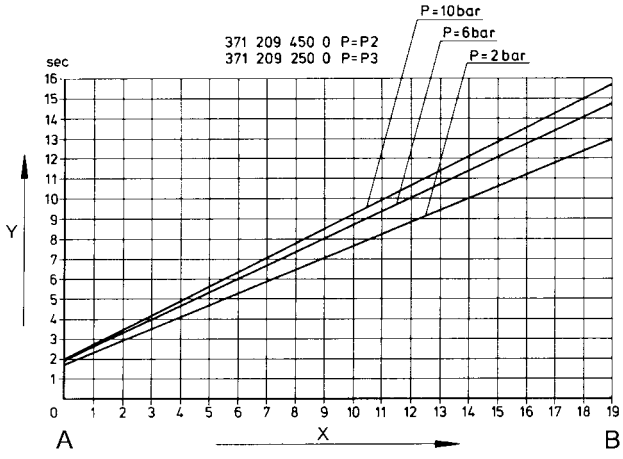
Type number

	Valve function	Trip point pressure for connection 2	Type number
	NC-valve	≥ 0.5 * P3	**371 209 450 0**
	NC-valve	-	**371 209 250 0**

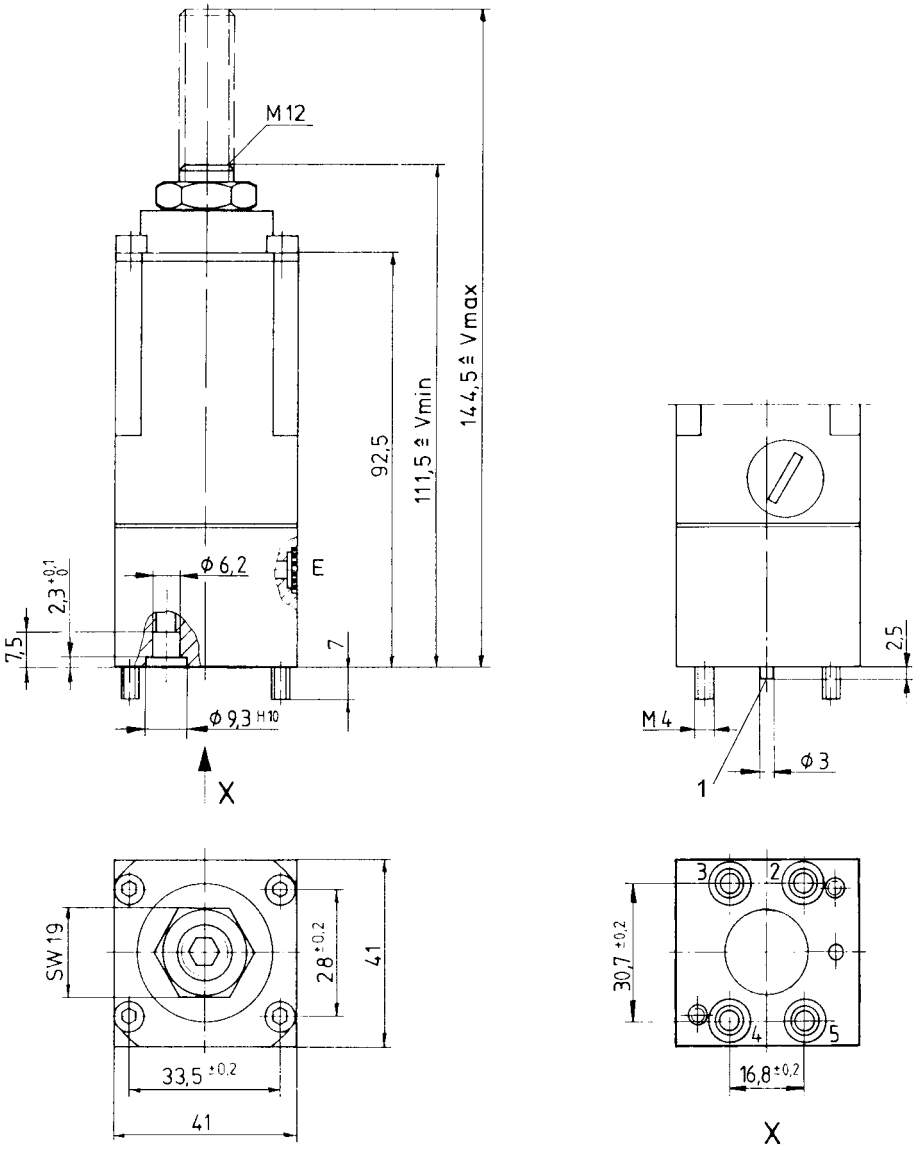
Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**371 209 000 2**

Time - pressure - diagram



x) Number of rotations, y) Time, A) Min. volume, B) Max. volume
The diagram is valid for P1 = P2. For longer switching times an additional volume in in port 4 has to be connected. (2.5 cm³ per second)



1) Dowel pin E) Exhaust

Way-Valves

3/2-way-valve, electromagnetically operated, monostable

Rexroth
Bosch Group

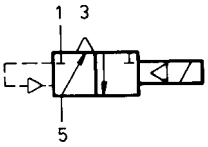
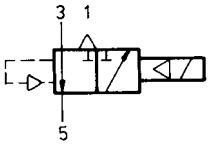
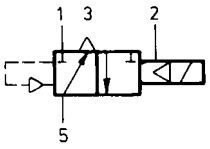
Technical data

Type		Poppet valve with pressure indicator
Operating pressure range		Max. 10 bar
Nominal diameter		ND 4
Ambient temperature range		-20°C to +60°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.4 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Operating voltages		24 V DC ± 20 %
Current consumption		270 mA
Insulation class		F according to VDE 0580
Protection with plug		IP 65 according to DIN VDE 0470
Duty cycle	ED	100%

Application area

Suitable for all applications. The valve is non-overlapping.

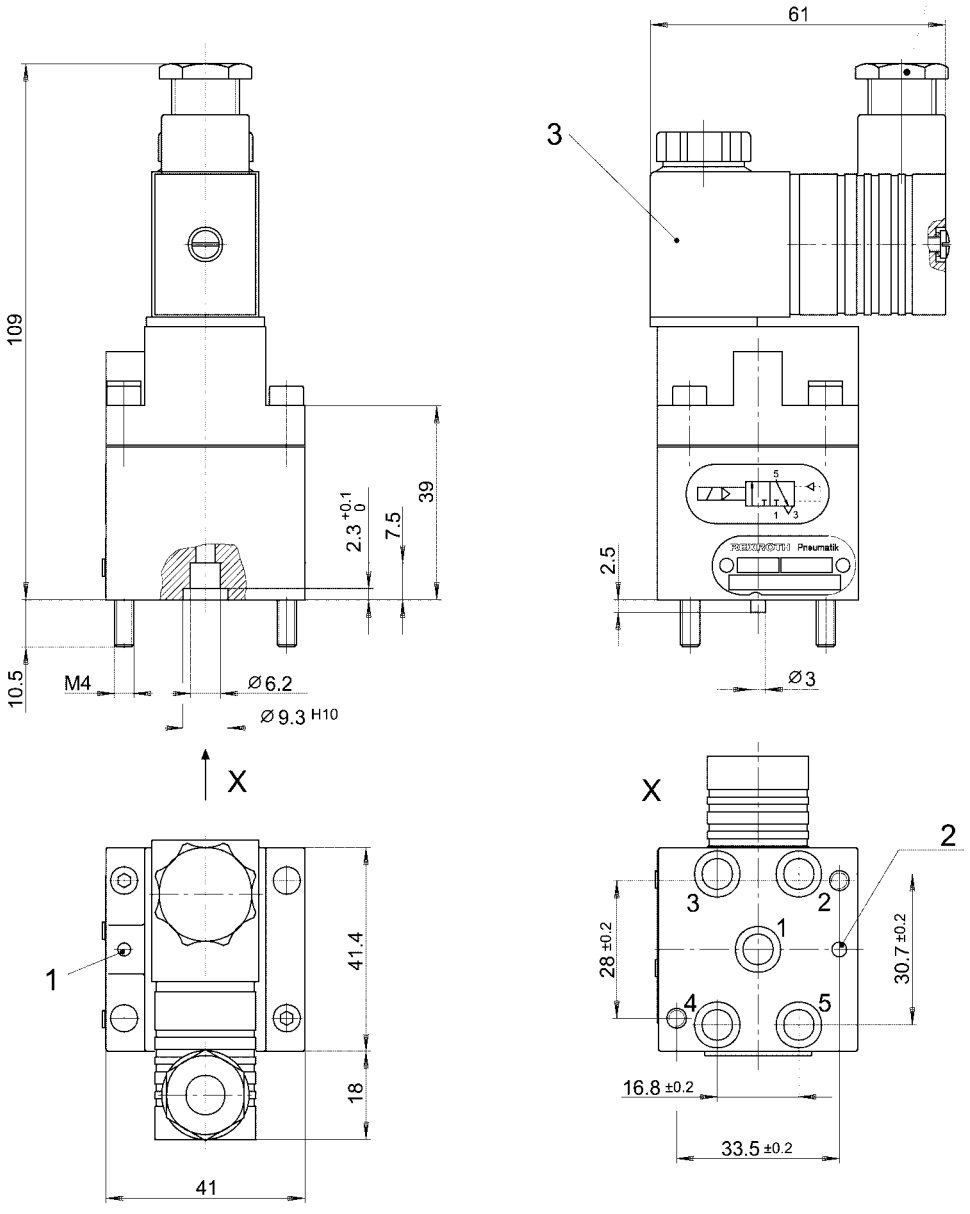
Type number

	Function Pilot control	Operating pressure range	Type number
	NC-valve without separate pilot control	0.5 to 10 bar	**372 225 022 0**
	NO-valve without separate pilot control	0.5 to 10 bar	**372 226 022 0**
	NC-/NO-valve with separate pilot control	-0.95 to +10 bar Pilot pressure ≥ 4 bar	**372 228 022 0**

Accessories (to be ordered separately)

Symbol	Type	Type number
	Spare part kit	**372 225 001 2**

Pg 9 ø6 - ø8 mm



1) Check pin, 2) Dowel pin

Way-Valves

3/2-way-valve, electromagnetically operated, monostable, for higher temperatures

Rexroth
Bosch Group

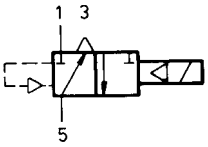
Technical data

Type		Poppet valve with pressure indicator
Operating pressure range		Max. 10 bar
Nominal diameter		ND 4
Ambient temperature range		0°C to +100°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.4 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Operating voltages		24 V DC ± 20 %
Current consumption		200 mA
Insulation class		F according to VDE 0580
Protection with plug		IP 65 according to DIN VDE 0470
Duty cycle	ED	100%

Application area

Suitable for all applications. Valve is non-overlapping.

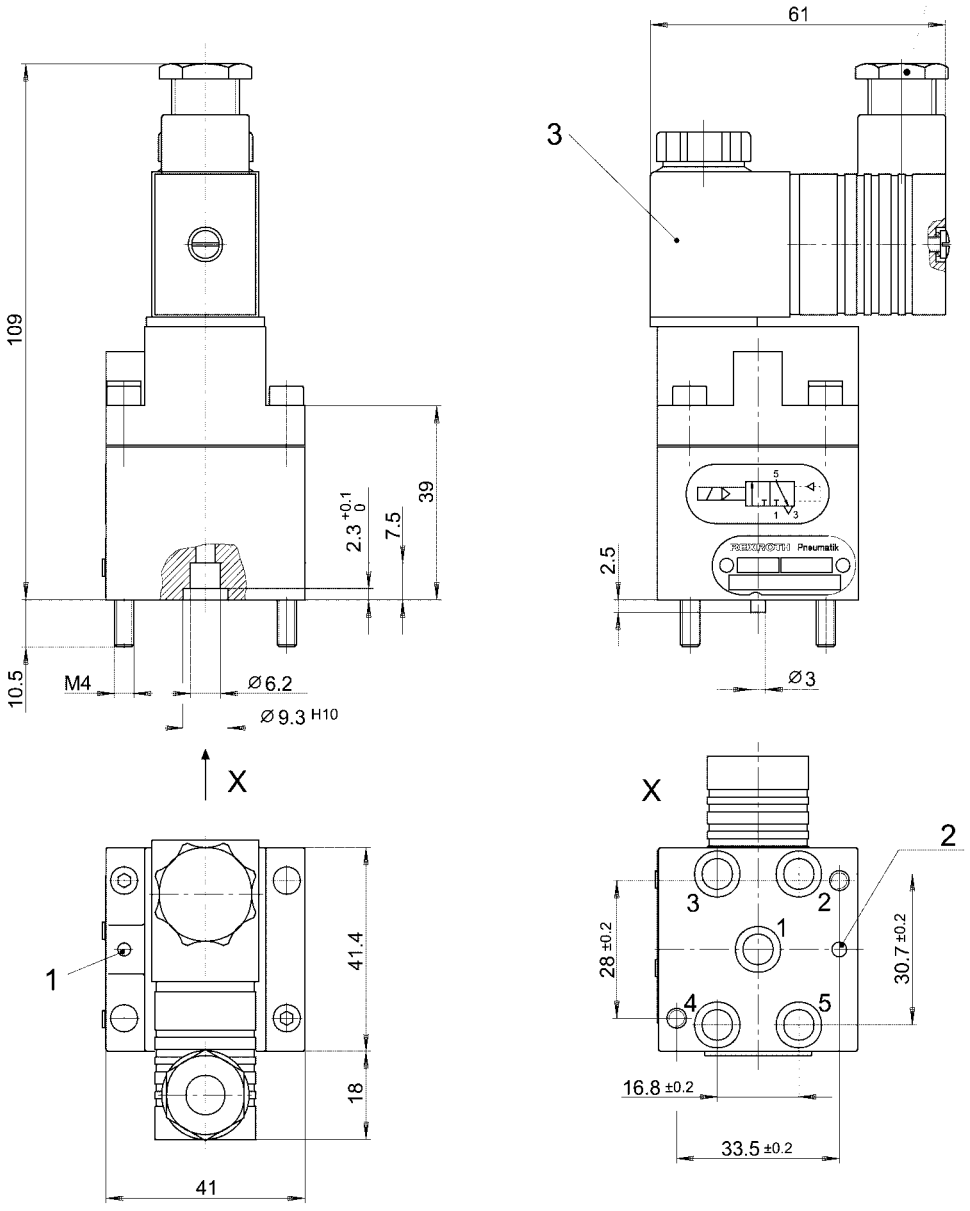
Type number

	Function Pilot control	Operating pressure range	Type number
	NC-valve without separate pilot control	0.5 bis 10 bar	**372 225 092 0**

Accessories (to be ordered separately)

Symbol	Type	Type number
	Spare part kit	**372 225 004 2**

Pg 9 ø6 - ø8 mm



1) Check pin (reeled-out if pressure in connection 1 >4 bar), 2) Dowel pin , 3) Solenoid can be turned by 90°.

Way-Valves

3/2-way-valve, electromagnetically operated, monostable

Rexroth
Bosch Group

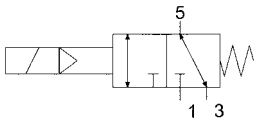
Technical data

Type		Poppet valve
Operating pressure range		0.5 to 8 bar
Nominal diameter		ND 0.8
Ambient temperature range		-20°C to +60°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.175 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Operating voltages		24 V DC ± 20 %
Insulation class		F according to VDE 0580
Protection with plug		IP 65 according to DIN VDE 0470
Duty cycle	ED	100%

Application area

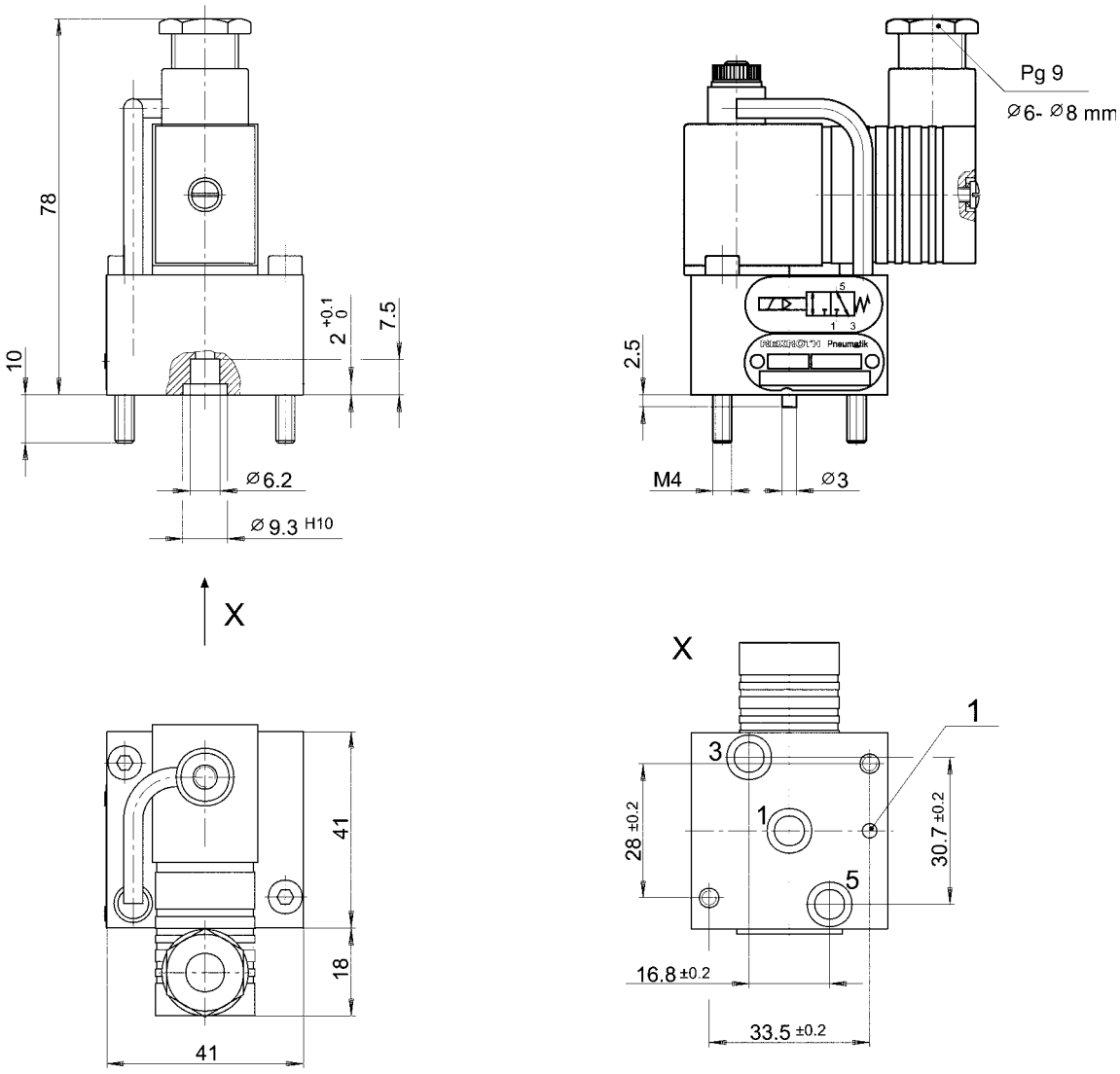
Suitable for all applications. Valve is non-overlapping.

Type number

	Function Pilot control	Operating pressure range	Type number
	NC-valve without separate pilot control	0.5 to 8 bar	**372 227 022 0**

Accessories (to be ordered separately)

Symbol	Type	Type number
	Spare part kit	**372 227 001 2**


78
10
2 +0.1 0
7.5
Ø6.2
Ø9.3 H10
X
41
18
41
Pg 9
Ø6- Ø8 mm
2.5
M4
Ø3
X
1
3
1
5
28 ±0.2
30.7 ±0.2
16.8 ±0.2
33.5 ±0.2

1) Dowel pin

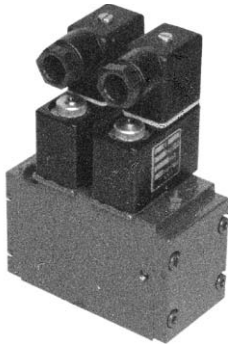
Way-Valves

3/2-way-valve, electromagnetically operated, bistable

Rexroth
Bosch Group

Technical data

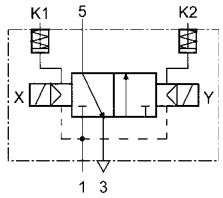
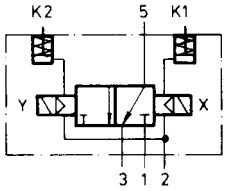
Type		Slide valve with pressure indicator
Operating pressure range		Max. 10 bar
Nominal diameter		ND 4
Ambient temperature range		-20°C to +60°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.7 kg
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Operating voltages		24 V DC ± 20 %
Current consumption		0.27 A
Insulation class		F according to VDE 0580
Protection with plug		IP 65 according to DIN VDE 0470
Duty cycle	ED	100%



Application area

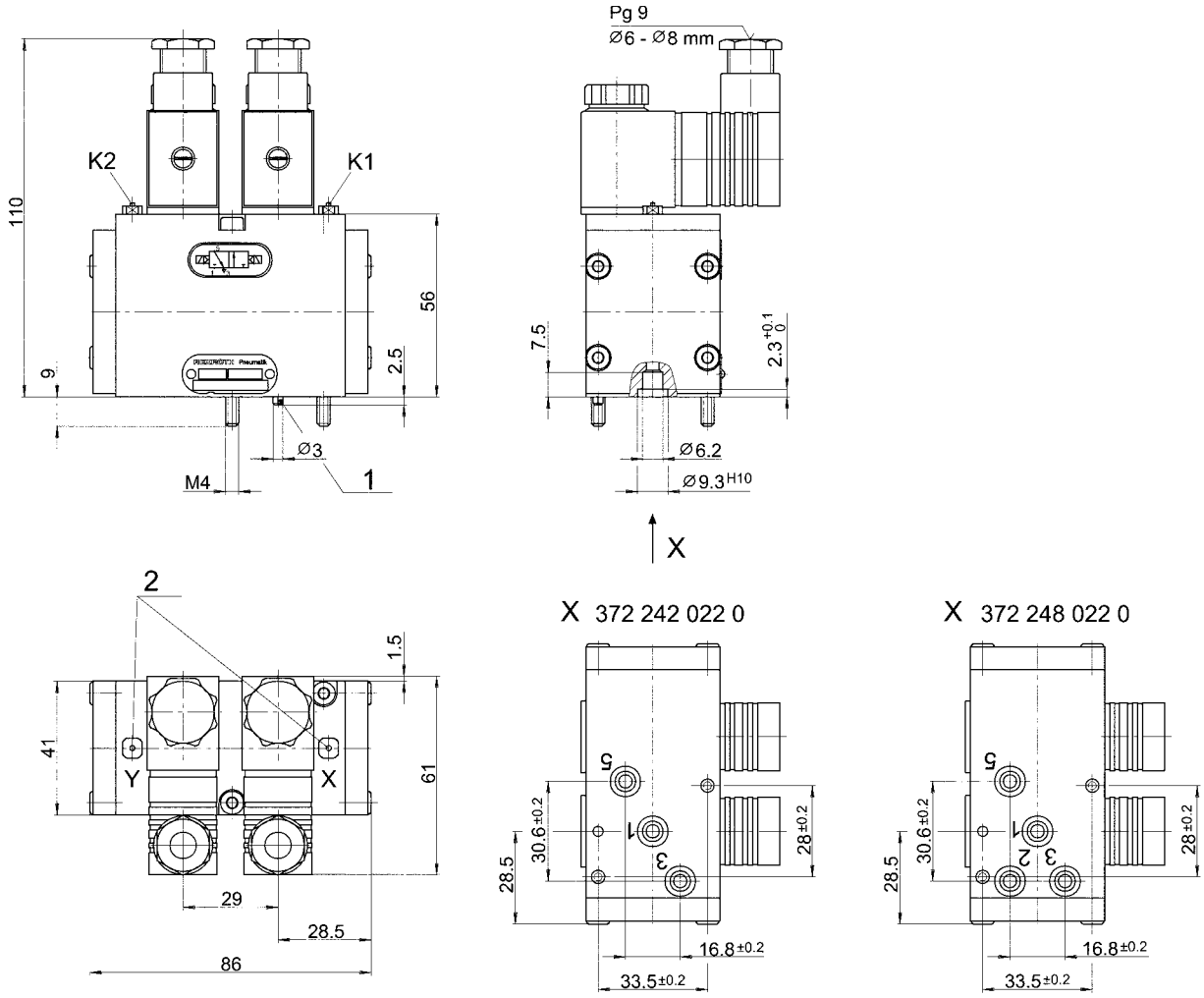
Suitable for all applications. Valve is non-overlapping.

Type number

	Function Pilot control	Operating pressure range	Type number
	NO-valve internal pilot control	5 to 10 bar	**372 242 022 0**
	NC- / NO-valve external pilot control	0 to 10 bar pilot pressure min. 4 bar	**372 248 022 0**

Accessories (to be ordered separately)

Symbol	Type	Type number
	Spare part kit	**372 242 000 2**



1) Dowel pin, 2) Check pin (extracted when respective solenoid is energized and if the pressure in connection 1> 4 bar)

Rexroth
Bosch Group

Products

Without external outputs

See page 28

With one external output

See page 30

With two external outputs

See page 32

Connection- and Distribution Blocks

Without external outputs

Rexroth
Bosch Group

Technical data

Operating pressure range		Max. 10 bar
Nominal diameter		ND 4
Ambient temperature range		-20°C to +70°C
Admissible medium		Compressed air, mineral oil
Weight		See table
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Torque of mounting screws		3 Nm

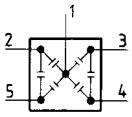
Electrical data of the detented switches		352 601 020 0, ... 021 0, ... 022 0, ... 024 0
Voltage		Max.50 V
Current		Max. 5 A
Kind of current		Direct current
Contact rating		Max. 30 W

Electric connection		Flat plug 6.3 DIN 46 247
Protection type		IP 00 according to DIN VDE 0470
	On application of the protective cover 897 750 342 4	
and cable ∅5mm	IP 65 according to DIN VDE 0470	

Electrical data of the detented switches	352 601 025 0	
Admissible load **) at	Ohmic load	Inductive load
30 V DC	10 A	5 A
110 V DC	0.5 A	0.03 A
220 V DC	0.2 A	0.03 A
250 V AC	2 A	-

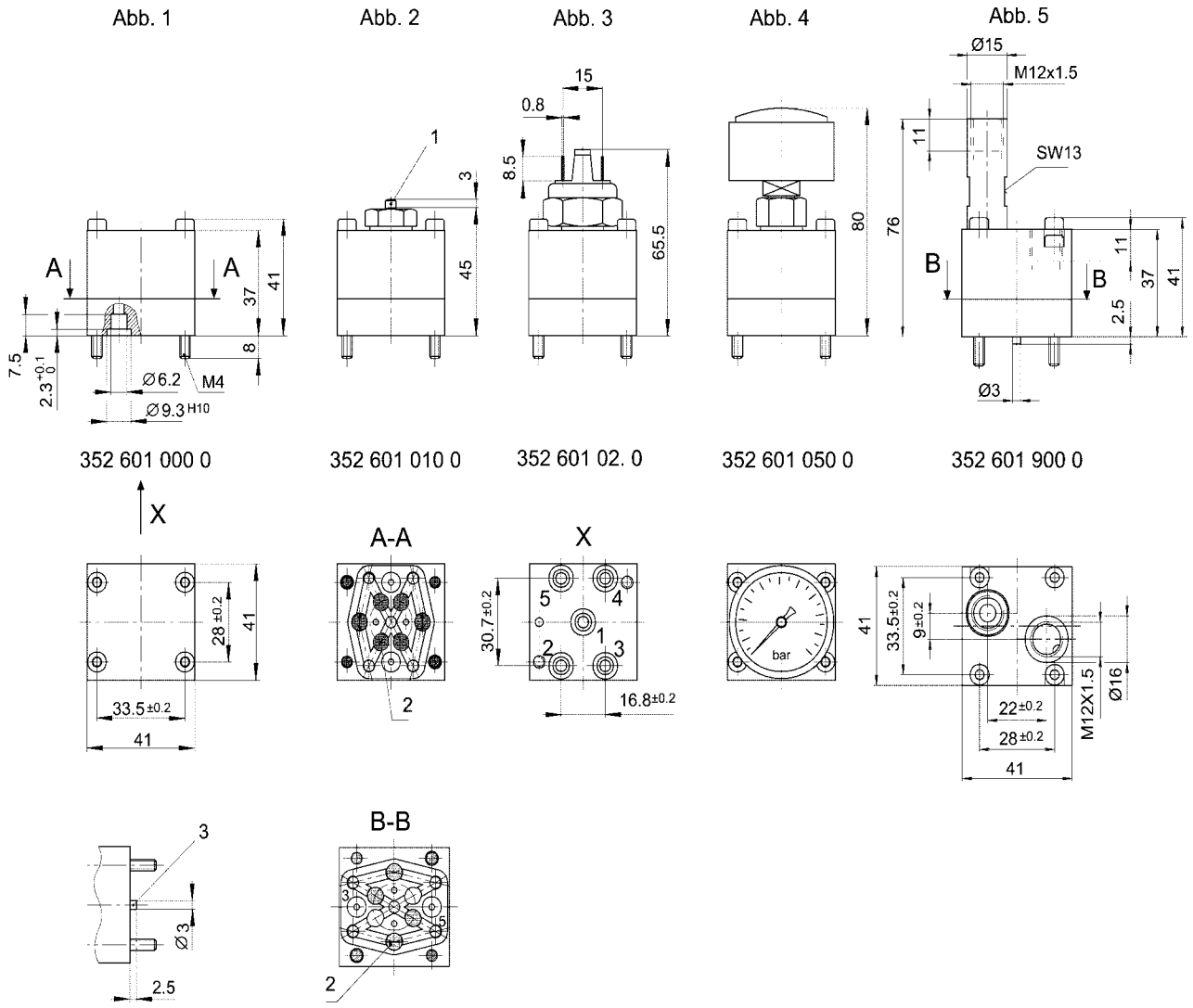
**) The detented switch must be earthed by means of either the load-bearing element or the control cabinet.

Type number

	Fig.	Auxiliary function	Designation	Weight [kg]	Type number
	1	Without		0.24	**352 601 000 0**
	2	Pressure indicator	Pin extracted p ≥3 bar Pin retracted p <0.2 bar	0.25	**352 601 010 0**
	3	Detented switch	Make contact element p = 4 bar ±10%	0.29	**352 601 020 0**
	3	Detented switch	Normally closed contact p = 4 bar ±10%	0.29	**352 601 021 0**
	3	Detented switch	Make contact element p = 2 bar ±10%	0.29	**352 601 022 0**
	3	Detented switch	Normally closed contact p = 2 bar ±10%	0.29	**352 601 023 0**
	3	Detented switch	Make contact element p = 3.5 bar ±10% *)	0.29	**352 601 024 0**
	4	Pressure gauge	0 to 10 bar	0.31	**352 601 050 0**
	4	Pressure gauge	0 to 2.5 bar	0.31	**352 601 051 0**
	4	Pressure gauge	0 to 6 bar	0.31	**352 601 052 0**
	5	Measuring connection 2, 4	Connection between 1, 3, 5	0.25	**352 601 900 0**

Accessories (to be ordered separately)

Symbol	Type	Type number
	Spare part kit	**341 040 000 2**



1) Check pin, 2) Plug, 3) Dowel pin

Connection- and Distribution Blocks

With one external output

Rexroth
Bosch Group

Technical data

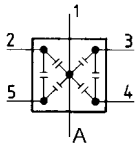
Operating pressure range		Max. 10 bar
Nominal diameter		ND 4
Ambient temperature range		-20°C to +70°C
Admissible medium		Compressed air, mineral oil
Weight		See table
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Torque of mounting screws		3 Nm

Electrical data of the detented switches		
Voltage		Max.50 V
Current		Max. 5 A
Type of current		Direct current
Contact rating		Max. 30 W

Electric connection		Flat plug 6.3 DIN 46 247
Protection type		IP 00 according to DIN VDE 0470
	On application of protective cover 897 750 342 4	
and cable ∅5mm		IP 65 according to DIN VDE 0470

**) Detented switch has to be earthed either through the load bearing element or the control cabinet.

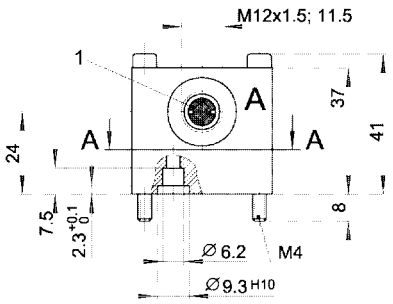
Type number

	Fig.	Auxiliary function	Designation	Weight [kg]	Type number
	1	Without		0.24	**352 602 000 0**
	2	Pressure indicator	Pin extracted p ≥ 3 bar Pin retracted p < 0.2 bar	0.25	**352 602 010 0**
	3	Detented switch	Make contact element p = 2 bar ±10%	0.29	**352 602 022 0**
	4	Pressure gauge	0 to 10 bar	0.31	**352 602 050 0**
	5	Without		0.24	**352 602 500 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**341 040 000 2**

Abb. 1



352 602 000 0
352 602 500 0

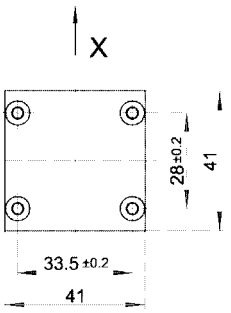
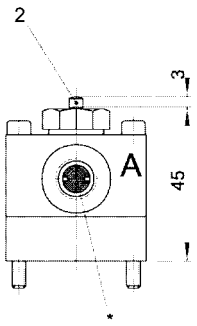


Abb. 2



352 602 010 0
352 602 510 0

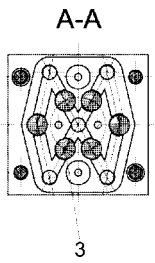
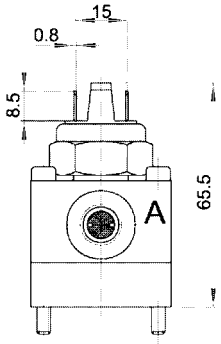
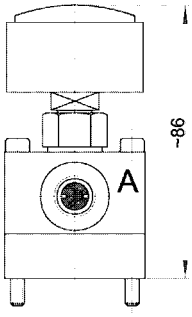


Abb. 3



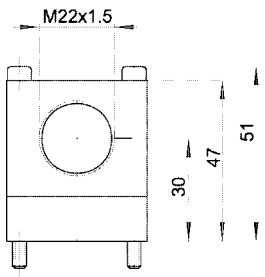
352 602 02. 0
352 602 52. 0

Abb. 4

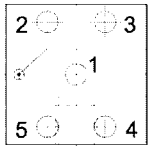


352 602 050 0
352 602 550 0

Abb. 5

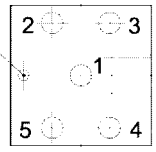


352 602 060 0

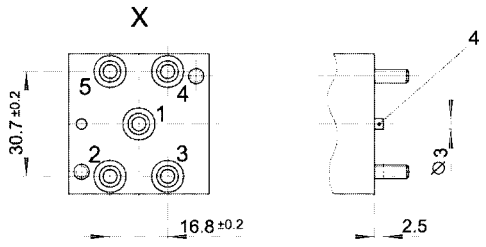


352 602 0.. 0

5



352 602 5.. 0



1) Strainer, 2) Check pin, 3) Plug, 4) Dowel pin, 5) Dowel pin and position of threaded connection

Connection- and Distribution Blocks

With two external outputs

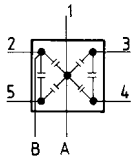
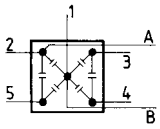
Rexroth
Bosch Group

Technical data

Operating pressure range		Max. 10 bar
Nominal diameter		ND 4
Ambient temperature range		-20°C to +70°C
Admissible medium		Compressed air, mineral oil
Weight		See table
Materials	Housing	Zn-diecasting
	Seals	BUNA-N
Torque of mounting screws		3 Nm
Electrical data of the detented switch		
Voltage		Max.50 V
Current		Max. 5 A
Type of current		Direct current
Contact rating		Max. 30 W
Electric connection		Flat plug 6.3 DIN 46 247
Protection		IP 00 according to DIN VDE 0470
	On application of the protective cover 897 750 342 4	
and cable ∅5mm	IP 65 according to DIN VDE 0470	

**) Detented switch has to be earthed by means of either the load bearing element or the control cabinet.

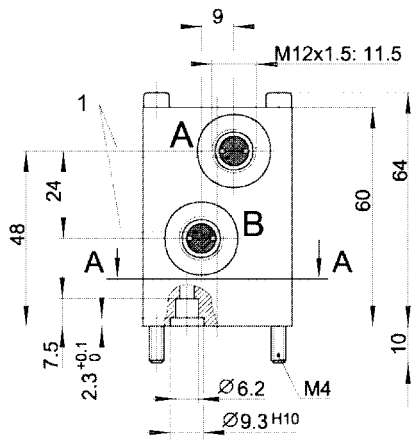
Type number

	Fig.	Auxiliary function	Designation	Weight [kg]	Type number
	1	Without		0.34	**352 602 100 0**
	2	Pressure indicator	Pin extracted p ≥ 2.5 bar Pin retracted p < 1 bar	0.36	**352 602 110 0**
	1	Without		0.24	**352 602 600 0**
	2	Pressure indicator	Pin extracted p ≥2.5 bar Pin retracted p < 1 bar	0.36	**352 602 610 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**341 040 000 2**

Abb. 1/Fig. 1



352 602 100 0
352 602 600 0

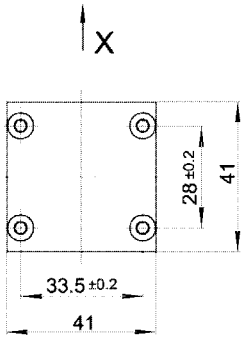
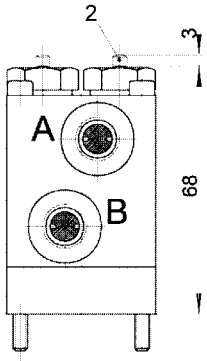
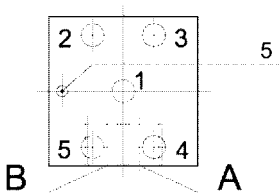


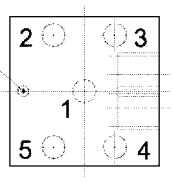
Abb. 2/Fig. 2



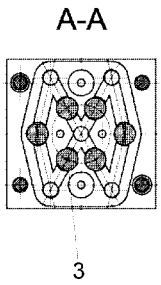
352 602 110 0
352 602 610 0

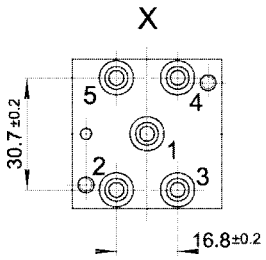


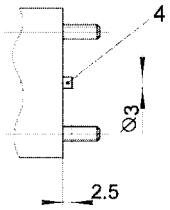
352 602 1.. 0



352 602 6.. 0







1) Strainer, 2) Check pin, 3) Plug, 4) Dowel pin, 5) Dowel pin and position of threaded connection.

Rexroth
Bosch Group

Products

Orifice check-valve, with adjustable time delay

See page 35

Check choke-valve

See page 38

Check-valve

See page 39

Shuttle-valve

See page 40

Pressure reducing-valve

See page 41

Accessory Valves

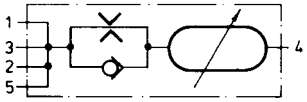
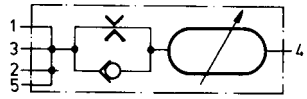
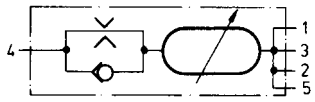
Orifice check valve, with adjustable time delay

Rexroth
Bosch Group

Technical data

Operating pressure	0,4 to 10 bar
Nominal diameter	ND 4
Ambient temperature range	- 20°C to + 70°C
Admissible medium	Compressed air, lubricated or non-lubricated
Torque of mounting screws	3 Nm
Adjusting volume	36.5 cm³
Weight	0.4 kg

Type number

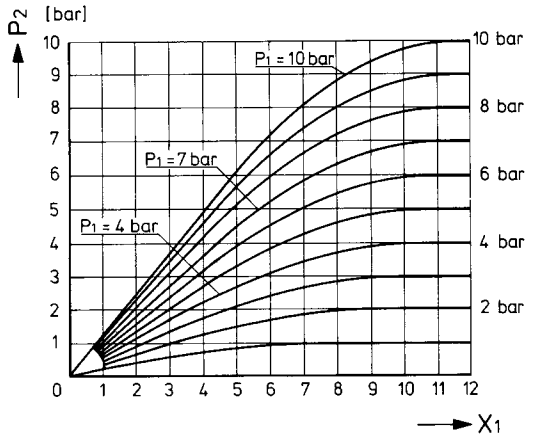
	Time delay	Type number
	See diagram 1 and 3	**334 115 000 0**
	See diagram 1 and 3	**334 115 005 0**
	See diagram 2 and 3	**334 115 050 0**
	See diagram 2 and 3	**334 115 055 0**

Accessories (to be ordered separately)

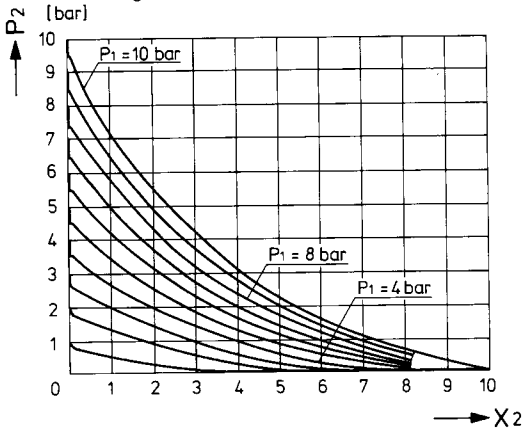
	Type	Type number
	Repair kit	**334 115 000 2**

Diagrams for the calculation of the time delay

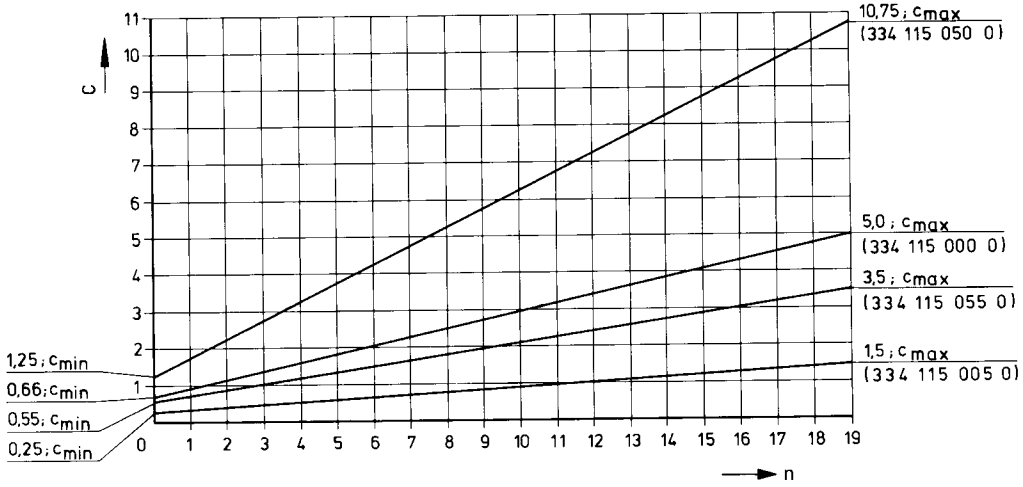
Diagr. 1



Diagr. 2



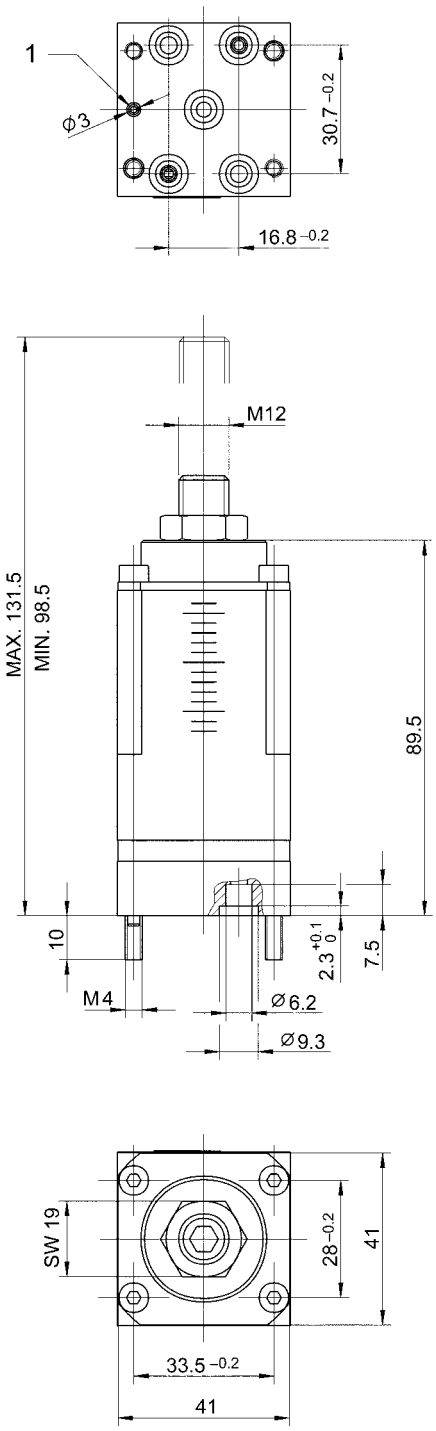
Diagr. 3



n) Number of rotations

Formula for the calculation of the switching delay

	Kind of delay	Formula	Symbol	Designation
	Switch-on signal delay	T1 = X1 * C	T1 X1 C	Charging time Charging index (diagram 1) Volume index (diagram 3)
	Switch-off delay	T2 = X2 * C	T2 X2 C	Venting time Venting index (diagram 2) Volume index (diagram 3)



1) Dowel pin
Close off unused connections with the enclosed seals 897 110 670 4 or 897 678 4.

Accessory Valves

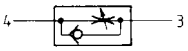
Check choke valve

Rexroth
Bosch Group

Technical data

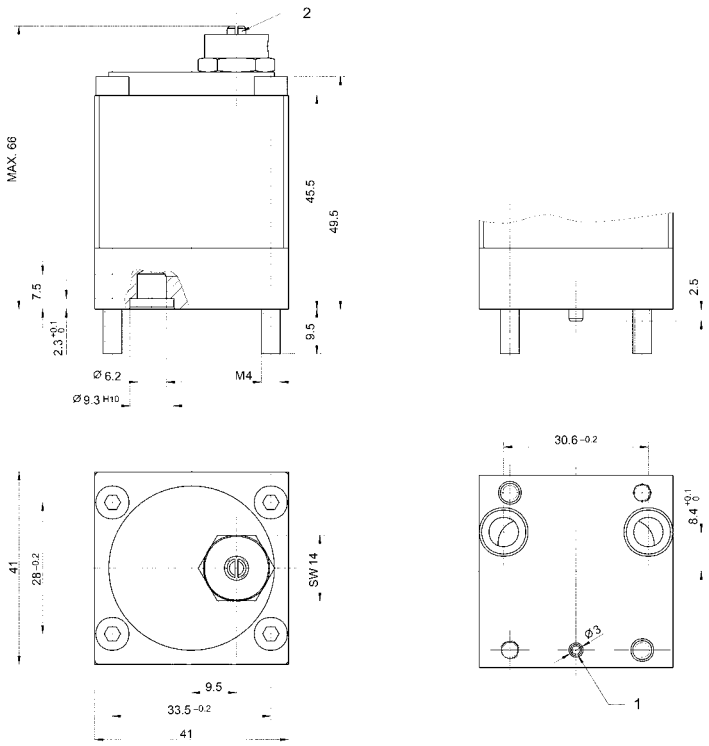
Operating pressure range	0.5 to 10 bar
Opening pressure	0.4 bar
Closing pressure	0.2 bar
Nominal diameter	ND 4
Ambient temperature range	- 20°C to + 70°C
Admissible medium	Compressed air, lubricated or non-lubricated
Torque of mounting screws	3 Nm
Weight	0.18 kg

Type number

	Function	Type number
	Check choke valve	**334 113 000 0**

Accessories (to be ordered separately)

	Type	Type number
	Repair kit	**334 019 001 2**

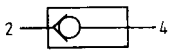


1) Dowel pin, 2) Throttle adjustment

Technical data

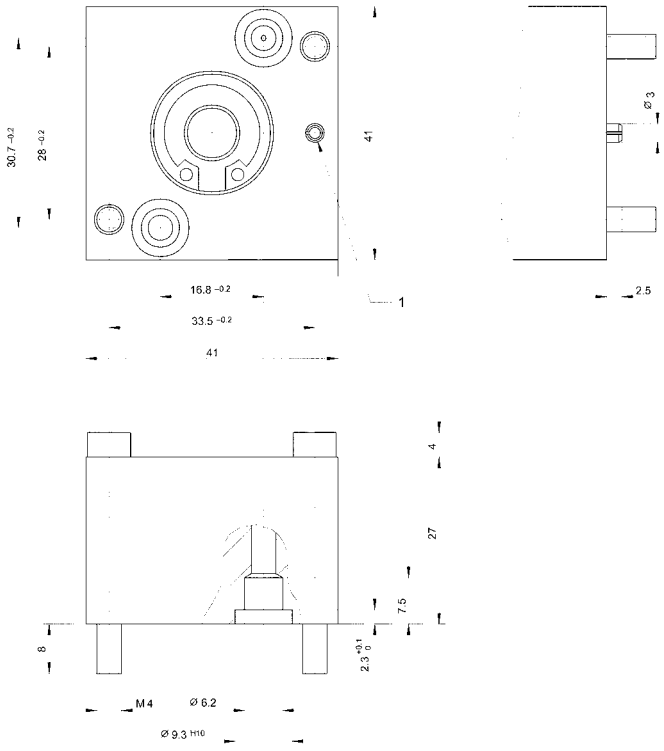
Operating pressure range	0.5 to 10 bar
Opening pressure	0.4 bar
Closing pressure	0.2 bar
Nominal diameter	ND 4
Ambient temperature range	- 20°C to + 70°C
Admissible medium	Compressed air, lubricated or non-lubricated
Torque of mounting screws	3 Nm
Weight	0.1 kg

Type number

	Function	Type number
	Check valve	**334 019 000 0**

Accessories (to be ordered separately)

	Type	Type number
	Repair kit	**334 019 001 2**



1) Dowel pin

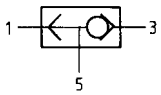
Accessory Valves

Shuttle valve

Technical data

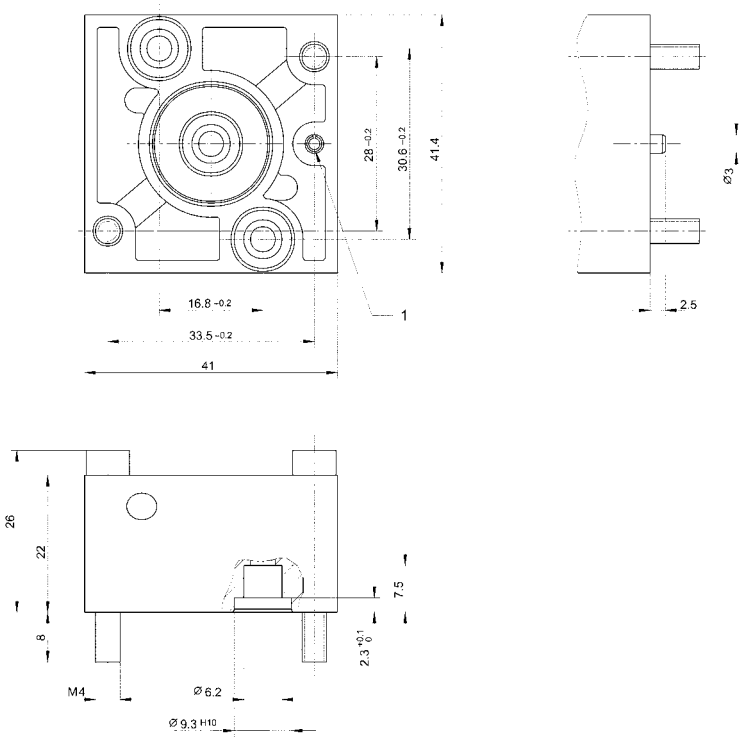
Operating pressure range	0.5 to 10 bar
Necessary differential pressure between connection 1and 3	0.02 bar
Nominal diameter	ND 4
Ambient temperature range	- 20°C to + 70°C
Admissible medium	Compressed air, lubricated or non-lubricated
Torque of mounting screws	3 Nm
Weight	0.1 kg

Type number

	Function	Type number
	Shuttle valve	**334 018 100 0**

Accessories (to be ordered separately)

	Type	Type number
	Repair kit	**334 018 001 2**

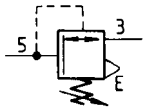


1) Dowel pin

Technical data

Operating pressure	Max. 10 bar
Nominal diameter	See table
Ambient temperature range	-20°C to +70°C
Admissible medium	Compressed air, lubricated or non-lubricated
Torque of mounting screws	3 Nm
Weight	0.5 kg

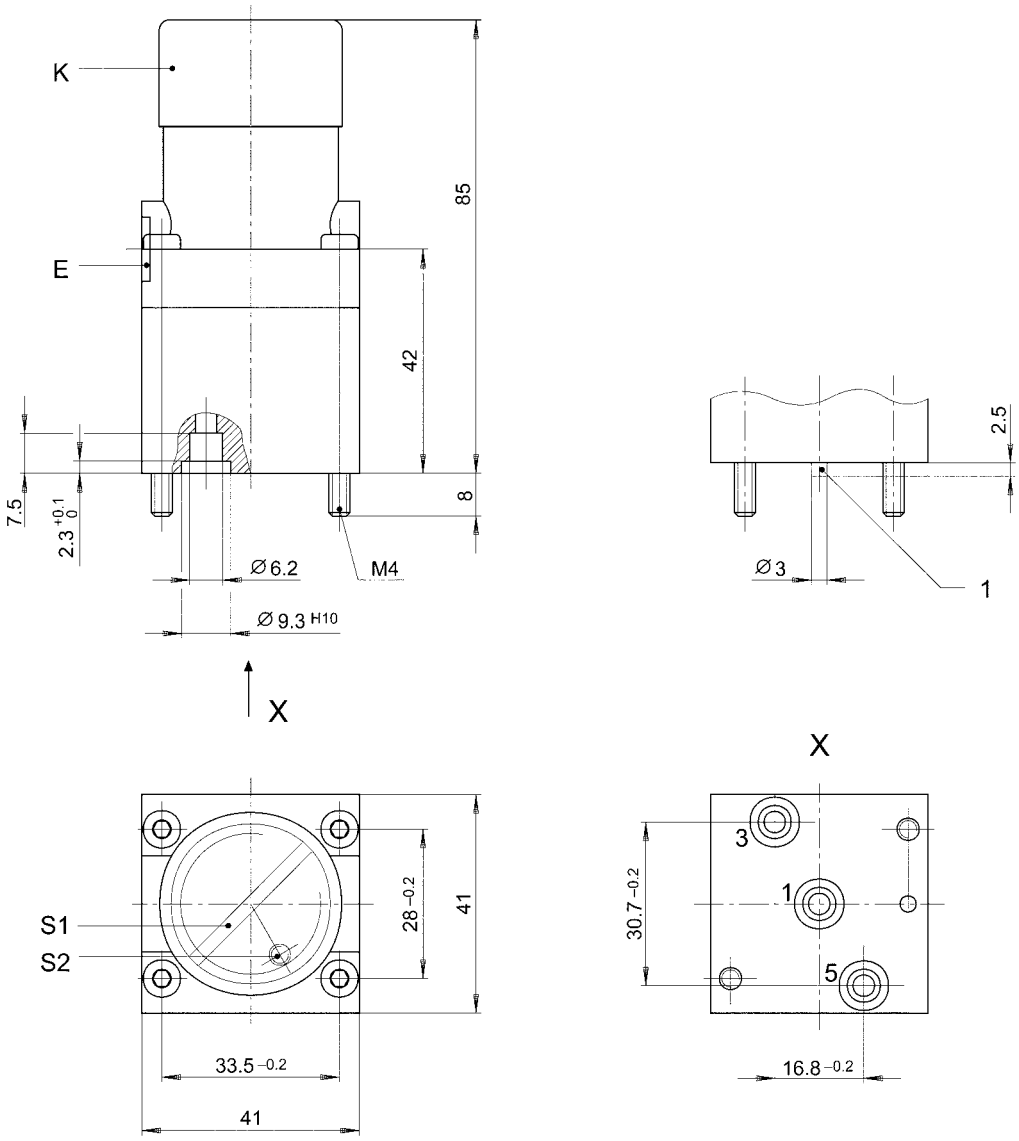
Type number

	Operation	Fig.	Nominal diameter	Outlet pressure [bar]	Hysteresis [bar]	Type number
	Adjusting screw	1	ND 4	0.4 to 8	0.4	**375 023 000 0**
	Adjusting screw	2	ND 4	1 to 8	0.6	**375 023 900 0**
	Adjusting screw	2	ND 2	1 to 8	0.25	**375 023 920 0**

Accessories (to be ordered separately)

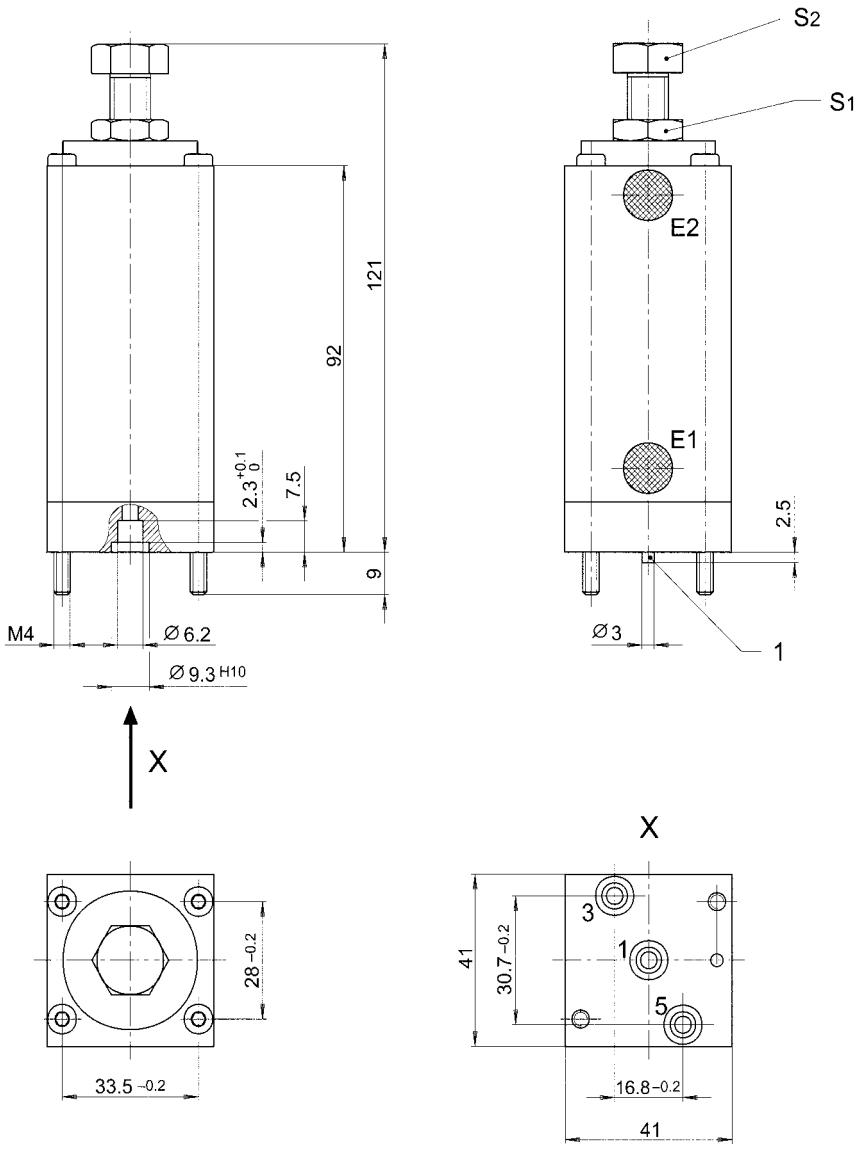
	Type	Valve	Type number
	Repair kit	**375 023 000 0**	**375 023 002 2**
	Repair kit	**375 023 900 0**	**375 023 003 2**
	Repair kit	**375 023 920 0**	**375 023 002 2**

Fig. 1



K) Protective cap, E) Exhaust, S1) Adjusting screw, S2) Safety screw, 1) Dowel pin

Fig. 2



E) Exhaust, S1) Safety nut, S2) Adjusting screw, 1) Dowel pin

Rexroth
Bosch Group

Products

Time delay valve

See page 45

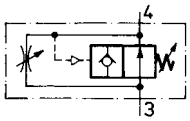
Timing valve

See page 47

Technial data

Operating pressure	Max. 10 bar
Nominal diameter	ND 4
Ambient temperature range	- 20°C to + 70°C
Admissible medium	Compressed air, lubricated or non-lubricated
Torque of mounting screws	3 Nm
Weight	0.38 kg

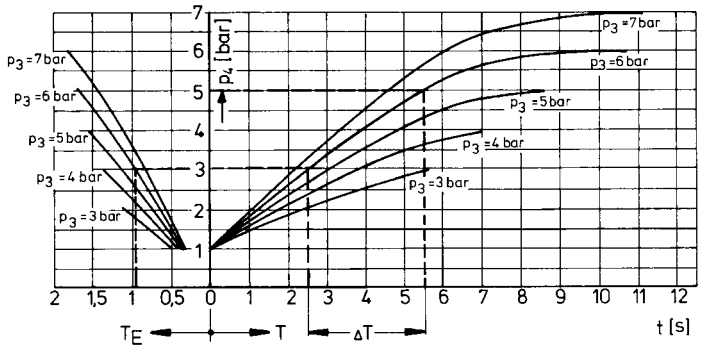
Type number

	Time delay	Type number
	See formula	**334 114 000 0**

Accessories (to be ordered separately)

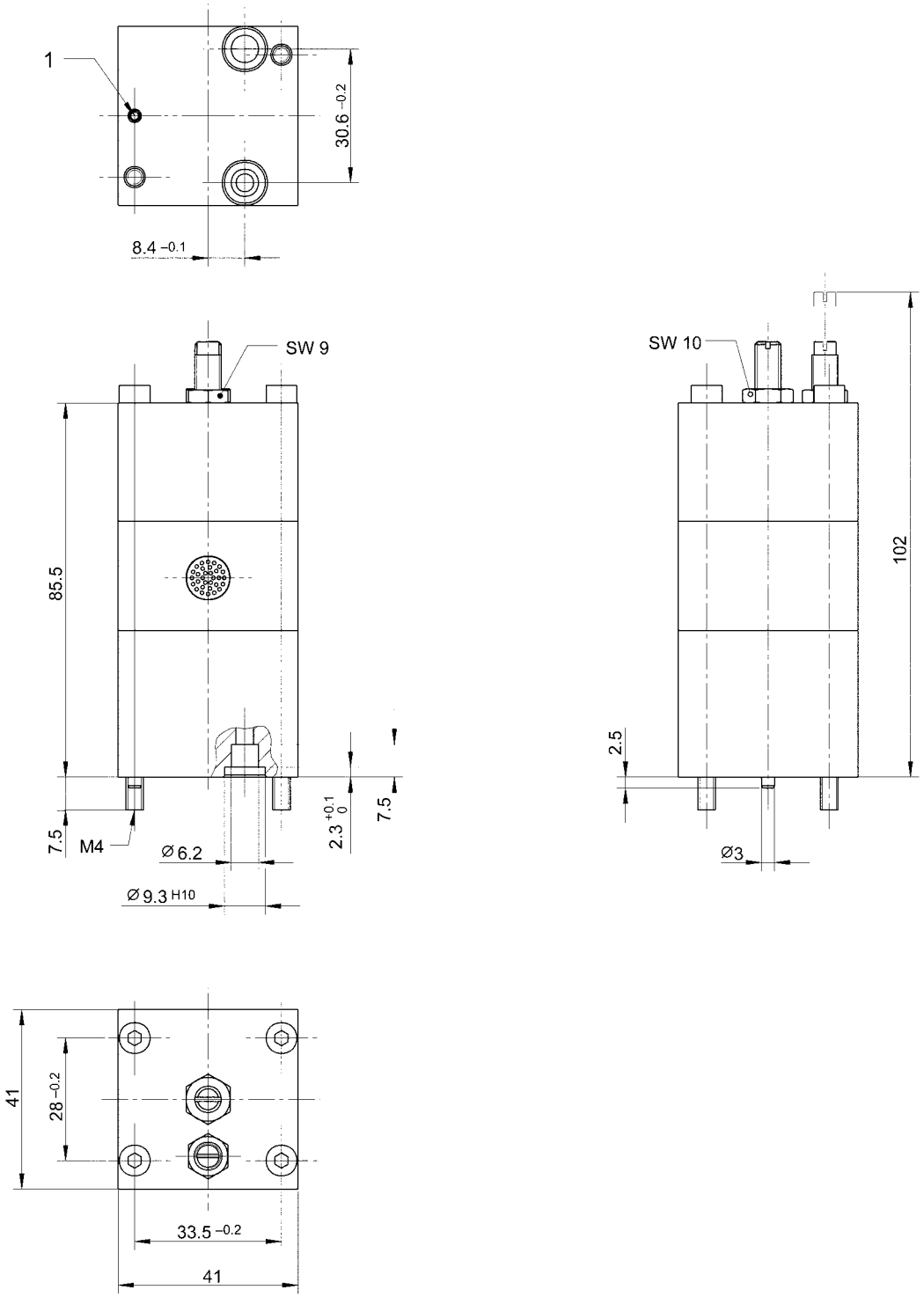
	Type	Type number
	Repair kit	**334 114 000 2**

Diagrams for calculating the time delay



Formula for calculating the switching delay

	Type of delay	Formula	Symbol	Description
	Switch-on signal delay	TV = (TE + dT * C) * V	TV	Time delay
			TE, dT	Time indexes (diagram 1)
			C	Factor for orifice
			C =1	Choke fully opened
			C = 7	Choke almost closes
			V	Volume following the valve

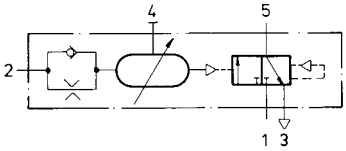
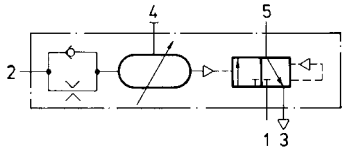


1) Dowel pin
Close off unused connections with the enclosed seals 897 110 670 4 or 897 678 4.

Technical data

Operating pressure	2 to 10 bar
Pressure in connection 2	≥ 0.5 * P1
Nominal diameter	ND 4
Ambient temperature range	- 20°C to + 70°C
Admissible medium	Compressed air, lubricated or non-lubricated
Torque of mounting screws	3 Nm
Weight	0.38 kg

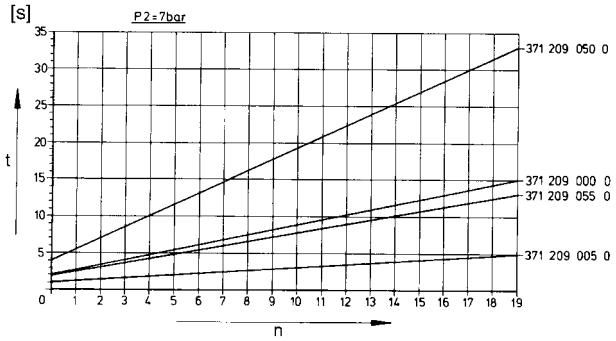
Type number

	Type of delay	Type number
	Switch-on signal delay	**371 209 000 0**
	Switch-on signal delay	**371 209 005 0**
	Switch-off delay	**371 205 050 0**
	Switch-off delay	**371 209 055 0**

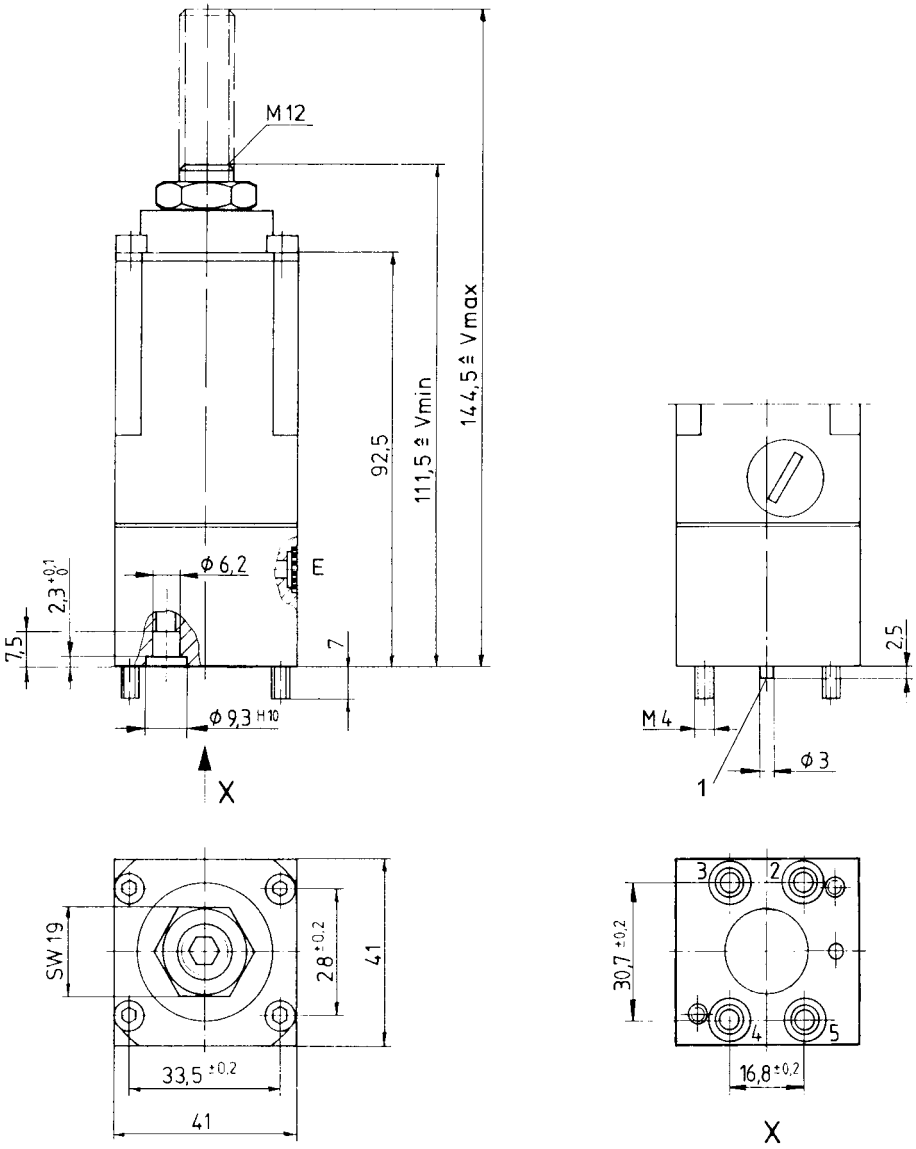
Accessories (to be ordered separately)

	Type	Type number
	Repair kit	**371 209 000 2**

Diagram for calculating the time delay



t) Time delay, n) Number of rotations of the adjusting screw



1) Dowel pin
Close off unused connections with the enclosed seals 897 110 670 4 or 897 678 4.

Rexroth
Bosch Group

Products

Reservoir
See page 50

Pressure switch
See page 52

Pressure switch, special plug
See page 54

Accessories

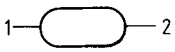
Single subplate with seals and plugs
See page 56

Multiple subplate with seals and plugs
See page 57

Technical data

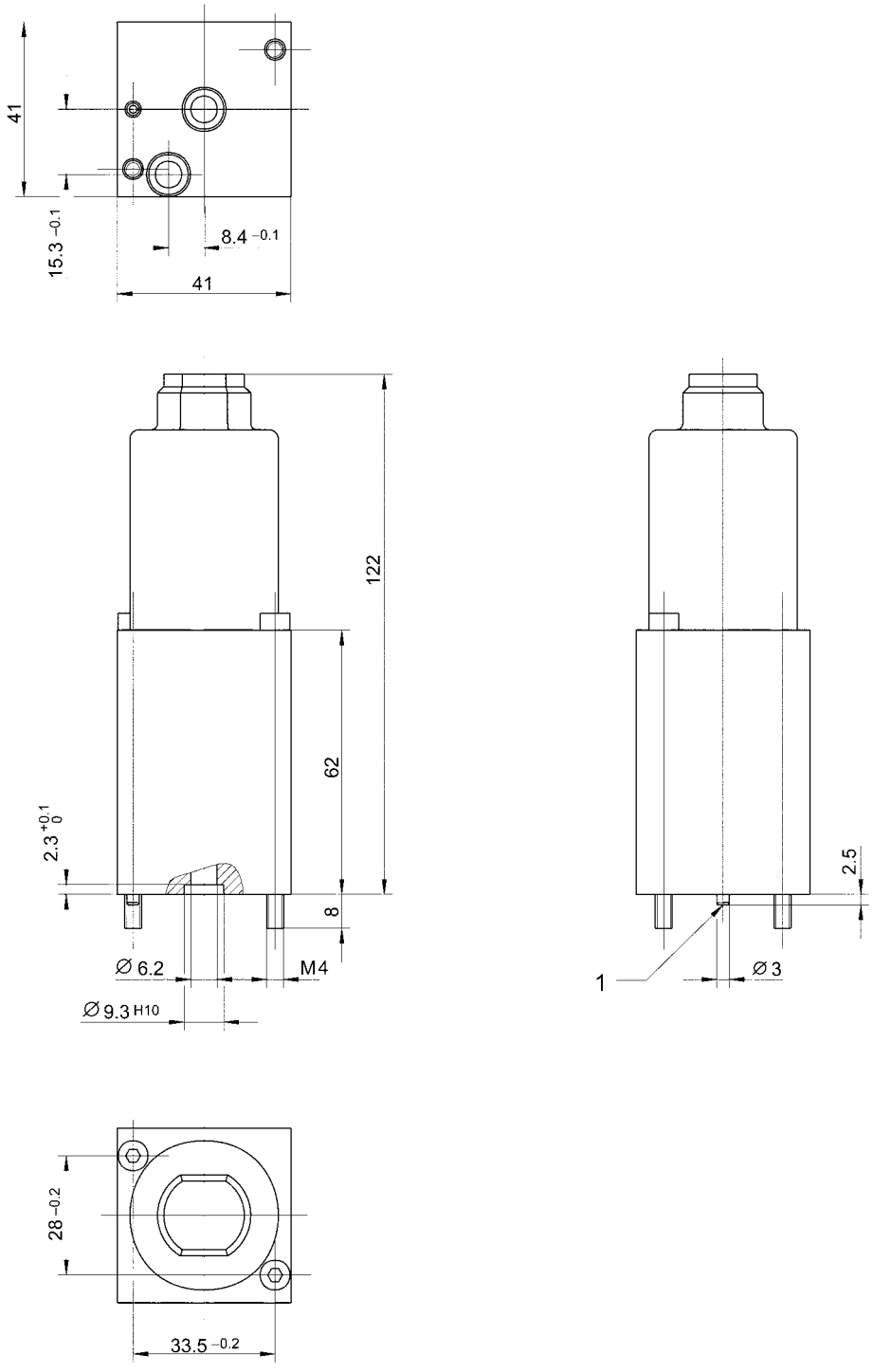
Operating pressure range	Max. 10 bar
Ambient temperature range	- 20°C to + 70°C
Admissible medium	Compressed air, lubricated or non-lubricated
Volume	75 cm³
Torque of mounting screws	3 Nm
Weight	0.17 kg

Type number

Symbol	Volume	Type number
	75 cm³	**351 002 000 0**

Accessories (to be ordered separately)

	Type	Type number
	O-ring	**897 070 630 4**

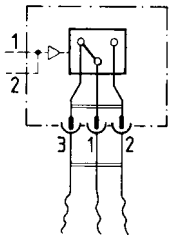


1) Dowel pin

Technical data

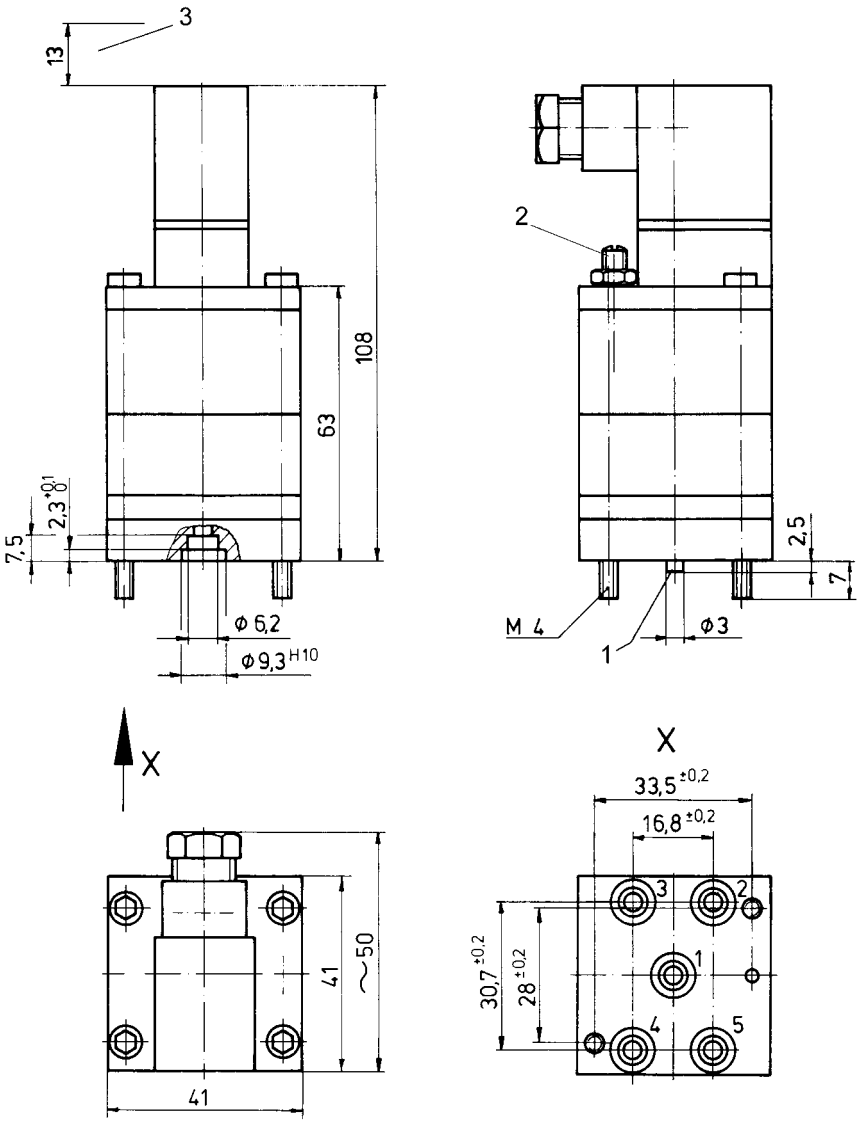
Operating pressure		Max. 10 bar
Ambient temperature range		-20 °C to + 70 °C
Admissible medium		Compressed air, water, mineral oil
Weight		0.26 kg
Hysteresis		See table
Admissible load	Inductive load	30 V DC, 3 A
	Ohmic load	30 V DC, 5 A
Contact material		Standard
Protection		IP 65 according to DIN VDE 0470

Type number

Symbol	Switching pressure range [bar]	Switching pressure adjusted [bar]	Hysteresis [bar]	Type number
	0.5 to 3	2.6 ± 0.4	0.3	**341 040 000 0**
	3 to 6	5.4 ± 0.6	0.4	**341 040 006 0**
	3.5 ± 10%	Not adjustable	0.3	**341 040 100 0**

Accessories (to be ordered separately)

	Type	Type number
	Repair kit	**341 040 000 2**
	Sealing plug	**897 110 670 4**
	Sealing plug (alternative)	**897 110 680 4**



1) Dowel pin, 2) Adjusting screw for switching pressure, 3) Space to take out the connector

Accessory Devices

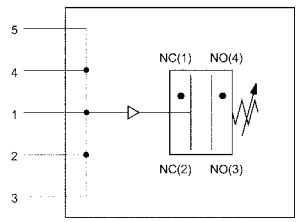
Pressure switch, special plug

Rexroth
Bosch Group

Technical data

Type of switch		Double circuit disconnector switch
Operating pressure		4 to 10 bar
Ambient temperature range		-20 °C to + 70 °C
Admissible medium		Compressed air, water, mineral oil
Weight		0.26 kg
Hysteresis		See diagram
Admissible load	Nominal voltage	Admissible current
(With ohmic load)	24 V DC	2 A
	60 V DC	0.5 A
	220V AC	6 A
Contact material		Standard
Protection		IP 65 according to DIN VDE 0470

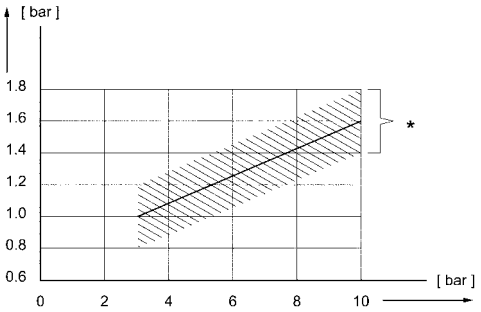
Type number

	Switching pressure range [bar]	Type number
	4 to 10	**341 040 255 0**

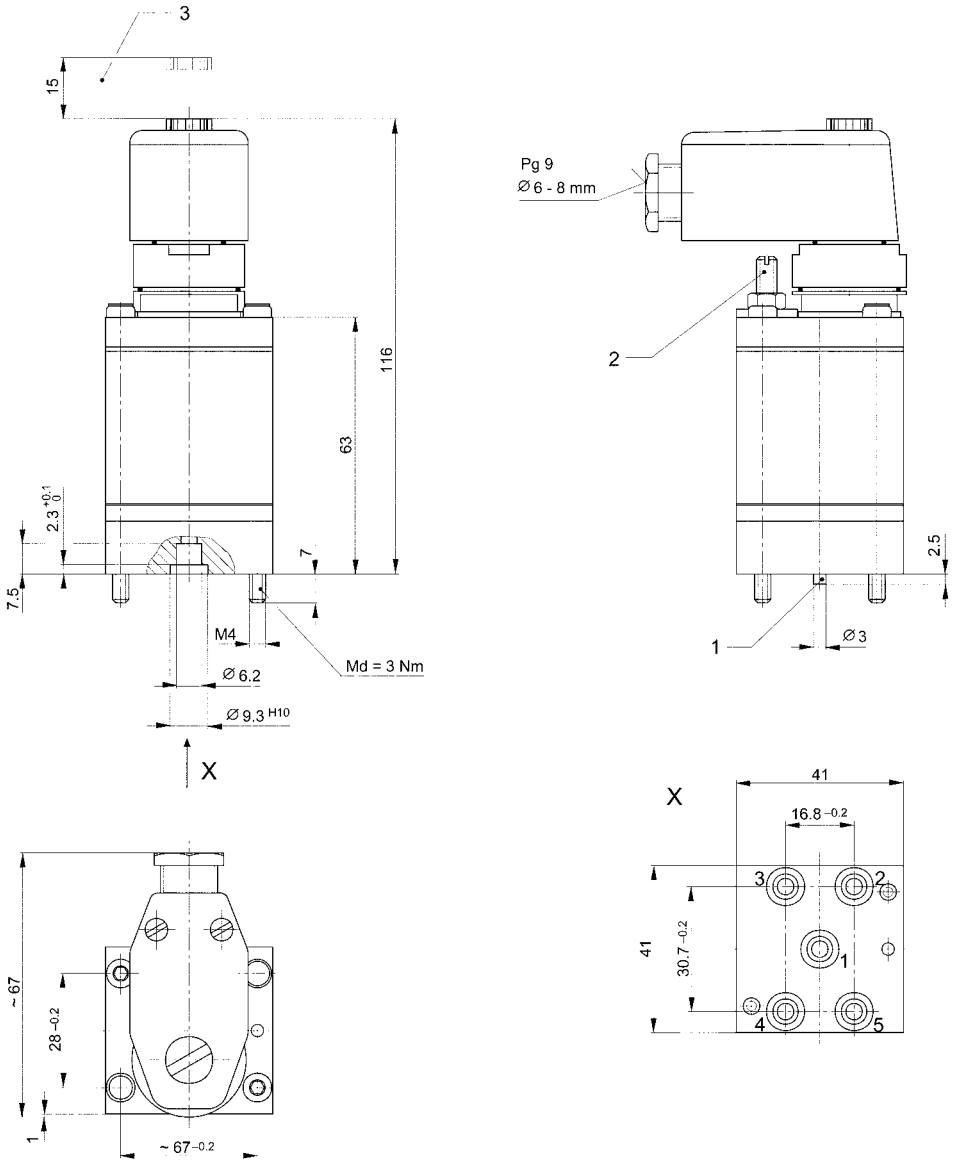
Accessories (to be ordered separately)

	Type	Type number
	Repair kit	**341 040 000 2**
	Sealing plug	**897 110 670 4**
	Sealing plug (alternative)	**897 110 680 4**

Pressure - hysteresis - diagram

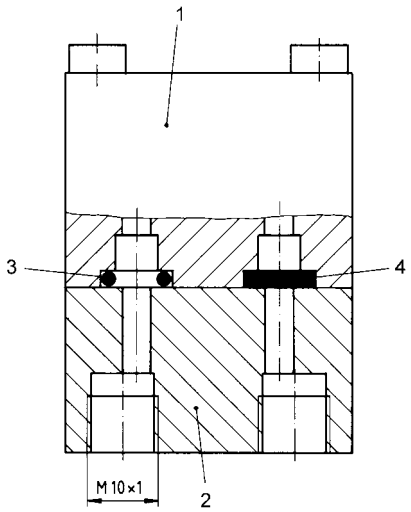


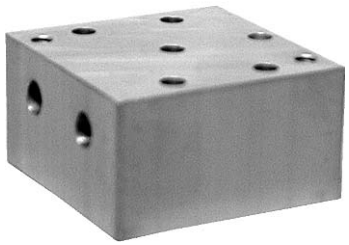
* Admissible variation of hysteresis



1) Dowel pin, 2) Adjusting screw for switching pressure, 3) Space to take out the connector

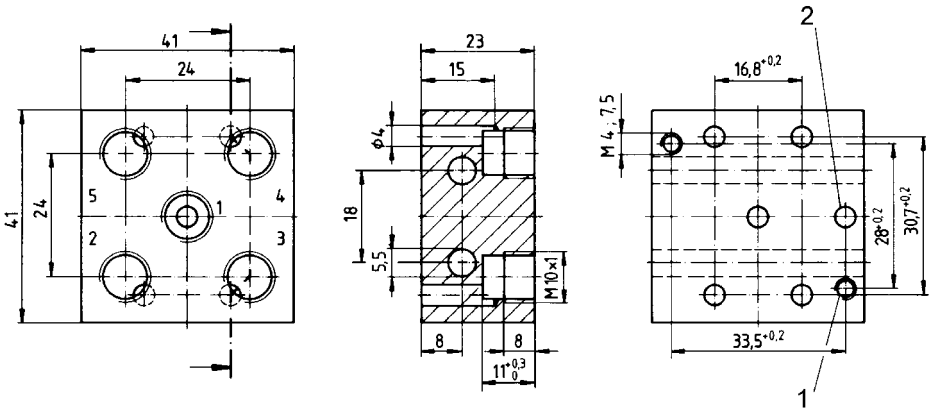
Single subplate with seals and plugs





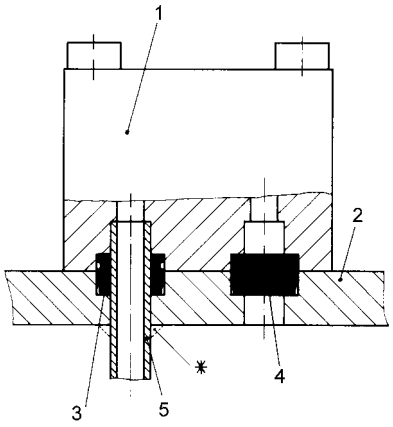
1) Valve, 2) Subplate, 3) O-ring, 4) Plug

Device	Type number
Single subplate	**333 725 100 4**
Plug	**897 110 670 4**
Seal	**897 085 010 4**



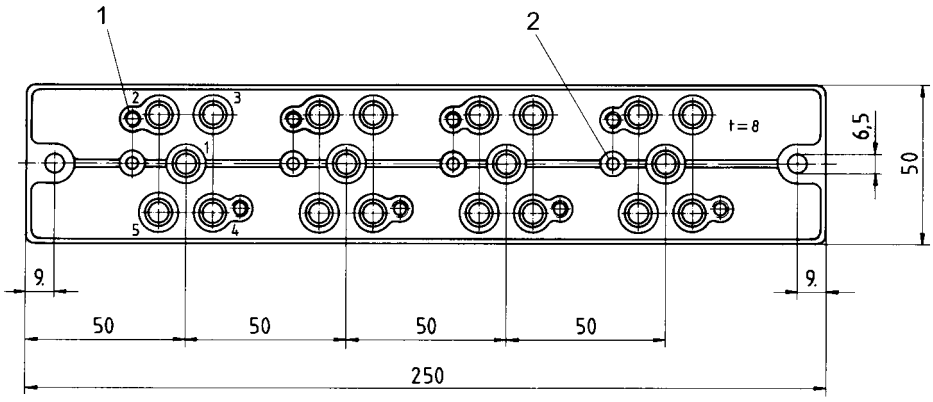
1) Thread for valve mounting, 2) Hole for dowel pin

Multiple subplate with seals and plugs



1) Valve, 2) Subplate, 3) Sealing ring, 4) Plug, 5) Cu-pipe 6x1
* After function testing of control units the copper pipes should be bonded by a suitable adhesive (e. g. araldit).

Device	Type number
Multiple subplate for 4 valves	**333 720 100 4**
Plug	**897 110 680 4**
Seal	**897 030 490 4**
Cu-pipe 6 x 1	**826 000 001 6**



1) Thread for valve mounting, 2) Hole for dowel pin

Positioning System

Rexroth
Bosch Group

Products

Double acting, with adjustable cushioning, 32-250 mm dia.

See page 2

Double acting, with solenoid piston and adjustable cushioning, 32-250 mm dia.

See page 5

Double acting, with solenoid piston, amplified version, 40-160 mm dia.

See page 8

Three-position-cylinder

See page 11

Positioning unit with integrated distance sensor

See page 13

Accessories

Proximity reed switch for electrical connector

See page 15

Connector for sensor 894 041 06X 2.

See page 15

Clamp for tie-rod cylinder

See page 16

Tie-Rod Cylinder Series 322/521

Double acting, with adjustable cushioning, 32-250 mm dia.

Rexroth
Bosch Group

Technical data

Type		Piston cylinder, tie-rod version
Operating pressure	p max.	10 bar
Ambient temperature range		- 25°C to +70°C
Medium		Compressed air, lubricated or non-lubricated
Materials	Piston rod	X 10 Cr Ni S 18.9 roller burnished
	Cylinder tube	Al-anodized
	Cover dia.	
	32 to 125 mm	Zn-diecasting
	160 to 250 mm	GD/GK - Al
	Seals	NBR

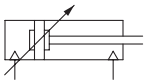
Application area

Suitable for all applications in mechanical engineering.

Technical information

Piston dia.		[mm]	32	40	50	63	80	100	125	160	200	250
Piston force,												
theoretical	Pushing force	[N]	482	754	1178	1870	3016	4712	7363	12064	18850	29452
at 6 bar	Pulling force	[N]	415	602	1025	1642	2788	4288	6939	11310	18095	28274
Cushioning length		[mm]	16	21	21	23.5	23.5	22.5	22.5	31.5	31.5	40
Cushioning energy		[Nm]	3.2	5.8	13	16.5	33.5	54	83.5	198	312	590
Weight	0 mm stroke	[kg]	0.72	1.3	1.64	2.84	4.18	6.46	9.18	11.42	14.65	40.6
	+ 50 mm stroke	[kg]	0.13	0.2	0.28	0.38	0.46	0.7	0.84	1.34	1.6	3.8

Type number



Piston dia.	32	40	50	63	80
Piston rod thread	M 10 x 1.5	M 16 x 1.5	M 16 x 1.5	M 20 x 1.5	M 20 x 1.5
Threaded ports 3)	G 1/8	G 1/4	G 1/4	G 3/8	G 3/8
Standard stroke 2)					
50	**521 168 001 0**	**521 178 001 0**	**521 188 001 0**	**521 198 001 0**	**521 208 001 0**
100	**521 168 000 0**	**521 178 000 0**	**521 188 000 0**	**521 198 000 0**	**521 208 000 0**
150	**521 168 002 0**	**521 178 002 0**	**521 188 002 0**	**521 198 002 0**	**521 208 002 0**
200	**521 168 003 0**	**521 178 003 0**	**521 188 003 0**	**521 198 003 0**	**521 208 003 0**
250	**521 168 016 0**	**521 178 014 0**	**521 188 018 0**	**521 198 015 0**	**521 208 017 0**
300	**521 168 014 0**	**521 178 015 0**	**521 188 007 0**	**521 198 014 0**	**521 208 013 0**
350	**521 168 011 0**	**521 178 019 0**	**521 188 013 0**	**521 198 013 0**	**521 208 028 0**
400	**521 168 017 0**	**521 178 016 0**	**521 188 008 0**	**521 198 016 0**	**521 208 011 0**
450	**521 168 030 0**	**521 178 031 0**	**521 188 032 0**	**521 198 036 0**	**521 208 023 0**
500	**521 168 031 0**	**521 178 030 0**	**521 188 031 0**	**521 198 031 0**	**521 208 030 0**
Max. stroke 1)	1000	1500	1500	1500	1500

Piston dia.	100	125	160	200	250
Piston rod thread	M 27 x 2	M 27 x 2	M 36 x 2	M 36 x 2	M 36 x 2
Threaded ports 3)	G 1/2	G 1/2	G 3/4	G 3/4	G 1
Standard stroke 2)					
50	**521 218 001 0**	**521 228 001 0**	**521 238 001 0**	**521 248 001 0**	**521 258 001 0**
100	**521 218 000 0**	**521 228 000 0**	**521 238 000 0**	**521 248 000 0**	**521 258 000 0**
150	**521 218 002 0**	**521 228 002 0**	**521 238 002 0**	**521 248 002 0**	**521 258 002 0**
200	**521 218 003 0**	**521 228 003 0**	**521 238 003 0**	**521 248 003 0**	**521 258 003 0**
250	**521 218 012 0**	**521 228 006 0**	**521 238 006 0**	**521 248 005 0**	**521 258 010 0**
300	**521 218 008 0**	**521 228 009 0**	**521 238 008 0**	**521 248 006 0**	**521 258 011 0**
350	**521 218 015 0**	**521 228 014 0**	**521 238 041 0**	**521 248 004 0**	**521 258 014 0**
400	**521 218 006 0**	**521 228 007 0**	**521 238 014 0**	**521 248 010 0**	**521 258 007 0**
450	**521 218 040 0**	**521 228 031 0**	**521 238 037 0**	**521 248 021 0**	**521 258 020 0**
500	**521 218 030 0**	**521 228 030 0**	**521 238 030 0**	**521 248 030 0**	**521 258 031 0**
Max. stroke 1)	2000	2000	2000	2000	2000

1) Recommended max. stroke (longer strokes on request).
2) Intermediate strokes in 5 mm increments available
3) According to ISO 228/1

Tie-Rod Cylinder Series 322/521

Double acting, with adjustable cushioning, 32-250 mm dia.

Rexroth
Bosch Group

Accessories (to be ordered separately)

Accessories	Type					
	**Piston dia.**	**32**	**40**	**50**	**63**	**80**
	clevis mounting	**521 016 346 2**	**521 026 346 2**	**521 036 346 2**	**521 046 346 2**	**521 056 346 2**
	Piston dia.	**100**	**125**	**160**	**200**	**250**
	Clevis mounting Further mountings ... 1)	**521 066 346 2**	**521 076 346 2**	**521 086 340 2**	**521 096 340 2**	**521 106 340 2**
	**Piston dia.**	**32**	**40**	**50**	**63**	**80**
	Rod clevis	**895 800 990 2**	**895 801 000 2**	**895 801 000 2**	**895 801 010 2**	**895 801 010 2**
	Piston dia.	**100**	**125**	**160**	**200**	**250**
	Rod clevis Further piston rod adapters ... 1)	**895 801 020 2**	**895 801 020 2**	**895 801 030 2**	**895 801 030 2**	**895 801 030 2**
	**Piston dia.**	**32**	**40**	**50**	**63**	**80**
	Spare part kit	**521 016 000 2**	**521 026 000 2**	**521 036 000 2**	**521 046 000 2**	**521 056 000 2**
	Piston dia.	**100**	**125**	**160**	**200**	**250**
	Spare part kit	**521 066 000 2**	**521 076 000 2**	**521 086 000 2**	**521 096 000 2**	**521 106 000 2**

1) ... see product overview

Fig. 1

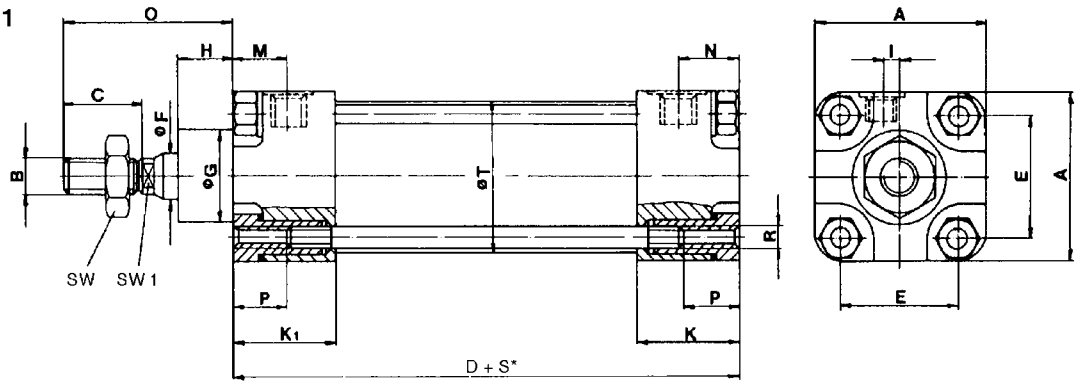
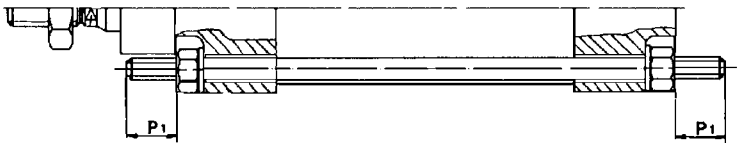


Fig. 2



S*= Stroke Fig. 1 Piston dia. 250 Fig. 2 Piston dia. 32 - 200 mm

Piston dia.	A	B	C	D	E	F	G^{e9}	H	I	K
32	45	M 10x1.5	20	80	33	12	25	15	3	23
40	52	M 16x1.5	36	110	40	18	32	15	4	33.5
50	65	M 16x1.5	36	110	49	18	32	15	4	33.5
63	75	M 20x1.5	46	125	59	22	45	20	4	38.5
80	95	M 20x1.5	46	125	75	22	45	20	4	36
100	115	M 27x2	63	145	90	30	55	20	0	39.5
125	140	M 27x2	63	145	110	30	55	20	0	39.5
160	180	M 36x2	85	180	140	40	65	25	0	51.5
200	220	M 36x2	85	180	175	40	65	25	0	47.5
250	280	M 36x2	70	213	220	50	95	75	0	-

Piston dia.	K1	M	N	O	P	P1	R	SW	SW1	∅T
32	27	15	11	45	10	-	M 6	17	8	36
40	45.5	25	13	70	10	-	M 6	24	13	45
50	45.5	25	14	70	14	-	M 8	24	13	55
63	55.5	33	16	85	14	-	M 8	30	17	69
80	52	33.5	17.5	85	17	-	M 10	30	17	85
100	62.5	41	18	110	17	-	M 10	41	24	105
125	62.5	41	18	110	18	-	M 12	41	24	132
160	81.5	51	21	135	20	-	M 16	55	32	167
200	77.5	49	19	135	20	-	M 16	55	32	210
250	-	31	31	165	-	45	M 20	55	36	262

Tie-Rod Cylinder Series 322/521

Double acting, with solenoid piston and adjustable cushioning,
32-250 mm dia.

Rexroth
Bosch Group

Technical data

Type		Piston cylinder, tie-rod version
Operating pressure	p max.	10 bar
Ambient temperature range		- 25°C to +70°C
Medium		Compressed air, lubricated or non-lubricated
Materials	Piston rod	X 10 Cr Ni S 18.9 roller burnished
	Cylinder tube	Al-anodized
	Cover Dia.	
	32 to 125 mm	Zn-diecasting
	160 to 250 mm	GD/GK - Al
	Seals	NBR

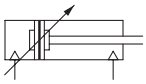
Application area

Suitable for all applications in mechanical engineering.

Technical information

Piston dia.		[mm]	32	40	50	63	80	100	125	160	200	250
Piston force,												
theoretical at 6 bar	Pushing force	[N]	482	754	1178	1870	3016	4712	7363	12064	18850	29452
	Pulling force	[N]	415	602	1025	1642	2788	4288	6939	11310	18095	28274
Cushioning length		[mm]	16	21	21	23.5	23.5	22.5	22.5	31.5	31.5	40
Cushioning energy		[Nm]	3.2	5.8	13	16.5	33,5	54	83.5	198	312	590
Weight	0 mm stroke	[kg]	0.72	1.3	1.64	2.84	4.18	6.46	9.18	11.42	14.65	40.6
	+50 mm stroke	[kg]	0.13	0.2	0.28	0.38	0.46	0.7	0.84	1.34	1.6	3.8

Type number



Piston dia.	32	40	50	63	80
Piston rod thread	M 10 x 1.5	M 16 x 1.5	M 16 x 1.5	M 20 x 1.5	M 20 x 1.5
Threaded ports 3)	G 1/8	G 1/4	G 1/4	G 3/8	G 3/8
Standard stroke 2)					
50	**322 060 601 0**	**322 061 602 0**	**322 062 601 0**	**322 063 601 0**	**322 064 601 0**
100	**322 060 600 0**	**322 061 600 0**	**322 062 600 0**	**322 063 600 0**	**322 064 600 0**
150	**322 060 602 0**	**322 061 603 0**	**322 062 602 0**	**322 063 602 0**	**322 064 602 0**
200	**322 060 603 0**	**322 061 604 0**	**322 062 603 0**	**322 063 603 0**	**322 064 603 0**
250	**322 060 609 0**	**322 061 609 0**	**322 062 608 0**	**322 063 606 0**	**322 064 607 0**
300	**322 060 603 0**	**322 061 605 0**	**322 062 604 0**	**322 063 607 0**	**322 064 605 0**
350	**322 060 608 0**	**322 061 606 0**	**322 062 619 0**	**322 063 612 0**	**322 064 611 0**
400	**322 060 605 0**	**322 061 607 0**	**322 062 617 0**	**322 063 610 0**	**322 064 608 0**
450	**322 060 630 0**	**322 061 634 0**	**322 062 630 0**	**322 063 621 0**	**322 064 639 0**
500	**322 060 632 0**	**322 061 631 0**	**322 062 618 0**	**322 063 633 0**	**322 064 633 0**
Max. stroke 1)	700	1500	1500	1500	1500

Piston dia.	100	125	160	200	250
Piston rod thread	M 27 x 2	M 27 x 2	M 36 x 2	M 36 x 2	M 36 x 2
Threaded ports 3)	G 1/2	G 1/2	G 3/4	G 3/4	G 1
Standard stroke 2)					
50	**322 065 601 0**	**322 066 601 0**	**322 067 602 0**	**322 068 601 0**	-
100	**322 065 600 0**	**322 066 600 0**	**322 067 600 0**	**322 068 600 0**	**322 069 600 0**
150	**322 065 602 0**	**322 066 602 0**	**322 067 601 0**	**322 068 602 0**	**322 069 602 0**
200	**322 065 603 0**	**322 066 603 0**	**322 067 603 0**	**322 068 603 0**	-
250	**322 065 608 0**	**322 066 618 0**	**322 067 609 0**	**322 068 604 0**	-
300	**322 065 610 0**	**322 066 610 0**	**322 067 608 0**	**322 068 605 0**	-
350	**322 065 605 0**	**322 066 607 0**	**322 067 614 0**	**322 068 609 0**	-
400	**322 065 609 0**	**322 066 611 0**	**322 067 607 0**	**322 068 606 0**	-
450	**322 065 637 0**	**322 066 635 0**	**322 067 606 0**	**322 068 611 0**	-
500	**322 065 631 0**	**322 066 630 0**	**322 067 635 0**	**322 068 638 0**	-
Max. stroke 1)	2000	2000	2000	2000	2000

1) Recommended max. stroke (larger strokes on request)
2) Larger strokes on request.
3) According to ISO 228/1

Tie-Rod Cylinder Series 322/521

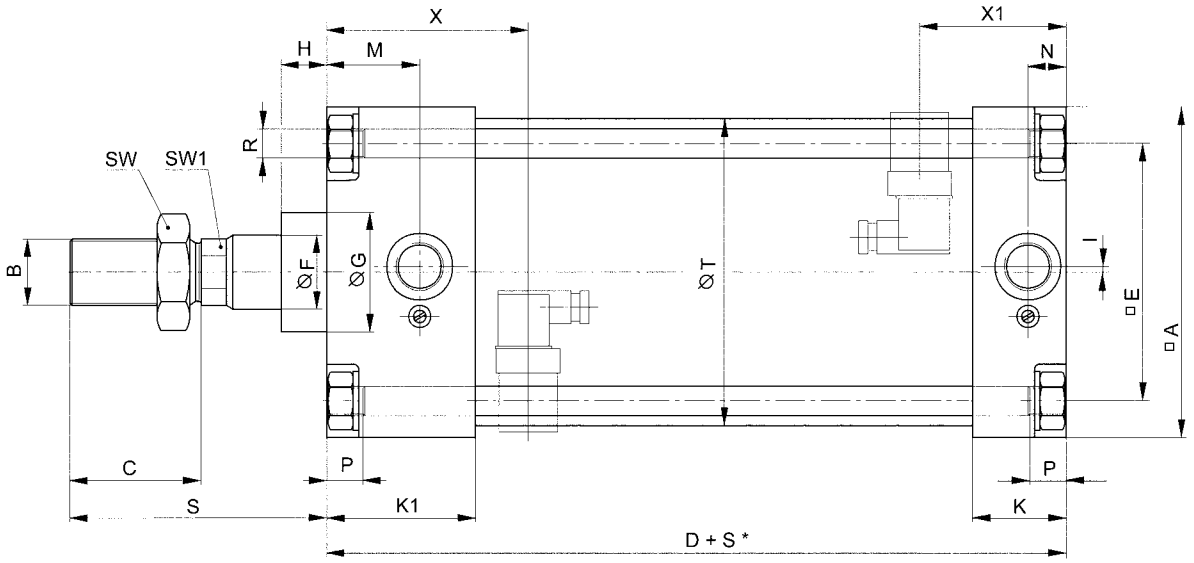
Double acting, with solenoid piston and adjustable cushioning,
32-250 mm dia.

Rexroth
Bosch Group

Accessories (to be ordered separately)

Accessories	Type					
	Piston dia.	**32**	**40**	**50**	**63**	**80**
	Clevis mounting	**521 016 346 2**	**521 026 346 2**	**521 036 346 2**	**521 046 346 2**	**521 056 346 2**
	Piston dia.	**100**	**125**	**160**	**200**	**250**
	Clevis mounting Further mountings ... 1)	**521 066 346 2**	**521 076 346 2**	**521 086 340 2**	**521 096 340 2**	**521 106 340 2**
	Piston dia.	**32**	**40**	**50**	**63**	**80**
	Rod clevis	**895 800 990 2**	**895 801 000 2**	**895 801 000 2**	**895 801 010 2**	**895 801 010 2**
	Piston dia.	100	125	160	200	250
	Rod clevis Further piston rod adapters ... 1)	**859 801 020 2**	**859 801 020 2**	**859 801 030 2**	**859 801 030 2**	**859 801 030 2**
	piston dia.	**32 - 63**	**80 - 125**	**160 - 200**	**250**	
	Proximity reed switch with LED Connector Further sensors ... 1) Clamp for sensors	**894 041 061 2** **894 100 470 2** - **322 061 356 2**	**894 041 061 2** **894 100 470 2** - **322 064 356 2**	**894 041 061 2** **894 100 470 2** - **322 067 352 2**	**894 041 061 2** **894 100 470 2** - **322 089 350 2**	
	Piston dia.	**32**	**40**	**50**	**63**	**80**
	Spare part kit	**322 060 000 2**	**322 061 000 2**	**322 062 000 2**	**322 063 000 2**	**322 064 000 2**
	Piston dia.	**100**	**125**	**160**	**200**	
	Spare part kit	**322 065 000 2**	**322 066 000 2**	**322 067 000 2**	**322 068 000 2**	

1) ... see product overview



S* = Stroke, x) Position of the solenoid, extracted x1) Position of the solenoid, returned
For standard cylinders of 250 mm dia. the tie rods protrude by 45 mm from the cylinder´s top and bottom covers.

Piston dia.	A	B	C	D	E	F	G^{e9}	H	I	K
32	45	M 10x1.5	20	103	33	12	25	15	3	23
40	52	M 16x1.5	36	131	40	18	32	15	4	33.5
50	65	M 16x1.5	36	133	49	18	32	15	4	33.5
63	75	M 20x1.5	46	150	59	22	45	20	4	38.5
80	95	M 20x1.5	46	149	75	22	45	20	4	36
100	115	M 27x2	63	174	90	30	55	20	0	39.5
125	140	M 27x2	63	190	110	30	55	20	0	39.5
160	180	M 36x2	85	222	140	40	65	25	0	51.5
200	220	M 36x2	85	227	175	40	65	25	0	47.5
250	280	M 36x2	70	231	220	50	95	75	0	84

Piston dia.	K1	M	N	O	P	R	SW	SW1	∅T	X	X1
32	27	15	11	45	10	M 6	17	8	36	54	50
40	45.5	25	13	70	10	M 6	24	13	45	72	60
50	45.5	25	14	70	14	M 8	24	13	55	73	61
63	55.5	33	16	85	14	M 8	30	17	69	83	66
80	52	33.5	17.5	85	17	M 10	30	17	85	83	67
100	62.5	41	18	110	17	M 10	41	24	105	98	75
125	62.5	41	18	110	18	M 12	41	24	132	106	83
160	81.5	51	21	135	20	M 16	55	32	167	126	96
200	77.5	49	19	135	20	M 16	55	32	210	128	98
250	84	31	31	165	-	M 20	55	36	262	115	115

Special Tie-Rod Cylinders

Double acting with solenoid piston, amplified version,
40-160 mm dia.

Rexroth
Bosch Group

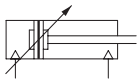
Technical data

Type		Piston cylinder, tie rod version
Operating pressure	p max.	Max. 10 bar
Ambient temperature range		- 25°C to +75°C
Medium		Compressed air, lubricated or non-lubricated
Materials	Piston rod	X 10 Cr Ni S 18.9 roller burnished
	Cylinder tube	Al - anodized, hard coated
	Cover dia.	
	32 to 125 mm	Zn-diecasting
	160 to 250 mm	GD/GK - Al
	Seals	NBR

Application area

Suitable for all applications in mechanical engineering.

Type number



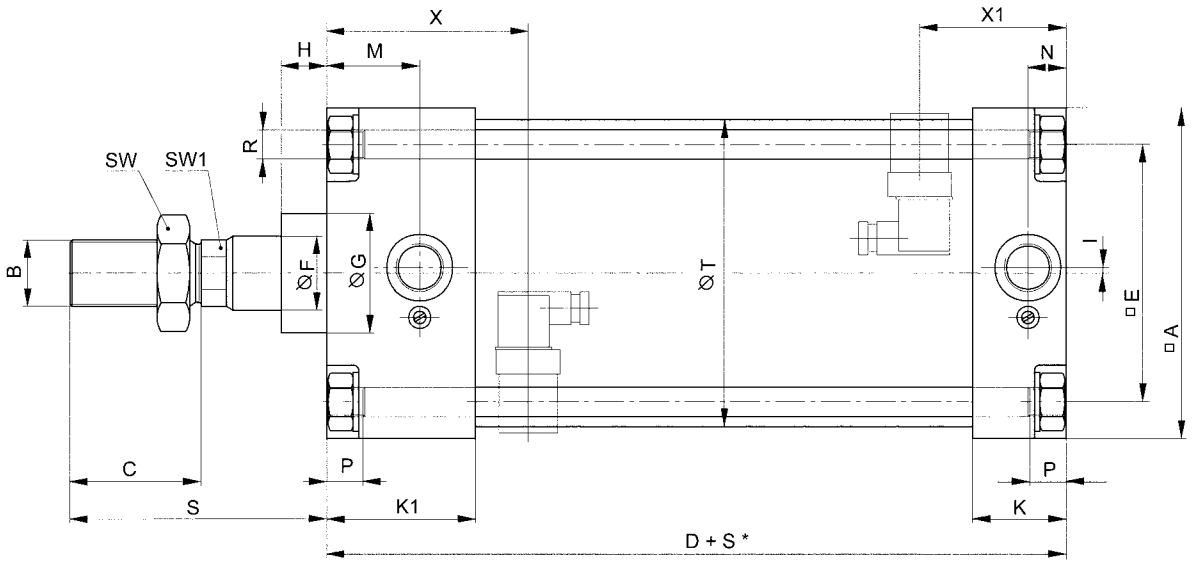
Piston dia.	Stroke	Cushioning	Flange shape	Type number
40	50	On both sides	Without	**322 061 190 0**
50	85	On both sides	Without	**322 062 185 0**
50	100	On both sides	I	**322 062 186 0**
50	70	On both sides	Without	**322 062 188 0**
50	55	On both sides	Without	**322 062 189 0**
50	100	On both sides	Without	**322 062 195 0**
50	72	On both sides	Without	**322 062 199 0**
63	120	On both sides	I	**322 063 185 0**
63	120	Without	I	**322 063 186 0**
63	120	On both sides	Without	**322 063 195 0**
80	140	On both sides	I	**322 064 190 0**
80	140	Without	I	**322 064 191 0**
80	140	On both sides	Without	**322 064 195 0**
80	160	On both sides	Without	**322 064 196 0**
100	160	On both sides	II	**322 065 185 0**
100	160	Without	II	**322 065 186 0**
100	160	On both sides	Without	**322 065 195 0**
125	180	On both sides	II	**322 066 191 0**
125	180	Without	II	**322 066 192 0**
125	180	On both sides	Without	**322 066 195 0**
160	195	Without	II	**322 067 190 0**

Accessories (to be ordered separately)

Accessories	Type					
	Piston dia.	**32 - 63**	**80 - 125**	**160 - 200**		
	Proximity reed switch with LED	**894 041 060 2**	**894 041 060 2**	**894 041 060 2**		
	Connector	**894 100 470 2**	**894 100 470 2**	**894 100 470 2**		
	Clamp for sensor	**322 061 356 2**	**322 064 356 2**	**322 067 352 2**		
	**Cylinder number**	**322 061 190 0**	**322 062 1.. 0**	**322 063 185 0**	**322 063 186 0**	**322 063 195 0**
	Spare part kit	**322 061 002 2**	**322 062 002 2**	**322 063 002 2**	**322 063 003 2**	**322 063 002 2**
	Cylinder number	**322 064 190 0**	**322 064 191 0**	**322 064 195 0**	**322 064 196 0**	**322 065 185 0**
	Spare part kit	**322 064 003 2**	**322 064 004 2**	**322 064 003 2**	**322 064 003 2**	**322 065 002 2**
	Cylinder number	**322 065 186 0**	**322 065 195 0**	**322 066 191 0**	**322 066 192 0**	**322 066 195 0**
	Spare part kit	**322 065 003 2**	**322 065 002 2**	**322 066 002 2**	**322 066 003 2**	**322 066 002 2**

Special Tie-Rod Cylinders

Double acting with solenoid piston, amplified version,
40-160 mm dia.



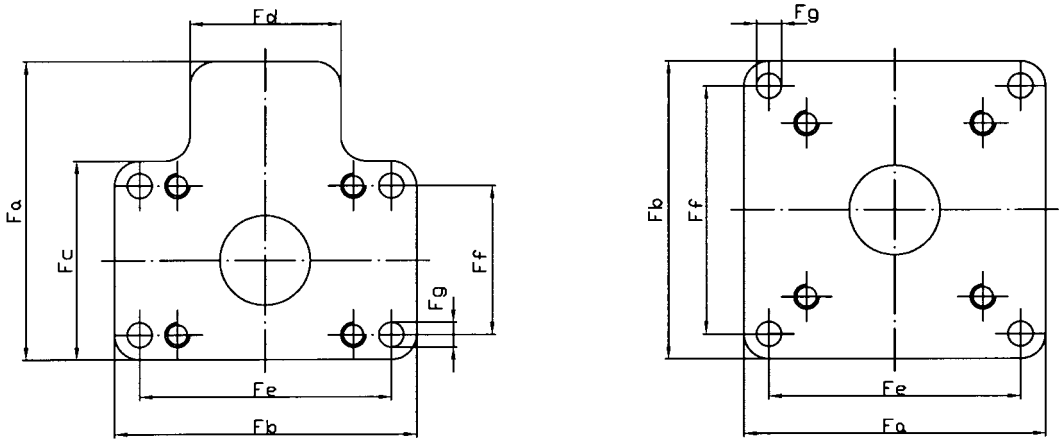
Piston dia.	A	B	C	D	E	F	G^{e9}	H	I	K2
40	52	M 16x1.5	36	131	40	18	32	15	4	33.5
50	65	M 16x1.5	36	133	49	18	32	15	4	33.5
63	76	M 20x1.5	46	150	59	22	45	20	4	38.5
80	95	M 20x1.5	46	149	75	22	45	20	4	36
100	115	M 20x1.5	63	174	90	30	55	20	0	39.5
125	140	M 27x2	63	190	110	30	55	20	0	39.5
160	180	M 36x2	85	211	140	40	65	25	0	51.5

Piston dia.	K1	M	N	O	R	SW1	SW2	T	X	X1
40	45.5	25	13	70	M 6	24	13	M14x1.5	72	60
50	45.5	25	14	70 *)	M 8	24	13	M14x1.5	73	61
63	55.5	33	16	130	M 8	30	17	M18x1.5	83	67
80	52	33.5	17.5	151**)	M 10	30	17	M18x1.5	83	67
100	62.5	41	18	190	M 10	30	24	M22x1.5	98	75
125	62.5	41	18	220	M 12	41	24	M22x1.5	106	83
160	81.5	48.5	18.5	203.5	M 16	55	32	M 26x1.5	123	88

*) For cylinders 322 062 186 0 and 322 062 195 0 the dimension O is= 115 mm
**) For cylinder 322 064 196 0 the dimension O is= 169 mm

Special Tie-Rod Cylinders

Double acting with solenoid piston, amplified version,
40-160 mm dia.



	Piston dia.	Fa	Fb	Fc	Fd	Fe	Ff	Fg	Depth
Flange I	50	93	100	67	50	80	49	9	25
	63	124	120	80	60	96	60	11	24
	80	132	146	104	80	120	75	14	28
Flange II	100	156	146	-	-	130	120	14	22
	125	186	170	-	-	156	140	14	28
	160	230	230	-	-	200	200	17.5	35

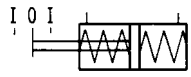
Cylinder
Three-position-cylinder

Rexroth
Bosch Group

Technical data

Type		Piston rod cylinder with spring held center position
Operating pressure		Max. 8 bar
Ambient temperature range		- 25 °C to + 70 °C
Admissible medium		Compressed air, lubricated or non-lubricated
Materials	Housing	Aluminium
	Piston rod	x 10 Cr Ni S 18.9
	Seals	NBR

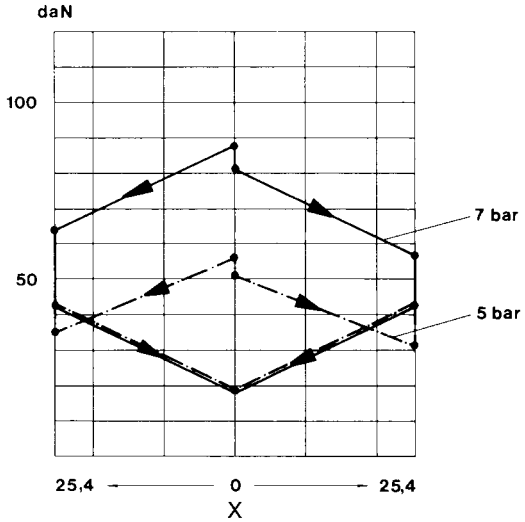
Type number

	Connection thread	Stroke [mm]	Type number
	M 14 x 1.5	2 x 25.4	**322 157 010 0**

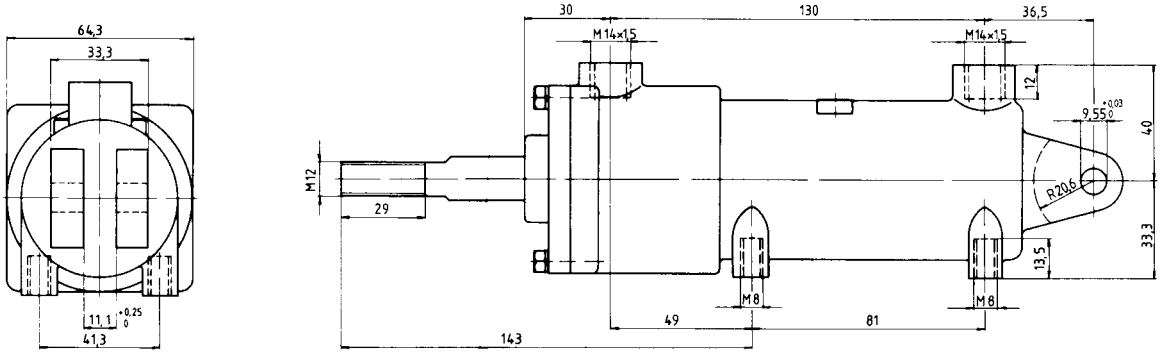
Accessories (to be ordered separately)

	Type	Type number
	Repair kit	**322 157 000 2**

Force - travel - diagram



x) Piston travel, y) Piston force


64,3
33,3
11,1 +0,25 0
41,3
30
130
36,5
M14x1,5
M14x1,5
12
9,55 +0,03 0
40
M12
29
R20,6
33,3
13,5
M8
M8
49
81
143

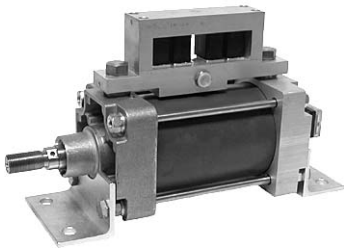
Positioning System

Positioning unit with integrated distance sensor

Rexroth
Bosch Group

Technical data

Type		Piston cylinder with analogue distance sensor
Operating pressure range		Max. 8 bar
Ambient temperature range		- 10 °C to + 60 °C
Admissible medium		Compressed air, lubricated or non-lubricated
Protection with connector		IP 65 - IEC 529 (DIN VDE 0470)
Materials	Piston rod	X 5 Cr Ni 18.9
	Cylinder tube	Steel
	Seals	NBR
Piston rod thread		M 20 x 1.5
Max. weight at the piston rod		125 kg
Max. counteracting force		1250 N
Accuracy		± 0.5
V max.		13 mm/s
Threaded connections		G 1/8 according to ISO 228 - 1
Solenoid valves:	Operating voltage	24 V DC ± 10 %
	Current consumption	142 mA
	Isolation	F according to VDE 580
	Duty cycle	100 %
Distance sensor	Nominal resistance	5 kOhm, ± 25 %
	Linearity	± 0.07 %
	Resolution	0.01 mm
	Operating voltage	Max. 40 V at 293 K
	Collector current	Max. 1 µA
Fault behaviour:	Pressure failure:	Piston rod remains in given position
	Voltage supply failure:	Piston rod retracts

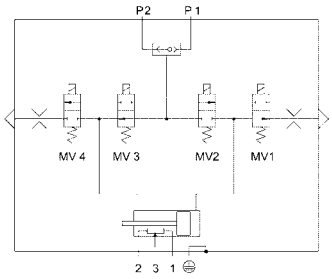


Application area

For infinitely positionable work flows, which are controlled by means of regulator influence.

7

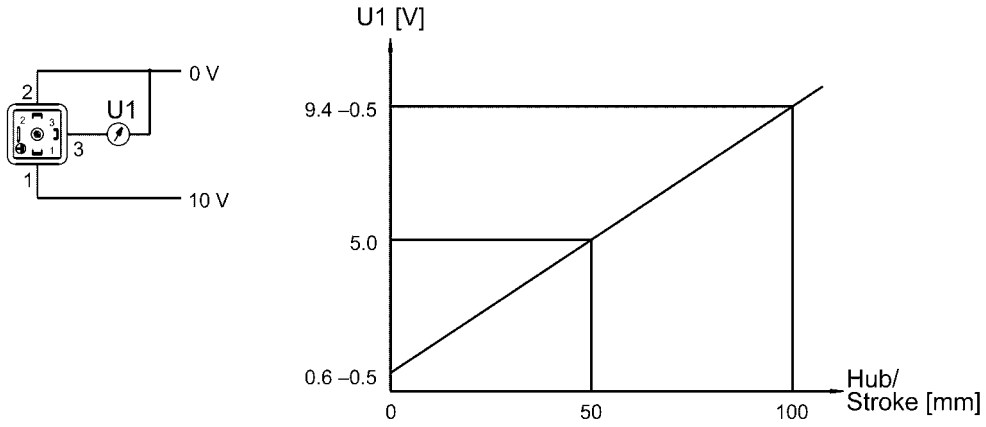
Type number

	Stroke	Type number
	99 mm	**323 862 301 0**

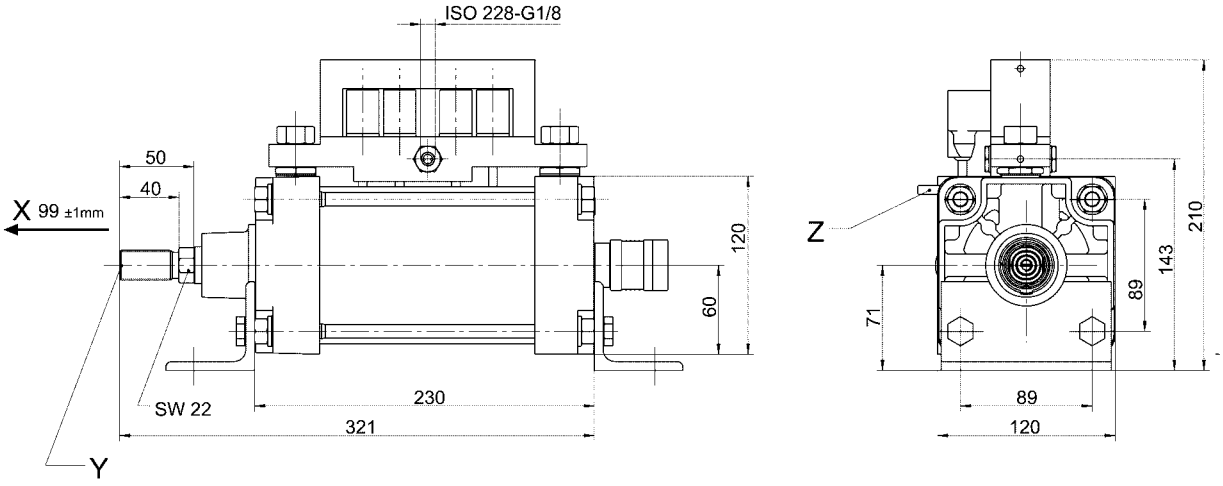
Accessories (to be ordered separately)

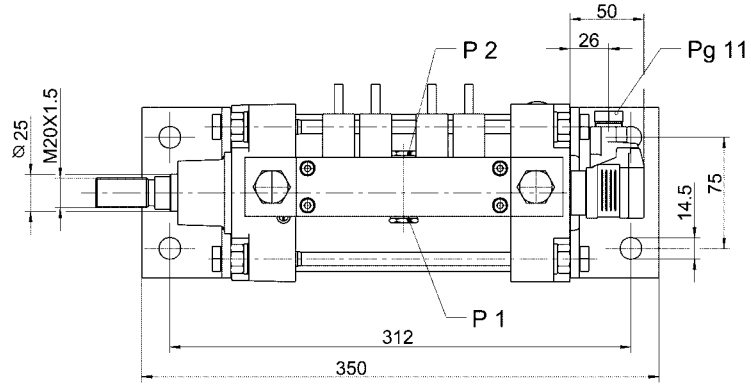
Type	Type number
Spare part kit for replacement of valve manifolds	**323 862 003 2**
Spare part kit for replacement of piston componentry	**323 862 004 2**
Spare part kit for replacement of all sealing elements (is not recommendable)	**323 862 005 2**

Positioning system diagram



1) Positioning unit 2) Positioning regulator 3) Nominal value





Installation: Valves' positions preferably vertically upright. Admissible deviation of up to 90° in each direction.

Proximity reed switch for electrical connector

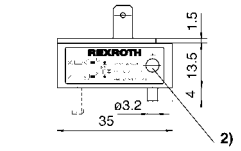
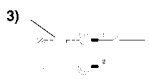


Fig.1



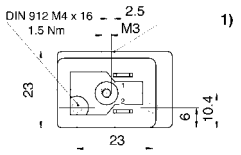
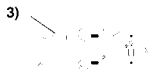


Fig.2



1) Switching point in the middle of this side 2) LED (yellow) 3) Load
Supplied with gasket. Mounting screw M4 supplied with the clamp (MA = 1.5 Nm) MA = torque of mounting screw.

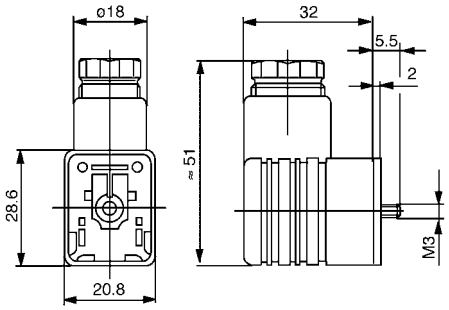
Type number	Type	Fig.	Ambient temp. range	Nominal voltage	Switching current	Switching capacity
894 041 060 2	Without LED	1	- 25° C to + 75° C	AC/DC 10-250 V	Max. 3 A	60 W / 60 VA
894 041 061 2	With LED	2	- 25° C to + 75° C	AC/DC 10-250 V	Max. 0,5 A	50 W / 50 VA

Protection with plug: IP65 - IEC 529 (DIN VDE 0470)
Max. peak voltage: 500 Vs Passing speed max.: 1.5 m/s
Switching point accuracy: +/- 0.1 mm Impact resistance : 50 g (11 ms)
Vibration resistance: 35 g (50 - 1000 Hz)

Piston dia.	32	40	50	63	80	100	125	160	200
A	12	13	14	16	17	17	16	20	20

The contact of the proximity reed switch remains closed for a stroke length of "A" mm (see table)

Connector for sensor 894 041 06X 2.



1) = to remove seals

Type number	Nominal voltage	Pins	Operating voltage
894 100 470 2	Max. 250 V	3	AC 60 V / DC 75 V

Protection type: IP 65 - IEC 529 (DIN VDE 0470) Cross section of cable : 3 x 0.25 mm²
Piping type: PVC - hose Insulation class : C to VDE 0110

Clamp for tie-rod cylinder

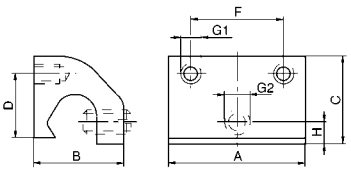


Fig. 1

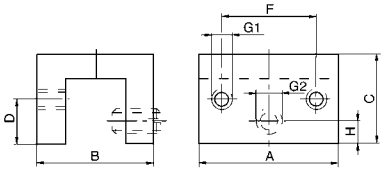


Fig. 2

Piston dia.	Type number	Fig.	A	B	C	D	F	G1	G2	H
32 to 63	**322 061 356 2**	1	35	19	21	16	23	M 4	M 6	5
80 to 125	**322 064 356 2**	1	35	22	21	12	23	M 4	M 6	5
160 to 200	**322 067 353 2**	2	32	32	22	11	23	M 4	M 6	6
250 to 320	**322 089 350 2**	2	41	41	30	16	23	M4	M 6	6

Mounting screws for clamp and proximity reed switch are supplied.
Figs. 1 and 2 for proximity reed switches 894 041 060 2, -061 2, -190 2, -202 2, -203 2

Actuator

Products

Pneumatically operated, with stop cylinder, max. 100 N

See page 2

Pneumatically operated, single, max. 100 N

See page 5

Pneumatically operated, single, max.16 N

See page 7

Pneumatically operated, with stop cylinder, max. 16 N

See page 9

Servo actuator, max. 890 N

See page 11

Servo positioning device, max. 2100 N

See page 13

Pneumatically operated, vented center position

See page 15

Accessories

Console

See page 17

Actuator

Pneumatically operated, with stop cylinder, max. 100 N

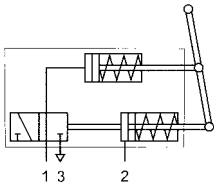
Rexroth
Bosch Group

Technical data

Type		Twin cylinder with maneuvering valve
Operating pressure		Max. 10 bar
Operating pressure connection 2		5 to 10 bar
Admissible force	At max. rod length	100 N
Travel range	Adjusting ex works	0 to 60 mm
Hysteresis		See hysteresis - friction - diagram
Ambient temperature range		- 20°C to + 70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		5 kg
Materials	Housing	Aluminium
	Inside parts	Steel
	Seals	BUNA-N

This actuator serves for an accurate speed setting of diesel-engine governors and pilot valves in servo systems with small regulating power.

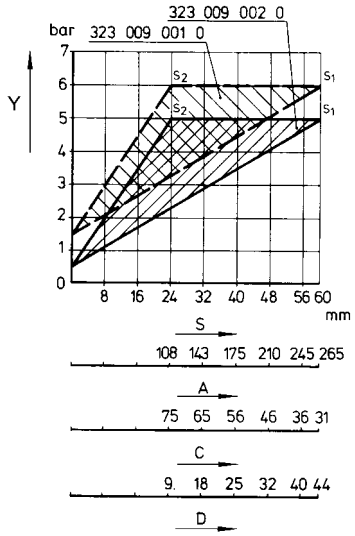
Type number

	Control pressure [bar]	Connection thread	Type number
	1.5 to 6.0	M 14 x 1.5	**323 009 001 0**
	0.5 to 5.0	M 14 x 1.5	**323 009 002 0**

Accessories (to be ordered separately)

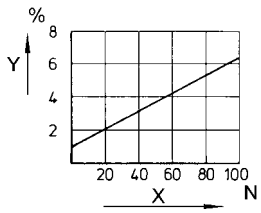
Accessories	Type	Type number
	Repair kit	**323 009 002 2**
	Mounting flange	**323 009 100 2**

Pressure - travel - diagram



S1 = Longest travel, S2 = Shortest travel, y = Pressure in connection 1
S = Travel, A = Rod length, C = Length C, D = Length D

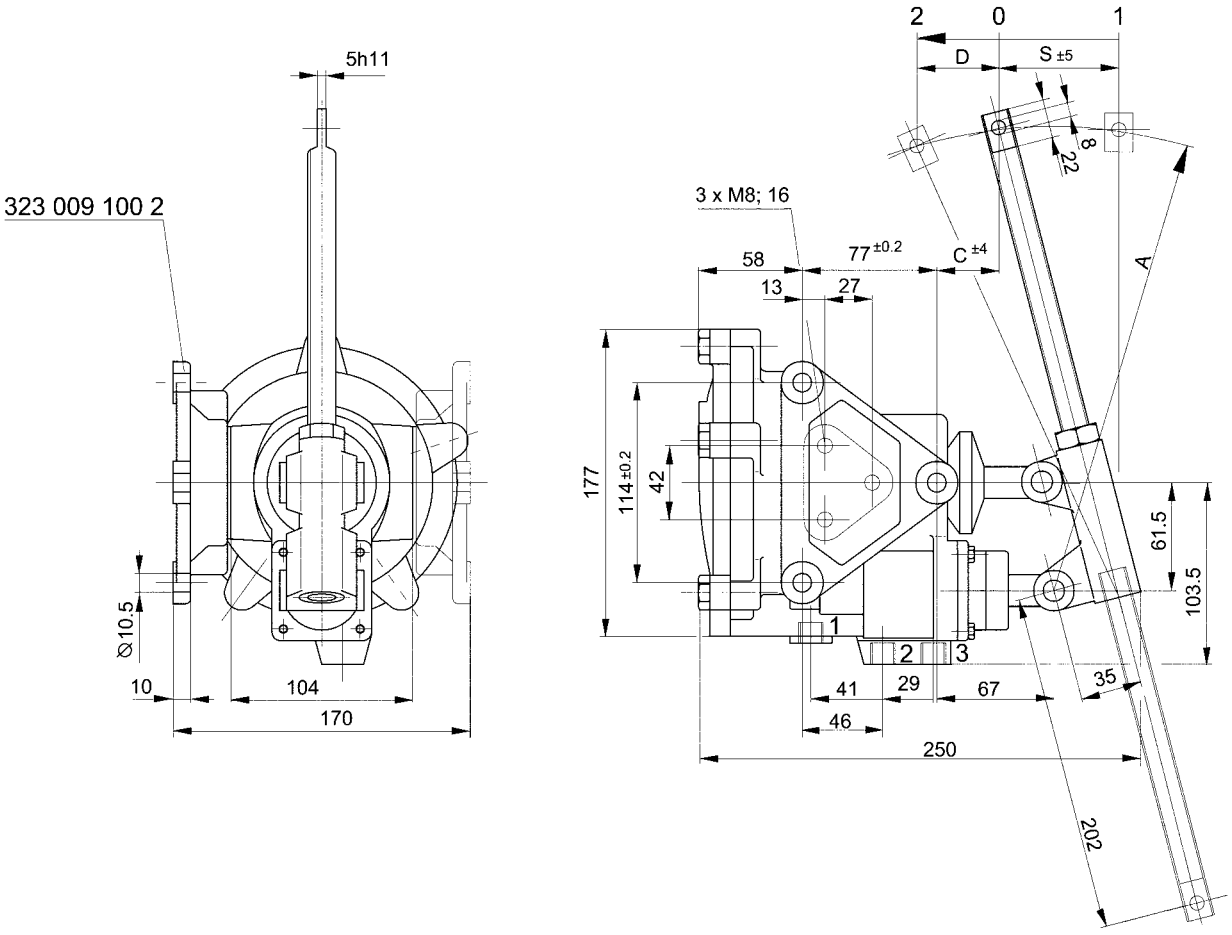
Hysteresis - friction- diagram



The actuator's hysteresis is decisively influenced by friction forces at the actuation mechanism of the device to be operated.
x) Friction, y) Hysteresis

Actuator

Pneumatically operated, with stop cylinder, max. 100 N



	A	C	D	S
Adjusting ex works	265	31	44	60
Lever completely screwed in	108	75	18	24

Actuator

Pneumatically operated, single, max.100 N

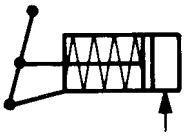
Rexroth
Bosch Group

Technical data

Type		Single cylinder
Operating pressure		Max. 10 bar
Operating pressure connection 2		5 to 10 bar
Admissible force	At max. rod length	100 N
Travel	Adjusting ex works	0 to 60 mm
Hysteresis		See hysteresis-friction-diagram
Ambient temperature range		- 20°C to + 70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		5 kg
Materials	Housing	Aluminium
	Inside parts	Steel
	Seals	BUNA-N

This actuator serves for an accurate speed setting of diesel-engine governors and pilot valves in servo systems with small regulating power.

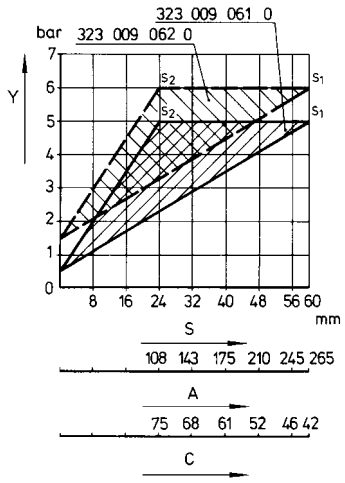
Type number

	Control pressure [bar]	Connection thread	Type number
	0.5 to 5.0	M 14 x 1.5	**323 009 061 0**
	1.5 to 6.0	M 14 x 1.5	**323 009 062 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**323 009 002 2**
	Mounting flange	**323 009 100 2**

Control pressure - travel - diagram



y = Pressure in connection 1, S = Travel, A = Rod length A, C = Length C

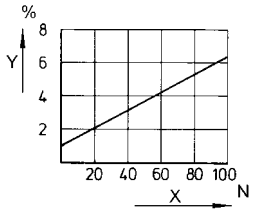
8

Actuator

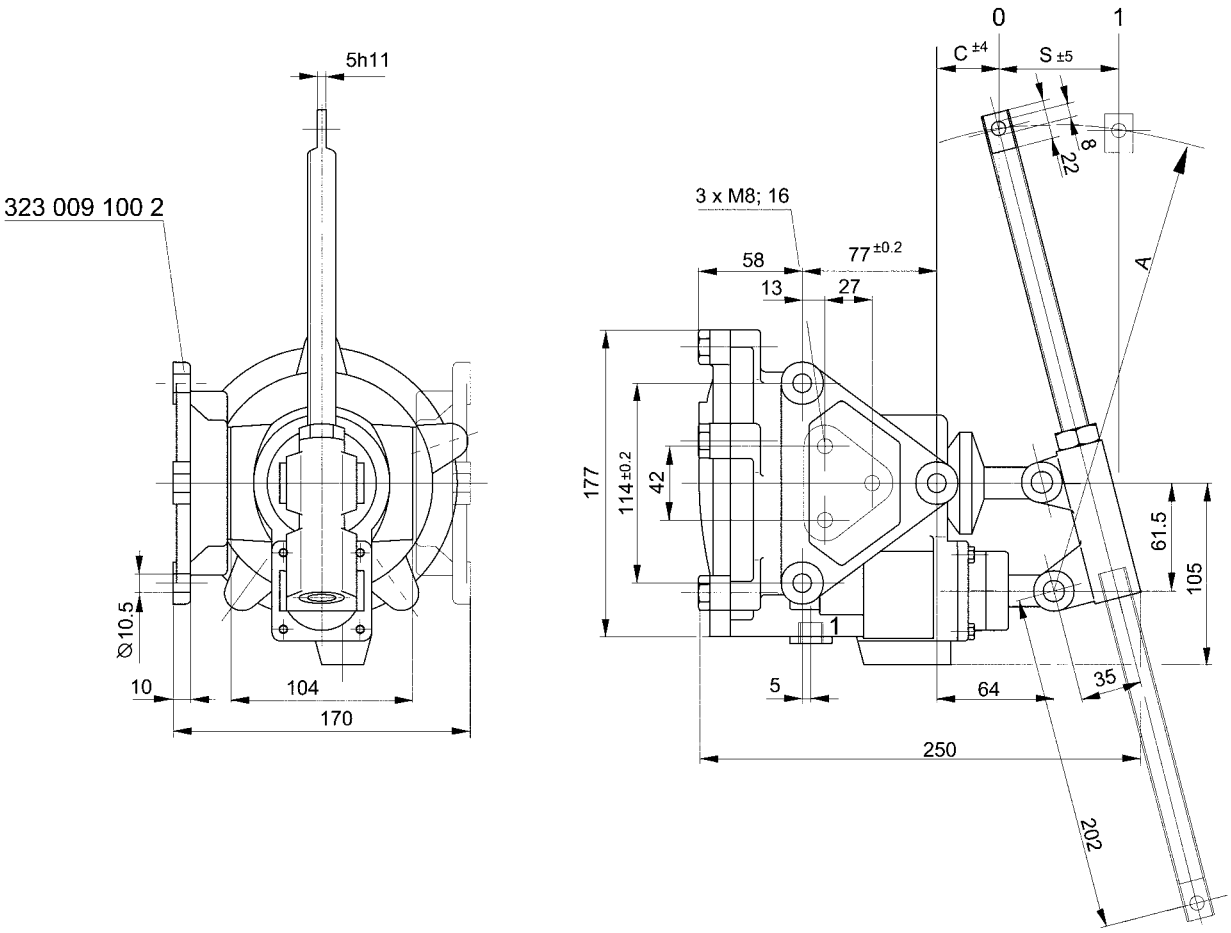
Pneumatically operated, single, max.100 N

Rexroth
Bosch Group

Hysteresis - friction- diagram



The actuator's hysteresis is decisively influenced by friction forces at the actuation mechanism of the device to be operated.
x = Friction, y = Hysteresis



	A	C	S
Adjusting ex works	265	42	60
Lever completely screwed in	108	75	24

Actuator

Pneumatically operated, single, max.16 N

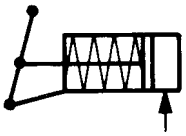
Rexroth
Bosch Group

Technical data

Type		Single cylinder
Operating pressure		Max. 8 bar
Control pressure		0.5 to 5 bar
Admissible force	At max. rod length	16 N
Travel		0 to 62 mm
Hysteresis		See hysteresis - friction - diagram
Ambient temperature range		- 20°C to + 70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		1.5 kg
Materials	Housing	Aluminium
	Inside parts	Steel
	Seals	BUNA-N

This actuator serves for an accurate speed setting of diesel-engine governors and pilot valves in servo systems with small regulating power.

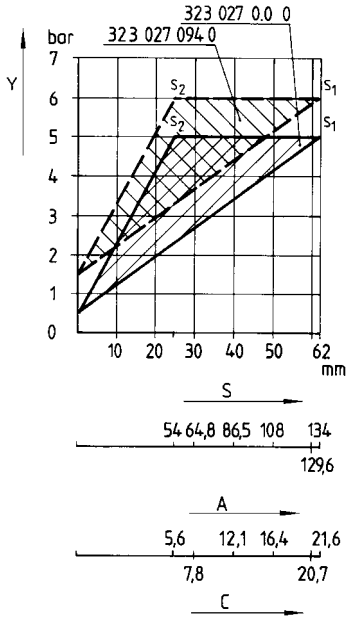
Type number

	Hand-wheel operator	Connection thread	Type number
	Without	M 14 x 1.5	**323 027 010 0**
	With	M 14 x 1.5	**323 027 030 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**323 027 001 2**

Control pressure - travel - diagram



y = Pressure in connection 1, S = Travel, A = Rod length A, C = Length C

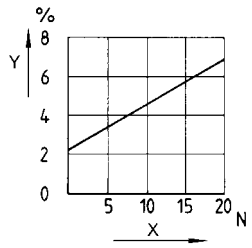
8

Actuator

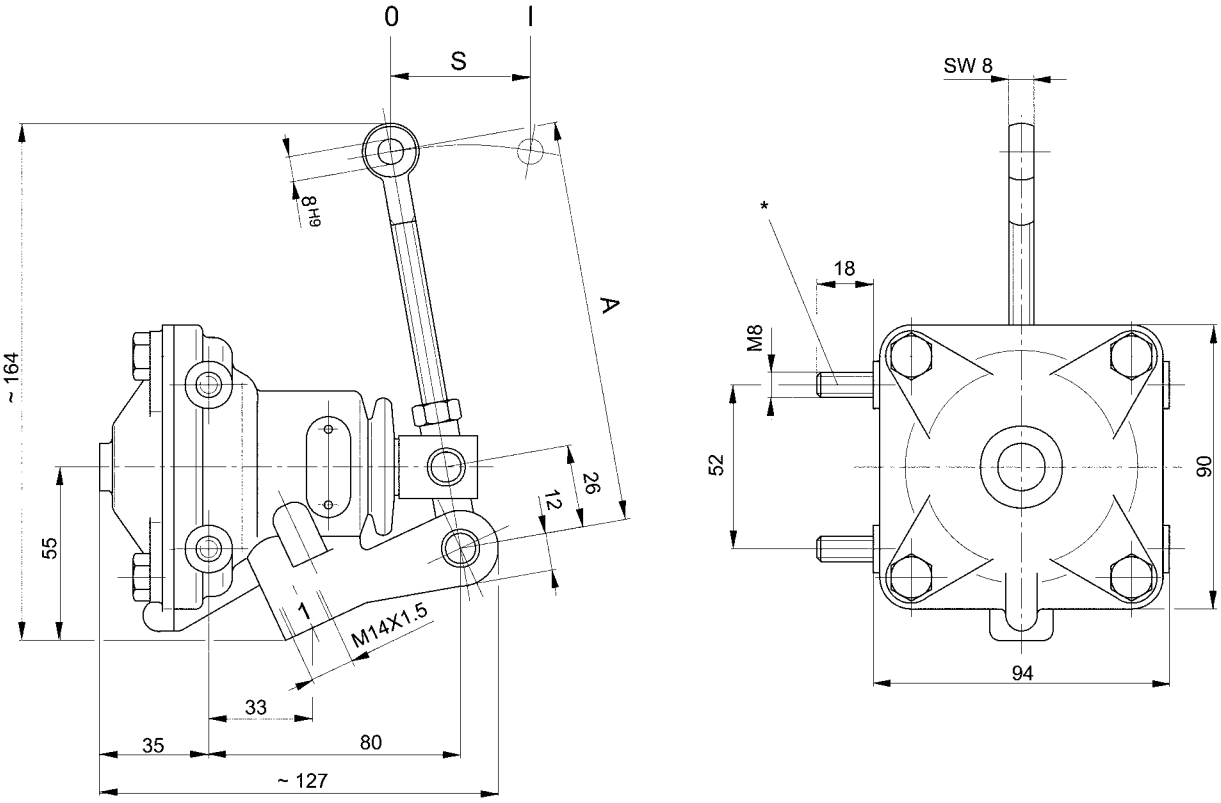
Pneumatically operated, single, max.16 N

Rexroth
Bosch Group

Hysteresis-friction-diagram



The actuator's hysteresis is decisively influenced by friction forces at the actuation mechanism of the device to be operated.
y = Hysteresis, x = Friction



* Studs M8 x 18, can be screwed in on right or left side.

	A	S
Adjusting ex works	134	62
Lever completely screwed in	54	25

Actuator

Pneumatically operated, with stop cylinder, max. 16 N

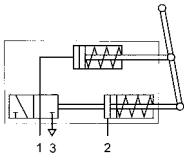
Rexroth
Bosch Group

Technical data

Type		Twin cylinder with maneuvering valve
Operating pressure		Max. 8 bar
Operating pressure connection 2		5.3 to 8 bar
Admissible force	At max. rod length	16 N
Travel		0 to 62 mm
Hysteresis		See hysteresis - friction - diagram
Ambient temperature range		- 20°C to + 70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		1.2 kg
Materials	Housing	Aluminium
	Inside parts	Steel
	Seals	BUNA-N

This actuator serves for an accurate speed setting of diesel-engine governors and pilot valves in servo systems with small regulating power.

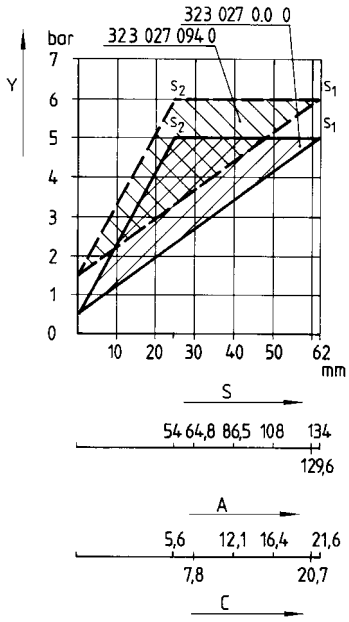
Type number

	Control pressure [bar]	Hand-wheel operator	Connection thread	Type number
	1.5 to 6.0	Without	M 14 x 1.5	**323 027 094 0**
	0.5 to 5.0	With	M 14 x 1.5	**323 027 020 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**323 027 001 2**

Control pressure- travel-diagram



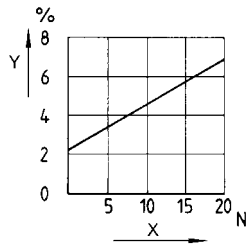
y = Pressure in connection 1, S = Travel, A = Rod length A, C = Length C

8

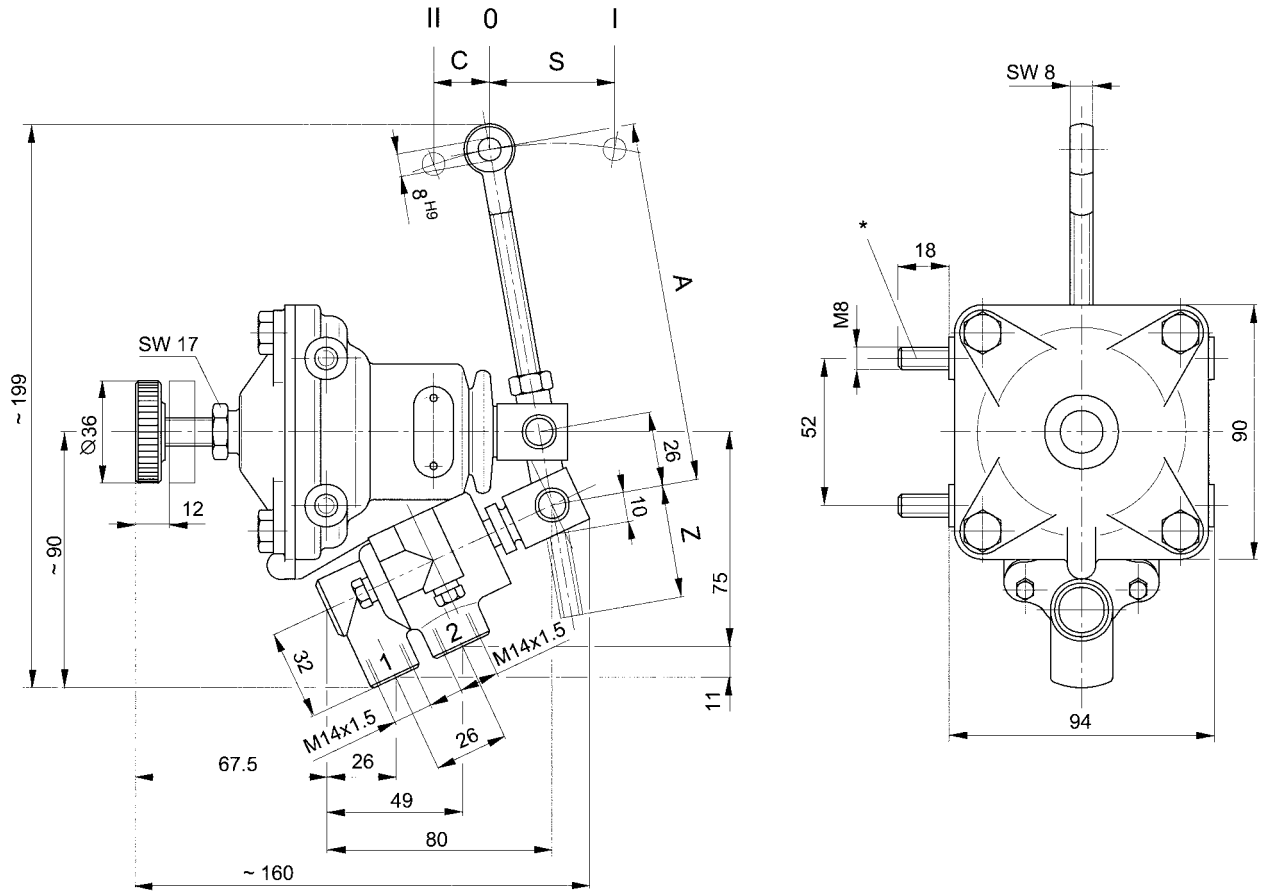
Actuator

Pneumatically operated, with stop cylinder, max. 16 N

Hysteresis-friction-diagram



The actuator's hysteresis is decisively influenced by friction forces at the actuation mechanism of the device to be operated.
y = Hysteresis, x = Friction



* Studs M8 x 18, can be screwed in on right or left side.

	A	C	S	Z
Adjusting ex works Lever completely screwed in	134 54	21.6 5.6	62 25	If distance Z >45 mm shorten lever by 5 mm

Actuator

Servo actuator, max. 890 N

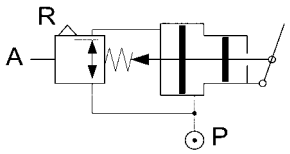
Rexroth
Bosch Group

Technical data

Type		Servo positioning device
Operating pressure		Max. 7 bar
Control pressure connection 2		0.5 to 5 bar
Admissible force (at p = 6 bar)	At max. stroke 171 mm	510 N
	At min. stroke 95 mm	890 N
Ambient temperature range		- 20°C to + 70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		8 kg
Materials	Housing	Aluminium
	Inside parts	Steel
	Seals	BUNA-N

This actuator serves for an accurate speed setting of diesel-engine governors and pilot valves in servo systems with small regulating power.

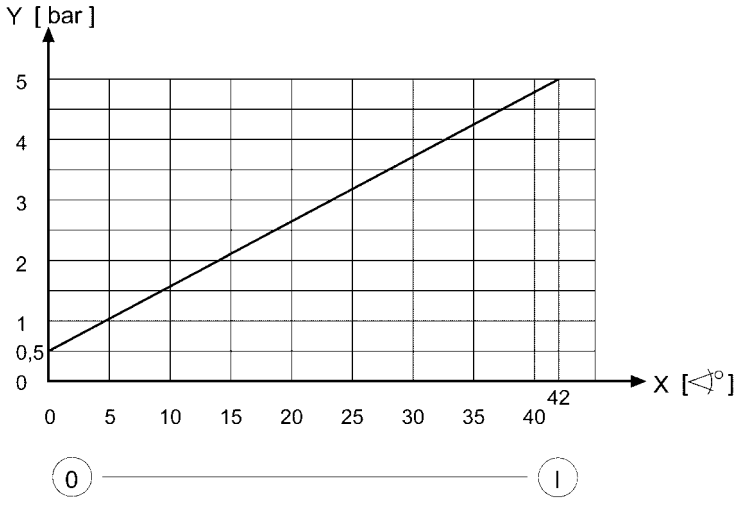
Type number

	Control pressure [bar]	Connection thread	Type number
	0.5 to 5.0	M 14 x 1.5	**323 020 100 0**

Accessories (to be ordered separately)

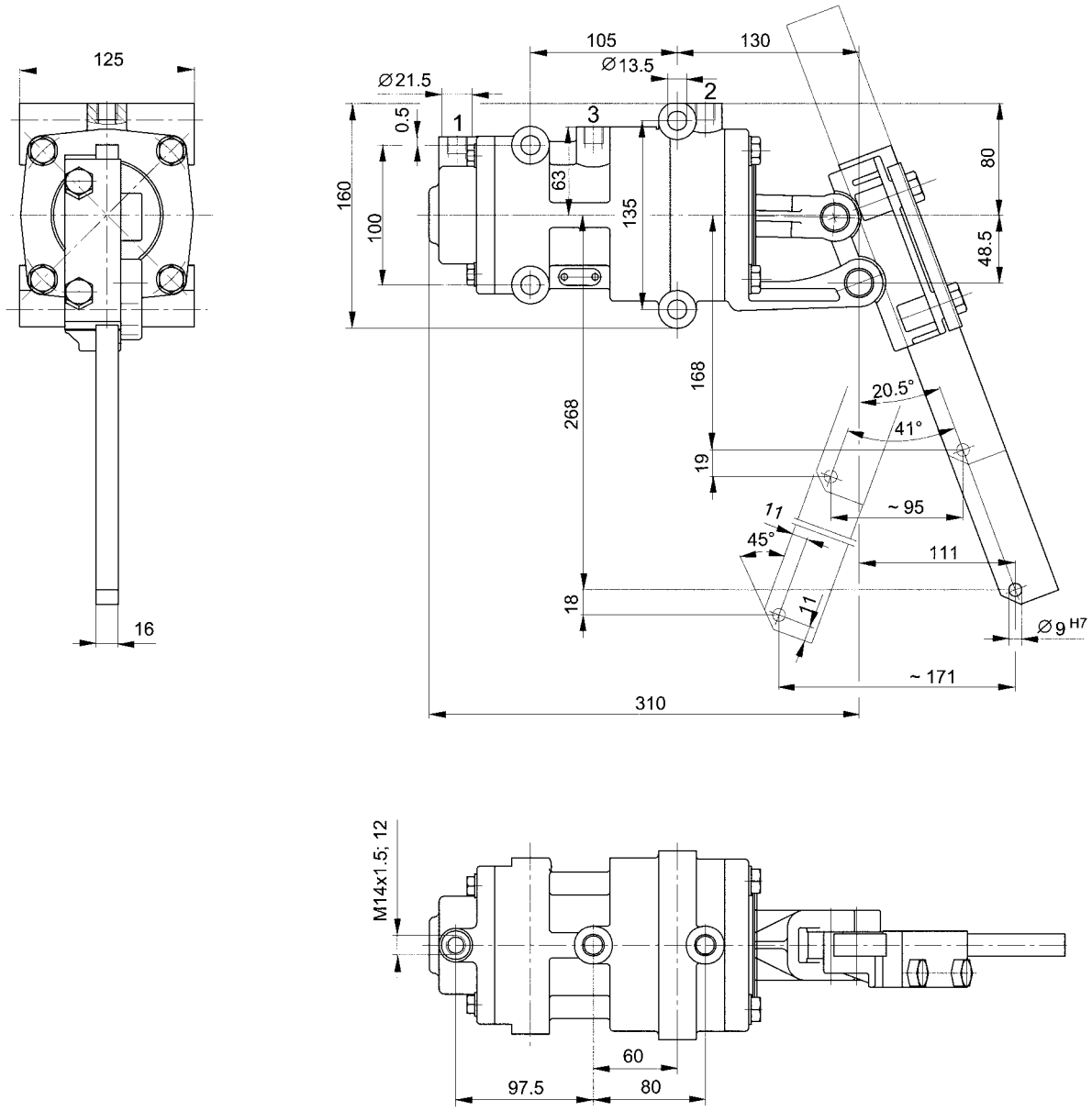
Accessories	Type	Type number
	Repair kit	**323 020 002 2**

Control pressure - travel - diagram



x = Actuating angle, y = Control pressure

8


125
16
105
130
Ø13.5
Ø21.5
0.5
1
2
3
160
100
63
135
80
48.5
168
268
20.5°
41°
19
~ 95
11
45°
111
18
11
Ø9 H7
~ 171
310
M14x1.5; 12
60
97.5
80

L = Rod length

Actuator

Servo actuator, max. 2100 N

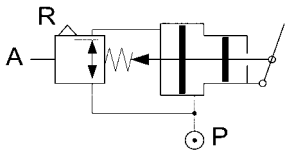
Rexroth
Bosch Group

Technical data

Type		Servo positioning device
Operating pressure		Max. 7 bar
Control pressure connection 2		0.5 to 5 bar
Admissible force (at p = 6 bar)	At max. stroke 250 mm	840 N
	At min. stroke 72 mm	2100 N
Ambient temperature range		- 20°C to + 70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		8 kg
Materials	Housing	Aluminium
	Inside parts	Steel
	Seals	BUNA-N

This actuator serves for an accurate speed setting of diesel-engine governors and pilot valves in servo systems with small regulating power.

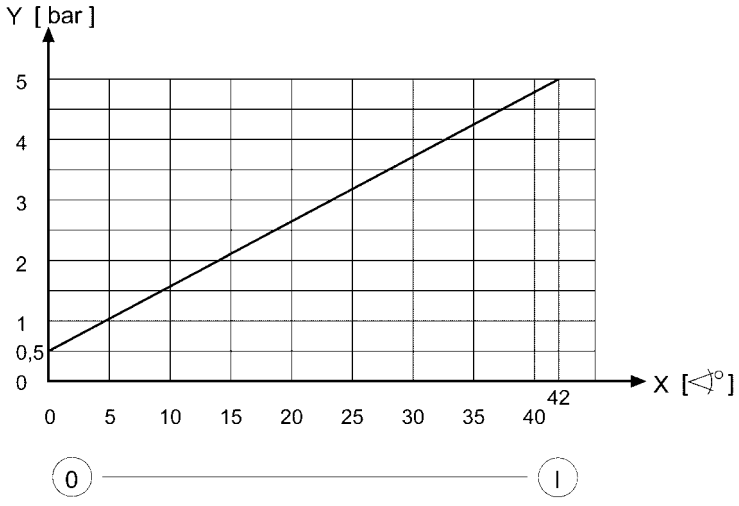
Type number

	Control pressure [bar]	Connection thread	Type number
	0.5 to 5.0	M 14 x 1.5	**323 020 110 0**

Accessories (to be ordered separately)

Accessories	Type	Type number
	Repair kit	**323 020 005 2**

Control pressure - travel - diagram

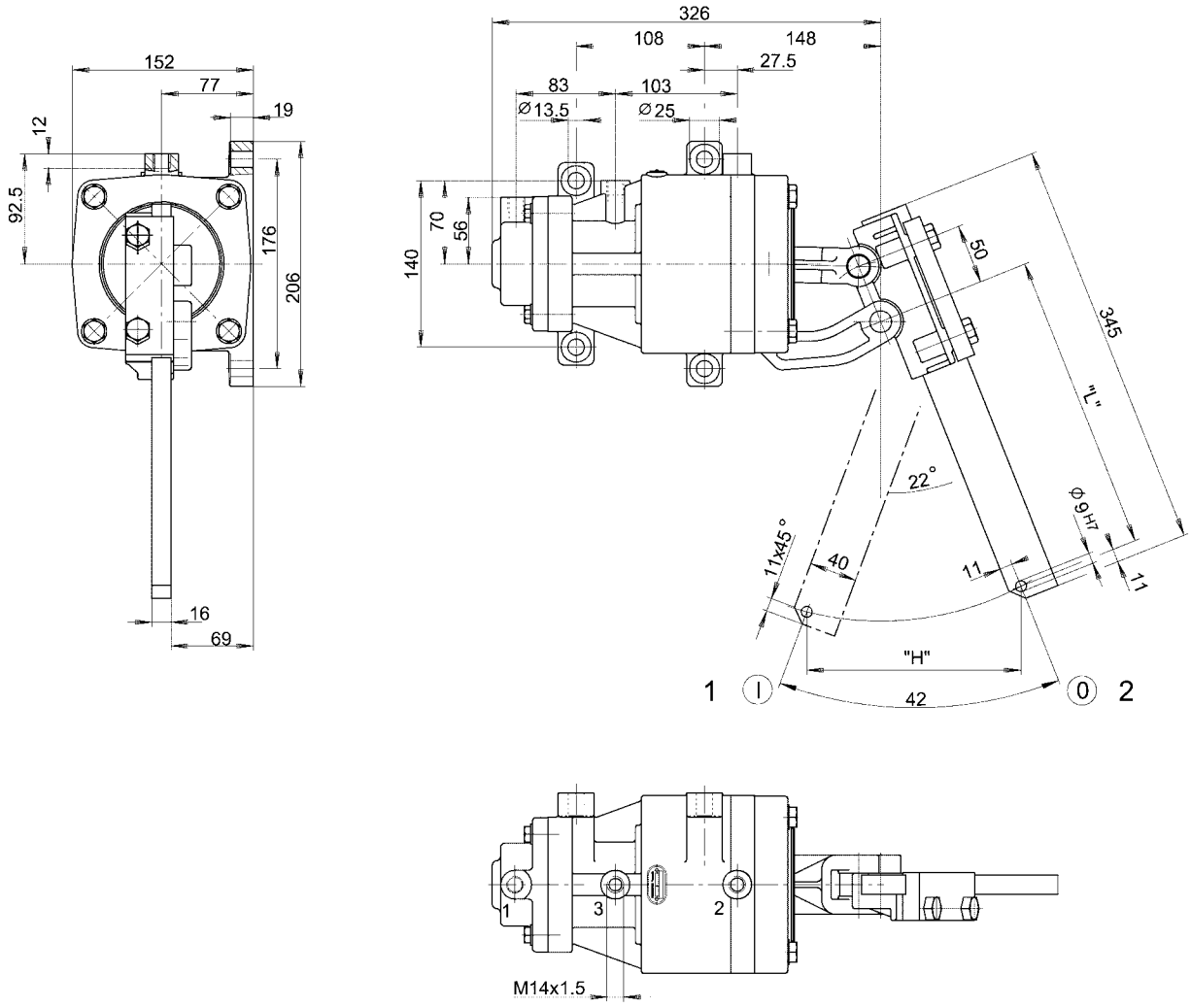


x = Actuating angle, y = Control pressure

8

Actuator

Servo actuator, max. 2100 N



L = Rod length

Actuator

Pneumatically operated, vented center position

Rexroth
Bosch Group

Technical data

Type		Cylinder with spring fixed center position
Operating pressure		Max. 8 bar + 20%
Admissible force		See diagram
Travel		2 x 40 mm
Hysteresis		See diagram
Ambient temperature range		- 20°C to + 70°C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		16 kg
Materials	Cylinder tube	Steel, nickeled inside
	Piston and piston rod	Steel, stainless
	Seals	BUNA-N
	Other parts	Aluminium resp. Steel, cadmium plated

This actuator serves for an accurate speed setting of diesel-engine governors and pilot valves in servo systems with small regulating power.

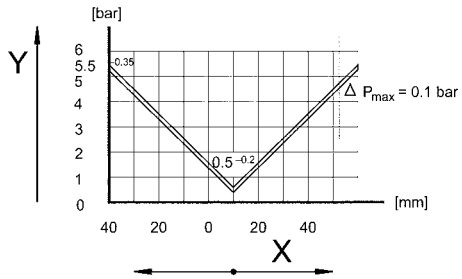
Type number

	Control pressure [bar]	Connection thread	Type number
	0.5 to 5.5	M 14 x 1.5	**323 891 001 0**

Accessories (to be ordered separately)

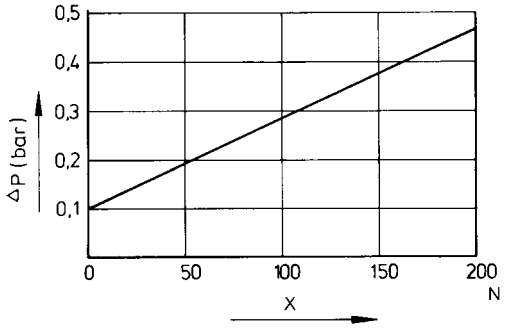
Accessories	Type	Type number
	Repair kit	**323 891 001 2**

Control pressure - travel - diagram

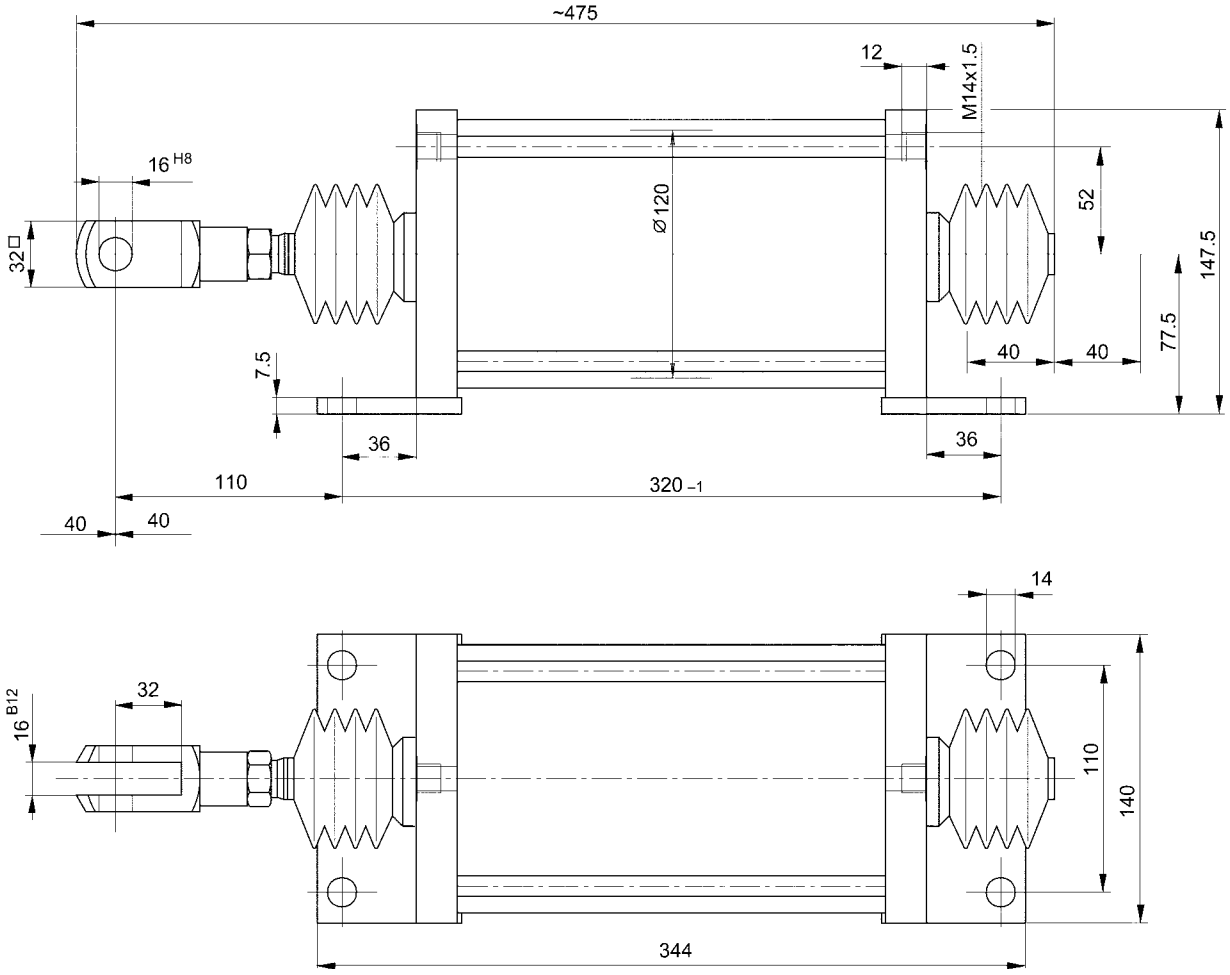


x = Stroke, y = Control pressure p

Hysteresis-friction-diagram



The actuator's hysteresis is decisively influenced by friction forces at the actuation mechanism of the device to be operated.
x = Force (friction forces) at piston rod



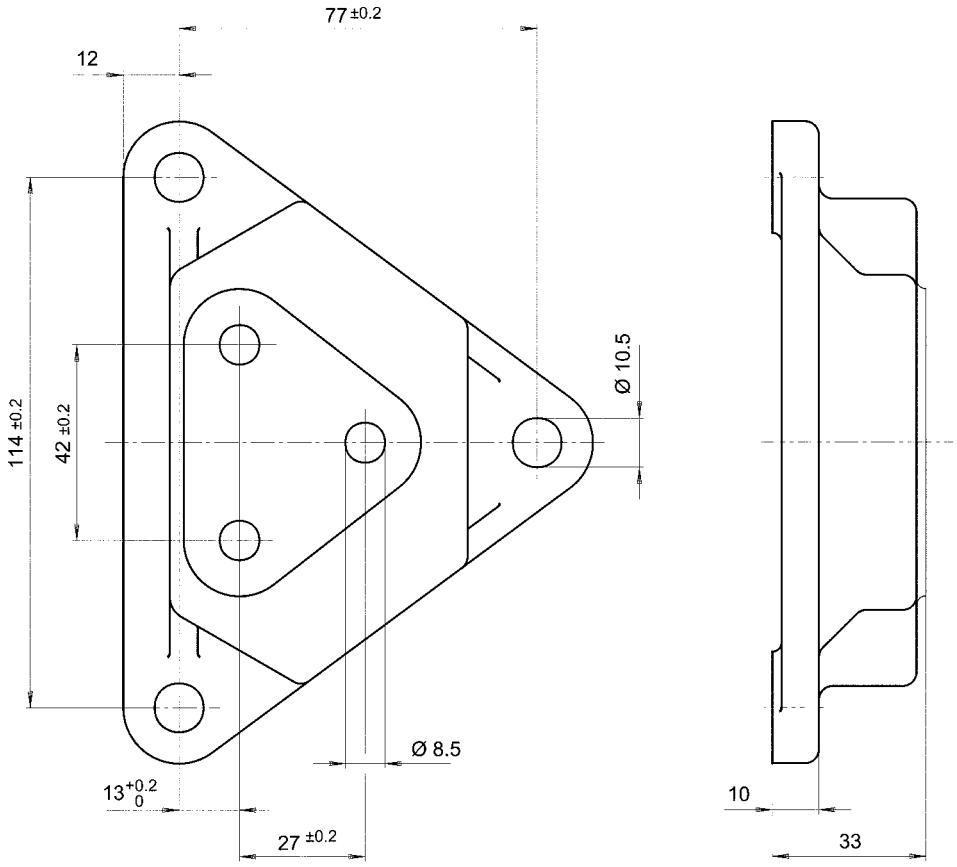
Console

Console for mounting the actuators 323 009 ... 0

Console

Screws M8x25, spring washers and disks are included in supply

Type	Type number
Console	**323 009 100 2**



Rexroth
Bosch Group

Products

Electrically operated, with swivel arm

See page 19

Electrically operated, linear controllable travelling range

See page 21

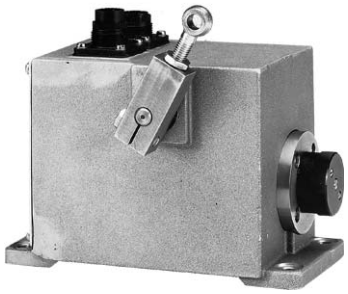
Actuator

Electrically operated, with swivel arm

Rexroth
Bosch Group

Technical data

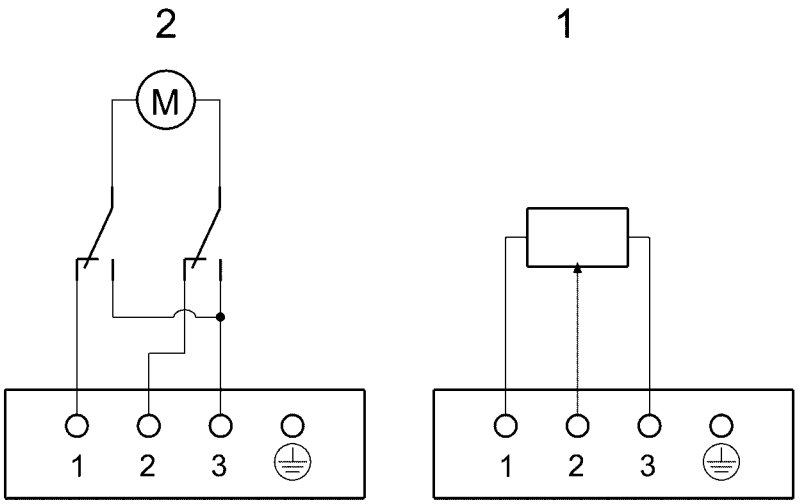
Type		Electric actuator with swivel arm
Nominal torque		8 Nm
Lever arm length	(adjustable)	60 to 75 mm
Angle traverse		60°
Operating time	(at angle-traverse 60°)	2.6 s
Ambient temperature range		- 20°C to + 75°C
Motor type		DC-engine with iron-free rotor
Operating voltage		24 V DC ± 20%
Current consumption		About 1.6 A
Connection resistance		6.2 Ω
Connection inductance		0.75 mH
Operation mode		S9 DIN 57 530 / VDE 0470
Protection		IP 55 DIN VDE 0470
Assembly position		Any
Potentiometer		
Resistance		5 kΩ
Resistance tolerance		± 3%
Linearity tolerance		± 0.5%
Load rating		1.5 W
Electric rotation angle		90°
Active rotation angle		60°



Type number

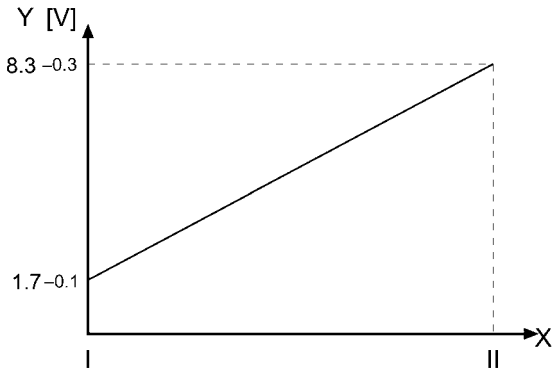
	Actuating angle	Type number
	60°	**323 699 030 0**

Terminal diagram

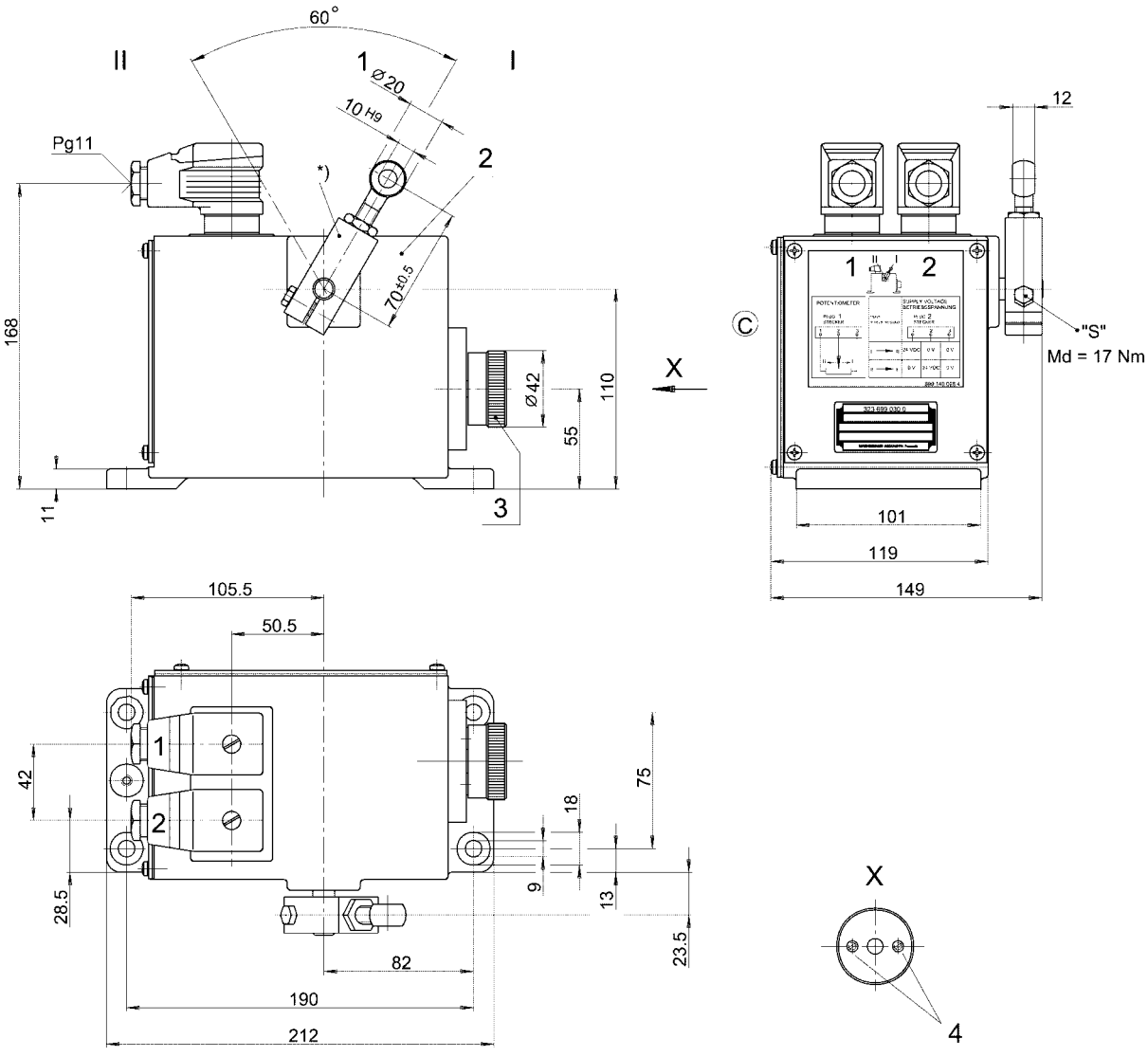


1) Plug 1 2) Plug 2

Control voltage-lever position-diagram



x) Lever position y) Voltage U1



1) Ball 2) Adjustable from 60 mm to 75 mm 3) Hand-wheel operator 4) Adjusting screws for automatic locking
*) After loosening the screw S the lever can be adjusted in any position.
ATTENTION: Adjust screws 4 symmetrically. By increasing the automatic locking the nominal torque decreases.

Actuator

Electrically operated, linear controllable travelling range

Rexroth
Bosch Group

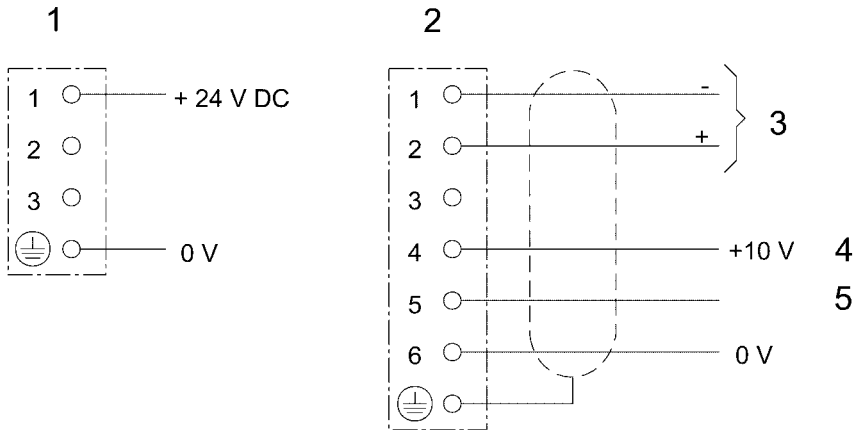
Technical data

Type		Electric actuator with linear travel range
Nominal force		150 N
Max. actuating force		300 N
Actuating speed		80 mm/s
Ambient temperature range		- 25°C to + 60°C
Motor type		DC-engine with permanent magnet
Operating voltage		24 V DC
Current consumption	Stationary	0.2 A
	At nominal load	2 A
	max.	15 A
Input signals	At current activation	4 ... 20 mA, 0... 20 mA
	At voltage-activation	2... 10 V, 0... 10 V
	At resistance-activation	2... 10kΩ
	Activation by MiniMarex	PWM signal
Assembly position		Any

Type number

	Stroke	Type number
	70 mm	**323 699 560 0**

Terminal diagram

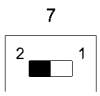


1) Plug 1 2) Plug 2 3) PWM-Signal of Mini-Marex actuator 4) Output 5) Input signal

Switch adjustment for input signals switch 1

PWM - signal

Current, voltage or resistance signal



8

Switch adjustment for input signals switch 2 *

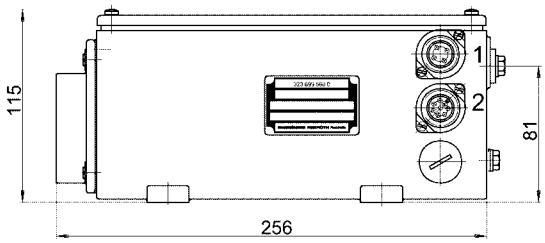
4 - 20 mA

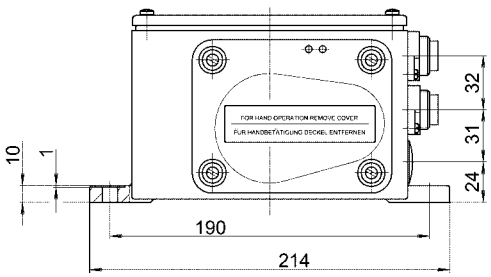
0 - 20 mA

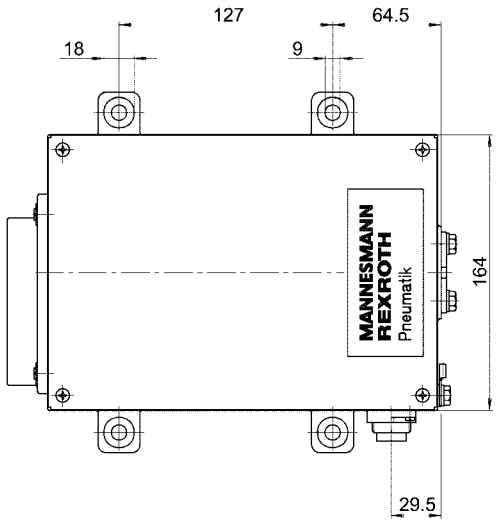
2 - 10 V

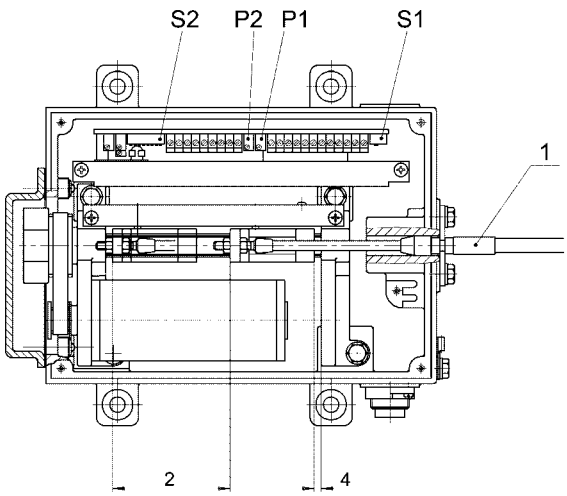
0 - 10 V Resistance activation

*) Only effective if S1 in position 1









1) Push-pull-cable-duct to be ordered separately 2) Max. stroke S1, S2) DIP switch P1, P2) Potentiometer for end position adjustment

Accessories

Rexroth
Bosch Group

Products

Cut-off-cock, 1/4-rotation, (3/2-way) G 1/4 - G 1/2

See page 2

Cut-off-cock, 1/4-rotation, (2/2-way) G 1/4 - G 1/2

See page 3

Pressure switch, M12 x 1.5

See page 4

Pressure switch, G 1/4

See page 5

Pressure gauges

See page 7

Rotary connector, 1 controlled line, NW 12

See page 10

Rotary connector, 1 controlled line, NW 12

See page 11

Accessories

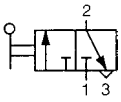
Cut-off-cock, 1/4-rotation, (3/2-way) G 1/4 - G 1/2

Rexroth
Bosch Group

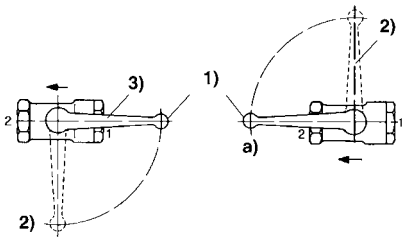
Technical data

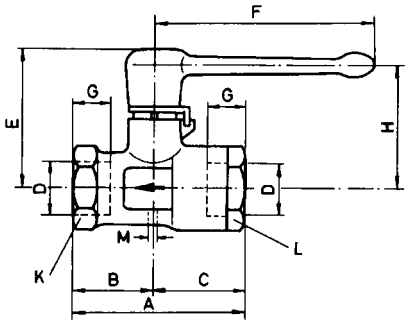
Type		Ball valve
Operating pressure max.		40 bar
Nominal diameter	ND	See table
Ambient temperature range		-20° C to +80° C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		See table
Materials	Housing	Brass, nickel-plated
	Hand lever	Cast metal

Type number

Symbol	ND	Threaded ports ISO 228/1	Weight [kg]	Type number
	7	G 1/4	0.26	**352 034 110 0**
	10	G 3/8	0.25	**352 034 210 0**
	13	G 1/2	0.29	**352 034 310 0**

Note: lever is removable.





1) Closed
2) Open
3) Lever position as delivered
a) Alternative lever position

ND	D Thread	A	B	C	E	F	G	H	K	L	M
7	G 1/4	59	27	32	45.5	69.5	12	43	SW 24	SW 24	2
10	G 3/8	59	27	32	45.5	69.5	12	43	SW 24	SW 24	2
13	G 1/2	66	32.5	33.5	46.5	69.5	15	44	SW 27	SW 27	2

Accessories

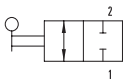
Cut-off-cock, 1/4-rotation, (2/2-way) G 1/4 - G 1/2

Rexroth
Bosch Group

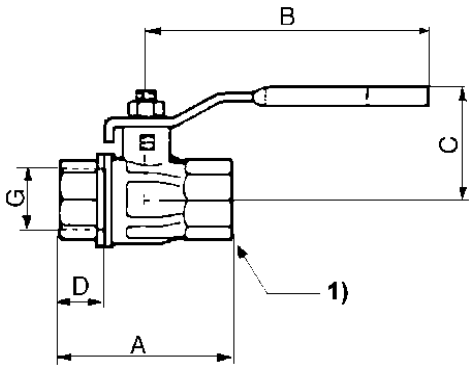
Technical data

Type		Ball valve
Operating pressure max.		See table
Nominal diameter	ND	See table
Ambient temperature range		-20° C to +150° C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		See table
Materials	Housing	Brass, nickel-plated
	Hand lever	Plastic-covered steel, blue
	Seals	Teflon

Type number

Symbol	ND	Threaded ports ISO 228/1	Operating pressue max. [bar]	Weight [kg]	Type number
	7	G 1/4	30	0.14	**352 032 150 0**
	10	G 3/8	30	0.14	**352 032 250 0**
	15	G 1/2	30	0.20	**352 032 350 0**

Note: lever is not removable.



ND	Thread G	A	B	C	D	1) SW
10	G 1/4	51.5	100	45	11	20
10	G 3/8	51.5	100	45	12	20
15	G 1/2	55	100	50	13.5	25

Accessories

Pressure switch, M12 x 1.5

Rexroth
Bosch Group

Technical data

Type		Spring-loaded diaphragm pressure switch
Operating pressure		Max. 10 bar
Excess pressure safety		Max. 30 bar
Admissible medium		Compressed air, lubricated or non-lubricated; Mineral oil
Ambient temperature range		- 40°C to + 80°C
Weight		0.06 kg
Contact rating *)	(With ohmic load)	30 W at 5 A
Current *)		Direct current
Protection		IP 00 according to VDE 0470
	With cover and cable ∅5	IP 65 according to VDE 0470

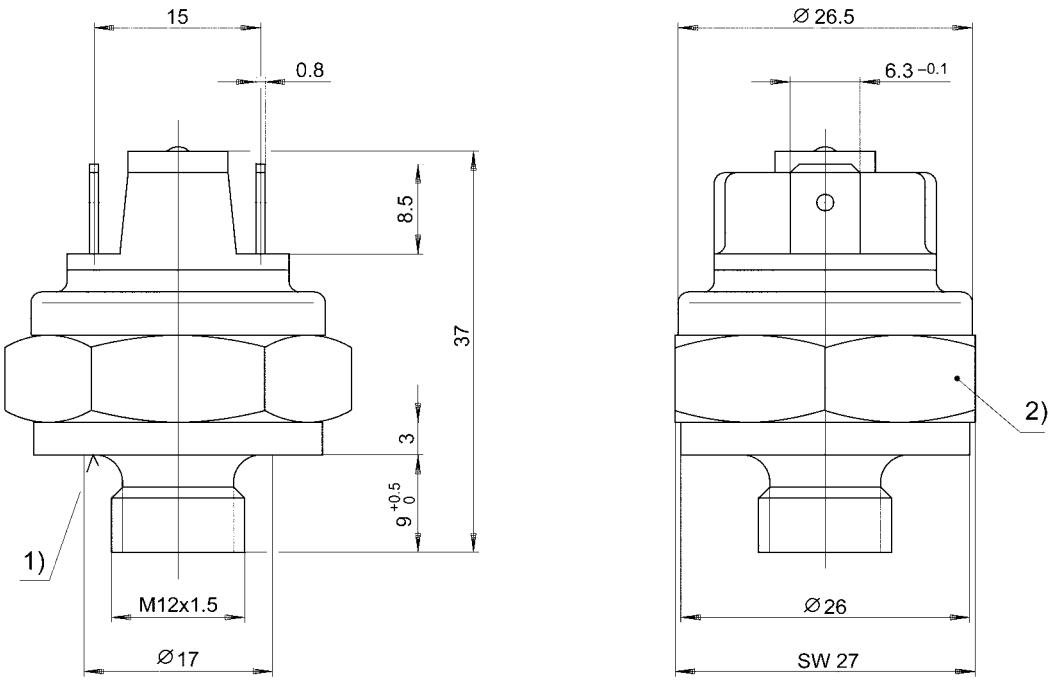
*) For inductive DC-circuits interpose a relay switch.

Type number

	Connection threads	Switch	Change-over pressure [bar]	Type number
	M 12 x 1.5	Normally open contact	4 ± 0.4	**441 014 017 0**
	M 12 x 1.5	Normally closed contact	4 ± 0.4	**441 014 013 0**

Accessories (to be ordered separately)

	Type	Type number
	Cover	**897 750 342 4**



1) Sealing surface 2) Change-over pressure and type of switch are stamped.

Accessories

Pressure switch, G 1/4

Rexroth
Bosch Group

Technical data

Type		Spring-loaded diaphragm switch
Operating pressure		Max. 15 bar
Admissible medium		Compressed air, lubricated or non-lubricated;
mineral oil; water		
Ambient temperature range		- 25°C to + 70°C
Weight		0.6 kg
Contact rating		
Max. voltage	(As control switch)	380 V AC
Current on contact		30 A at cos fi ≥ 0.7
Permanent current		10 A at cos fi ≥ 0.4
Max. voltage	(As single-phase motor switch)	220 V AC
Admissible load	At 125 V AC	0.18 kW
	At 220 V AC	0.36 kW
Admissible current	At 24 V DC	0.05 to 2 A
	At 110 V DC	Max. 0.5 A

*) For inductive DC-circuit interpose a relay switch.

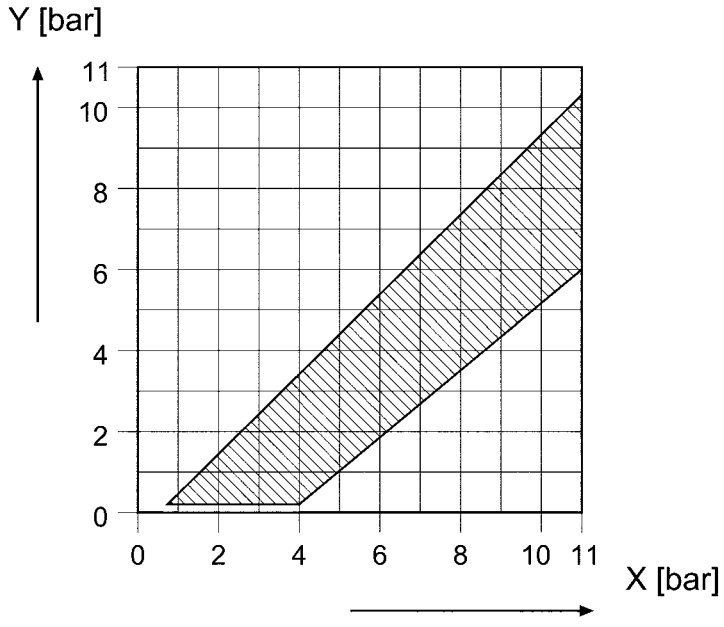
Type number

	Connection threads	Switch	Starting pressure [bar]	Switch-off pressure [bar]	Type number
	G 1/4	Change-over switch	3 ± 0.1	2.5 ±0.08	**341 042 001 0**

Accessories (to be ordered separately)

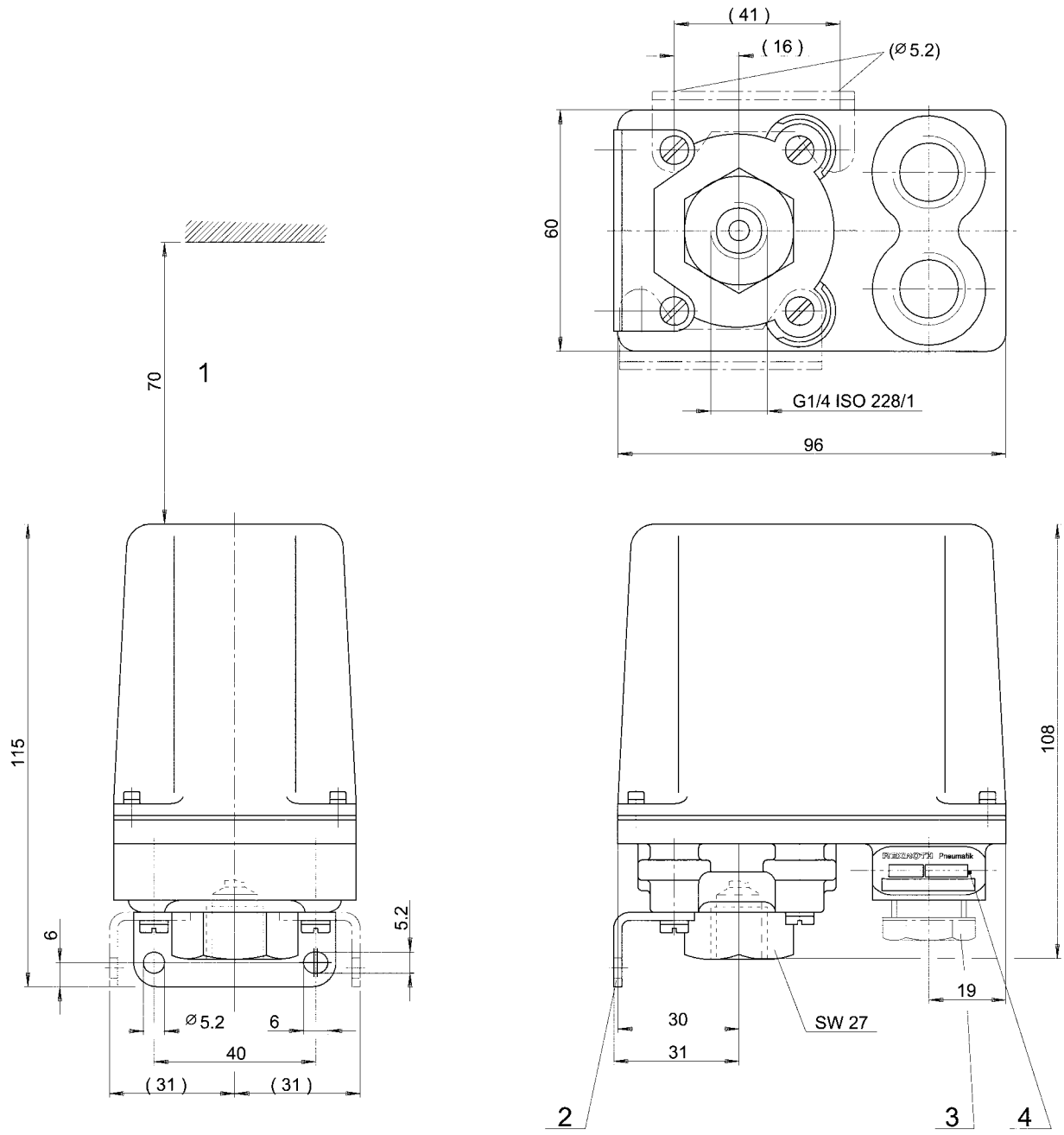
	Type	Type number
	Connector	**811 528 013 4**

Starting- /Switch-off pressure diagram



x: Switch-off pressure y: Starting pressure

9



1) Necessary space for switch adjustment 2) Mounting bracket is convertible by 90° to the left or right side.
3) Connector BPG 13.5 x 6-12, DIN 46320 - FS (810 528 013 4) to be ordered separately

Technical data

Type	Bourdon tube lever system
Ambient temperature range	+5° C to +50° C 0° C to +50° C (with dry air)
Admissible medium	compressed air

Single pressure gauge

Symbol	Designation dia.	Connections	Mounting type	Type number	Fig.	Indicating range	Calibration	Accuracy
	∅ 50	R 1/8	Screw-in thread	**353 019 010 0**	1	0 to 12	bar psi	1.6
	∅ 63 / filled with glycerin	R 1/4	Screw-in thread	**353 013 000 0**	2	0 to 10	bar psi	1.6
	∅ 63 /filled with glycerin	R 1/4	Screw-in thread	**353 013 001 0**	2	0 to 16	bar psi	1.6
	∅ 60 with 24 V lamp	Tube ∅ 6x1	U-clamp	**353 003 002 0**	3	0 to 10	bar	1
	∅ 63 / filled with glycerin	R 1/4	Facing ring	**353 013 021 0**	4	0 to 6	bar psi	1.6
	∅ 63 / filled with glycerin	R 1/4	Screw-in thread	**353 013 002 0**	2	0 to 25	bar psi	1.6
	∅ 63 / filled with glycerin	G 1/4	Screw-in thread	**353 013 006 0**	5	0 to 1000	kPa	1.6

Twin pressure gauge

Symbol	Designation dia.	Threaded ports	Mounting type	Type number	Fig.	Indicating range [bar]	Calibration	Accuracy*)
	60 with 24 V lamp+P168	Tube ∅ 6x1	U-Clamp	**353 004 002 0**	6	0 to 10	psi	1

* In reference to full scale deflection

Fig. 1	A	B	C	D	E [h 11]	F
50 1/8	50	16.5	9.5	27.3	1/8	14

Abb. 1

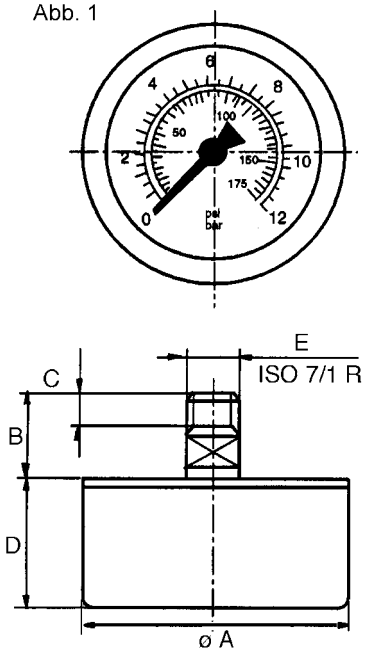


Abb. 3

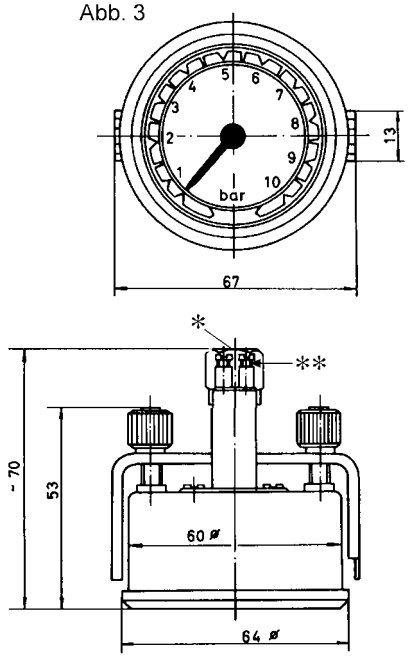
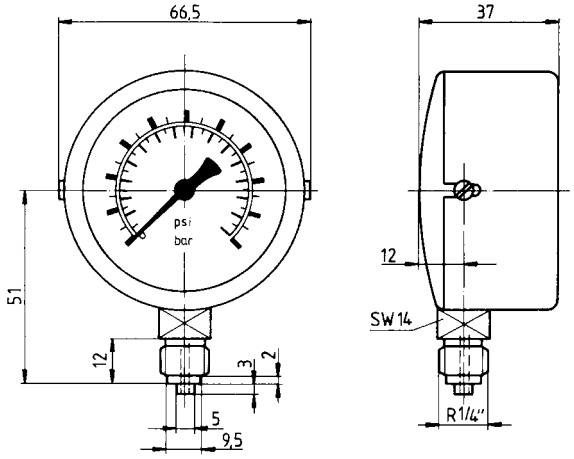


Abb. 2



*) For tube∅ 6 x 1 **) Bipole connection for light 12 V / 2 W

Abb. 4

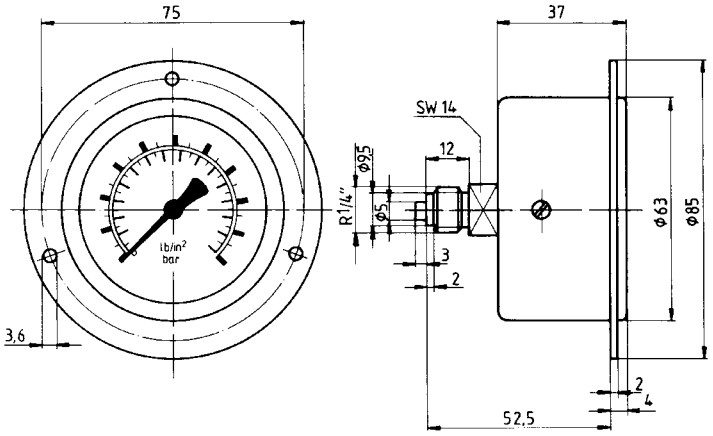


Abb. 5

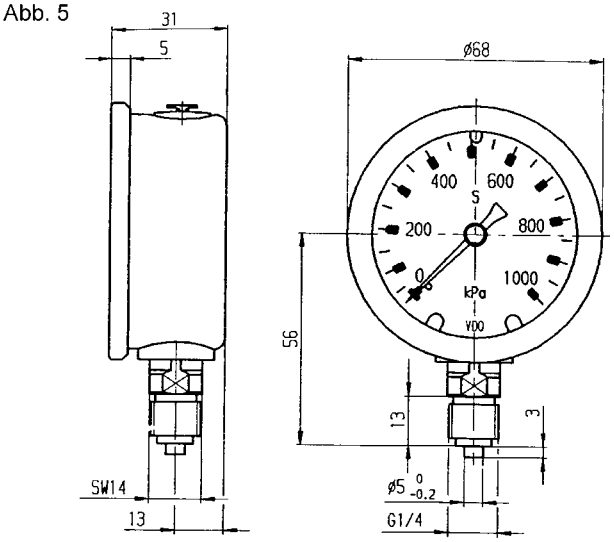
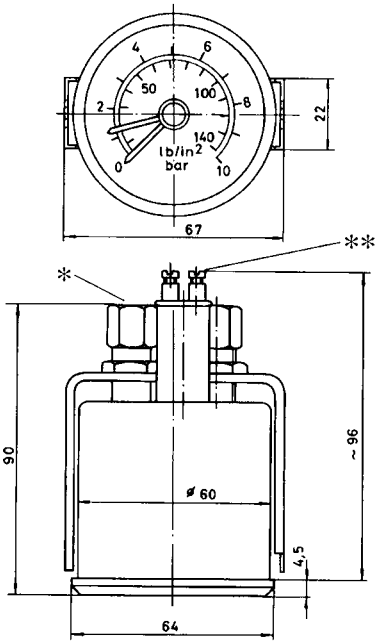


Abb. 6



*) For tube∅ 6 x 1 **) Bipole connection for light 12 V / 2 W

Accessories

Rotary connector, 1 controlled line, ND 12

Technical data

Operating pressure		8 bar
Ambient temperature range		- 25° to + 40° C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		0.7 kg
Speed	n max.	See diagram

Type number

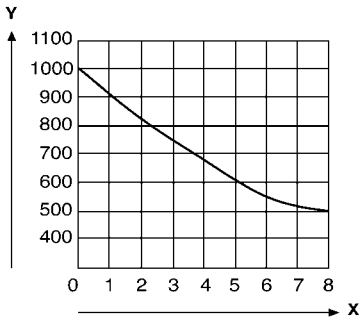
	Type number *
	353 107 000 0

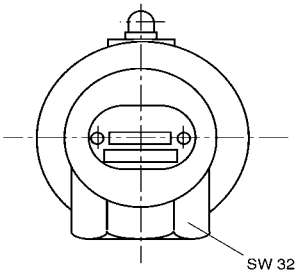
* For threaded ports M 22x1.5 ISO 228/1

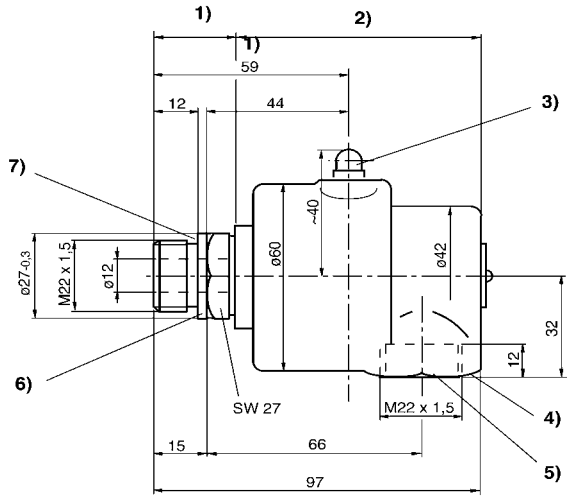
Accessories (to be ordered separately)

Accessories	Type	Type number
	Spare part kit	**353 107 000 2**

Fig. 1







1) Rotary 2) Strator 3) Cone lubrication nipple AM 6 DIN 71 412 4) Sealing surface
5) Compressed air supply 6) Centering spigot 7) Sealing surface
Fig. 1 The diagram is valid if the ambient temperature is max. 20° C.
x: Operating pressure p [bar] y: Speed n [1/min]

Accessories

Rotary connector, 1 controlled line, ND 12

Technical data

Max. operating pressure		8 bar
Ambient temperature range		- 25° to + 40° C
Admissible medium		Compressed air, lubricated or non-lubricated
Weight		1 kg
Speed	n max.	3000 l/min.

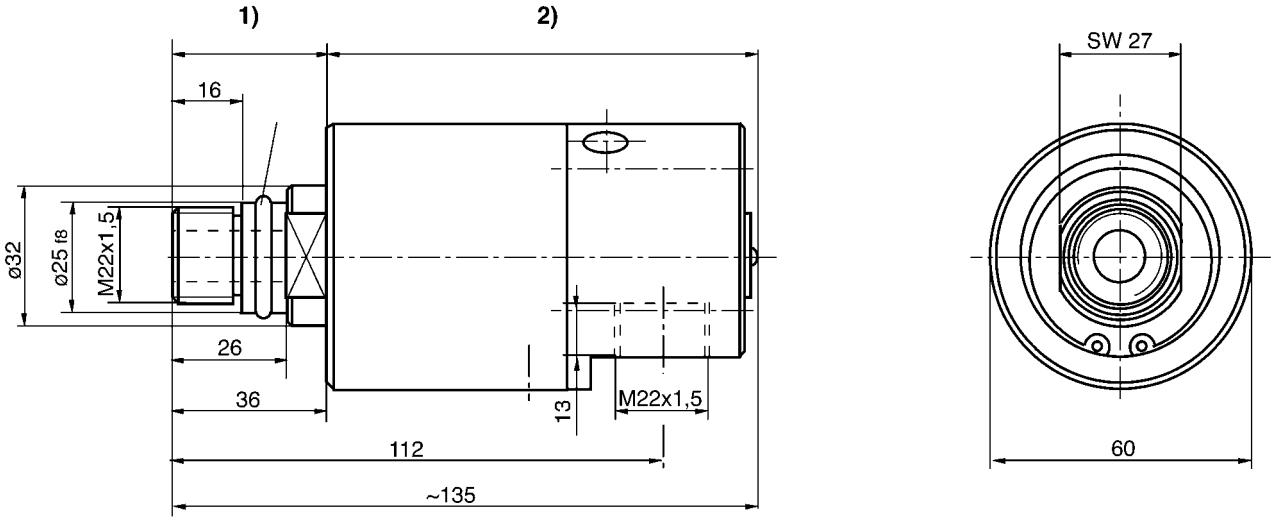
Type number

	Type number *
	353 117 000 0

* For threaded ports M 22 x 1.5 ISO 228/1

Accessories (to be ordered separately)

Accessories	Type	Type number
	Spare part kit	**353 117 000 2**



1) Rotary 2) Strator

Mounting Material

Rexroth
Bosch Group

Products

10

Pipe Couplings and Pipes, Copper-Pipe Program

Rexroth
Bosch Group

Couplings with male stud connection and cutting ring

Operating pressure	Vacuum to max. 40 bar
Ambient temperature range	-20° C to +70° C

Application area

Mainly for the connection of pipes in compressed air systems. The pipe couplings may also be used for low-pressure hydraulics and neutral gases.

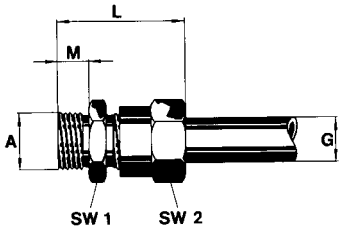
Technical information

Function and design
The connectors are of the compression type and consist of a connector body, an olive and a gland nut. When the gland nut is tightened, the olive grips the tube and gives a rigid leakproof connection.

General
Couplings which will be screwed in directly in connections, have to be provided with a flat seat.

Installation
1. Cut off the pipe right-angled. Check that the pipe has a smooth surface and is otherwise undamaged in the area where the coupling is to be fitted. Remove any burr and blow the tube clean.
2. Place the gland nut and olive over the tube. Then push the end of the tube into the connector until it bottoms.
3. Tighten the gland nut by hand and then 1.5 turns more with a spanner. Tightening too hard will damage the connection and result in an unsatisfactory seal.
   Note: It is recommended that the olive is oiled before fitting tubing 12 mm dia. or larger.

Straight male stud coupling



Type number	Tube D1	Thread G	L1	L	SW1	SW2
893 800 294 0	6	M 10 x 1.0	8	31	14	14
893 800 014 0	6	M 12 x 1.5	10	37	17	14
893 800 064 0	6	M 14 x 1.5	10	39	19	14
893 800 022 0	6	M 22 x 1.5	12	37	27	14
893 800 244 0	8	M 14 x 1.5	10	35	17	17
893 800 044 0	10	M 12 x 1.5	10	39	19	19
893 800 073 0	10	M 14 x 1.5	10	39	19	19
893 800 109 0	10	M 22 x 1.5	12	40	27	19
893 800 354 0	10	R 1/4	12	38	19	19
893 800 134 0	10	R 3/8	11	39	19	19
893 800 033 0	15	M 22 x 1.5	12	52	27	27
893 800 144 0	15	R 1/2	12	54	27	27

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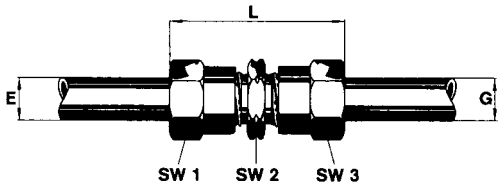
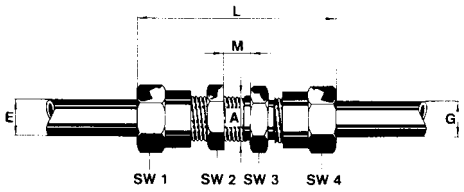
Straight coupling



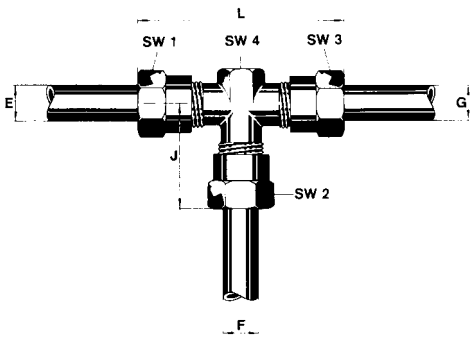
Type number	E	G	L	SW1	SW2	SW3
893 820 024 0	10	10	48	19	17	19
893 820 054 0	15	10	61	27	27	19

Bulkhead coupling



Type number	A	E	G	L	M max.	SW1	SW2	SW3	SW4
893 820 160 0	M 16 x 1.5	10	10	75	10	19	22	22	19

Equal tee coupling



Type number	E	F	G	J	L	SW1	SW2	SW3	SW4
893 860 114 0	10	6	10	30	59	19	14	19	17
893 860 074 0	15	6	15	36	97	27	14	27	19
893 860 053 0	10	10	10	30	59	19	19	19	17

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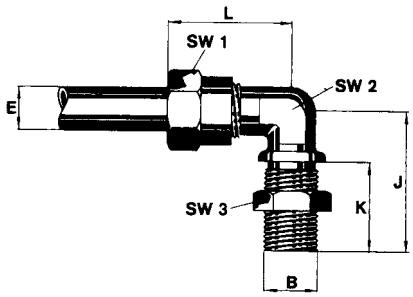
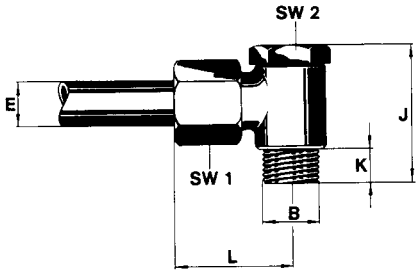
Male stud elbow coupling



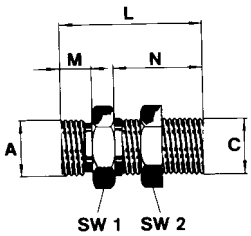
Type number	B	E	J	K	L	SW1	SW2	SW3
893 830 014 0	M 12 x 1.5	6	33,5	19,5	30	14	12	17
893 830 441 2	M 22 x 1.5	10	45	25	40	19	19	27
893 830 042 0	M 22 x 1.5	15	45	25	55	27	27	27

Elbow banjo coupling



Type number	B	E	J	K	L	SW1	SW2
893 830 074 0	M 14 x 1.5	10	36.5	9	29	19	19

Double connector with lock nut



Type number	A	C	L	M	N	SW1	SW2
893 890 014 0	M 22 x 1.5	M 22 x 1.5	54	12	34	27	27
893 890 040 0	R 1/2	M 22 x 1.5	54	12	34	27	27

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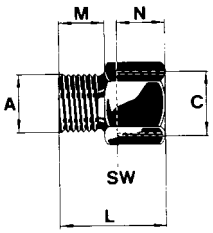
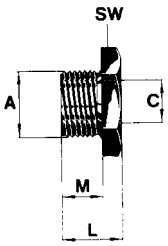
Transfer pipe



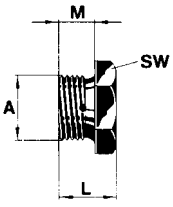
Type number	A	Tube	C	L	M	N	SW
893 180 040 4	M 16 x 1.5	10	M 12 x 1	27	11	10	17

Reducing adapter



Type number	A	C	L	M	SW
893 181 194 4	M 22 x 1.5	M 14 x 1.5	18	12	27
893 181 200 4	R 1	M 22 x 1.5	30	20	46

Plug



Type number	A	L	M	SW
893 010 011 4	M 14 x 1.5	9	13	19
893 010 070 4	M 22 x 1.5	19	12	27
810 903 018 4	R 1/8	17	8	10
893 010 060 4	R 1/2	15	9	27

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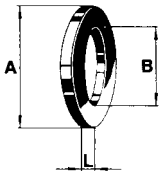
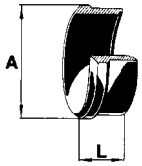
Sealing washer



Type number	A	B	L	Material	For threads
811 401 172 4	13.9	10.2	1.0	Al	M 10 x 1.0 / R 1/8
811 401 032 4	15.9	12.2	1.5	Al	M 12 x 1.5
811 401 048 4	17.9	14.2	1.5	Cu	M 14 x 1.5 / R 1/4
811 401 045 4	17.9	14.2	1.5	Al	M 14 x 1.5 / R 1/4
811 401 066 4	21.9	18.2	1.5	Al	M 18 x 1.5 / R 3/8
811 401 080 4	26.9	22.2	1.5	Al	M 22 x 1.5 / R 1/2

Cutting ring

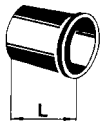


Type number	A	L	For pipe coupling
893 050 014 4	9	9.5	6 mm
893 050 054 4	11	9.5	8 mm
893 050 034 4	18	10	15 mm

Copper pipe

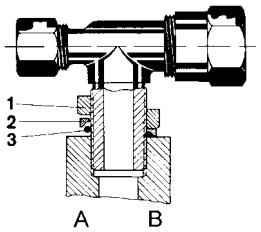
Type number	External diameter x thickness of wall	Weight kg / m
828 000 003 6	8 x 1	0.20
828 000 004 6	10 x 1	0.25
828 000 005 6	15 x 1.5	0.57

Sleeve insert for copper pipe



Type number	L	For tube
893 040 210 4	10	6 x 1
893 040 220 4	15	8 x 1
893 040 230 4	15	10 x 1
893 040 250 4	15	15 x 1.5

Thread seal with lock nut



1) Lock nut, 2) Thrust ring, 3) O-ring
A) Before tightening the lock nut, B) After tightening the lock nut

For threads	Type number O-ring	Type number thrust ring
M 10 x 1	**897 070 030 4**	**893 030 060 4**
M 14 x 1.5	**897 070 070 4**	**893 030 080 4**

Cross reference list

Rexroth
Bosch Group

Device	Chapter
151 003 100 0	2
322 06_ 06_ 0	7
322 06_ 1__ 0	7
322 06_ 6__ 0	7
322 061 356 2	7
322 064 356 2	7
322 067 352 2	7
322 089 350 2	7
322 157 010 0	7
323 009 001 0	8
323 009 002 0	8
323 009 061 0	8
323 009 062 0	8
323 009 100 2	8
323 020 100 0	8
323 020 110 0	8
323 027 010 0	8
323 027 020 0	8
323 027 030 0	8
323 027 094 0	8
323 699 030 0	8
323 699 560 0	8
323 862 301 0	7
323 891 001 0	8
332 404 000 0	1
332 703 001 0	1
332 705 000 0	1
332 732 000 0	1
332 733 000 0	1
333 720 104 4	6
333 725 100 4	6
334 018 100 0	6
334 019 000 0	6
334 113 000 0	6
334 114 000 0	6
334 115 000 0	6
334 115 005 0	2
334 115 050 0	7
334 115 055 0	7
334 306 100 0	7
334 306 101 0	7
334 306 102 0	7
334 306 103 0	7
334 306 104 0	7
334 306 105 0	7

Device	Chapter
335 320 000 0	8
335 379 100 0	1
335 379 101 0	1
335 379 110 0	1
338 500 000 0	4
338 500 001 0	4
341 040 000 0	6
341 040 006 0	6
341 040 100 0	6
341 040 255 0	6
341 042 001 0	9
346 056 550 0	5
351 001 050 0	2
351 001 054 0	2
351 001 055 0	2
351 001 056 0	2
351 001 057 0	2
351 001 502 0	2
351 002 000 0	6
351 020 020 0	2
351 020 024 0	2
351 020 025 0	2
351 020 026 0	2
351 020 027 0	2
351 020 030 0	2
351 020 506 0	2
351 040 024 0	2
351 040 025 0	2
351 040 026 0	2
351 040 027 0	2
351 040 030 0	2
351 040 506 0	2
351 060 030 0	2
351 060 034 0	2
351 060 035 0	2
351 060 036 0	2
351 060 037 0	2
351 060 040 0	2
351 060 504 0	2
351 060 506 0	2
352 032 150 0	9
352 032 250 0	9
352 032 350 0	9
352 034 110 0	9
352 034 210 0	9

Cross reference list

Rexroth
Bosch Group

Device	Chapter
352 034 310 0	9
352 601 000 0	6
352 601 010 0	6
352 601 020 0	6
352 601 021 0	6
352 601 022 0	6
352 601 023 0	6
352 601 024 0	6
352 601 050 0	6
352 601 051 0	6
352 601 052 0	6
352 601 900 0	6
352 602 000 0	6
352 602 010 0	6
352 602 022 0	6
352 602 050 0	6
352 602 100 0	6
352 602 110 0	6
352 602 500 0	6
352 602 600 0	6
352 602 610 0	6
353 003 002 0	9
353 004 002 0	9
353 013 000 0	9
353 013 001 0	9
353 013 002 0	9
353 013 006 0	9
353 013 021 0	9
353 019 010 0	9
353 107 000 0	9
353 117 000 0	9
361 051 050 0	5
361 062 850 0	5
361 071 050 0	5
361 081 050 0	5
361 089 050 0	5
361 091 160 0	5
361 131 902 0	3
361 151 050 0	5
361 151 060 0	5
361 151 650 0	3
361 169 050 0	5
362 101 220 0	3
362 108 220 0	3
362 121 220 0	3

Device	Chapter
362 128 020 0	3
362 128 022 0	3
362 141 220 0	3
362 300 000 0	3
362 300 500 0	3
362 300 900 0	3
362 300 901 0	3
363 003 000 0	4
363 007 000 0	4
363 042 900 0	4
363 043 010 0	4
363 043 100 0	4
363 057 010 0	4
363 057 100 0	4
363 063 000 0	4
363 129 000 0	4
363 130 000 0	4
371 020 000 0	4
371 029 000 0	4
371 029 001 0	4
371 029 002 0	4
371 029 003 0	4
371 029 004 0	4
371 029 005 0	4
371 029 006 0	4
371 029 007 0	4
371 029 008 0	4
371 029 009 0	4
371 029 010 0	4
371 029 011 0	4
371 029 012 0	4
371 029 013 0	4
371 029 014 0	4
371 029 015 0	4
371 029 019 0	4
371 030 000 0	4
371 055 000 0	4
371 110 020 0	4
371 110 641 2	4
371 111 010 0	4
371 200 000 0	6
371 200 110 0	6
371 201 000 0	6
371 203 000 0	6
371 201 000 0	6

Cross reference list

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Device	Chapter
371 203 006 0	6
371 203 055 0	6
371 204 100 0	6
371 204 200 0	6
371 205 050 0	6
371 205 100 0	6
371 205 200 0	6
371 208 050 0	6
371 209 000 0	6
371 209 005 0	6
371 209 055 0	6
371 209 250 0	6
371 209 450 0	6
372 225 022 0	6
372 225 092 0	6
372 226 022 0	6
372 227 022 0	6
372 228 022 0	6
372 242 022 0	6
372 248 022 0	6
372 351 222 0	4
372 352 222 0	4
372 353 222 0	4
372 354 222 0	4
372 355 222 0	4
372 356 222 0	4
372 359 222 0	4
372 652 222 0	4
372 653 222 0	4
372 656 222 0	4
372 657 222 0	4
372 662 222 0	4
372 663 222 0	4
373 016 000 0	5
373 017 100 0	5
373 017 121 0	5
373 505 000 0	4
375 001 030 0	1
375 003 100 0	1
375 003 200 0	1
375 023 000 0	6
375 023 900 0	6
375 023 920 0	6
375 210 000 0	5
432 199 030 0	1

Device	Chapter
332 404 000 0	1
432 500 020 0	1
434 202 100 0	4
441 014 013 0	9
441 014 017 0	9
521 168 ___ 0	7
521 178 ___ 0	7
521 188 ___ 0	7
521 198 ___ 0	7
521 208 ___ 0	7
521 218 ___ 0	7
521 228 ___ 0	7
521 238 ___ 0	7
521 248 ___ 0	7
521 258 ___ 0	7
534 017 000 0	4
534 098 100 0	4
534 098 110 0	4
534 098 120 0	4
534 098 130 0	4
534 098 140 0	4
534 108 000 0	4
534 112 210 0	4
534 112 310 0	4
535 120 300 0	1
535 140 320 0	1
563 020 120 0	4
563 020 122 0	4
563 020 124 0	4
563 446 910 0	4
563 446 912 0	4
573 504 010 0	4
810 903 018 4	10
811 401 032 4	10
811 401 045 4	10
811 401 048 4	10
811 401 066 4	10
811 401 080 4	10
811 401 172 4	10
828 000 003 6	10
828 000 004 6	10
828 000 005 6	10
891 181 200 4	10
893 010 011 4	10
893 010 060 4	10

Cross reference list

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Device	Chapter
893 010 070 4	10
893 040 210 4	10
893 040 220 4	10
893 040 230 4	10
893 040 250 4	10
893 050 014 4	10
893 050 034 4	10
893 050 054 4	10
893 180 040 4	10
893 181 194 4	10
893 800 014 0	10
893 800 022 0	10
893 800 033 0	10
893 800 044 0	10
893 800 064 0	10
893 800 073 0	10
893 800 109 0	10
893 800 134 0	10
893 800 144 0	10
893 800 244 0	10
893 800 294 0	10
893 800 354 0	10
893 820 024 0	10
893 820 054 0	10
893 820 160 0	10
893 830 014 0	10
893 830 042 0	10
893 830 074 0	10
893 830 441 2	10
893 860 053 0	10
893 860 074 0	10
893 860 114 0	10
893 890 014 0	10
893 890 040 0	10
894 041 060 2	7
894 041 061 2	7
894 100 470 2	7
897 070 030 4	10
897 070 070 4	10
934 300 001 0	2
973 001 010 0	5
973 500 000 0	4

Maintenance instructions

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Generally the recommended maintenance and repair intervals should be observed according to the attached table.
Since, however, the necessity for maintenance and repair work mainly depends upon working conditions of a control system the scheduled maintenance and repair intervals may serve as approcimate guiding standards for European conditions such as:
1. Central European climate (average temperature +20°C).
2. Use of normally cleaned and drained air.
3. Operations with valves, cylinders and actuators corresponding to 25.000 maneuvers per year.

When working conditions are not similar, the maintenance and repair intervals may be changed accordingly.
For instance in tropical regions the air contains much more ozone than in European regions. This in connection with higher outside temperatures and higher humidity may cause a more rapid aging of rubber parts.
In countries with lower temperatures special attention should be paid to careful draining of the control system to avoid accumulation of water. The proper funtion of antifreezers and relatively dry air prevent freezing of the system.
Maintenance and repair work to be accomplished is classified by 3 steps:

Step I (Maintenance)

This work is carried out by service personnel. It includes all daily, weekly and monthly maintenance work that is listed in the attached table, such as checking of oil level, refilling of oil and antifreeze solution, cleaning of the filter inserts, draining etc. Any defects found must be removed.

Step II (Inspection)

It is recommended to disassembly heavily stressed devices within the control system, such as directional control valves for 420 psi, maneuvering valves, actuators and positioners. In case wearing parts are found in bad conditions repair (step III) is necessary.

Step III (Repair)

This work should be carried out by specially trained personnel. Repair works includes the following:
1. Disassemble devices and clean all parts.
2. If found necessary, replace defective and worn parts.
3. Check springs and replace, if necessary.
4. Re-assemble devices by using the indicated lubricants.
5. Adjust devices within the control system.
6. Testrun the engine and take over the installation.

Maintenance instructions

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		Kind of maintenance work	Intervals							
Equipment	Step	Description	Daily	Weekly	Monthly	1	2	4	8	Pos. of equipment
Cylinders Actuators	I II		X					X	 X	2; 6
Filter After first-time operation	I II III	Draining Clean filter insert Replacement		X		X			 X	6
Lubricators	I	Check oil level	X							1
Antifreezers	I I II	Fill up with antifreeze solution at temperatures below +5°C Empty completely Replace wick	X			 X		 X		2; 4; 6
Check- and choke valves	II III	Replacement						X	 X	
Air reservoir	I	Draining	X							
Drain valve	I III	Mech. operated Replacement	X						 X	
Safety valves	III	Replacement							X	
Change over valves	II III							X	 X	2; 6
Cut-off cocks	III	Replacement							X	
Rotary connectors	III III							X	 X	2; 6
Controlair valves	II III							X	 X	2; 6
Maneuvering valves	II III							X	 X	2; 6
E/P-converter	II III							X	 X	2; 6
Way-valve for 10 bar	II III							X	 X	2; 6
Way-valve for 30 bar	II III						X	 X		2; 6
Pressure governors	II							X		2; 6
Hydraulic Way-valves	III								X	2; 6

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Chart of lubricants and detergents				
Pos.	Type number	Packing size	Application for	Alternative usable
1	**831 501 096 4**	1 l	Lubricators	SHELL :Tellus 15 : Diala D BP : HPL-40 : IS-O ARAL : TT ESSO : Spinesso 34
2	**831 502 073 4**	20 g	For rubber seals and valve housing	SHELL : Alvania 2 ESSO : Beacon 2 ARAL : Fett HL 2 TEXACO : DEA Glissando Fo 20
3	**831 502 056 4**	0,75 kg	For device subject to extern temperatures	
4	**830 702 087 4** **830 702 088 4**	1 l 5 l	For antifreezers	
5	**830 407 084 4**	12 x 50 ml	For fittings	
6	Standard agents for example cleaning gasoline, trichlorethylen	For metallic housings and filter cartridges		

Instructions for Placing Orders for Spare Parts

To enable you to carry out repairs yourself, Rexroth Mecman assembled the spare parts for all common standard devices, that can be profitably repaired in spare part kits. Their numbers are printed in bold type below the tables on the corresponding pages of this catalogue, just as the type numbers of the complete devices. If different spare part kits are needed for a specific device, these are listed at the end of the tables.
The spare part kits contain all wearing parts necessary for repair.

List of available spare part kits

Rexroth
Bosch Group

Device	Chapter	Spare part kit
335 320 000 0	1	335 320 002 2
335 379 100 0	1	335 379 001 2
335 379 101 0	1	335 379 001 2
335 379 110 0	1	335 379 001 2
375 001 030 0	1	375 001 007 2
375 003 100 0	1	375 003 000 2
375 003 200 0	1	375 003 001 2
535 140 320 0	1	535 140 000 2
332 732 000 0	1	332 732 000 2
332 705 000 0	1	332 705 000 2
332 733 000 0	1	332 733 000 2
535 120 300 0	1	535 120 00. 2
432 500 020 0	1	132 016 000 2
332 703 001 0	1	132 016 000 2
432 404 000 0	1	332 404 000 2
432 199 030 0	1	432 199 004 2
362 121 220 0	3	362 126 001 2
361 131 902 0	3	362 126 001 2
362 141 220 0	3	362 126 001 2
361 151 650 0	3	362 171 000 2
362 101 220 0	3	362 171 000 2
362 128 020 0	3	362 128 000 2
362 128 022 0	3	362 128 000 2
362 108 220 0	3	362 128 000 2
563 020 120 0	4	563 020 000 2
563 020 122 0	4	563 020 000 2
563 020 124 0	4	563 020 000 2
363 130 000 0	4	363 129 000 2
363 129 000 0	4	363 129 000 2
363 042 900 0	4	363 042 002 2
563 446 910 0	4	363 042 002 2
563 446 912 0	4	363 042 002 2
363 003 000 0	4	363 003 002 2
363 007 000 0	4	363 003 002 2
363 063 000 0	4	363 063 000 2
363 043 100 0	4	363 063 000 2
363 057 100 0	4	363 063 000 2
371 030 000 0	4	371 030 000 2
363 043 010 0	4	371 030 001 2
363 057 010 0	4	371 030 000 2
371 020 000 0	4	371 020 000 2
371 111 010 0	4	371 111 000 2
371 055 000 0	4	371 055 000 2

Device	Chapter	Spare part kit
371 029 000 0	4	371 029 000 2
371 029 001 0	4	371 029 000 2
371 029 002 0	4	371 029 000 2
371 029 003 0	4	371 029 000 2
371 029 004 0	4	371 029 000 2
371 029 005 0	4	371 029 000 2
371 029 006 0	4	371 029 000 2
371 029 007 0	4	371 029 000 2
371 029 008 0	4	371 029 000 2
371 029 009 0	4	371 029 000 2
371 029 010 0	4	371 029 000 2
371 029 011 0	4	371 029 000 2
371 029 012 0	4	371 029 000 2
371 029 013 0	4	371 029 000 2
371 029 014 0	4	371 029 000 2
371 029 015 0	4	371 029 000 2
371 029 019 0	4	371 029 000 2
372 351 222 0	4	372 351 000 2
372 352 222 0	4	563 102 000 2
372 354 222 0	4	563 102 000 2
372 353 222 0	4	563 102 000 2
372 652 222 0	4	563 102 000 2
372 653 222 0	4	563 102 000 2
372 656 222 0	4	563 102 000 2
372 657 222 0	4	563 102 000 2
372 356 222 0	4	372 355 000 2
372 355 222 0	4	372 355 000 2
372 359 222 0	4	372 351 000 2
534 108 000 0	4	534 106 000 2
373 505 000 0	4	373 505 000 2
371 110 020 0	4	371 110 003 2
372 662 222 0	4	372 222 000 0
372 663 222 0	4	372 663 000 2
361 051 050 0	5	361 050 000 2
361 071 050 0	5	361 050 000 2
361 151 050 0	5	361 050 000 2
361 151 060 0	5	361 050 000 2
361 081 050 0	5	361 050 000 2
361 062 850 0	5	361 050 000 2
361 091 160 0	5	361 050 000 2
361 089 050 0	5	361 050 000 2
361 169 050 0	5	361 050 000 2
373 017 100 0	5	373 017 000 2

List of available spare part kits

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Device	Chapter	Spare part kit
373 017 121 0	5	373 017 000 2
973 001 010 0	5	973 001 000 2
373 016 000 0	5	373 016 000 2
375 210 000 0	5	375 210 000 2
346 056 550 0	5	see page of catal.
371 200 000 0	6	371 200 002 2
371 201 000 0	6	371 200 002 2
371 200 110 0	6	371 200 003 2
371 203 000 0	6	371 203 002 2
371 203 006 0	6	371 203 002 2
371 203 055 0	6	371 203 002 2
371 205 100 0	6	371 204 003 2
371 205 200 0	6	371 204 003 2
371 204 100 0	6	371 204 003 2
371 204 200 0	6	371 204 003 2
371 208 050 0	6	371 208 001 2
371 209 450 0	6	371 209 000 2
371 209 250 0	6	371 209 000 2
372 225 022 0	6	372 225 001 2
372 226 022 0	6	372 225 001 2
372 228 022 0	6	372 225 001 2
372 225 092 0	6	372 225 004 2
372 227 022 0	6	372 227 001 2
372 242 022 0	6	372 242 000 2
372 248 022 0	6	372 242 000 2
352 601 000 0	6	341 040 000 2
352 601 010 0	6	341 040 000 2
352 601 020 0	6	341 040 000 2
352 601 021 0	6	341 040 000 2
352 601 022 0	6	341 040 000 2
352 601 023 0	6	341 040 000 2
352 601 024 0	6	341 040 000 2
352 601 050 0	6	341 040 000 2
352 601 051 0	6	341 040 000 2
352 601 052 0	6	341 040 000 2
352 601 900 0	6	341 040 000 2
352 602 000 0	6	341 040 000 2
352 602 010 0	6	341 040 000 2
352 602 022 0	6	341 040 000 2
352 602 050 0	6	341 040 000 2
352 602 500 0	6	341 040 000 2
352 602 100 0	6	341 040 000 2
352 602 110 0	6	341 040 000 2

Device	Chapter	Spare part kit
352 602 600 0	6	341 040 000 2
352 602 610 0	6	341 040 000 2
334 115 000 0	6	334 115 000 2
334 115 000 0	6	334 115 000 2
334 115 005 0	6	334 115 000 2
334 115 050 0	6	334 115 000 2
334 115 055 0	6	334 115 000 2
334 113 000 0	6	334 019 001 2
334 019 000 0	6	334 019 001 2
334 018 100 0	6	334 018 001 2
375 023 000 0	6	375 023 002 2
375 023 900 0	6	375 023 003 2
375 023 920 0	6	375 023 002 2
334 114 000 0	6	334 114 000 2
371 209 000 0	6	371 209 000 2
371 209 005 0	6	371 209 000 2
371 205 050 0	6	371 209 000 2
371 209 055 0	6	371 209 000 2
341 040 000 0	6	341 040 000 2
341 040 006 0	6	341 040 000 2
341 040 100 0	6	341 040 000 2
341 040 255 0	6	341 040 000 2
521 168 ___ 0	7	521 016 000 2
521 178 ___ 0	7	521 026 000 2
521 188 ___ 0	7	521 036 000 2
521 198 ___ 0	7	521 046 000 2
521 208 ___ 0	7	521 056 000 2
521 218 ___ 0	7	521 066 000 2
521 228 ___ 0	7	521 076 000 2
521 238 ___ 0	7	521 086 000 2
521 248 ___ 0	7	521 096 000 2
521 258 ___ 0	7	521 106 000 2
322 060 6__ 0	7	322 060 000 2
322 061 6__ 0	7	322 061 000 2
322 062 6__ 0	7	322 062 000 2
322 063 6__ 0	7	322 063 000 2
322 064 6__ 0	7	322 064 000 2
322 065 6__ 0	7	322 065 000 2
322 066 6__ 0	7	322 066 000 2
322 067 6__ 0	7	322 067 000 2
322 068 6__ 0	7	322 068 000 2
322 061 190 0	7	322 061 002 2
322 062 1__ 0	7	322 062 002 2

List of available spare part kits

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Device	Chapter	Spare part kit
322 063 185 0	7	322 063 002 2
322 063 186 0	7	322 063 003 2
322 063 195 0	7	322 063 002 2
322 064 190 0	7	322 064 003 2
322 064 191 0	7	322 064 004 2
322 064 195 0	7	322 064 003 2
322 064 196 0	7	322 064 003 2
322 065 185 0	7	322 064 003 2
322 065 186 0	7	322 065 003 2
322 065 195 0	7	322 065 002 2
322 066 191 0	7	322 066 002 2
322 066 192 0	7	322 066 003 2
322 066 195 0	7	322 066 002 2
322 157 010 0	7	322 157 000 2
323 862 301 0	7	see page of catal.
323 009 001 0	8	323 009 002 2
323 009 002 0	8	323 009 002 2
323 009 061 0	8	323 009 002 2
323 009 062 0	8	323 009 002 2
323 027 010 0	8	323 027 001 2
323 027 030 0	8	323 027 001 2
323 027 094 0	8	323 027 001 2
323 027 020 0	8	323 027 001 2
323 020 100 0	8	323 020 002 2
323 020 110 0	8	323 020 005 2
323 891 001 0	8	323 891 001 2
353 107 000 0	9	353 107 000 2
353 117 000 0	9	353 117 000 2
322 064 190 0	7	322 064 003 2
322 064 191 0	7	322 064 004 2
322 064 195 0	7	322 064 003 2
322 064 196 0	7	322 064 003 2
322 065 185 0	7	322 064 003 2
322 065 186 0	7	322 065 003 2
322 065 195 0	7	322 065 002 2
322 066 191 0	7	322 066 002 2
322 066 192 0	7	322 066 003 2
322 066 195 0	7	322 066 002 2
322 157 010 0	7	322 157 000 2
323 862 301 0	7	see page of catal.
323 009 001 0	8	323 009 002 2
323 009 002 0	8	323 009 002 2
323 009 061 0	8	323 009 002 2

Device	Chapter	Spare part kit
323 009 062 0	8	323 009 002 2
323 027 010 0	8	323 027 001 2
323 027 030 0	8	323 027 001 2
323 027 094 0	8	323 027 001 2
323 027 020 0	8	323 027 001 2
323 020 100 0	8	323 020 002 2
323 020 110 0	8	323 020 005 2
323 891 001 0	8	323 891 001 2
353 107 000 0	9	353 107 000 2
353 117 000 0	9	353 117 000 2
323 027 094 0	8	323 027 001 2
323 027 020 0	8	323 027 001 2
323 020 100 0	8	323 020 002 2
323 020 110 0	8	323 020 005 2
323 891 001 0	8	323 891 001 2
353 107 000 0	9	353 107 000 2
353 117 000 0	9	353 117 000 2

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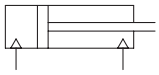
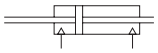
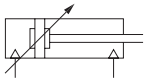
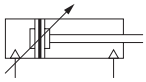
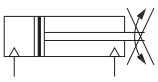
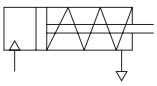
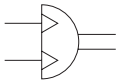
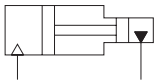
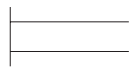
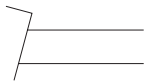
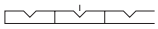
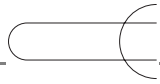
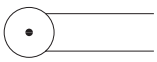
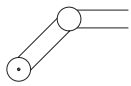
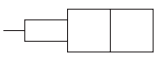
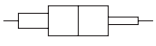
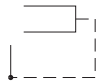
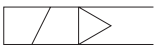
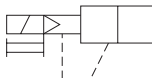
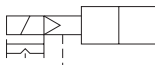
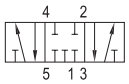
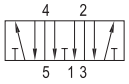
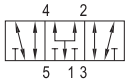
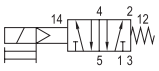
1.1 Pneumatic symbols, cylinders

Description	Explanation	Symbol
Double acting pneumatic cylinder		
	With through piston rod	
	With adjustable cushioning	
	With magnetic piston rod for proximity switch indication	
	With piston rod protected against torsion	
Single acting pneumatic cylinder	Return stroke by means of external forces and/or integrated spring	
Rotary actuator		
Pressure transmitter	Device which converts a pneumatic pressure value into a higher hydraulic pressure value	

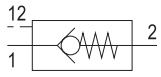
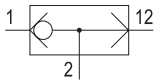
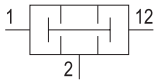
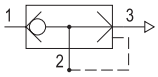
1.2 Pneumatic symbols, Valves

Description	Explanation	Symbol
Manual operation		
General		
Push-button		
Lever	Two directions of operation	
Pedal	One direction of operation	
	Three position action	
Mechanical operation		
Plunger	Two directions of operation	
	Operation in any position	
Roller	Two directions of operation	
Roller	One direction of operation	
Spring		
Pneumatic operation		
Pressure operated		
Pressure operated	By different opposing influence areas	

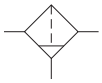
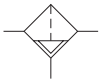
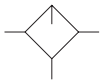
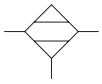
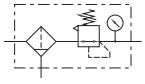
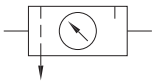
Description	Explanation	Symbol
Air spring		
Electrical operation		
Solenoid	Direct operated valve	
Solenoid with pilot valve		
Solenoid with pilot valve and manual override	Manual override is unistable. Pilot valve with central air feed	
Solenoid with pilot valve and manual override	Manual override is bistable. Pilot valve with separate air feed	
Way-valves		
2/2-way-valve	Normally closed. The number of ports shows the non-actuated basic position	
	Flow in both directions. The number of ports shows the non-actuated basic position. Normally closed	
	Normally open	
3/2-way-valve	Normally closed	
	Normally open	
4/2-way-valve		
5/2-way-valve		
	As above but with adjustable integrated exhaust chokes	

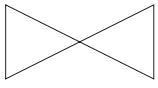
Description	Explanation	Symbol
5/3-way-valve	Normally closed	
	Normally open	
	Pressure centre	
Complete symbol (example)	5/2-way-valve with unistable manual override. Solenoid with pilot valve.	

1.3 Pneumatic symbols, functional- and throttle valves

Description	Explanation	Symbol
Check valve		
	With spring	
	Pilot controlled	
Valve with OR-function	Non-return valve with two inlet ports and two outlet ports which blocks the exhausted inlet port automatically	
Valve with AND-function	Valve with two inlet ports and one outlet port. The outlet port is vented as long as pressure is applied in both inlet ports	
Quick exhaust valve	Non-return function in the inlet port. When the inlet port is unloaded the outlet port exhausts into free air	
Throttle	Constant throttling in both directions of flow	
Adjustable throttle		
Adjustable check-choke valve		

1.4 Pneumatic symbols, filter, regulator, lubricator

Description	Explanation	Symbol
Pressure regulator		
Pressure regulator	With relief	
Filter with water separator	Manually drained	
	Automatically drained	
Lubricator		
Air dryer		
Conditioning unit	Conditioning of filter separator, pressure regualtor pressure gauge and lubricator.	
	Simplified	

Description	Symbol
Transmission of energy	
Working line	
Pilot line	
Pipeline connection	
Crossed pipelines	
Flexible pipe	
Air supply	
Connector plugged	
Electric line	
Exhaust port without pipe connection	
Exhaust port threaded for connection	
Silencer	
Reservoir for compressed air (container)	
Stop cock (simplified)	
Other devices	
Pressure switch, pneumatically operated	
Pressure gauge	

2. Basic pneumatic

Cylinders

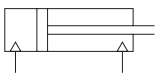
There are two basic functions of cylinders: single-acting and double-acting.

A single-acting cylinder is driven by air pressure in one direction and a built-in spring in the other direction and can only perform work (develop force) in the direction that is driven by air pressure.

A double-acting cylinder is driven by air pressure in both directions and can also perform work (develop force) in both directions.

Symbol single-acting cylinder:

Symbol double-acting cylinder:



There are also numerous different designs of cylinders that fit certain applications: rodless cylinder, profile cylinder, short-stroke cylinder, shuttle cylinder, kostalo-cylinder, round cylinder, duo cylinder, bellow cylinder and so on.

The force of the cylinder depends on the piston area and air pressure according to formula: F = p x A x 10
F = force in Newton
p = pressure in bar
A = piston area in cm² (square centimeters)
10 = factor for gravity

Valves

To make a cylinder move you need some type of directional valve.

For a single-acting cylinder you need a 3/2-way-valve, which means a valve with 3 ports and 2 positions.

Symbol 3/2-way-valve

Port 1 is the supply port for air pressure
Port 2 is the outlet to the cylinder
Port 3 is the exhaust from the cylinder

For a double-acting cylinder you need a 4/2 or 5/2-way-valve, which means a valve with 4 or 5 ports and 2 positions.

Symbol 5/2-way-valve:

Port 1 is the supply port for air pressure.
Ports 2 and 4 are the outlets to the cylinder.
Ports 3 (and 5) are the exhausts from the cylinder.

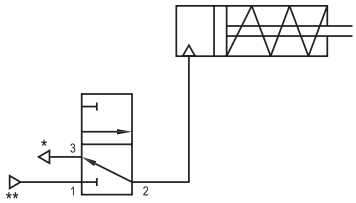
There are also different ways of controlling a valve: manually, mechanically, electrically and by air pressure. The application decides which is most suitable.

Directional valves come in different designs that fit different applications: single valves, compact valves; manifold valves for instance (several units).

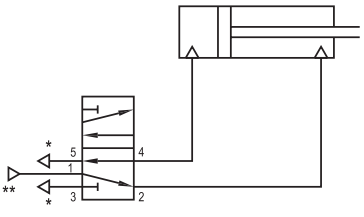
Other valves than directional valves are: pressure regulating, flow regulating (check and choke valves), E/P-converters, logic valves and quick exhaust valves. Pressure regulating valves (pressure regulators) control the air pressure, which means the force of the cylinder. Flow regulating valves control the air flow, which means the speed of the cylinder. E/P-converters give the air pressure dependent on an analogue electrical signal. Logic valves are used in pneumatically controlled sequences and perform logic functions. Quick exhaust valves help speeding up a cylinder by exhausting a chamber extra quickly.

Examples

How to connect a single-acting cylinder with a 3/2-way-valve: (circuit)



How to connect a double-acting cylinder with a 5/2-way-valve: (circuit)



This is just an introduction. For more information please see the following pages.

3.0 Valves and tubes

3.1 Definitions of way-valves

Ports of pneumatic devices are marked in order to provide clear details in all technical documentation.

Number	Port
1	Supply port
2, 4, 6	Delivery ports
3, 5, 7	Exhaust ports
10, 12, 14	Pilot ports

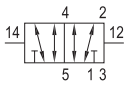


Fig. 3.1.1

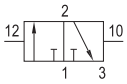


Fig.3.1.2

A pilot signal at 12 connects supply port 1 with the delivery port 2. A pilot signal at 10 does not connect suppply port 1 with any delivery port. The marking of the pilot ports applies to all types of actuation.

Switching positions of way-valves

The first digit in the designations 2/2, 3/2, 5/2 or 5/3 indicates the number of ports. For example: a 3/2-way-valve has 3, a 5/2-way-valve has 5 ports. The second digit indicates the number of switching positions. A 3/2-way-valve for example has 2, a 5/3-way-valve has 3 different switching positions. The port interconnections in the various switching positions for every way-valve are to be found on the relevant page in the catalogue.

2/2-way-valve

Fig. 3.1.3

2/2-way-valves have no exhaust, so that supply and delivery lines can be only disconnected or connected.
The function of a 2/2- way-valve can also be carried out by a 3/2-way-valve, if the exhaust port is plugged.

3/2-way-valve

Fig. 3.1.4

Fig. 3.1.5

Fig. 3.1.6

These way-valves can be divided into normally closed (NC) valves , normally open (OP) valves and control valves which can be used both as NC and NO valves. Within the NC-valve in zero position delivery line 2 is connected to exhaust 3, supply line 1 being cut off. When actuated the delivery line is connected to the supply and the exhaust is cut off. With the NO-valve in zero position supply-line 1 is connected to delivery line2, exhaust 3 being cut off. When actuated the delivery line is connected to the exhaust and supply is cut off.
The function of a 3/2-way-valve can also be carried out by a 4/2- or a 5/2-way-valve if one of the two delivery lines 4 or 2 is closed.

4/2-way-valve

Fig. 3.1.7

4/2-way-valves connect alternately the two delivery lines 4 and 2 to supply 1 or exhaust 3.
Both delivery lines are vented via the common exhaust port 3. If for example the speed of a connected double-acting cylinder is controlled by means of a choke in the exhaust of the valve, the outstroke and the instroke speed of the piston cannot be adjusted separately.

5/2-way-valve

Fig. 3.1.8

5/2-way-valves connect alternately the two delivery lines 4 and 2 to supply 1 or to the exhausts 3 and 5. Delivery line 4 is vented via exhaust 5, delivery line 2 is vented via exhaust 3. If for example the speed of a connected double-acting cylinder is controlled by means of a choke in the exhaust of the valve, the outstroke and the instroke of the piston can be adjusted separately.

5/3-way-valve

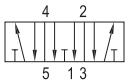


Fig. 3.1.9

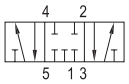


Fig. 3.1.10

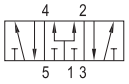


Fig. 3.1.11

5/3-way-valves have a third switching position between the two that are also in the 5/2-way-valve. This is the zero position. This position is so designed that either all ports are cut off (normally closed), or the two delivery lines 4 and 2 are connected to the exhausts 5 and 3, while supply line 1 is cut off (normally open), or the delivery lines 2 and 4 are connected to supply line 1 (Y-function).

3.1.1 Flow data for pneumatic components

Over pressure and absolute pressure

In a space from which all air has been removed, zero pressure prevails. The pressure relative to this point is called absolute pressure and is often used in calculation expressions. However in everyday speech and in Rexroth Mecman catalogues, pressure is related to atmospheric pressure which lies 1 bar above the absolute pressure zero.

$Pa = P + P_O = P + 1$

Pa = absolute pressure
P = gauge pressure
P_0 = absolute atmospheric pressure

Flow

In this catalogue the air flow is expressed as the flow volume converted to normal conditions (1 bar and 20°C). The dimensions are Nl/s or Nl/min.

Flow characteristics

The flow is measured in standardized flow equipment as shown in the figure below

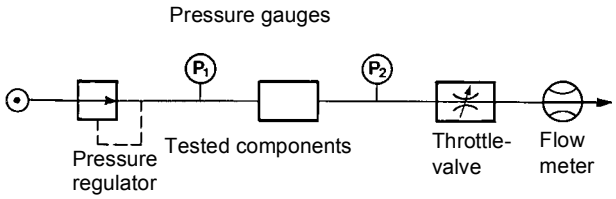


Fig. 3.1.12, flow measuring equipment

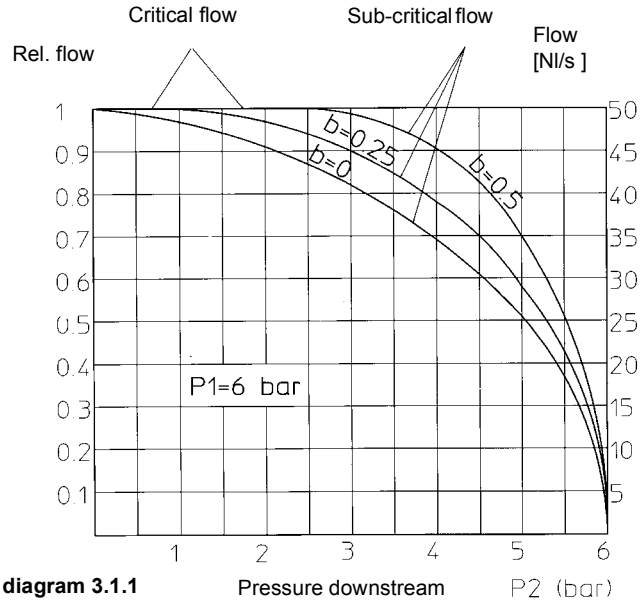


diagram 3.1.1

Flow curves for three different valves are shown in the diagram 5.1.1. These curves are reached by keeping the pressure constantly at P1=6 bar. By opening the throttle valve the pressure drop over the valve increases (P_2 reduces) and the flow rises in accordance with an elliptic curve. Sub-critical flow prevails, followed by a phase where the flow is not able to increase dispite the increasing pressure drop. The flow is then said to be saturated or critical. The border between sub-critical and critical flow is indicated by the b-value which is defined as the ratio between the absolute pressure downstream (P_2a) and upstream (P_1a) at the point of change.
Example: At which pressure does the change between critical and sub-critical flow occur for a b-value of 0.5?

$$\frac{P_2a}{P_1a} = 0.5 \rightarrow P_2a = 0.5 \bullet P_1a = 0.5 \bullet 7 = 3.5 \text{ bar}$$

$P_2 = P_a - P_o = 3.5 - 1 = 2.5$ bar.

Flow data Rexroth Mecman Pneumatics

Unfortunately there is no uniform method of indicating the flow data for pneumatic components. Rexroth Mecman uses the following values:

Qn: Normal flow [Nl/min]. Measured with P_1 = 6 bar and pressure drop ΔP = 1 bar over the valve.
Best valve in diagram 3.1.1, Qn = 35 x 60 = 2100 Nl/min
C: C-value [l/s]. The measuring method is as per ISO/DIS 6358; obtained by dividing the maximum flow by the absolute pressure p_1a.
For all valves in diagram 3.1.1: C = 50/(6+1) = 7.1 l/s/bar.
ND: Nominal diameter [mm].The diameter of a hole with the same area as that of the smallest flow area of the component.

Other flow data

kv: The kv-value (Nl/min)
Measured with water at a pressure drop ΔP = 1 bar over the valve.
Kv: Kv-value. As above but expressed in m³/hour.
Cv: Cv-value. [US gallons/min).
Measured with water at a pressure drop ΔP = 1 psi (0.07bar) bar) over the valve.

Conversion between different flow data

Qn = 216 • C for b=0
Qn = 247 • C for b=0.25
Qn = 294 • C for b=0.5
Qn = 66 • kv
Qn = 1100 • Kv
Qn = 984 • Cv

For a hole with diameter:
$Qn = 37.6 \bullet d^2$
$C = 0.128 \bullet d^2$

4.1 Actuators general

4.1.1 Cylinder cycle

The cylinder cycle can be divided into four phases: starting time, acceleration, steady state and cushioning. See fig. 4.1.1 plus diagrams 4.1.1 and 4.1.2.

Starting times

When the valve reverses, a pressure difference occurs over the cylinder piston due to the flow running into the cylinder over ports 1-2 and out of the cylinder over ports 4-5. When the pressure difference is sufficiently large to overcome the start friction of the cylinder and any external load, the cylinder starts. The starting time is determined mainly by the volume on the exhaust side of the cylinder. The greater the volume (longer cylinder) the longer the starting time.

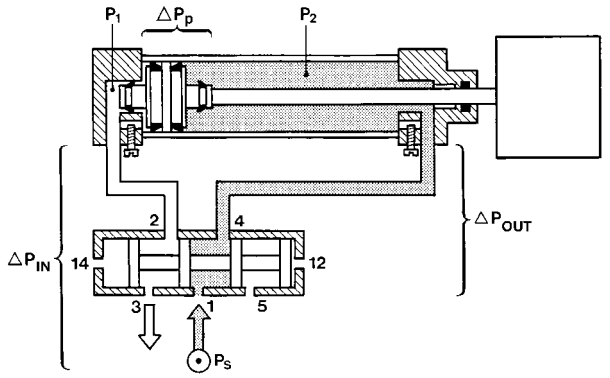


Fig. 4.1.1

Acceleration

For a particular cylinder diameter, the shorter the cylinder, the greater the acceleration. In most cylinder cases full speed is reached after 10-30% of the cylinder stroke.The three curves in diagram 4.1.2 represent the following cylinder cases.
a.Horizontal movement
b.Vertically descending movement with a relatively large mass in relation to the cylinder area.
c. Vertically ascending movement with relatively large mass.

Steady state

The velocity of the cylinder is determined by the flow via ports 4-5. The C-value of the cylinder over ports 4-5 provides a good assessment of the steady state velocity of the cylinder (v_{ss}). Diagram 4.1.1 shows how the available pressure Ps (generally ~ 6 bar) is distributed for the following typical pressure drops:
– ΔP_{IN}. Pressure drop over the valve and tubing of the clinder inlet side ΔP_{IN} is a pure loss. In order to be able to meet the opposing requirements of small losses and reasonable valve size $\Delta P_{IN\ should\ be}$ca. ~ 1 bar. The flow rare Qn is a good guide for choosing a suitable valve since it is also defined with a pressure drop of ΔP_{IN} = 1 bar.
– ΔP_PThe pressure drop ΔP_P over the cylinder piston is needed to overcome the friction of cylinder and load.

For a vertically ascending movement ΔP_P must also overcome the effect of the force of gravity on the mass.

– ΔP out: Pressure drop over valve and tubing on the exhaust side of the cylinder.

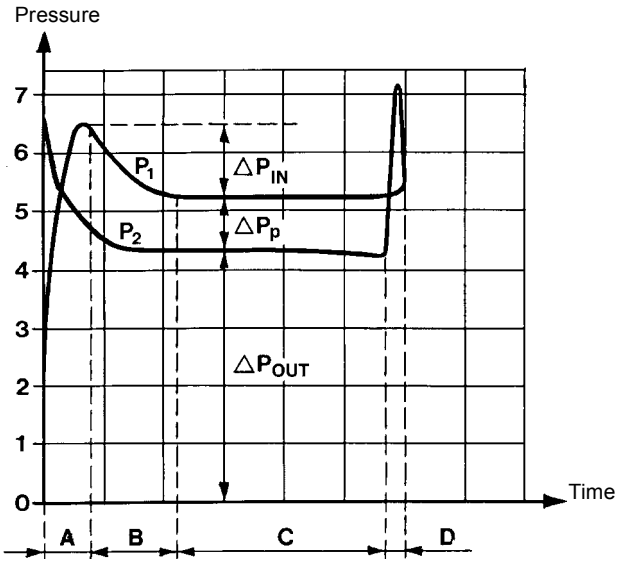


diagram 4.1.1

A Starting time C Steady state
B Acceleration D Cushioning

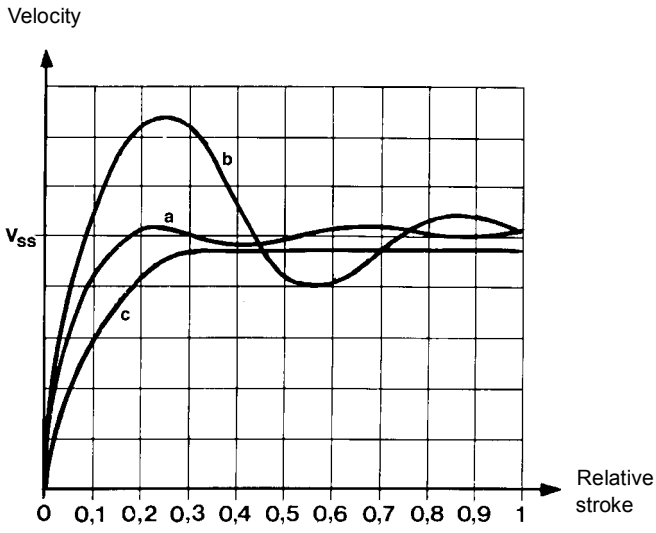


diagram 4.1.2

Cushioning

When the piston reaches the cushioning bush the flow is led over a throttle screw. The pressure on the exhaust side of the cylinder increases and the movement is retarded.
For detailed information see separate training manual.

4.1.2 Speed control, piston rod cylinders

Cylinder speed can be adjusted by means of choke-valves, check-choke valves or by exhaust chokes in the way-valve.

Choking of supply air in single acting cylinders

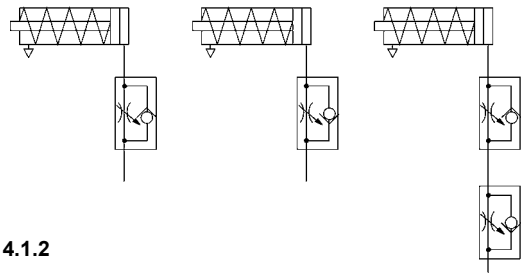


Fig. 4.1.2

Outstroke choked
Instroke not choked

Outstroke not choked
Instroke choked

Outstroke choked
Instroke choked

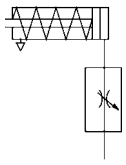


Fig. 4.1.3

Another possibility is the use of a choke instead of a check-choke valve. Outstroke and instroke speeds are different; they cannot be set separately.

Choking of exhaust in double-acting cylinders

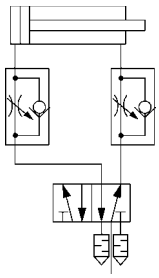


Fig. 4.1.4

The advantage of exhaust choke is that contrary to supply choking the entire supply pressure is available for the outstroke. This allows a steady speed which is largely constant even during load changes.

Mounting the check-choke valve directly onto the cylinder is especially advantageous because the effect of the pipe length can be ignored in this case

Choking of exhaust using way-valves

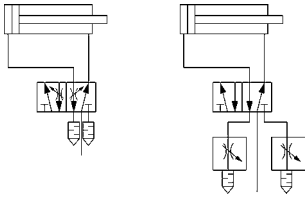


Fig. 4.1.5

If exhaust chokes are used (either external or built into the valve) the pipe length between valve and cylinder should be kept as short as possible in order to reduce the volume to be choked.

4.1.3 Action forces

The theoretical static force which the cylinder generates in accordance with table 4.1.1. is the decisive factor. Force is given in N/bar in both push and pull direction. The internal friction of the cylinder is approx. 5-20% of the theoretical piston force (∂ = 0.05-0.2).

The actual piston force is is calculated as follows

Push direction $F = F_D \cdot P\ (1 - \partial)$
Pull direction $F = F_Z \cdot P\ (1 - \partial)$

Example: Which force does a cylinder of a 50 mm diameter generate in push direction at a pressure of 6 bar?
Answer: If the friction forces of the cylinder are assumed to be 20% the force will be:
F = 196 N/bar • 6 bar • (1- 0.2) = 940 N

4.1.4 Air consumption / stroke

When calculating the air consumption the stroke volume of pull and push direction in dm³ can be read off the table for each mm stroke length.The effect of the piston rod with standard cylinders is taken into account in the „pull direction“ column.
The air consumpion is calculated as follows:

$$V = (V_D + V_Z) \cdot s \cdot \frac{P_a}{P_o}$$

s	[mm]	Stroke of the cylinder
P_a	[bar]	Absolute pressure
P_o	[bar]	Atmopheric pressure
V	[Nl]	Air consumption

Example:
How much be the consumption air will there be for a cylinder 80 mm dia. with a 400 mm stroke? The pressure is 6 bar.
Answer:
$V = (5 \cdot 10^{-3} dm^3/mm + 4.53 \cdot 10^{-3}\ dm^3/mm) \cdot 400\ mm \cdot 7bar/1bar$
$V = 26.684\ dm^3 \approx 26.7\ Nl$

Table 4.1.1

		Push direction			Pull direction		
Piston dia.	**Piston rod dia.**	**Piston area**	**Piston force per bar**	**Stroke vol. per mm**	**Piston area**	**Piston force per bar**	**Stroke vol. per mm**
[mm]	[mm]	A_D [cm^2]	F_D [N / bar]	Stroke V_D [dm^3/mm]	A [cm^2]	F_Z [N / bar]	Stroke V_D [dm^3/mm]
8	4	0,5	5	$0,05 \cdot 10^{-3}$	0,4	3,8	$0,04 \cdot 10^{-3}$
10	4	0,78	7,8	$0,08 \cdot 10^{-3}$	0,7	6,6	$0,07 \cdot 10^{-3}$
12	6	1,13	11,3	$0,11 \cdot 10^{-3}$	0,9	8,5	$0,09 \cdot 10^{-3}$
16	6	2	20	$0,2 \cdot 10^{-3}$	1,7	17,3	$0,17 \cdot 10^{-3}$
20	8	3,14	31,4	$0,3 \cdot 10^{-3}$	2,6	26,4	$0,26 \cdot 10^{-3}$
25	10	4,91	49,1	$0,5 \cdot 10^{-3}$	4,1	34,2	$0,41 \cdot 10^{-3}$
32	12	8,04	80,4	$0,8 \cdot 10^{-3}$	6,9	69,1	$0,69 \cdot 10^{-3}$
40	16	12,6	126	$1,26 \cdot 10^{-3}$	10,6	106	$1,06 \cdot 10^{-3}$
50	18	19,6	196	$1,96 \cdot 10^{-3}$	17,1	171	$1,71 \cdot 10^{-3}$
50	20	19,6	196	$1,96 \cdot 10^{-3}$	16,5	165	$1,65 \cdot 10^{-3}$
63	20	31	310	$3,1 \cdot 10^{-3}$	28,1	280	$2,81 \cdot 10^{-3}$
80	22	50	500	$5 \cdot 10^{-3}$	46,6	465	$4,65 \cdot 10^{-3}$
80	25	50	500	$5 \cdot 10^{-3}$	45,5	454	$4,53 \cdot 10^{-3}$
100	25	78	780	$7,8 \cdot 10^{-3}$	73,6	736	$7,36 \cdot 10^{-3}$
125	30	122	1227	$12,2 \cdot 10^{-3}$	115	1156	$11,5 \cdot 10^{-3}$
125	32	122	1220	$12,2 \cdot 10^{-3}$	115	1147	$11,5 \cdot 10^{-3}$
160	40	201	2010	$20,1 \cdot 10^{-3}$	188	1880	$18,8 \cdot 10^{-3}$
200	40	314	3140	$31,4 \cdot 10^{-3}$	302	3016	$30,2 \cdot 10^{-3}$
250	50	491	4910	$49,1 \cdot 10^{-3}$	471	4712	$47,1 \cdot 10^{-3}$
320	60	804	8040	$80,4 \cdot 10^{-3}$	776	7760	$77,6 \cdot 10^{-3}$

4.1.6 Estimation of piston movement cycle time

As a starting point the relationship m/A is used where m is the load on the cylinder (kg) and A the cylinder piston area in cm^2. A pneumatic-cylinder normally is not loaded higher than $m/A \leq 4$.

Example: A 63 mm diameter cylinder with a 200 mm stroke is to move a mass of 45 kg vertically upwards. Estimate the cycle time for a single stroke, if the final velocity of the cylinder is to be 0.7 m/s .
Answer: According to table 4.1.1 the piston area A = 31 cm^2.

$$\frac{m}{A} = \frac{45}{31} = 1.5$$

The time for a single stroke where k_m is read from the diagram is as follows:

$$t = \frac{k_m \cdot s}{1000 \cdot v_{ss}} = \frac{1.6 \cdot 200}{1000 \cdot 0.7} = 0.45 \text{ seconds}$$

It can also be seen from the diagram that a pressure drop of ~ 1.5 bar over the cylinder piston is needed to overcome the mass load.

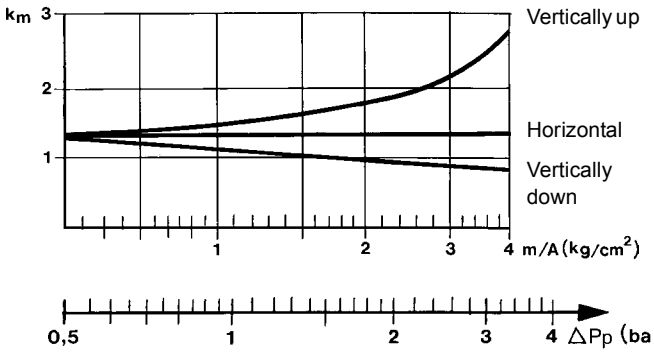


diagram 4.1.3

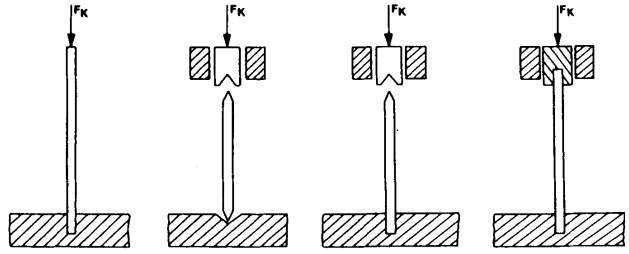
$$t = \frac{k_m}{1000} \cdot s/v_{ss}$$

t = Cycle time (s)
s = Cylinder stroke (mm)
v_{ss} = Constant piston steady state (m/s)

Limitation: accuracy is reduced for short cylinders.

4.1.5 Buckling length

The four different Euler loading cases are:

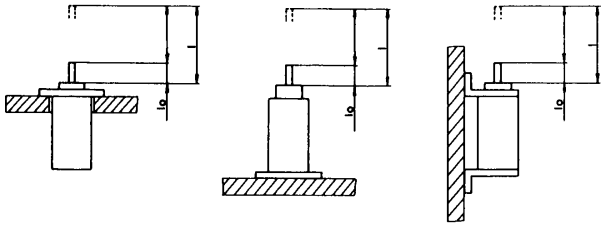


Euler case 1 | Euler case 2 | Euler case 3 | Euler case 4

Abb. 4.2.16

F_K = Buckling load
Euler cases 1 and 2 are relevant for cylinders.

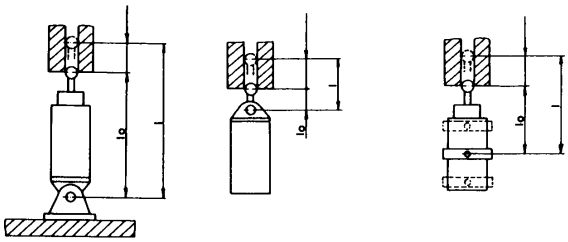
The following are Euler case 1:



Front flange mounting. | Rear flange mounting. | Foot mounting

Fig. 4.2.17

The following are Euler case 2:



Rear clevis mounting | Front trunnion mounting. | Rear trunnion mounting.

Fig. 4.2.18

Euler case 1

Stroke [mm]

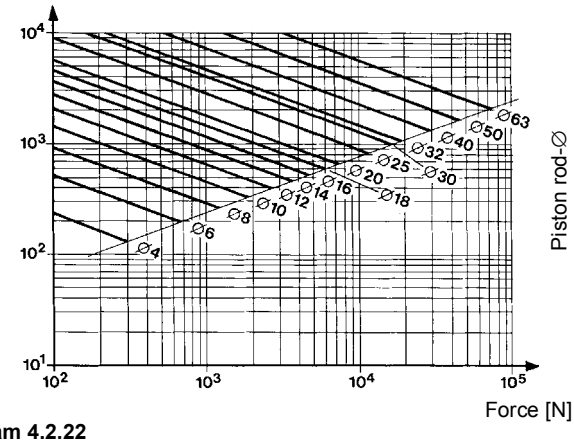


diagram 4.2.22

Euler case 2

Stroke [mm]

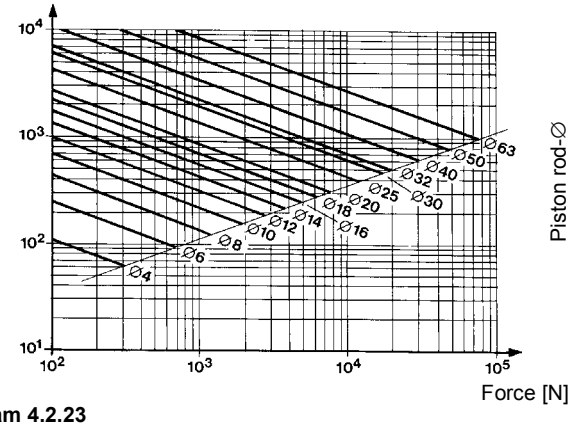


diagram 4.2.23

Example:
F_K = 2000 N
Stroke = 500 mm
Euler case 2
Searched: Piston rod diameter

Answer: Piston rod diameter 18 or more will fit.

4.2 Cylinders with only end position cushioning

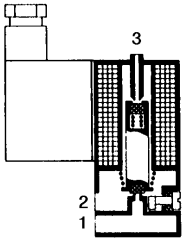
In order to prevent impact when the piston reaches the end cover, cylinders without cushioning should either be operated at lower piston speed or else external stops or industrial shock absorbers must be used. See respective cylinder for detailed information about load limitations.

5.1 Function and design of way-valves

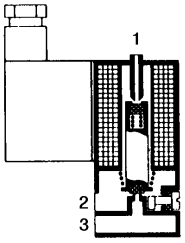
Valve types can be divided into poppet, diaphragm and slide valves. The latter can be subdivided into tubular and flat slide valves.

Poppet valves

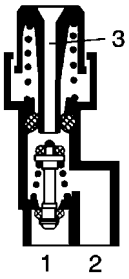
Poppet valves have the valve seat closed by a seal. By means of this static sealing a high degree of tightness and high numbers of operating cycles can be reached. Poppet valves come in smaller nominal diameters up to about 4 mm .
Examples of poppet valve design:

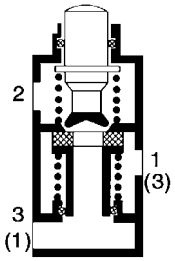


NC-valve

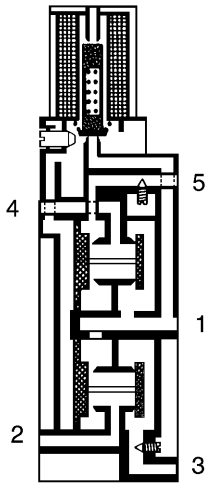


NO-valve



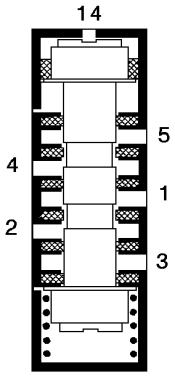


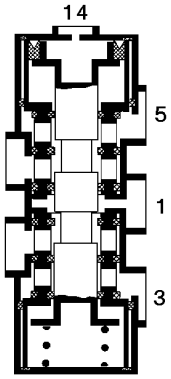
Diaphragm valves
Diaphragm valves offer the same advantages as poppet valves (high degree of tightness, high number of operating cycles) and are also available for larger nominal diameters.
Examples of diaphragm valve design:



Slide valves

Slide valves are sealed by means of o-rings, double-o-rings (tubular slides) or by ceramic to ceramic. Both slide types are also available with metal to metal sealing.
Examples of tubular valve design:





Actuation types
Way-valves are actuated, that means switched into working position, mechanically by means of a lever or a plunger, pneumatically by means of a piston or electro-magnetically by means of a solenoid.They are returned to zero position either by spring, internally pneumatically (pneumatic spring), pneumatically or electro-magnetically.

Mechanical actuation
Mechanical actuation includes for example actuation by button, roller lever, roller lever with idle return and manual actuation as push-button, lever, button or pedal.

Pneumatic actuation
The pilot pressure at ports 14 or 12 should normally correspond to the pressure at line 1, where the minimal operating pressure must be observed. Many way-valves, however, are able to work with a smaller minimal pilot pressure. Details of the minimum pilot pressure can be found on this relevant pages of the catalogue. If a way-valve is pneumatically operated and returned, the valve is called impulse or bistable valve. Unlike way-valves with spring or air-spring return (unistable valves) the bistable way-valve can also be switched by means of a short pulse only at pilot port 14 or 12. By applying pressure to port 14 the valve is switched to working position, and to port 12 it is switched to the initial position. Should there, however, be a continuous signal at port 14 it is not possible to switch the valve by pressurizing 12 because of the internal friction. The same applies to a continuous signal at port 12 and pressurizing of 14. Exceptions are way-valves with priority position (differential piston valves).

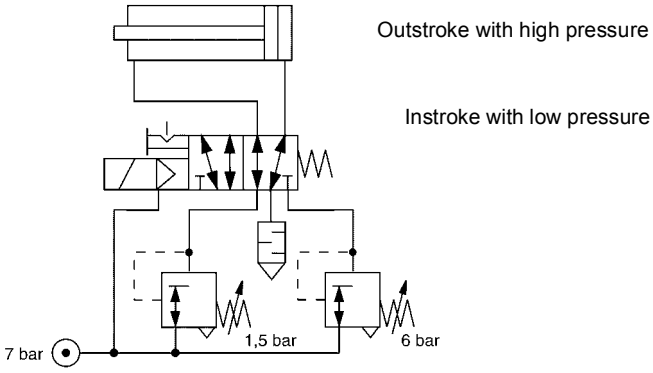
Direct electromagnetic actuation
Way-valves with electromagnetic actuation are also called solenoid valves. Solenoid valves with small nominal diameters (up to approx. 4 mm) are directly actuated, that means the solenoid armature directly opens and closes the valve. The minimum operating pressure corresponds to atmospheric pressure. With a suitable design vacuum can also be switched. For solenoid valves with double electromagnetic actuation the directions described in the preceeding paragraph apply.

Indirect electromagnetic actuation
Solenoid valves with nominal diameters from 3mm upwards are operated via pilot control. Here a pressurized piston switches the slide of the valve, being exhausted or vented via a small electrically directly actuated 3/2-solenoid-way-valve. This 3/2-solenoid-way-valve (pilot valve) is pressurized via an airchannel from the supply (internal piloting) or via a separate port (external piloting). Pilot valves are usually equipped with a manual override which allows the valve to be switched to working positon without the need for electricity.

Internal piloting
The minimum operating pressure is determined by the switching pressure of the basic valve (see respective page of catalogue). The supply line which feeds the pilot valve must always have this minimum pressure. For 3/2-solenoid-way-valves this implies the necessity for different valve designs for normally open and normally closed valves unless the pilot valve is specially designed to be pressurized via both port 1 and port 3.

External piloting
External piloting is always necessary when pressure below the minimum operating pressure or vacuum must be switched or if a double pressure operation is required. For such applications valves with a port for the external supply of pilot pressure must be used.

Example: external piloting for double pressure operation



Return
a. Spring return:Way-valves with spring return are switched back to the initial position, irrespective of the operating pressure, as soon as the actuation stops b. Return by internal air spring: The internal air spring is pressurized via port 1. In order to guarantee that the internal air spring switches back the pressure at supply port 1 must be at least equal to the minimum operating pressure.
Instroke with low pressure

Types of connection
Way-valves can be mounted singularly, or several valves can be interlocked or mounted on manifolds or base plates. Many valves of the Rexroth Mecman Pneumatics range, e. g. Type 740/840, CD 7-valve, can be mounted singularly, stacked or mounted on manifolds or base plates.

Single mounting
On case of single mounting the way valves are directly fixed with screws. There are holes for this in the valve body.
For other types of connections see working logic.

5.2 Technical data of solenoid valves

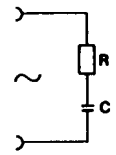
Duty cycle
All solenoid coils of Rexroth Mecman Pneumatics solenoid valves are designed for continuous operation (100 % duty). There is no danger of overheating, even when operated at maximum voltage and temperatures.

Voltage tolerances
The voltage tolerances depend on whether AC or DC coils are used. In case AC distinction must be made between coils for 50/60 Hz and coils for either 50 Hz or 60 Hz. Please find the tolerance values on the relevant catalogue pages.

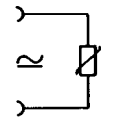
Power consumption
Rexroth Mecman Pneumatics power consumption of solenoid valves is low. DC solenoid valves have a constant power consumption. With AC solenoid one must differentiate between the higher in-rash power and the lower holding power. This is based on the fact that the power dissipation of AC solenoids is a function of the armature position.

Protective circuitry
Solenoid coils are inductive loads. Switching off inductive loads generates cut-off voltage peaks through self-induction, which can reach a multiple of the supply voltage. Depending on the voltage peaks and the type of switching contacts they must be limited to safe values. This is achieved by interference suppression using e. g. RC-combinations, varistors or diodes (erase diodes), which are connected in parallel to the solenoid coil or switch contact. For DC varistors and diodes (idle diodes) are used, for AC varistors and RC-combinations.

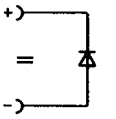
RC-combinations



Varistor



Diode



Displays
To indicate the switching state of solenoid coils light emitting diodes (LED) or lamps are used. These are often combined with protective circuitry.

Insulation grades to VDE 0580
Insulating materials of solenoid coils are classified into grades of insulating materials according to VDE 0580 (see table below). Rexroth Mecman Pneumatics solenoid valves are fitted with coils of grade B or F (depending on type). Even when operating continuously and to the limits of voltage tolerances and ambient temperature the operating temperature is still considerably below the maximum permitted temperature.

Insulation grade	Y	A	E	B	F	H	C
Temperature limit °C	90	105	120	130	155	180	>180

6.1 Protection and insulaton grades for electrical equipment

The letters IP indicate the protection against contact and ingress of solid objects and water. The first digit from 0 to 6 indicates the degree of protection against contact and ingress of solid objects. The second digit from 0 to 8 indicates the degree of protection against ingress of water.

Table 6.1
Degrees of protection against contact and ingress of solid objects

First digit	Designation	Degree of protection
0	No protection	No special protection for persons against accidential contact with current-carrying or moving parts.
1	Protection against solid objects of 50 mm dia. and larger	The solid object, ball 50 mm dia,. must not go into completely*)
2	Protection against solid objects 12.5 mm dia. and larger	The solid object, ball 12.5 mm dia, must not go into completely*)
3	Protection against solid objects 2.5 mm dia. and larger	The solid object, 2.5 mm dia., must not go into in general*)
4	Protection against solid objects 1.0 mm dia. and larger	The solid object, 1.0 mm dia., must not go into at all*)
5	Protection against dust deposits	The ingress of dust is not completely prevented but dust must not enter in such quantities to harm the satisfying work or the safety of the device
6	Protection against ingress of dust	No ingress of dust

*) Note: the complete diameter of a solid object must not go through an opening of the housing

Table 6.2
Degrees of protection against water

Second digit	Designation	Degree of protection
0	No protection	No special protection.
1	Protection against water dripping	Water dripping vertically should have no harmful effects.
2	Protection against water if the housing is tilted to 15°	Water dripping vertically should have no harmful effects if the housing is tilted by an angle of less than 15° with respect to the vertical
3	Protection against water spray	Water spraying in any angle less than 60° with respect to the vertical should have no harmful effect.
4	Protection against splashing water	Water splashing from all directions against the equipment should have no harmful effect.
5	Protection against water jets	A water jet coming out of a nozzle and directed towards the equipment from all directions should have no harmful effect
6	Protection against floofing	Temporary flooding e. g. by heavy seas, should not cause water to enter in sufficient quantities to have a harmful effect.
7	Immersion proof	Water should not enter in sufficient quantities to have a harmful effect during the immersion of the device under specified conditions of pressure and time.
8	Submersion proof	Water should not enter in sufficient quantities to have a harmful effect during the submersion of the device under a specified pressure and for an unspecified period of time.

Table 6.3

Requirements on insulation

1	2	3
Thermal class	Limit temperature °C	Over limit temperature K
Y	90	50
A	105	65
E	120	80
B	130	90
F	155	115
H	180	140
200	200	160
220	220	180
250	250	210
Temperatures over 250°C should increase in 25 °C-intervals and also with relevant described classes. .		

7.1 Function and design of pressure control valves

Function

Depending on the type, pressure control valves react to pressure changes in the supply line (primary line) or in the exhaust pipe (secondary pipe) as a function of command value. The basic operating principle is the balance of forces by corresponding pressures on both sides of the diaphragm (2).

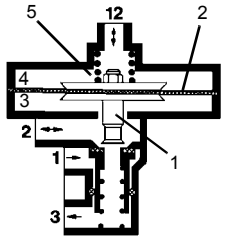


Fig. 7.1

By pressure changes in chambers (3) or (4) diaphragma (2) and valve tappet (1) are moved out of their neutral position. The valve system (1) opens flows from port to port and into or out of chamber (3) until the balance of forces on the diaphragm is reached again. The function of a diaphragm can also be realized by a piston.

The command value (4) preset in this example as a pneumatic pressure can be replaced by the force of a compression spring (5). In this way various types of actuation, based on the same principle, are possible: fig. 7.2 to 7.3.

Designs and types of actuation

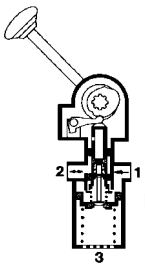


Fig. 7.2

Manual-mechanical actuation

Fig. 2 shows one method of setting the command value manually. For this purpose the entire valve system is moved linearly by means of a lever and a cam.

The pressure equalizes via the valve seats until they are closed, because the control piston moved by the pressure has reached again an equilibrium position between secondary pressure and control spring. These pressure control valves are also available with other types of actuation.

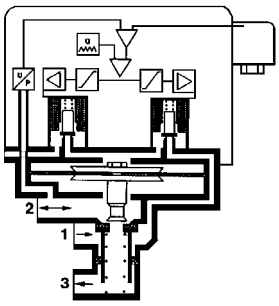


Fig. 7.3

Electrical actuation

In electropneumatic pressure control valves as in fig. 3 secondary pressure 2 corresponds to an electric analogue command value. On this way pressure control can be adapted to fully automated electrical processes. The operating principle corresponds to fig. 1, except that the electrical command value is converted to a pneumatic command value by means of a suitable electronic circuit and two solenoid valves. The use of suitabel devices permits an electrical binary setting of the command value.

Characteristic lines

Type and shape of the characteristic lines are distinctive features and important when choosing the device for the relevant application.

Characteristic line command value / secondary pressure

This characteristic line shows the normally proportional relationship between the preset command value (pneumatic, mechanical, electrical) and the regulated secondary pressure at port 2 .Friction in the device is not taken into consideration. That means, this ideal characteristic line follows the same course for regulating the pressure upwards and downwards.

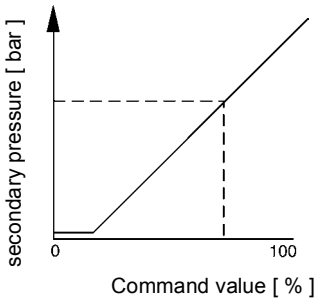


Fig. 7.4

Control hysteresis

In practice each moving part is subjected to friction. Therefore, the secondary pressure will only begin to fall, when the command value has already been reduced by a certain amount. This is the point where the static friction of the piston is overcome. This is where the downwards characteristic line starts. The displacement »H« of the two lines is the control hysteresis. It can be consider reduced by the use of a diaphragm (3) as shown in fig. 1. Also the upwards characteristic line, as shown in the diagram below, does not start rising until a certain command value is reached.

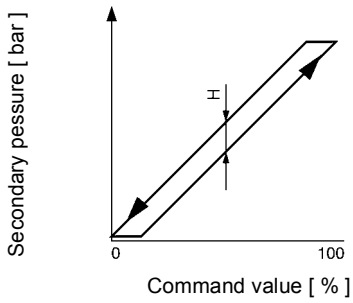


Fig. 7.5

Refill

Air consumption at the secondary port of a pressure control valve leads initially to a pressure drop to below the preset command value until here too the static friction of the piston is overcome and compressed air is refilled. The resulting pressure difference up to the start of refilling is the refill hysteresis »HN«.

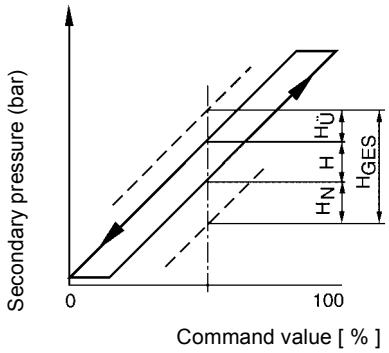
Over flow

A back pressure in the secondary port, which is quite common in practice, leads initially to a pressure increase to above the set value. The secondary port is »over flowed«. Only after the piston friction has been overcome the exhaust of the valve is opened and the surplus air is vented. The pressure difference up to that point is the over flow hysteresis »HÜ«.

Total hysteresis

The sum of control hysteresis, refill hysteresis and over flow hysteresis gives the total hysteresis. In many cases this is less important than the individual components from which it results. Because of this the requirements of the relevant application are decisive.

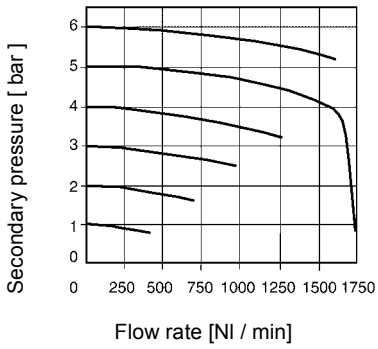
Fig. 7.6



Characteristic of flow

The diagram shows a family of six characteristic lines for a primary pressure of 7 bar and different secondary pressures. As the need for air increases (increase of flow volume) the cross section of a pressure control valve is steadily increased. Correspondingly the effective pressure drops to only slightly below the set secondary pressure.The absolute values depend on the specific design of the device. However, if the maximum cross-section is reached, a further increase of air consumption results in a large drop of pressure in the secondary pipe, as can be seen from the continuation of the 5 bar characteristic line in fig. 7. This area, however, cannot be used in practice, and is therefore not shown for the other characteristic lines.

Fig. 7.7



8.1 Air preparation

The more carefully the preparation of the air, which is needed for pneumatic control systems, is carried out the higher are the expectations you can have concerning the reliability, the perfect function and the life of such a system.
The following are comments which should be taken into account when supplying a pneumatic system with compressed air:

8.2 Filtering

In most cases of application, filters have to fulfill two requirements:

a) Holding up impurities

b) Possibilities of draining

The filtering of the air will be carried out by means of sintered filter inserts. The porosity of those filter inserts depends on the application:

ca. 50 - 70 µ Main filter in the supply pipe of a system

ca. 80 - 140 µ Line filter installed in places where special parts need an additional protection

8.3 Draining

Atmospheric air always contains a certain amount of water vapour. After leaving the compressor, compressed air can generally be regarded as 100 % saturated. Water drops out in case of further cooling down within the following piping system.

a) If the pneumatic system is supplied by compressed air of 30 bar the biggest part of the water vapour will already be condensed in the starting air bottles. For a careful treatment of control pressure a regular draining of the bottles is required. The compressed air of 30 bar taken from the starting air bottles is reduced to an operating pressure of 6 - 8 bar.

In front of this pressure reducing station a filter with integrated drain valve should be installed where water drop-out is possible in case of further cooling of the compressed air. (already contained in pressure reducing station 335 320 000 0). Due to the reduction to 6 - 8 bar, the relative humidity decreases to 20-25 % because of expanding of compressed air, thus being extremly unsaturated.

In praxis it turned out that water drops are carried forward, if starting air bottles and filters are not drained properly, or in case of unfacourable pipe relaying. Therefore we recommend to provide an air reservoir arranged behind the pressure reducing station. Additionally this reservoir serves as air reservoir in case of large air consumption occuring suddenly.

b) In some other cases an air compressor is intended for supplying compressed air needed by the control system (average 6 - 8 bar).

Before entering the pneumatic control system, the saturated compressed air has to be cooled down to the lowest temperature within the system. That way water drops out as much as possible. The drainage device mounted at the air reservoir should be placed at the „coldest“ point because of the a/m reason.

Piping between compressor and reservoir has to be assembled with flow. Thus it is ensured that any condensate produced flows into the reservoir.

Furthermore it is advisable to install a filter between compressor and reservoir holding up dirt, oil and other impurities. A filter with intergrated drain valve should be installed behind the reservoir separating carried out over drop shaped water.

c) Only if the drainage described under a) and b) is not sufficient, a special air-drying apparatus has to be provided.

8.3 Antifreezing

It is recommended to use an antifreezer, if devices, pipes or parts of a compressed air system operate in temperature ranges below +5°C for a longer time.

The antifreezer should be installed in a place with an ambient temperature as warm as possible before the piping joins frosty zones.

8.4 Lubrication

Because of the small number of operations it is not necessary to install lubicators in marine propulsion systems. Experience has shown that the greasing of the internal parts of the devices done at our works during assembly is sufficient within the given maintenance intervals.
We recommend to repair all heavily stressed devices within the high pressure part of the system (30 bar) after 4 years. Valves of the low pressure part (10 bar) should be repaired within intervals of 8 years.

Conversion factors

Conversion factors between different measurement systems

Unit of length
1 inch (in) = 25.4 mm; 1 mm → = 0.03937 inch
1 foot (ft) = 30.48 cm; 1 cm = 0.0328 foot

Unit of area
1 square inch (sq in) = 6.452 cm^2; 1 cm^2 = 0.155 sq in
1 square foot (sq ft) = 929.03 cm^2; 1cm^2 = 0.00107 sq ft

Unit of volume
1 cubic inch (cu in) = 16.39 cm^3; 1 cm^3 = 0.06102 cu in
1 cubic foot (cu ft) = 28.32 dm^3; 1 dm^3 = 0.03531 cu ft
1 gallon GBR = 4.546 dm^3; 1 dm^3 = 0.22 gallon
1 gallon USA = 3.785 dm^3; 1 dm^3 = 0.2642 gallon

Mass unit
1 pound (Lb) = 0.4536 kg; 1kg = 2.205 lb
1 ounch (oz) = 28.35 g; 1 g = 0.03527 oz

Unit of force
1 pound force (lb, lbf) = 4.448 N; 1N = 0.2248 lb
1 kg force (kp) = 9.81 N; 1N = 0.1019 kp

Pressure unit
1 Pascal (Pa) =$1 \cdot 10^{-5}$ bar; 1bar = $1 \cdot 10^5$ Pa
1 pound weight per square inch (psi)= 0.06896 bar; 1 bar = 14.5 psi

Temperature
°F = 1.8 · °C+32, conversion to °F from °C.

Flow
$Q_n = 216 \cdot C$for b = 0
$O_n = 247 \cdot C$ for b = 0.25
$Q_n = 294 \cdot C$ for b = 0.5
$Q_n = 66 \cdot k_v$
$Q_n = 1100 \cdot K_v$
$Q_n = 984 \cdot C_v$

ООО «Бош Рексрот»
Pneumatics
Marine Technique
105523, Россия, Москва,
Щелковское ш., д. 100, эт.11
Телефон: +7 (495) 783 30 60
Факс: +7 (495) 783 30 69
marinesales@boschrexroth.ru
www.boschrexroth.com/marine

Ваш торговый представитель

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