PNEUMATIC BRAKE EQUIPMENT FOR TRAILER VEHICLES

PRODUCT CATALOGUE

WABCO

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Edition 4

This publication is not subject to an updating service.
You will find the current version at:
http://www.wabco.info/i/1021

1 General information

Symbols used in this document

Important information, notes and/or tips

Reference to information on the internet

– Action step

⇨ Consequence of an action

■ List

• List

WABCO Academy

https://www.wabco-academy.com/home/

WABCO Online product catalogue

http://inform.wabco-auto.com/

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Before choosing the right trailer system, a few general points must be considered:

WABCO recommends a brake calculation for every type of trailer braking system.

The braking systems in this document do not take the special conditions of the trailer such as trailer dimensions, axle types, wheel brake type, tyre type, etc. into account. Based on the brake calculations, it may be possible to determine whether the braking system is suitable for the applications involved.

For a correct brake calculation, it is important that the "Technical vehicle data" application form is filled out. The application form can be located at the end of this chapter.

More information and support can be obtained through your WABCO partner.

Trailer braking system with automatic load-dependent brake force controller (LSV) must be set up before the installation.

The LSVs in trailers are universal valves. "Universal" does not mean Plug&Play, it means that the LSV can be used for different types of trailers.

The LSV must be set before installation in the braking system, see chapter 5.26 "Load sensing valve (LSV) 475 71X", page 94, page 110 (Tools, Parameter definition, Setting, LSV data plate) and documentation "LSV test equipment 435 008 000 0", see chapter 3 "Introduction", page 12.

The setting parameters must be calculated.

There are several ways to determine the parameters for the LSV setting, for example:

- Calculation with "nomographs"
- Calculation with "LSV calculation software"
- Calculation with "Trailer brake calculation" - this service can be requested from WABCO

In order to do this, WABCO requires a completed application form for the brake calculation, which you can find at the end of the chapter.

In accordance with legal requirements, the vehicle must be marked with the required information regarding the LSV testing. The respective signs can be obtained through WABCO for this, see chapter 5.26 "Load sensing valve (LSV) 475 71X", page 94.

More information and support can be obtained through your WABCO partner.

In the air suspension system of the trailer there is a levelling valve which must be adjusted.

The levelling valve 464 006 100 0 in the air suspension system has a lever. The optimal suspension conditions are defined with the lever length. The height limitation can also be defined, see chapter 5.20 "Levelling valve 464 006", page 75.

More information and support can be obtained through your WABCO partner.

The lift control valve may have to be set before the installation for air suspension systems on trailers with lifting axle control valve 463 084 000 0.

The lifting axle control valve (LACV) in trailers is a universal valve. It can be used for various lifting axle control requirements. The lifting axle is lowered manually with the LACV. The lifting axle is raised automatically. The LACV is factory-set so that it raises the axle with a bellows pressure of approximately 4 bar (switching point).

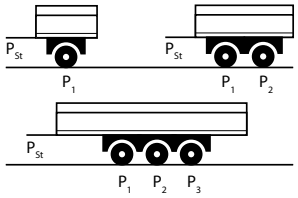
If it is necessary to lift the lifting axle at a different switching point, this can be adjusted, see chapter 5.16 "Lifting axle control valve 463 084", page 59.

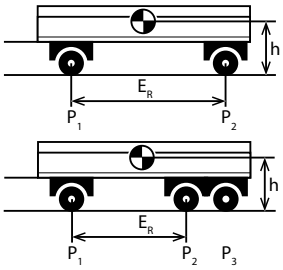
WABCO

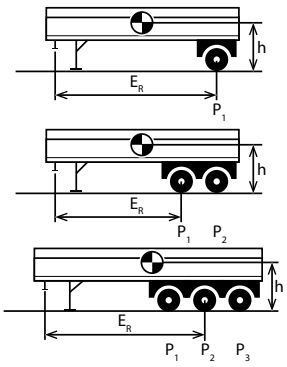
Technical vehicle data

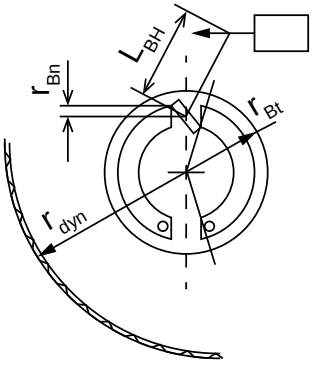
for the brake calculation for trailers

Vehicle Manufacturer:		Type:	
Vehicle acceptance according to:	EC / ECE ☐	other ☐	max. speed ☐
Country of initial registration	☐		

Central axle trailer	**Name**			**laden**	**unladen**
	Total mass	P	kg		
	Noseweight	P_{Nw}	kg		
	Axle load axle 1	P_1	kg		
	Axle load axle 2	P_2	kg		
	Axle load axle 3	P_3	kg		

Drawbar trailer				**laden**	**unladen**
	Total mass	P	kg		
	Axle load axle 1	P_1	kg		
	Axle load axle 2	P_2	kg		
	Axle load axle 3	P_3	kg		
	Centre of gravity height	h	mm		
	existing wheelbase	E_R	mm		
	Wheelbase range	E_R	mm		

Semitrailer				**laden**	**unladen**
	Total mass min.	P	kg		
	Total mass max	P	kg		
	Axle load axle 1	P_1	kg		
	Axle load axle 2	P_2	kg		
	Axle load axle 3	P_3	kg		
	Centre of gravity height	h	mm		
	existing wheelbase	E_R	mm		
	Wheelbase range	E_R	mm		

	**Axle**			**1**	**2**	**3**	
	Cylinder: Number / Type	K_{DZ}					
	possible lever lengths	l_{BH}	mm				
	Drum/disc radius	r_{Bt}	mm				
	C°						
	mech. efficiency	η	%				
	Cam radius	r_{Bn}	mm				
	dyn. unloaded tire diameter or tire identification	min. / existing / max	r_{dyn}	mm			
	Threshold torque	M_{AL}	Nm				

Axle manufacturer:	**Type:**	**Test report number:**
Brake size:	*For "standard axles" only axle manufacturer and test report number required!*	
WABCO circuit diagram no.:	*Axle assemblies see back side!*	

Trailing steering axle:	☐	**Tristop cylinder:**	☐	**ABS VCS:**	☐	**EBS:**	☐

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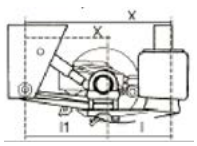
Technical vehicle data

for the brake calculation for trailers

Multi-axle assemblies	Manufacturer:	Type:

Air suspension

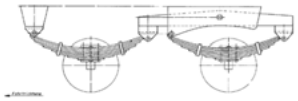


☐

or

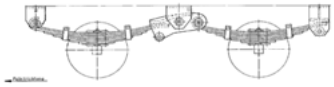
Spring link l1/l2 (mm):	/
Spring link x1/x2 (mm):	/
Bellows diameter (mm):	
Drawing no.:	

Leaf spring multi-axle assembly (with dyn. compensation)



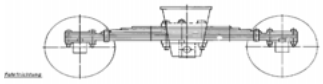
☐

Leaf spring multi-axle assembly (without dyn. compensation)



☐

Balance beam multi-axle assembly



☐

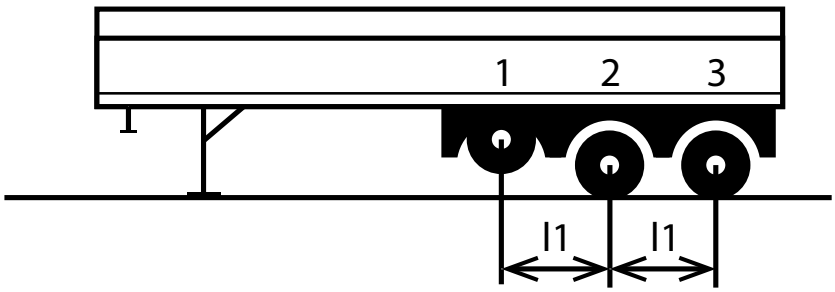
Individual axles mechanical

☐

Please enclose drawing if assembly is not listed here!

Bellows pressure (bar)	laden	unladen	Spring deflection (mm)	
Front axle:			Front axle:	
Rear axle(s):			Rear axle(s):	

Semitrailer with lifting axle(s)



Axle	1	2	3
Which axle(s) are to be lifted (x):			
Axle distance l1 (mm):			
Bellows pressure laden (bar):			
Bellows pressure unladen (with axle/s lifted) (bar):			
Bellows pressure unladen (all axles lowered) (bar):			
Axle load(s) unladen (with axle(s) lifted) (kg):			
Axle load(s) unladen (all axles lowered) (kg):			

2 Safety information

Observe all necessary regulations and instructions:

- Read this document carefully.
  Adhere to all instructions, information and safety information to prevent injury to persons and damage to property.
  WABCO will only guarantee the safety, reliability and performance of their products and systems if all the information in this publication is adhered to.
- Always abide by the vehicle manufacturer's specifications and instructions.
- Observe all accident regulations of the respective company as well as regional and national regulations.

Make provisions for a safe work environment:

- Only trained and qualified technicians may carry out work on the vehicle.
- Use personal protective equipment if required (safety goggles, respiratory protection, ear protectors, etc.).
- Pedal actuations can lead to severe injuries if persons are in the vicinity of the vehicle. Make sure that pedals cannot be actuated as follows:
  - Switch the transmission to "neutral" and actuate the park brake.
  - Secure the vehicle against rolling with chocks.
  - Fasten a visible note to the steering wheel indicating that work is being performed on the vehicle and that the pedals are not to be actuated.

Avoiding electrostatic charge and uncontrolled discharging (ESD)

Note during construction and building the vehicle:

- Prevent potential differences between components (e.g. axles) and the vehicle frame (chassis).
  Make sure that the resistance between metallic parts of the components and the vehicle frame is less than 10 Ohm (< 10 Ohm).
  Establish an electrically conductive connection between moving or insulated vehicle parts, such as axles, and the frame.
- Prevent potential differences between the towing vehicle and the trailer.
- Make sure that an electrically conductive connection is made between metal parts in the towing vehicle and the coupled trailer via the coupling (king pin, fifth wheel, claws with pins), even without a cable being connected.
- Use electrically conductive bolted connections when fastening the ECUs to the vehicle frame.
- Use only cable conforming to WABCO specifications or original WABCO cable.
- Run the cable within metallic casings where possible (e.g. inside the U-beam) or behind metal and grounded protective plating to minimise the influence of electro-magnetic fields.
- Avoid the use of plastic materials if they can cause electrostatic charging.

While carrying out repair or welding work on the vehicle, observe the following:

- Disconnect the battery (if installed in the vehicle).
- Disconnect cable connections to devices and components and protect connectors and ports against contamination.
- Always connect the grounding electrode directly with the metal next to the welding point when welding to prevent magnetic fields and current flow via the cable or components.
  Make sure that current is well conducted by removing paint or rust.
- Prevent heat influences on devices and cabling when welding.

3 Introduction

The equipment for towing vehicles is subject to continual changes, which are either caused by improving technology or more legal requirements.

Spring chamber cylinders have become mandatory in towing vehicles and will secure a parked trailer or even the entire train from rolling in case of a complete pressure-loss in the braking system. An additional mechanical parking brake with cables is not required.

Disc brakes are becoming ever more popular in wheel brakes. In comparison with drum brakes, they are easier to maintain and are not as subject to fading, diminishing braking performance over long downgrades.

ABS is required legally in most regions and is an equipment standard now.

Trailer EBS is another addition to traffic safety. Braking is shortened by the electronic transfer of the braking request. ABS and the RSS safety system are integrated. Additional devices for adapting the braking pressure to the load status are not required.

Air suspension is implemented in almost all utility vehicles nowadays. Not only the cargo but the streets too are preserved. In addition, a constant ride height and the adjustability to various ramp heights also speak for the air suspension.

Ramp heights can be learned and moved to with the push of a button with trailer ECAS. In addition, a multitude of lifting axle circuits and special functions are possible.

With the Trailer EBS E, the complexity of the trailer control is increased again. This device includes the complete braking system with an ECAS system. The control of other components of the towing vehicle can also be handled.

4 Schematic diagram

– Open the WABCO INFORM online product catalogue:
http://inform.wabco-auto.com

– Search for documents by entering the diagram number.

4.1 Lift axle circuits

Number	Single circuit	Dual circuit	Electr. actuated	Mechan. actuated	Fully automatic control	Traction help (TH)	Lowering function	Rotary slide valve	TASC	Height limiting levelling valve	2 LACV	ELM	Residual pressure	remarks
ABS														
841 801 447 0		x	x											
841 801 448 0		x		x										
841 801 449 0		x			x									
841 801 472 0		x			x		x							
841 801 473 0		x	x			x								
841 801 476 0		x		x							x			2 LACV
841 801 479 0		x			x		x							
841 801 520 0		x			x		x							
841 801 522 0		x			x	x								
841 801 524 0		x			x		x	x		x				5-axle trailer, 2 LACV
841 801 525 0		x			x	x								StVZO § 41
841 801 529 0		x			x	x	x							
841 801 572 0		x			x		x							
841 801 573 0		x			x	x	x	x		x				
841 801 574 0		x			x		x	x		x				
841 801 576 0		x	x			x					x			2 LACV
841 801 600 0					x		x							
841 801 927 0	x		x					x	x	x				
841 801 928 0									x					
EBS														
841 801 791 0		x	x		x							x		with ELM
841 801 792 0	x		x		x							x		with ELM
841 801 920 0		x	x		x			x	x	x				
841 801 921 0		x	x		x	x	x	x	x	x				Switch for lifting axle controller in trailer
841 801 922 0		x	x		x	x	x	x	x	x				Switch for lifting axle controller in towing vehicle
841 801 923 0	x		x		x	x	x	x		x			x	Switch for lifting axle controller in towing vehicle
841 801 924 0	x		x		x			x	x	x				
841 801 925 0	x		x		x	x	x	x	x	x				Switch for lifting axle controller in towing vehicle

Schematic diagram
Lift axle circuits

Number	Single circuit	Dual circuit	Electr. actuated	Mechan. actuated	Fully automatic control	Traction help (TH)	Lowering function	Rotary slide valve	TASC	Height limiting levelling valve	2 LACV	ELM	Residual pressure	remarks
841 801 926 0	x		x		x	x	x	x	x	x				Switch for lifting axle controller in towing vehicle
841 801 929 0	x		x		x	x	x	x		x	x		x	Switch for lifting axle controller in towing vehicle
841 802 070 0	x		x		x	x	x	x		x	x			Switch for lifting axle controller in towing vehicle
841 802 071 0	x		x		x	x	x	x			x			Switch for lifting axle controller in trailer and towing vehicle
841 802 072 0	x		x		x	x	x	x		x				Switch for lifting axle controller in towing vehicle
841 802 073 0	x		x		x	x	x	x			x			Switch for lifting axle controller in trailer and towing vehicle
841 802 074 0	x		x		x	x	x	x	x					Switch for lifting axle controller in towing vehicle
841 802 075 0	x		x		x	x	x	x	x					Switch for lifting axle controller in trailer
841 802 076 0	x		x		x	x	x	x						Switch for lifting axle controller in trailer and towing vehicle
841 802 077 0	x		x		x	x	x	x	x				x	Switch for lifting axle controller in towing vehicle
841 802 078 0	x		x		x	x	x	x			x		x	Switch for lifting axle controller in towing vehicle
841 802 079 0	x		x		x	x	x	x			x			Switch for lifting axle controller in towing vehicle
841 802 138 0		x	x		x	x	x	x	x		x			with 2 single-circuit LACV

4.2 Air suspension

Axles	In connection with braking system	Number	Height sensor	Lifting axle(s)	Comment	ECAS ECU
Semitrailer						
1-2-3 axle	VCS	841 801 722 0	1	1		446 055 065 0
2-3 axle	VCS	841 801 723 0	1	1		446 055 065 0
2-3 axle	VCS	841 801 724 0	2 right/ left	1		446 055 065 0
2-3 axle	VCS	841 801 725 0	2	1		446 055 065 0
3 axles	VCS	841 801 726 0	1	2 separate		446 055 065 0
2-3 axle	VCS	841 801 727 0	1		1 Trailing-Axle Control	446 055 065 0
2-3 axle	VCS	841 801 730 0	1	1	Train transport	446 055 065 0
2-3 axle	VCS	841 801 731 0	1		Traction help	446 055 065 0
1-3 axle	VCS	841 801 732 0	1		Tire deflection compensation	446 055 065 0
3 axles	VCS	841 801 733 0	2	2 separate		446 055 065 0
3 axles	VCS	841 801 734 0	2 right/ left	2		446 055 065 0
2-3 axle	VCS	841 801 735 0	2			446 055 065 0
3 axles	VCS	841 801 736 0	1	2 separate		446 055 065 0
2-3 axle	VCS	841 801 737 0	2 right/ left			446 055 065 0
3 axles	VCS	841 801 780 0	1	2 parallel		446 055 065 0
2-3 axle	VCS	841 801 782 0	2		Tire deflection compensation	446 055 065 0
1-2-3 axle	VCS II	841 802 022 0	1			446 055 065 0
2-3 axle	VCS II	841 802 023 0 (in the annex)	1	1		446 055 066 0
2-3 axle	VCS II	841 802 024 0	2 right/ left	1		446 055 066 0
2-3 axle	VCS II	841 802 025 0	2	1		446 055 066 0
3 axles	VCS II	841 802 026 0	1	2 separate		446 055 066 0
2-3 axle	VCS II	841 802 027 0	1		1 Trailing-Axle Control	446 055 066 0
2-3 axle	VCS II	841 802 080 0	1	1	Train transport	446 055 066 0
2-3 axle	VCS II	841 802 081 0	1		Traction help	446 055 066 0
1-3 axle	VCS II	841 802 082 0	1		Tire deflection compensation	446 055 066 0
3 axles	VCS II	841 802 083 0	2	2 separate		446 055 066 0
3 axles	VCS II	841 802 084 0	2 right/ left	2		446 055 066 0
2-3 axle	VCS II	841 802 085 0	2			446 055 066 0
3 axles	VCS II	841 802 086 0	1	2 separate		446 055 066 0

Axles	In connection with braking system	Number	Height sensor	Lifting axle(s)	Comment	ECAS ECU
2-3 axle	VCS II	841 802 087 0	2 right/ left			446 055 066 0
3 axles	VCS II	841 802 089 0	1	2 parallel		446 055 066 0
2-3 axle	VCS II	841 802 091 0	2		Tire deflection compensation	446 055 066 0
2-3-4 axle	EBS	841 801 750 0 (in the annex)	2		with front axle valve	446 055 066 0
2-3-4 axle	EBS	841 801 751 0	2		without front axle valve	446 055 066 0
1-2-3 axle	EBS	841 801 752 0	1			446 055 066 0
2-3 axle	EBS	841 801 753 0 (in the annex)	1	1		446 055 066 0
2-3 axle	EBS	841 801 754 0	2 right/ left	1		446 055 066 0
2-3 axle	EBS	841 801 755 0	2	1		446 055 066 0
3 axles	EBS	841 801 756 0	1	2 separate		446 055 066 0
2-3 axle	EBS	841 801 757 0	1		1 Trailing-Axle Control	446 055 066 0
2-3 axle	EBS	841 801 760 0	1	1	Train transport	446 055 066 0
2-3 axle	EBS	841 801 761 0	1		Traction help	446 055 066 0
1-3 axle	EBS	841 801 762 0	1		Tire deflection compensation	446 055 066 0
3 axles	EBS	841 801 763 0	2	2 separate		446 055 066 0
3 axles	EBS	841 801 764 0	2 right/ left	2		446 055 066 0
2-3 axle	EBS	841 801 765 0	2			446 055 066 0
3 axles	EBS	841 801 766 0	1	2 separate		446 055 066 0
2-3 axle	EBS	841 801 767 0	2 right/ left			446 055 066 0
3 axles	EBS	841 801 769 0	1	2 parallel		446 055 066 0
2-3 axle	EBS	841 801 821 0	2		Tire deflection compensation	446 055 066 0
3 axles	EBS	841 801 822 0	1		1st axle: Traction help 3rd axle: Manoeuvring assistance	446 055 066 0
3 axles	EBS	841 801 823 0	1	2 separate	2nd lifting axle: Manoeuvring assistance + Forced lowering	446 055 066 0
3 axles	EBS	841 801 824 0	1	1	single circuit	446 055 066 0
3 axles	EBS	841 801 825 0	1	2	single circuit	446 055 066 0
3 axles	EBS	841 801 826 0	1	2 separate		446 055 066 0
3 axles	EBS	841 801 827 0	1	1	without traction help	446 055 066 0
2-3 axle	EBS E	841 802 150 0 (in the annex)		1	Conventional air suspension Levelling valve	
3 axles	EBS E	841 802 017 0	1		Battery operation	446 055 066 0

Axles	In connection with braking system	Number	Height sensor	Lifting axle(s)	Comment	ECAS ECU
Drawbar trailer						
2 axles	with/without ABS/EBS	841 801 434 0 (in the annex)			Levelling valve	
3 axles	with/without ABS/EBS	841 801 435 0 (in the annex)			Levelling valve with height limitation and rotary slide valve	
1-3 axle	with/without ABS/EBS	841 801 436 0 (in the annex)			Levelling valve	
1-3 axle	with/without ABS/EBS	841 801 437 0 (in the annex)			Levelling valve with height limitation and rotary slide valve	
2-3-4 axle	VCS	841 801 720 0	2		with front axle valve	446 055 065 0
2-3-4 axle	VCS	841 801 721 0	2		without valve throttle	446 055 065 0
3-4 axle	VCS	841 801 728 0	3		with front axle valve	446 055 065 0
3-4 axle	VCS	841 801 729 0	3	1	with front axle valve	446 055 065 0
3-4 axle	VCS	841 801 738 0	2	1	with front axle valve	446 055 065 0
2-3 axle	VCS	841 801 781 0	2		with front axle valve, Train transport	446 055 065 0
2-3-4 axle	VCS II	841 802 020 0 (in the annex)	2		with front axle valve	446 055 066 0
2-3-4 axle	VCS II	841 802 021 0	2		without valve throttle	446 055 066 0
2-3-4 axle	VCS II	841 802 028 0	3		with front axle valve	446 055 066 0
3-4 axle	VCS II	841 802 029 0	3	1	with front axle valve	446 055 066 0
3-4 axle	VCS II	841 802 088 0	2	1	with front axle valve	446 055 066 0
2-3 axle	VCS II	841 802 090 0	2		with front axle valve, Train transport	446 055 066 0
2-3 axle	VCS II	841 802 092 0	2		2x rear axle valve	446 055 066 0
2-3-4 axle	EBS	841 801 758 0	3		with front axle valve	446 055 066 0
3-4 axle	EBS	841 801 759 0	3	1	with front axle valve	446 055 066 0
3-4 axle	EBS	841 801 768 0	2	1	with front axle valve	446 055 066 0
2-3 axle	EBS	841 801 820 0	2		with front axle valve, Train transport	446 055 066 0
2 axles	EBS E	841 802 016 0	2		with control box & Unloading level switch	446 055 066 0
2 axles	EBS E	841 802 018 0	2		with control box & battery	446 055 066 0
2 axles	EBS E	841 802 019 0	2		with control box	446 055 066 0
2 axles	EBS E	841 802 242 0	2		with front axle valve, without control box, with unloading level	446 055 066 0

Axles	In connection with braking system	Number	Height sensor	Lifting axle(s)	Comment	ECAS ECU
Connection of control box and remote control unit to ECAS						
	VCS II	841 801 785 0				
	VCS	841 801 828 0				
	EBS	841 801 829 0				

5 Device description

The following device descriptions are sorted by product number (first 6 numbers).

5.1 Diaphragm cylinder 423 XXX

Diaphragm cylinder

for Cam Brakes

for disc brakes

Application

Drawbar trailer and semitrailer with more than one axle.

Brake chambers are used on the axles that do not have to be equipped with Tristop® cylinders.

Purpose

To generate the braking force for the wheel brakes. It can also be used to actuate other facilities, e.g. for clamping, raising or gear-shifting.

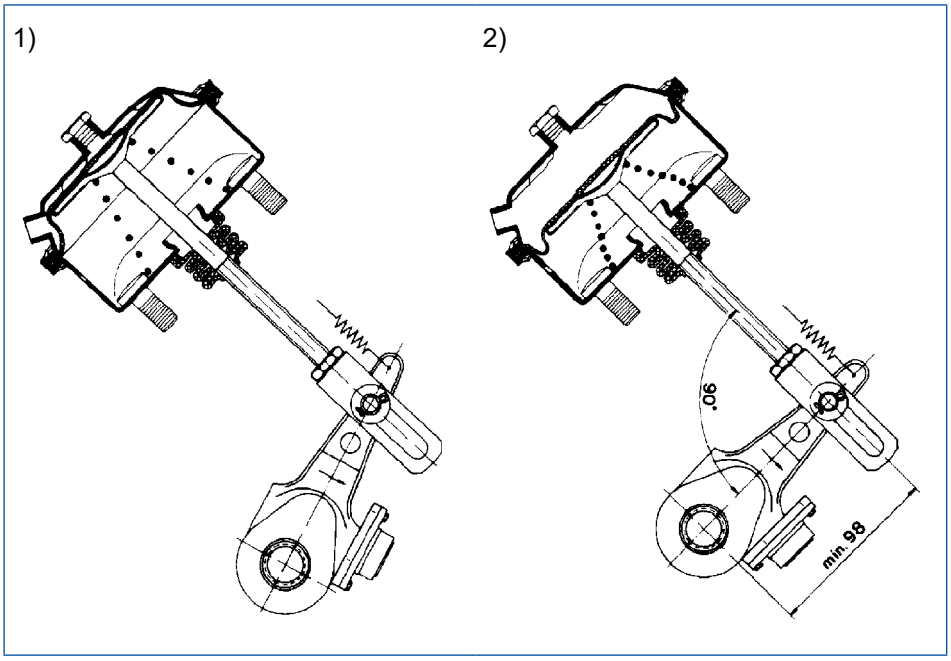
Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

- Install the diaphragm cylinder at an upward slant to the yoke joints so that any penetrating water can run out again.
- Make sure that the brake line is not lower than the cylinder heads when installing, so that the brake line and the connection points will not be damaged (by ground contact).
  Two couplings on the diaphragm cylinder simplify the line route, which can be used optionally by implementing the screw-plug.
  When installing the brake chambers or when adjusting the brake, the push-rod cannot be pulled out.
- Make sure that the cylinder achieves its idle position when the brake is released (the piston does not hang on the brake lever but presses the diaphragm against the rear wall of the housing).
- If the rods of a mechanical park brake assembly also affect the brake lever, then the piston of the cylinder is not to be pulled out past a specified stroke when actuating this assembly. To prevent damages, use a yoke with an oblong slot.

Installation diagram

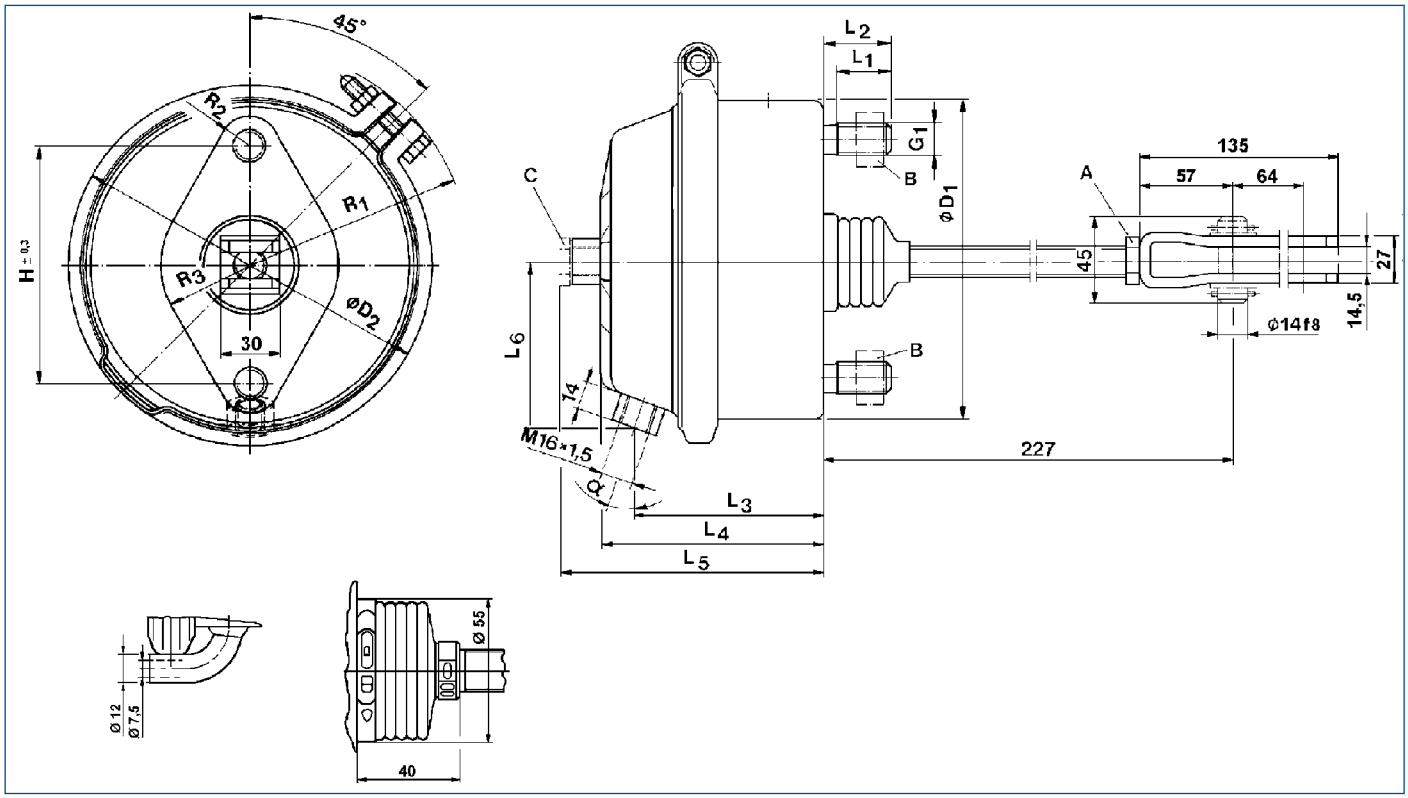


LEGEND			
1)	Rest position: no play permitted between piston and diaphragm	**2)**	Operating position: at maximum stroke

The axle manufacturers recommend using the sealed version for trailing steering axles with vertically installed diaphragm cylinders (piston rod points upwards):

Order number 24": 423 106 905 0 (with accessory kit)

Installation dimensions – Diaphragm cylinder for the cam brake (with gaiter)



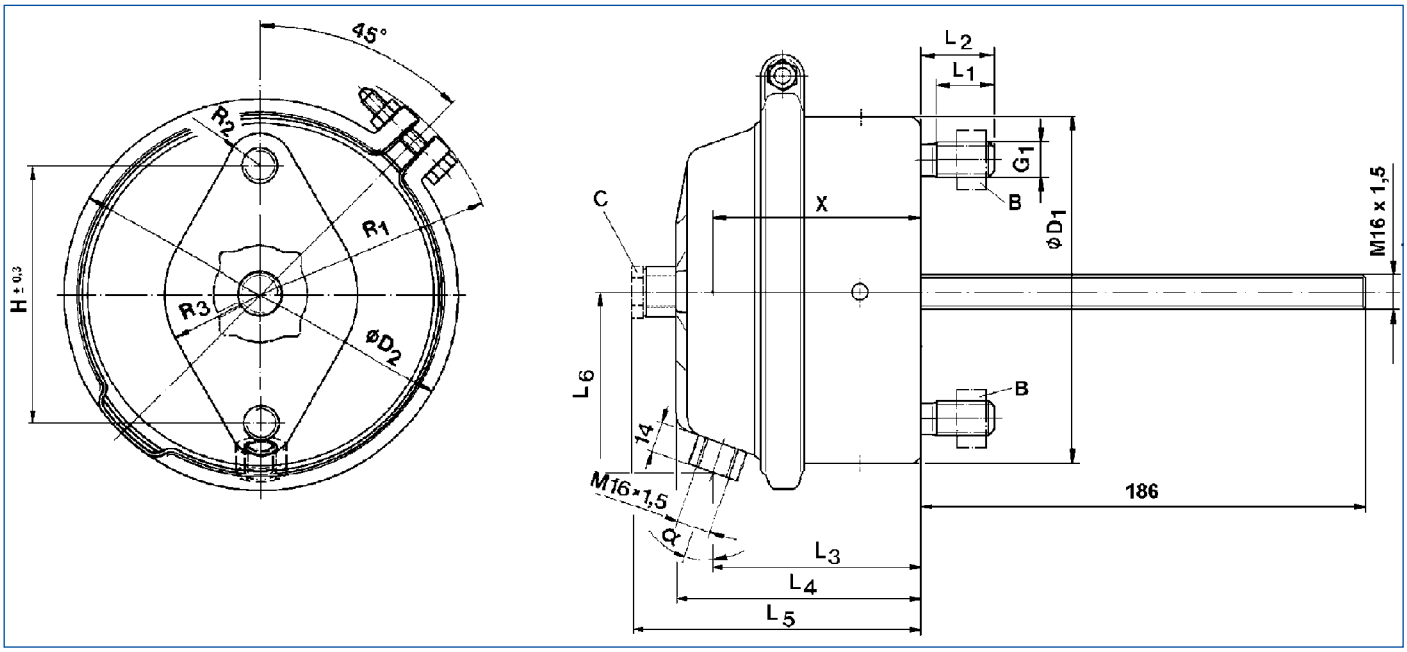
TYPE	Installation dimensions [mm]														
	D_1	D_2	G_1	H	L_1	L_2	L_3	L_4	L_5	L_6	R_1	R_2	R_3	X	α
24	161	185	M 16x1.5	120.7	27	34	96	113	134	85	112	15	45	96	19.5°
36	–	230	M 16x1.5	120.7	27	33	136	152	176	112	133	21.5	55	134	15°

Technical data – Diaphragm cylinder for the cam brake (with gaiter)

ORDER NUMBER	423 106 905 0* – TYPE 24	423 008 919 0** – TYPE 36
Max. stroke	75 mm	76 mm
Volume-stroke at 2/3 stroke	0.93 litres	1.65 litres
Tightening torque A	80 ±10 Nm	
Tightening torque B	180+30 Nm	
Tightening torque C	45 ±5 Nm	60 ±5 Nm
Accessories pack	423 000 533 2	–
Weight	3.0 kg	4.5 kg
Max. operating pressure	8.5 bar	
Permissible medium	Air	
Operating temperature range	-40 °C to +80 °C	

LEGEND			
1)	with fording capability: Ventilation with pipe; supplied with accessories pack	**2)**	The brake chamber type 36 (thread M 22x1.5) is delivered complete, with fastening nuts and screw plug, but with no yoke joint. The yoke joint can be ordered separately (see chapter "Brake chamber accessories" on page 27).

Installation dimensions – diaphragm cylinder for cam brake (with disc seal)

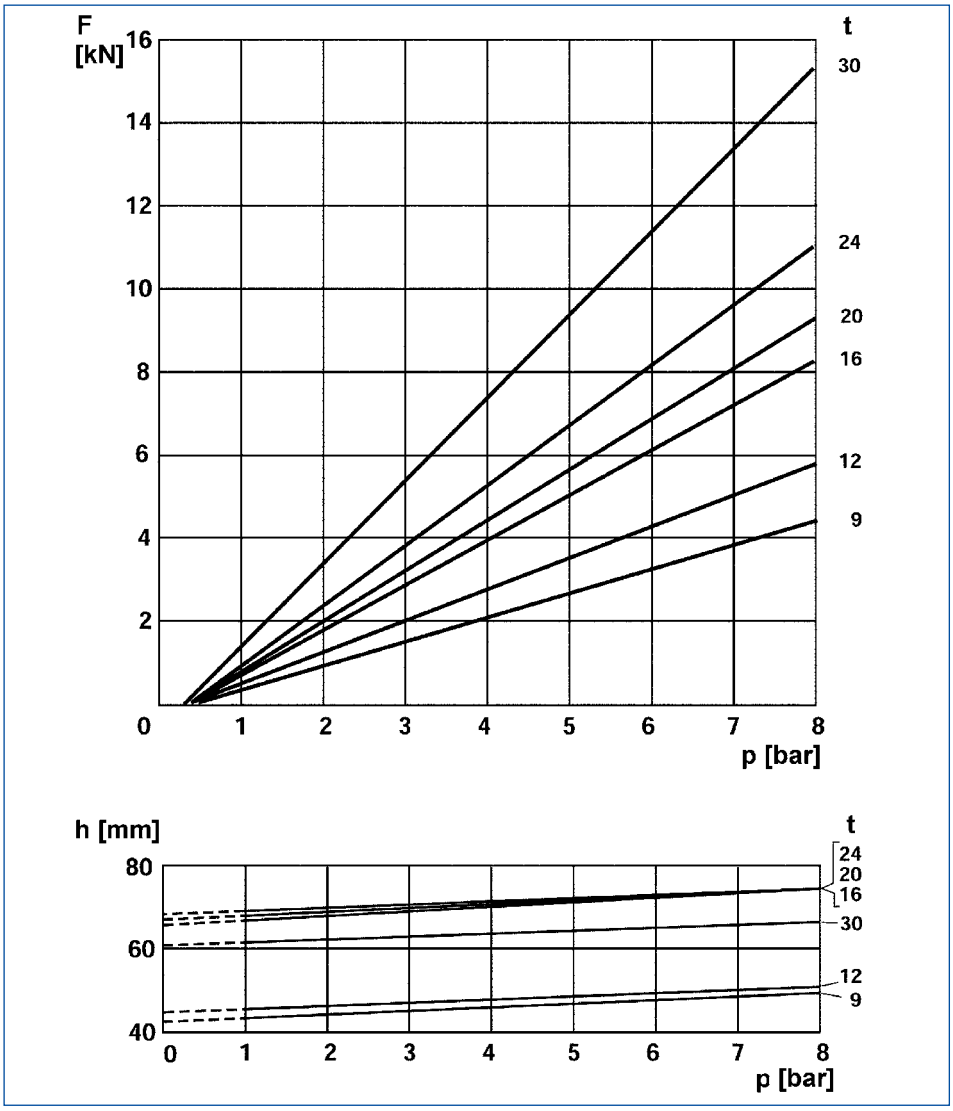


TYPE	Installation dimensions [mm]														
	D_1	D_2	G_1	H	L_1	L_2	L_3	L_4	L_5	L_6	R_1	R_2	R_3	X	α
9	112	135	M 12x1.5	76.2	20	25	97	108	–	63	86	23	32	91	22.5°
12	123	144	M 12x1.5	76.2	20	25.5	103	114	136	66	94	22	34	98	22.5°
16	141	166	M 12x1.5	76.2	20	25.5	96	112	133	75	101	17	35	96	20.5°
20	151	174	M 16x1.5	120.7	27	34	96	112	134	80	105	15	45	96	20.5°
24	161	185	M 16x1.5	120.7	30	34.5	96	113	134	85	111	15	45	103	19.5°
30	162	209	M 16x1.5	120.7	27	34.5	104	113	134	92	123	15	45	102	30°

Technical data – Brake chamber for the cam brake (with disc seals)

ORDER NUMBER	423 102 900 0 TYPE 9	423 103 900 0 TYPE 12	423 104 900 0 TYPE 16	423 105 900 0 TYPE 20	423 106 900 0 TYPE 24	423 107 900 0 TYPE 30
Max. stroke	60 mm		75 mm			
Max. capacities at 2/3 stroke [litres]	0.28	0.40	0.75	0.85	0.93	1.15
Tightening torque A	80 ±10 Nm					
Tightening torque B	70+16 Nm			180+30 Nm		
Tightening torque C	–	40 ±5 Nm				
Order number for "Round hole" accessories	423 902 537 2	423 902 533 2		423 000 534 2		
Order number for "Slotted hole" accessory kit	423 902 536 2	423 902 534 2		423 000 535 2		
Gaiter	Yes		No			

Pressure diagrams – Brake chamber for cam brake (with disc seals) Types 9 to 30

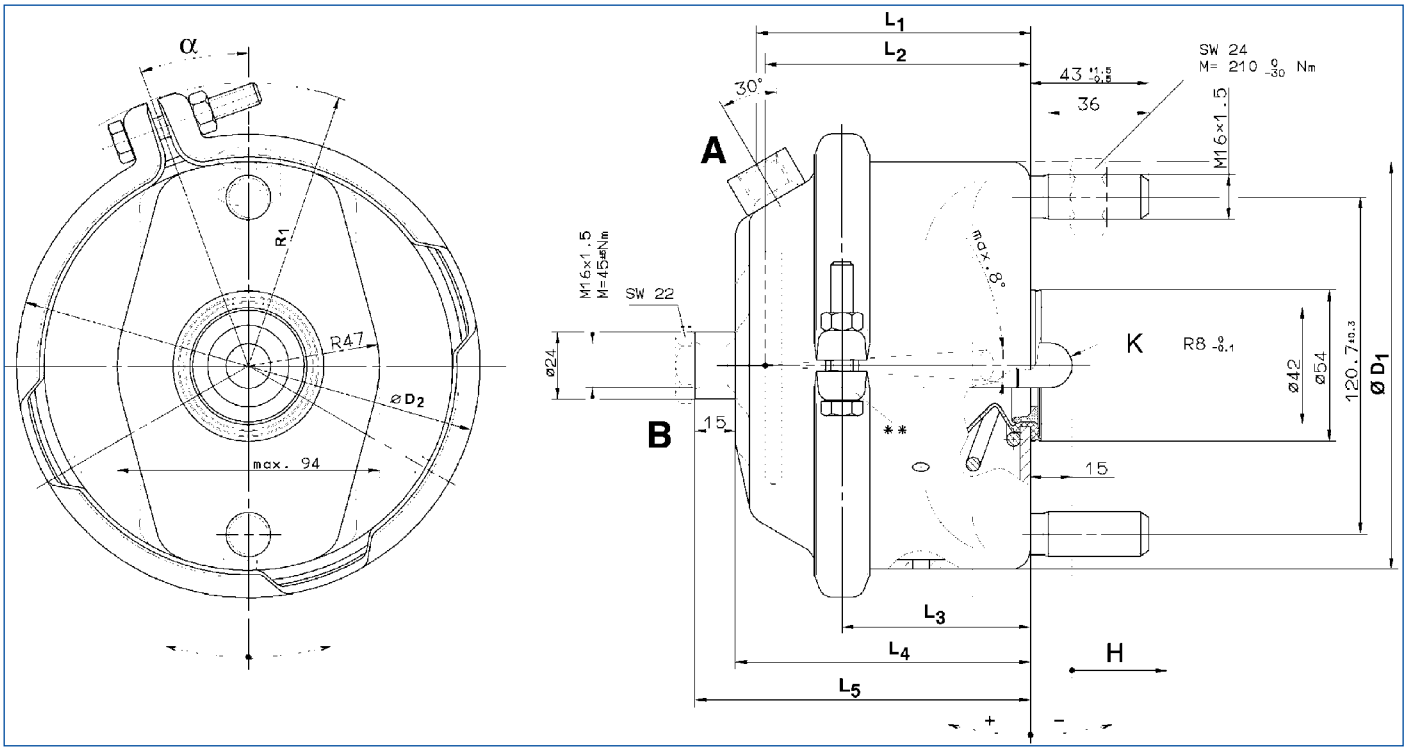


LEGEND			
F	The average piston force is the force determined using an iteration of the values between 1/3 and 2/3 of the overall piston stroke (h_{max}).	**p**	Pressure in brake cylinder
h	The usable piston stroke is the stroke at which the piston force is 90% of the average piston force F.	**t**	Type

Type	F [N]	h [mm]	h_{max} [mm]
9	606 x p - 242	0.64 x p + 44	60
12	766 x p - 230	0.57 x p + 46	60
16	1056 x p - 317	0.86 x p + 68	75
20	1218 x p - 244	0.74 x p + 69	75
24	1426 x p - 285	0.56 x p + 70	75
30	1944 x p - 389	0.67 x p + 62	75

Diaphragm cylinder 423 XXX

Installation dimensions – diaphragm cylinder for disc brake



LEGEND			
K	Ball	**H**	Stroke

ORDER NUMBER	TYPE	Installation dimensions [mm]									CONNECTION	
		D_1	D_2	L_1	L_2	L_3	L_4	L_5	R_1	α	A	B
423 114 710 0	14	146	166	98	95	67	106	121	101	20°	x	1)
423 104 710 0	16	146	166	98	95	67	106	121	101	20°	x	x
423 104 715 0	16	146	166	100	94	66	104	119	103	0°	1)	x
423 104 716 0	16	146	166	100	94	66	104	119	103	90°	1)	x
423 504 003 0	16	146	166	98	92	64	102	117	101	0°	1)	x
423 112 710 0	18	175	175	94	92	65	103	117	106	20°	x	x
423 505 000 0	20	153	175	94	92	65	102	117	106	20°	x	x
423 110 710 0	22	163	185	94	92	65	102	117	111	20°	x	x
423 506 001 0	24	163	185	99	94	65	106	120	112.5	20°	x	x

LEGEND	
1)	with screw plug M 16x1.5

Technical data – diaphragm cylinder for disc brake

TYPE	14	16	18	20	22	24
Max. deflection of the push rod	8° (with 0 mm stroke)					
Max. stroke	57 mm		62 mm			64 mm
Capacities at 2/3 stroke [litres]	0.60		0.68	0.71	0.81	
Max. operating pressure	10 bar			10.2 bar		
Thermal range of application	-40 °C to +80 °C					
Weight	3.2 kg		2.8 kg		3.0 kg	

Test results – Brake chamber for disc brakes (types 14 to 24)

F	The average piston force is the force determined using an iteration of the values between 1/3 and 2/3 of the overall piston stroke (h_{max}).	**h**	The usable piston stroke is the stroke at which the piston force is 90% of the average piston force F.

TYPE	F [N]	h [mm]	h_{max} [mm]
14	861 x p - 255	1.40 x p + 40	57
16	1062 x p - 308	0.54 x p + 46	57
18	1138 x p - 330	1.19 x p + 47	64
20	1210 x p - 351	1.00 x p + 55	64
22	1332 x p - 373	0.79 x p + 50	64
24	1453 x p - 407	0.57 x p + 48	64

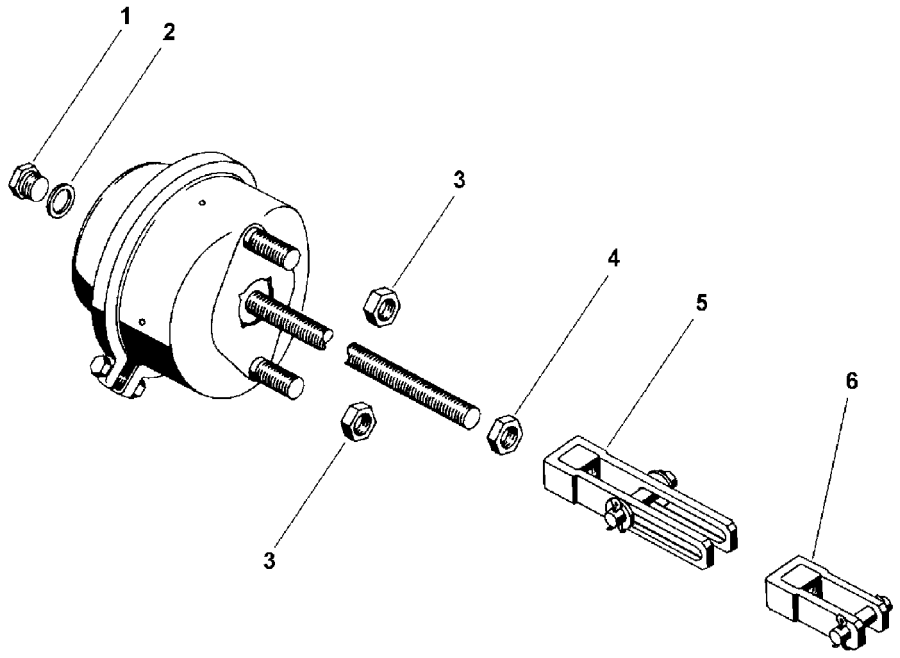
Installation instructions – Brake chamber for disc brake

- Install the brake chamber horizontally so that the opened breather hole/drain hole faces downward.
  Maximum deviation: ±30°
  Permissible deviations: 10° with push rod showing upward; 30° showing downwards.
- Be sure to remove the plastic plugs of the lower drain hole.
- Fasten the brake chamber with nuts M 16x1.5 property class 8 (WABCO No. 810 304 031 4)
- Thread on both nuts by hand until the brake chamber makes full contact.
- Then tighten both nuts to approximately 120 Nm and tighten to 210 Nm (Tolerance -30 Nm) with a torque wrench.
  If you are using self-locking nuts, the torque must be increased accordingly.

The piston rod must seat in the slot of the brake lever at / with maximum 10° deflection of the piston rod.
Flange area and sealing surface of brake chamber and disc brake must be clean and undamaged.

The gaiter must have no damages and together with the back-up ring, being proper seated.

Brake chamber accessories



ITEM	DESIGNATION		ORDER NUMBER	423 000 531 2	423 000 532 2	423 000 533 2	423 000 534 2	423 000 535 2	423 002 530 2	423 103 532 2	423 901 533 2	423 901 538 2	423 902 532 2	423 902 533 2	423 902 534 2	423 902 535 2	423 902 536 2	423 902 537 2	423 903 530 2
1	Screw plug	M 16x1.5	893 011 710 4	1	1	1	1	1		1			1	1	1				
2	Ring seal	A 16x20	811 401 057 4	1	1	1	1	1		1			1	1	1				
3	Hexagon nut	M 12	810 304 026 4	2	2				2	2									
		M 12x1.5	810 304 027 4										2	2	2	2	2	2	
		M 16x1.5	810 304 031 4			2	2	2				2							2
4	Hexagon nut	M 14x1.5	810 306 013 4						1	1									1
		M 16x1.5	810 319 029 4	1	1		1	1						1	1		1	1	
5	Yoke joint with bolt Ø 14	M 16x1.5	895 801 310 2		1			1							1		1		
		M 14x1.5	895 801 312 2						1	1									
6	Yoke joint with bolt Ø 14	M 16x1.5	895 801 513 2	1			1							1				1	
		M 14x1.5	895 801 511 2																1
		M 14x1.5	810 612 020 2																
-	Pins	14x45x35.6	810 601 100 4			1						1	1						
		14x45x31.2	810 601 097 4								1								
		12x45x34	810 601 084 4													1			
-	Washer	15	810 403 011 4			2						2	2						
-	Split pin	4x22	810 511 034 4			2					2	2	2			2			

5.2 Line filter 432 500

Application

All trailers in the area of the coupling to the towing vehicle, for single- and dual-line brakes. If there are no filters already integrated in the hose couplers, line filters are inserted into the brake line and the supply line.

Purpose

Protecting the compressed-air brake system from contamination.

Maintenance

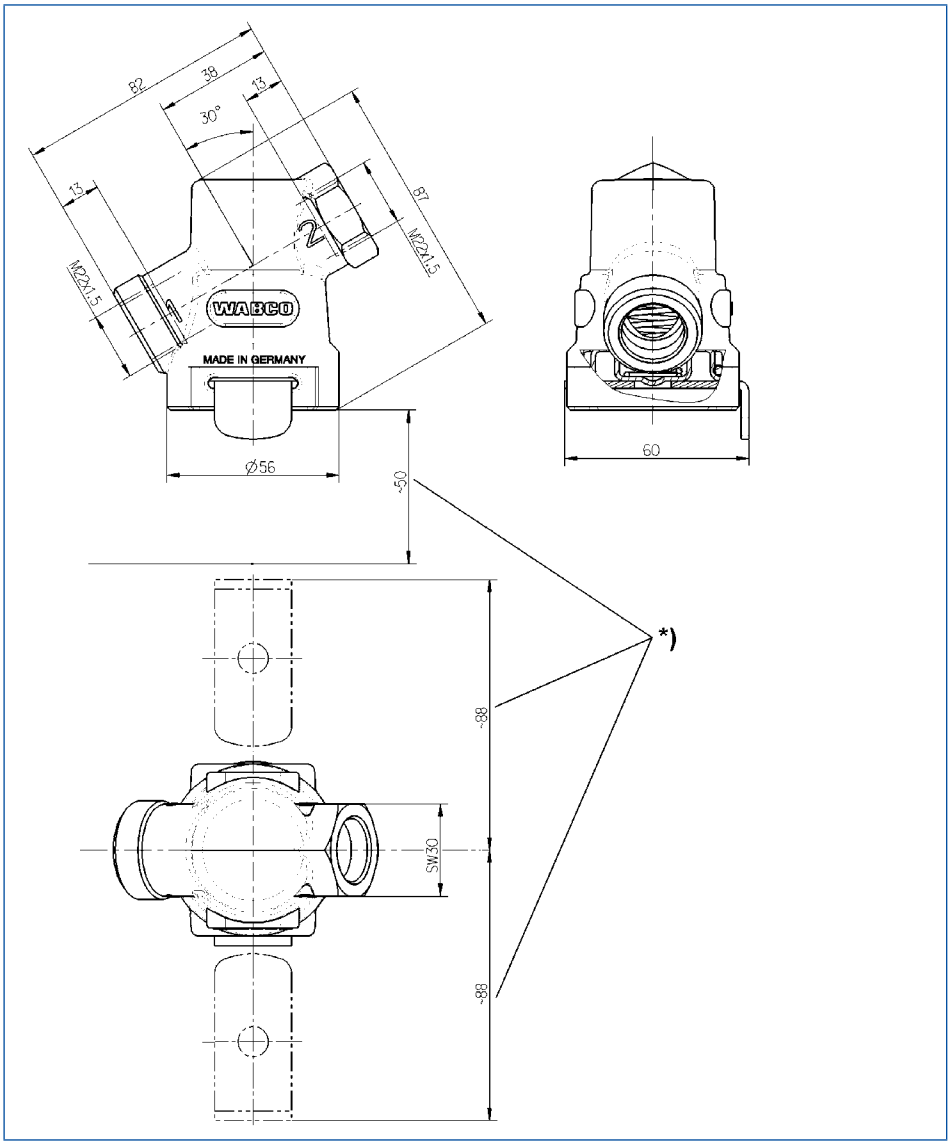
- Clean the line filter – depending on the operating conditions – every 3 to 4 months. Remove the filter set and blow it out with compressed air.
- Replace the damaged filter inserts.

Installation recommendation

- Install the filter with bulkhead couplings in the pipe system.

Make sure that there is sufficient space for removing the filter insert (see following figure).

Installation dimensions for 432 500 020 0

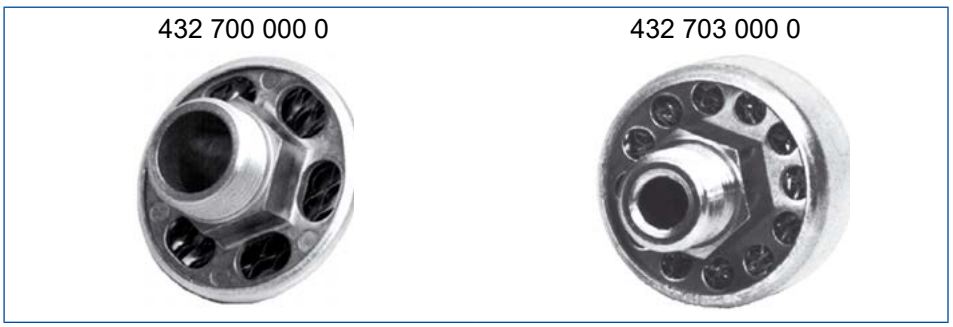


LEGEND					
1	Energy supply	**2**	Energy discharge	***)**	Space required for removing filter cartridge

Technical data

ORDER NUMBER	432 500 020 0	432 500 021 0
Max. operating pressure	20 bar	
Free passage	Ø 12 mm = 1.13 cm^2	
Port threads	M 22x1.5	M 16x1.5
Pore size of filter	80 to 140 µm	
Permissible medium	Air	
Thermal range of application	-40 °C to +80 °C	
Weight	0.29 kg	
Remark	–	

5.3 Vent valve 432 70X



Application

Installation in the exhaust opening of compressed air actuated brake and control devices.

Purpose

Damping exhaust noise.

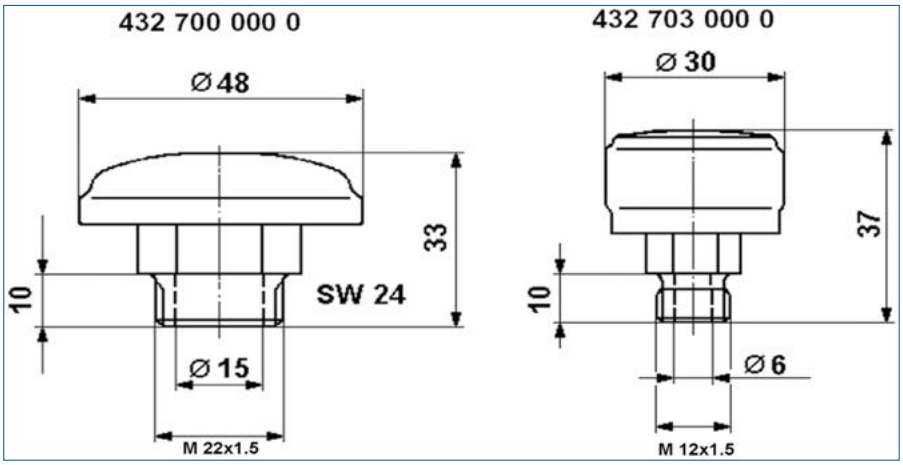
Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

– Install the exhaust filter in an optional location.
Sufficient space for mounting/dismounting on the compressed air device.

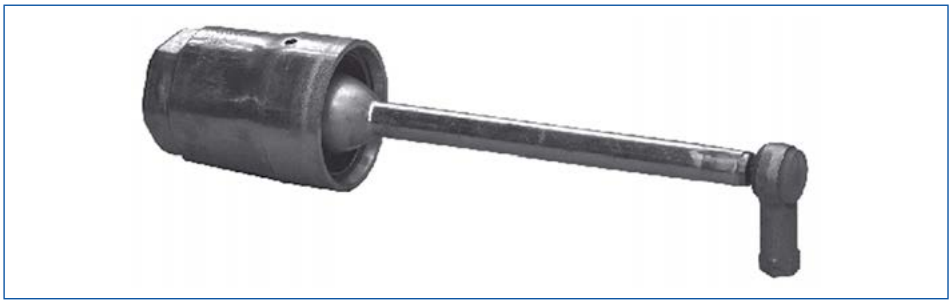
Installation dimensions for 432 700 000 0 and 432 703 000 0



Technical data

ORDER NUMBER	432 700 000 0	432 703 000 0
Port threads	M 22x1.5	M 12x1.5
Permissible medium	Air	
Thermal range of application	-40 °C to +125 °C	-40 °C to +120 °C
Weight	0.03 kg	0.02 kg

5.4 Knuckle joint 433 306



Application

Vehicles with leaf-spring suspension. Knuckle joints are used in combination with mechanical LSV controllers.

Purpose

Prevents damages to load-dependent control valves or automatic brake force controllers, if the axle suspension is compressed or extended past the normal distance.

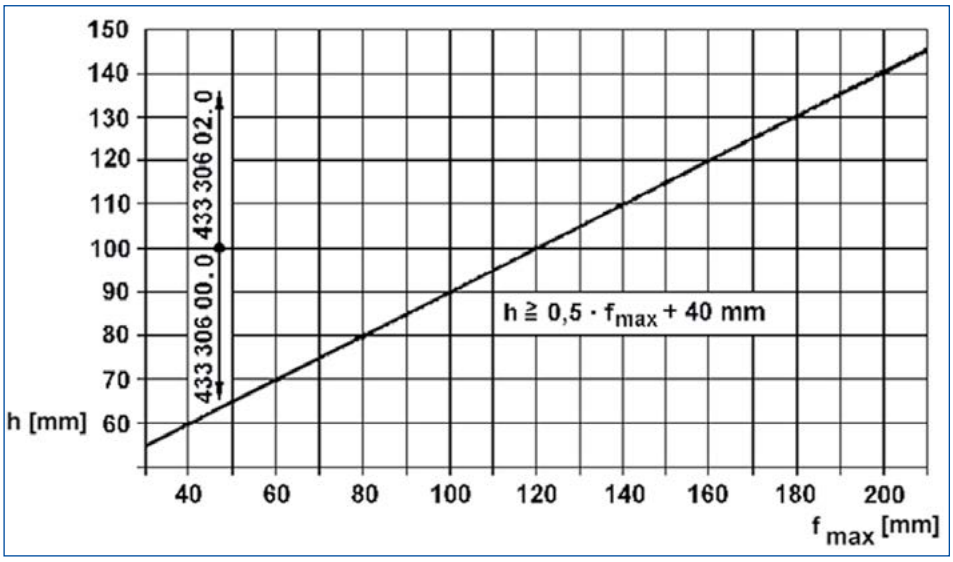
Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation regulations

– Choose the knuckle joint that guarantees that the path exceeding the adjustment range of the controller is not greater than the possible deflection h.

– For trailers – single and dual axle – take the dimension for the deflection h from the following diagram:



LEGEND			
h	Deflection	**f_{max}**	Max. spring deflection according to the specifications of the axle manufacturer

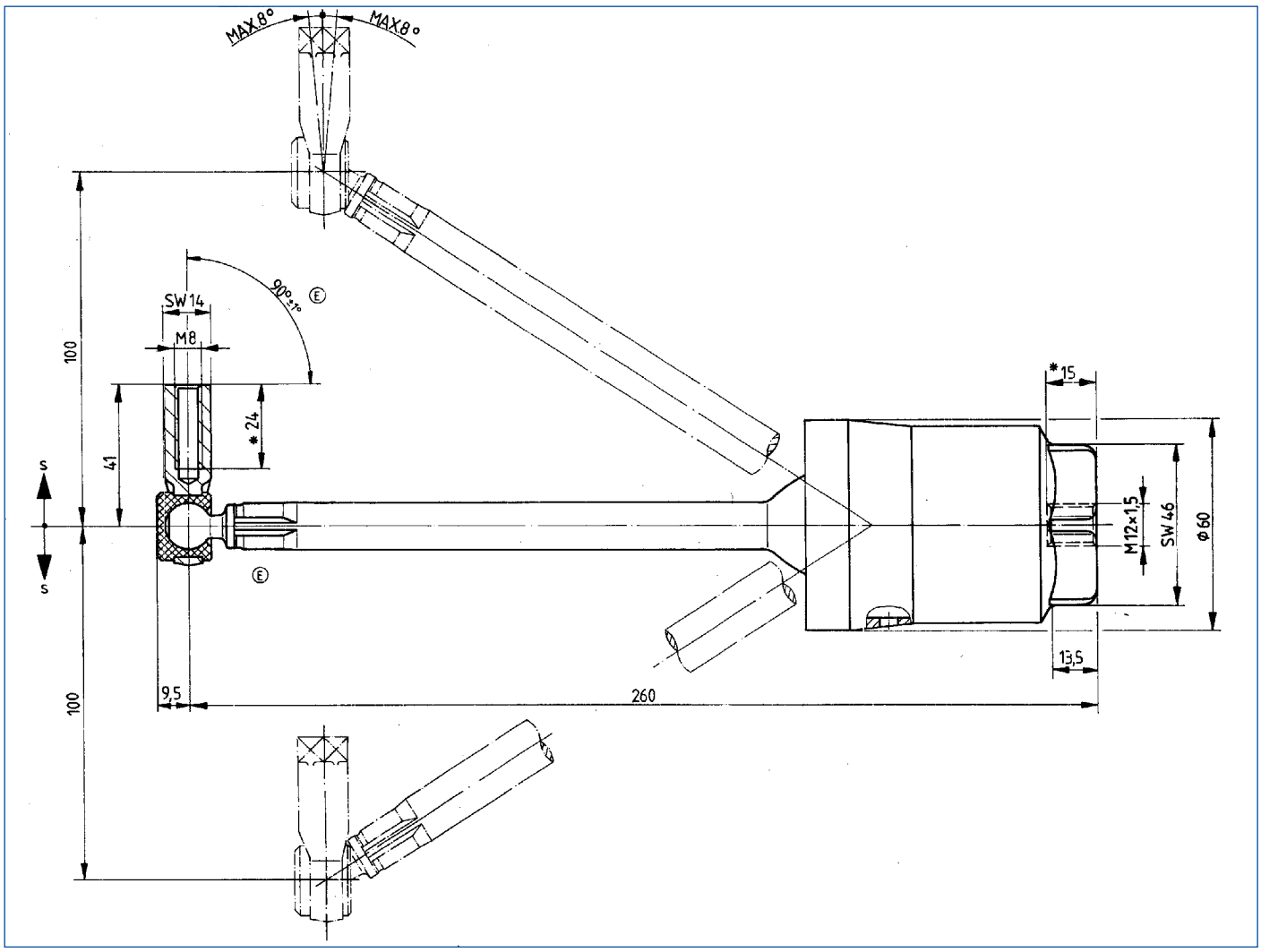
– Fasten the knuckle joint to the single axle or between the two axles of the dual-axle assembly based on the respective instructions of the axle manufacturer.
– Arrange the knuckle joint so that its ball joint is seated in the neutral point of the axle or axles. The "neutral point" is the point that is free of outside influence:
  - Twisting movement of the axle during braking procedure
  - Wandering in curves with steering axles
  - One-sided load on the axle with uneven streets

Only the static and dynamic axle changes are permitted to be the reason for adjusting the automatic load-sensing valve.

– Connect the knuckle joint through a round rod with an M8 thread and hexagon nut M8 DIN 934 (not included in delivery) with the adjustment lever of the automatic brake force controller. The length of this connection rod depends on the mounting of the devices on the vehicle.
– Depending on the existing fastening capabilities for the connecting rod of the load-sensing valve to be used, either leave the connecting rod smooth or apply an M8 thread of approx. 25 mm in length.
– Screw an M8 DIN 934 hexagon nut onto the thread.
– Screw the other end of the connecting rod into the ball joint and secure it with the hexagon nut.
– Carefully trim the smooth ends to prevent any damage to the rubber thrust members.

Knuckle joint 433 306

Installation dimensions



Technical data

ORDER NUMBER	LENGTH L [mm]	DEFLECTION h [mm]	DISPLACEMENT [N]	
			F_1	F_2
433 306 002 0	260	100	90	190

5.5 Linkage 433 401

433 401 003 0

Application

If threaded onto the axle.

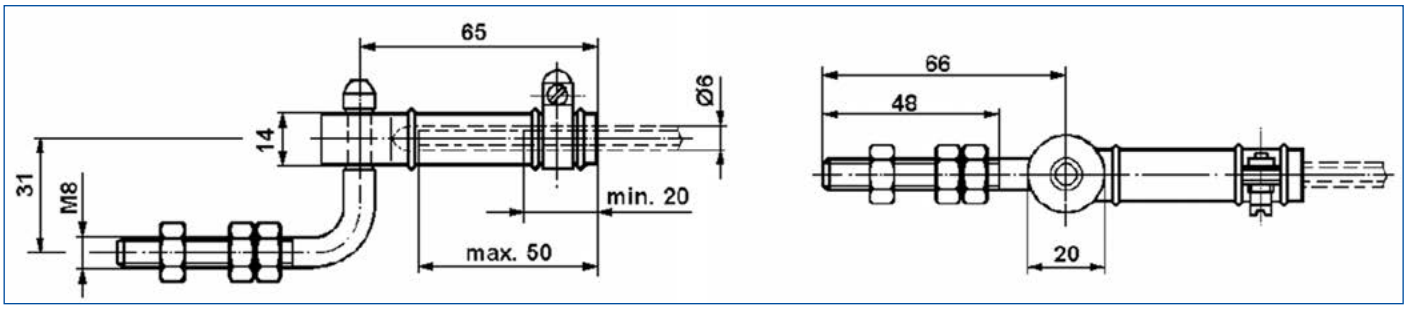
Purpose

A flexible rubber connection for the guiding the air suspension valve 464 006 XXX X or an ECAS height sensor.

Installation recommendation

– Use a flat iron to fasten the linkage on the vehicle axle.
The Ø 6 pipe for the connection between the two rubber sleeves (adjustment lever of the air suspension valve and the linkage) does not belong in the scope of delivery.

Installation dimensions



5.6 Check valve 434 014

Application

For multiple applications in compressed air systems.

Purpose

To protect the pressurised lines against unintentional venting.

Maintenance

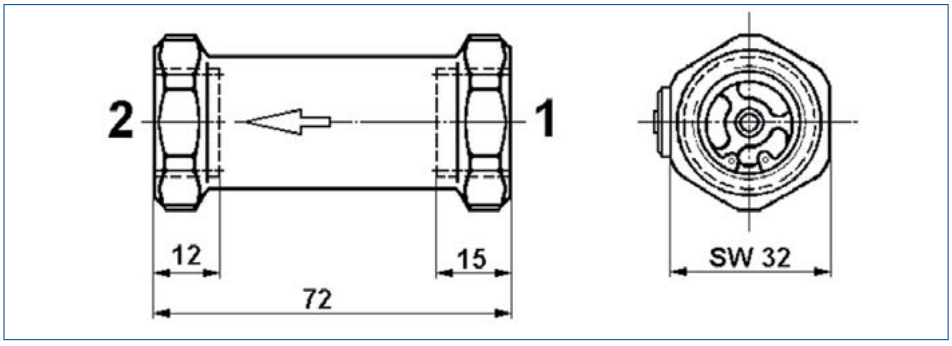
Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

– Install the valve anywhere in the piping.

Pay attention to the arrow on the housing that shows the direction of flow during the installation.

Installation dimensions



Technical data

ORDER NUMBERS	434 014 000 0	434 014 001 0
Max. operating pressure	20 bar	
Nominal diameter	Ø 8 mm	
Port threads	M 22x1.5	
Permissible medium	Air	
Thermal range of application	-40 °C to +80 °C	
Weight	0.17 kg	
Comment	–	Constant throttling Ø 1 mm

5.7 Charging valve 434 100

Application

Multiple applications in compressed air systems.

Purpose

Charging valve with backflow

Enabling of the passage for the compressed air to the 2nd compressed air reservoir only after the calculation pressure of the braking system in the 1st reservoir has been reached; as a result, the service brake system is ready for operation more quickly.

If the pressure drops in the 1st first reservoir, there is a feedback supply of air from the 2nd reservoir.

Charging valve without backflow

Residual pressure maintenance in lifting bellows of a lifting axle to prevent the bellows from wrinkling when the lifting axle is lowered. The passing of compressed air to auxiliary equipment (e. g. door actuation, auxiliary and parking braking systems, servo clutch, etc.) only when the rated pressure for the braking system has been reached.

Charging valve with limited backflow

The passing of compressed air to other consumers (e. g. auxiliary and parking braking systems) only when the rated pressure for the braking system has been reached. Also the protection of pressure for the towing vehicle in the event of the trailer's supply line failing.

If the pressure in the air reservoirs for the service braking system drops, some of the compressed air flows back until the closing pressure (which is dependent on the charging pressure) is attained.

Maintenance

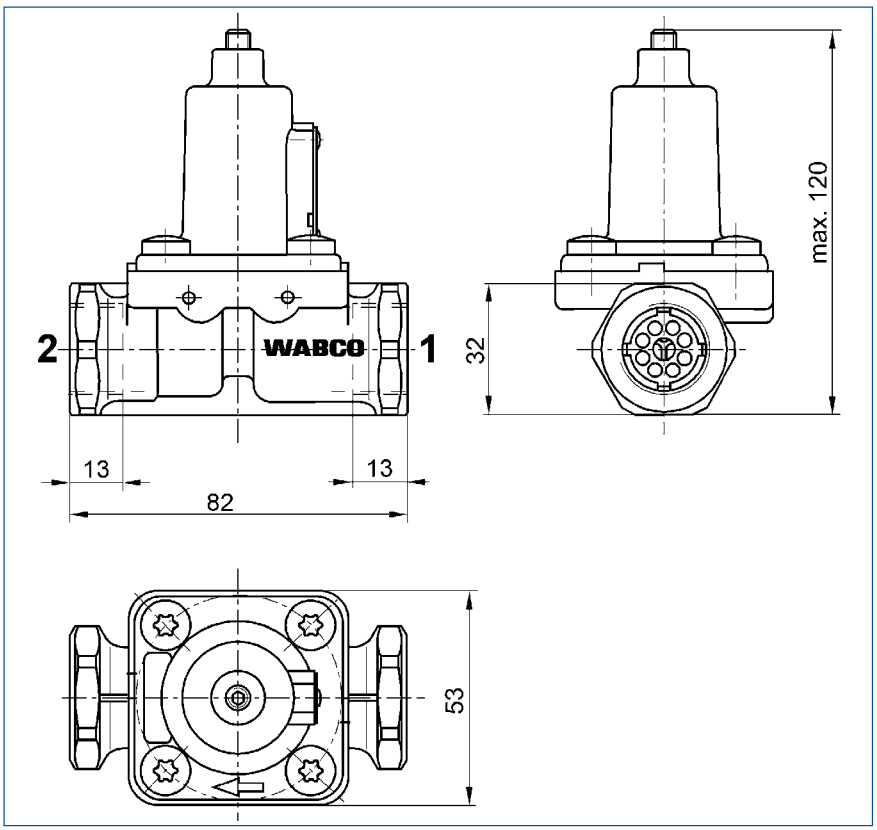
Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

– Install the charging valve anywhere in the piping.

Pay attention to the arrow on the housing that shows the direction of charge flow during the installation.

Installation dimensions



CONNECTIONS			
1	Energy supply	**2**	Energy discharge

Technical data

ORDER NUMBERS	434 100 XXX 0
Max. operating pressure	13 bar
Nominal diameter	Ø 8 mm
Port threads	M 22x1.5
Permissible medium	Air
Thermal range of application	-40 °C to +80 °C
Weight	0.45 kg

ORDER NUMBER	VALVE TYPE	CHARGING PRESSURE (TOLERANCE -0.3 bar)
434 100 024 0	with backflow	6.0 bar
434 100 027 0	with backflow	0.5 bar
434 100 122 0	without backflow	4.5 bar
434 100 124 0	without backflow	5.5 bar
434 100 125 0	without backflow	6.0 bar
434 100 126 0	without backflow	6.5 bar
434 100 222 0	with limited backflow	6.2 bar (Closing pressure = Charging pressure -15 %)

5.8 Two-Way Valve 434 208

Application

Multiple applications in compressed air systems.

Towing vehicle example: Actuation of brake cylinder with braking system or ASR system.

Trailer example: Control of another axle with higher braking pressure of Trailer EBS.

Purpose

The output pressure increase controlled from two separate inputs.

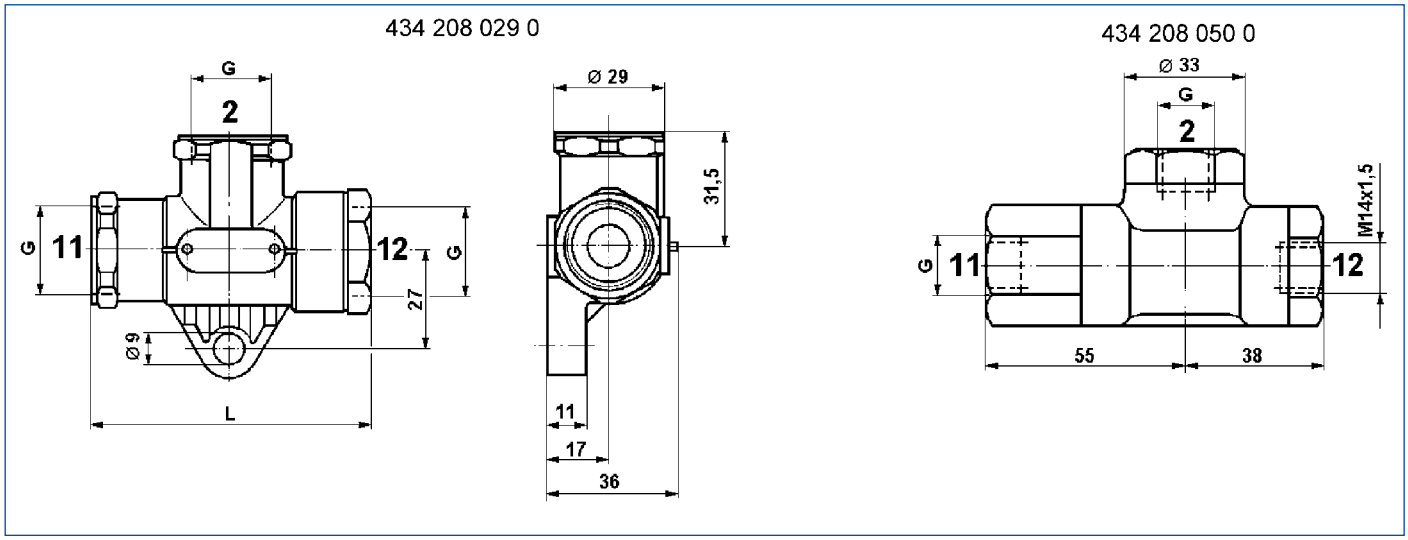
Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

– Install the two-way valve with connections 11 and 12 horizontally (see DIN 74 341) loose in the pipe line.

Installation dimensions for 434 208 029 0 and 434 208 050 0



LEGEND							
2	Energy discharge	**11**	Energy supply	**12**	Energy supply	**G**	Thread

Technical data

ORDER NUMBER	434 208 029 0	434 208 028 0	434 208 050 0
Max. operating pressure	10 bar		
Install dimension L	76 mm		93 mm
Nominal diameter	Ø 12 mm		Ø 10.5 mm
Port threads	M 22x1.5 - 12 deep	M 16x1.5 - 12 deep	
Permissible medium	Air		
Thermal range of application	-40 °C to +80 °C		
Max. tightening torque	53 Nm		
Weight	0.15 kg		0.39 kg

5.9 Pressure switch 441 009 / 441 014

5.9.1 Pressure switch 441 009

Application

Multiple applications in compressed air systems. Separate housing, switches exclusively to ground.

Purpose

The pressure switch is used for switching electrical devices or indicator lights on or off.

Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

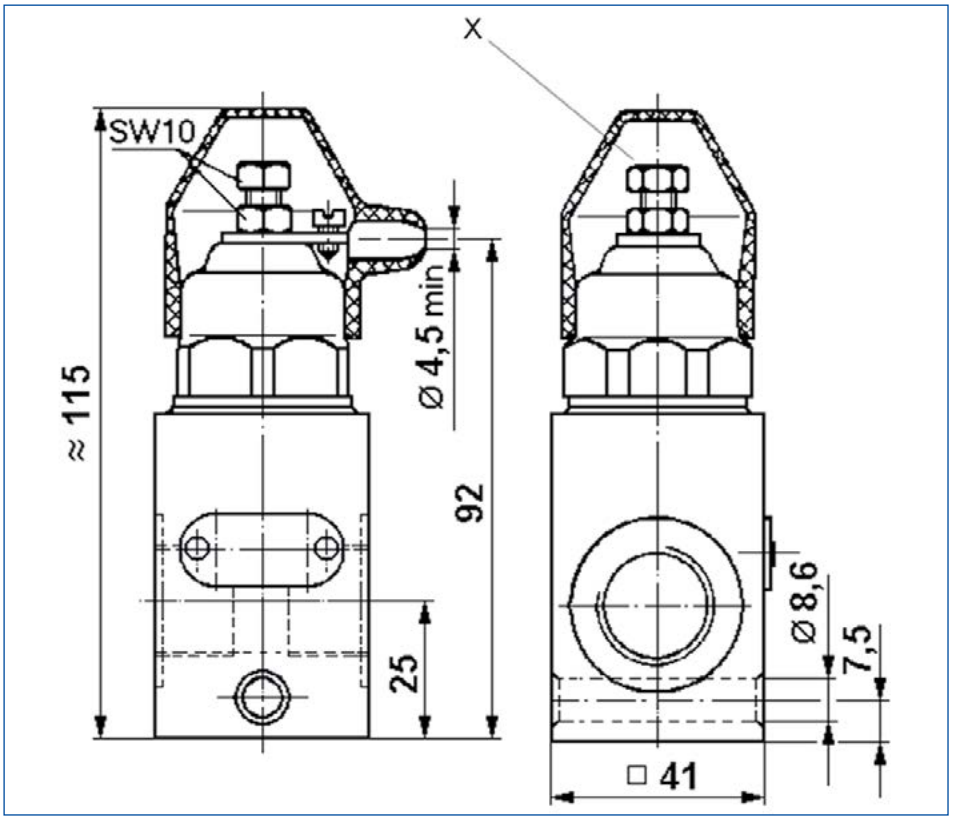
Installation recommendation

– Install the 1-pin pressure switch in any location in the pressure line.
– Fasten the pressure switch with one M8 bolt.

Make sure that fastening is made to a proper ground contact (do not fasten to plastic parts).

– Attach a cable eyelet to the cable to be connected.

Installation dimensions

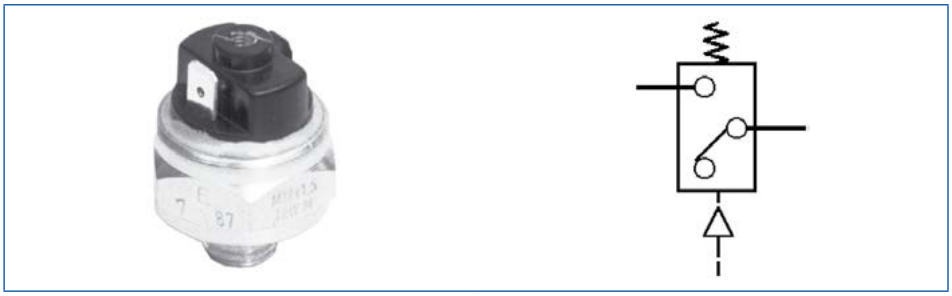


LEGEND	
X	Adjusting screw

Technical data

ORDER NUMBER	441 009 001 0 ON SWITCH	441 009 101 0 OFF SWITCH
Max. operating pressure	10 bar	
Actuating pressure	set to 5.0 ±0.2 bar	
	can be adjusted from 1.0 to 5.0 bar	
Port threads	M 22x1.5	
Max. operating voltage (DC voltage)	30 V	
Max. electrical breaking capacity with inductive load and direct current	2 A	
Permissible medium	Air	
Thermal range of application	-40 °C to +80 °C	
Weight	0.22 kg	

5.9.2 Pressure switch 441 014



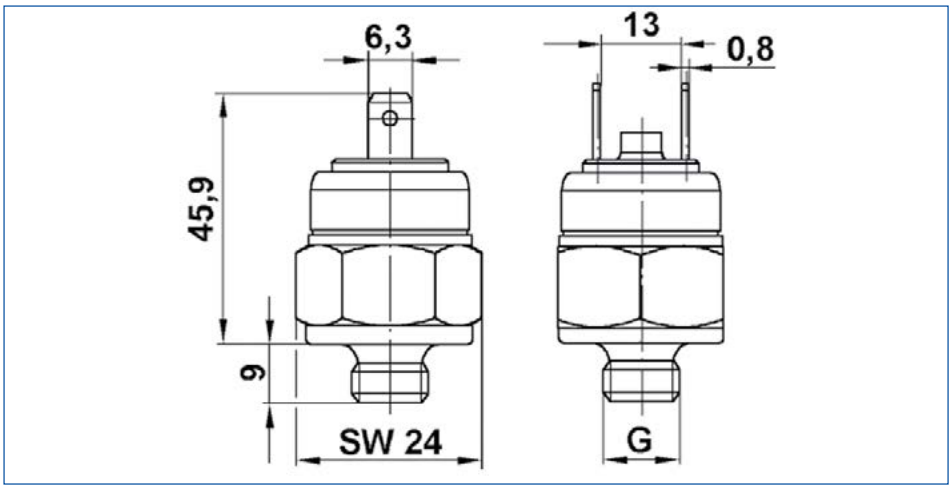
Application

Multiple applications in compressed air systems.

Purpose

The pressure switch is used, depending on the version, for switching electrical devices or indicator lights on or off.

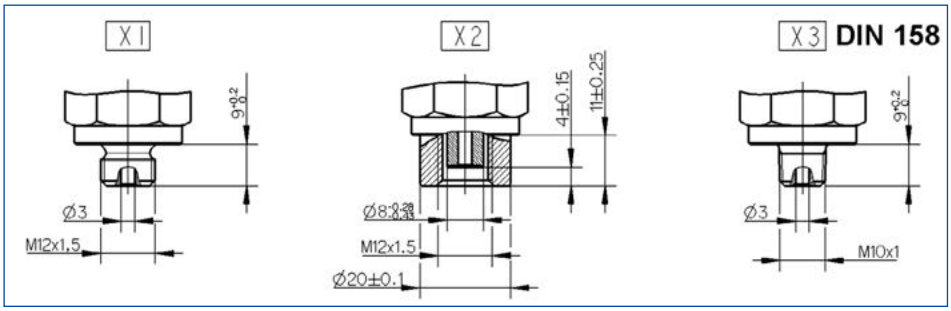
Installation dimensions



Technical data

ORDER NUMBER	441 014
Max. operating pressure	12 bar
Voltage	12 V / 24 V
Max. electrical switching capacity at ohmic load	30 W
Max. electrical switching capacity at relay load	5 W
Permissible medium	Air
Thermal range of application	-40 °C to +80 °C

Variants



ORDER NUMBER	SWITCHING PRESSURE(BAR)	TYPE	COLOUR	CONNECTION THREAD
441 014 001 0	2.0 ± 2.0	NOC	Red	X1
441 014 002 0	1.0 ± 0.2	NOC	Red	X3
441 014 004 0	5.5 ± 0.6	NCC	Green	X1
441 014 005 0	2.0 ± 0.2	NOC	Red	X3
441 014 006 0	2.0 ± 0.2	NCC	Green	X1
441 014 007 0	3.0 ± 0.3	NOC	Red	X3
441 014 008 0	4.2 ± 0.4	NCC	Green	X3
441 014 009 0	4.0 ± 0.4	NOC	Red	X3
441 014 010 0	0.3 ± 0.1	NCC	Green	X1
441 014 012 0	3.5 ± 0.4	NCC	Green	X1
441 014 013 0	4.1 ± 0.4	NCC	Green	X1
441 014 014 0	4.5 ± 0.5	NCC	Green	X1
441 014 015 0	5.0 ± 0.5	NCC	Green	X1
441 014 017 0	4.0 ± 0.4	NOC	Red	X1
441 014 018 0	1.2 ± 0.2	NCC	Green	X1
441 014 019 0	0.15 ± 0.1	NOC	Red	X1
441 014 020 0	2.0 ± 0.2	NCC	Green	X3
441 014 021 0	0.5 ± 0.15	NOC	Red	X1
441 014 022 0	6.0 ± 0.6	NOC	Red	X1
441 014 023 0	2.5 ± 0.3	NOC	Red	X1
441 014 024 0	1.0 ± 0.2	NOC	Red	X1
441 014 025 0	6.0 ± 0.6	NCC	Green	X1
441 014 026 0	4.5 ± 0.5	NOC	Red	X1
441 014 029 0	5.0 ± 0.5	NOC	Red	X1
441 014 032 0	5.2 ± 0.5	NCC	Green	X1
441 014 040 0	3.0 ± 0.3	NOC	Red	X1
441 014 061 0	5.7 ± 0.6	NCC	Green	X1
441 014 072 0	6.6 ± 0.6	NCC	Green	X1
441 014 073 0	5.5 ± 0.6	NOC	Red	X1
441 014 100 0	0.15 ± 0.1	NOC	Red	X2
441 014 101 0	4.5 ± 0.5	NCC	Green	X2
441 014 102 0	5.5 ± 0.6	NCC	Green	X2
441 014 104 0	0.5 ± 0.15	NOC	Red	X2
441 014 105 0	5.7 ± 0.6	NCC	Green	X2

5.10 Pressure sensor 441 044

Application

Multiple applications in compressed air systems for monitoring pressure.

Purpose

Conversion of a pneumatic pressure valve into an analogue electrical signal that can be evaluated by controller electronics.

Technical data

ORDER NUMBER	441 044 102 0
Max. operating pressure	10 bar
Electrical connection	Bayonet (DIN), DIN 72585-A1-3.1-Sn/K2
Port threads	M 16x1.5
Thermal range of application	-40 °C to +80 °C
Permissible medium	Air
Voltage	8 - 32 V DC
Sensitivity	400 mV/bar
Ring seal	897 770 250 4
Weight	0.03 kg

5.11 Shut-off cock with venting 452 002 / 952 002

452 002 XXX X

952 002 XXX X

Application

Multiple applications in compressed air systems.

Purpose

Shutting off compressed air lines.

Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

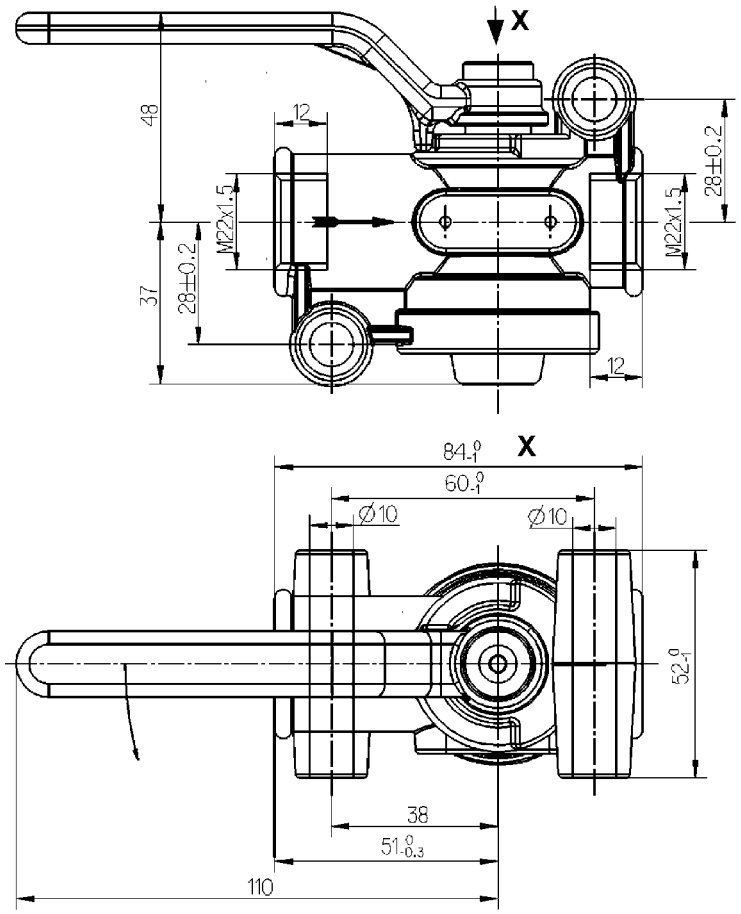
– Fasten the shut-off valve with two M8 screws.

Make sure of the flow direction (arrow direction) when installing and that there is sufficient room for actuating the lever.

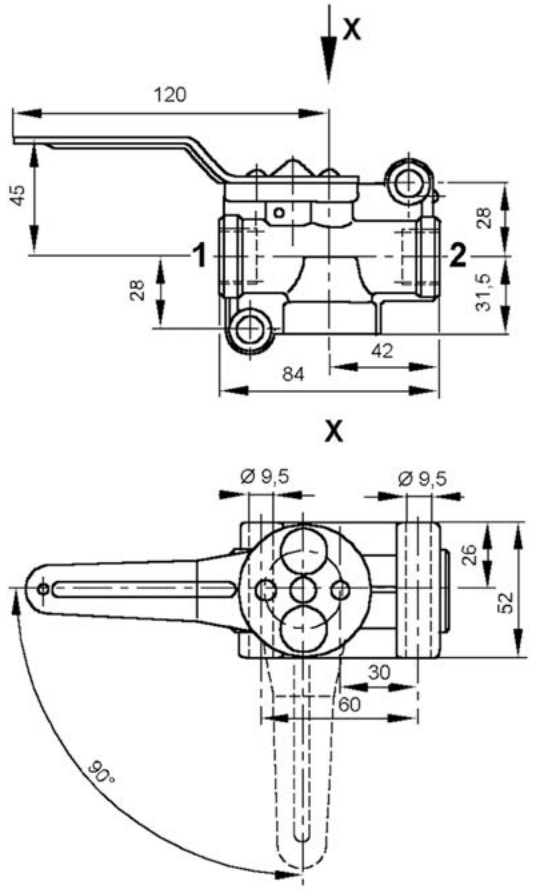
Shut-off cock with venting 452 002 / 952 002

Installation dimensions for 452 002 131 0 and 952 002 000 0

452 002 131 0



952 002 000 0



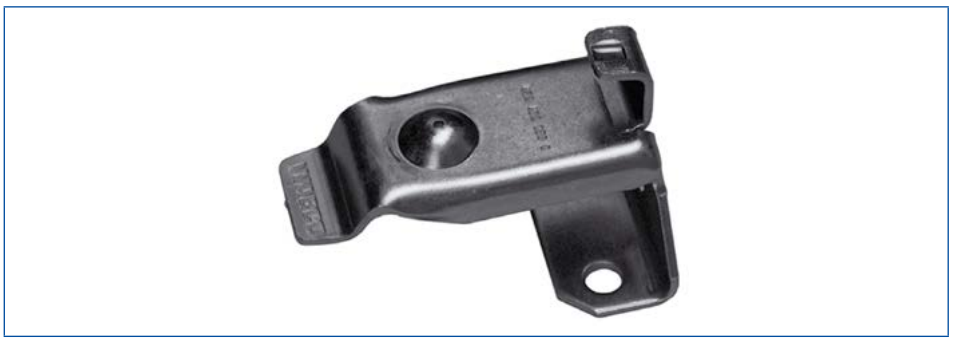
LEGEND
View X

Technical data

ORDER NUMBER	452 002 131 0	452 002 132 0	452 002 133 0	952 002 000 0
Max. operating pressure	10 bar			
Port threads	M 22x1.5 - 12 deep			
Lever actuation a/b	90°			
Permissible medium	Air			
Thermal range of application	-40 °C to +80 °C			
Weight	0.26 kg			0.58 kg

SHUT-OFF COCK	90° LEFT	0°	90° RIGHT
452 002 131 0	closed	open	closed
452 002 132 0	vented	charged	vented
452 002 133 0	closed	charged	vented
952 002 000 0	closed	open	closed

5.12 Dummy coupling with fastening 452 402



Application

Semitrailer tractors and drawbar trailers.

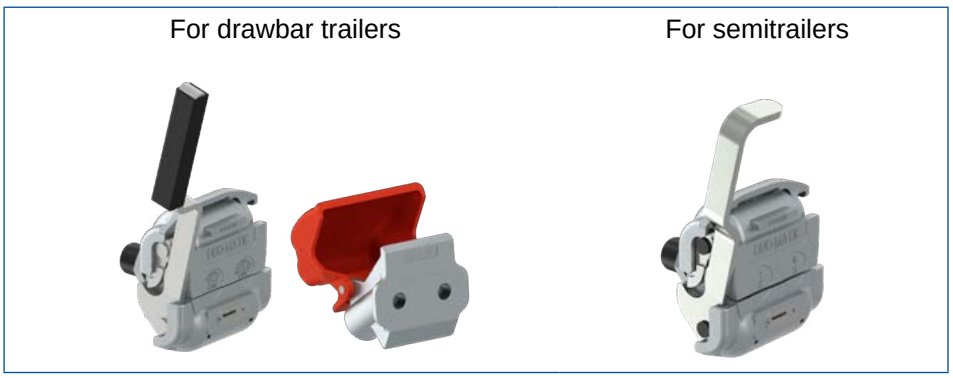
Purpose

Holder for disconnected brake lines with coupling head.

Technical data

ORDER NUMBER	452 402 000 0	452 402 002 0
For coupling heads	452 200 / 952 200	452 201
Weight	0.3 kg	

5.13 Duo-Matic quick-coupling 452 80X



Application

Connection of towing vehicle and trailer instead of using hose couplers

Purpose

Connect the air braking system of the motor vehicle with the braking system of the trailer.

With Duo-Matic quick-couplings, the trailer vehicles can be coupled quicker and more securely than with standard coupling heads.

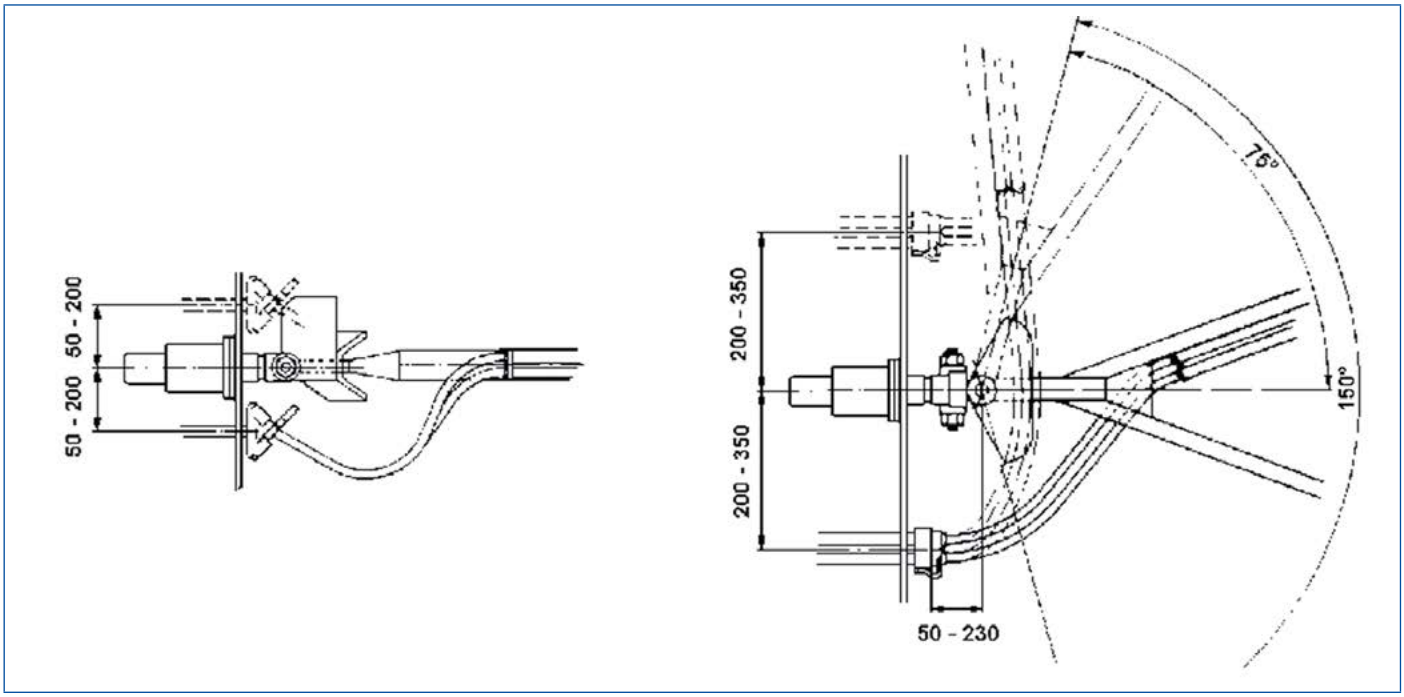
Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

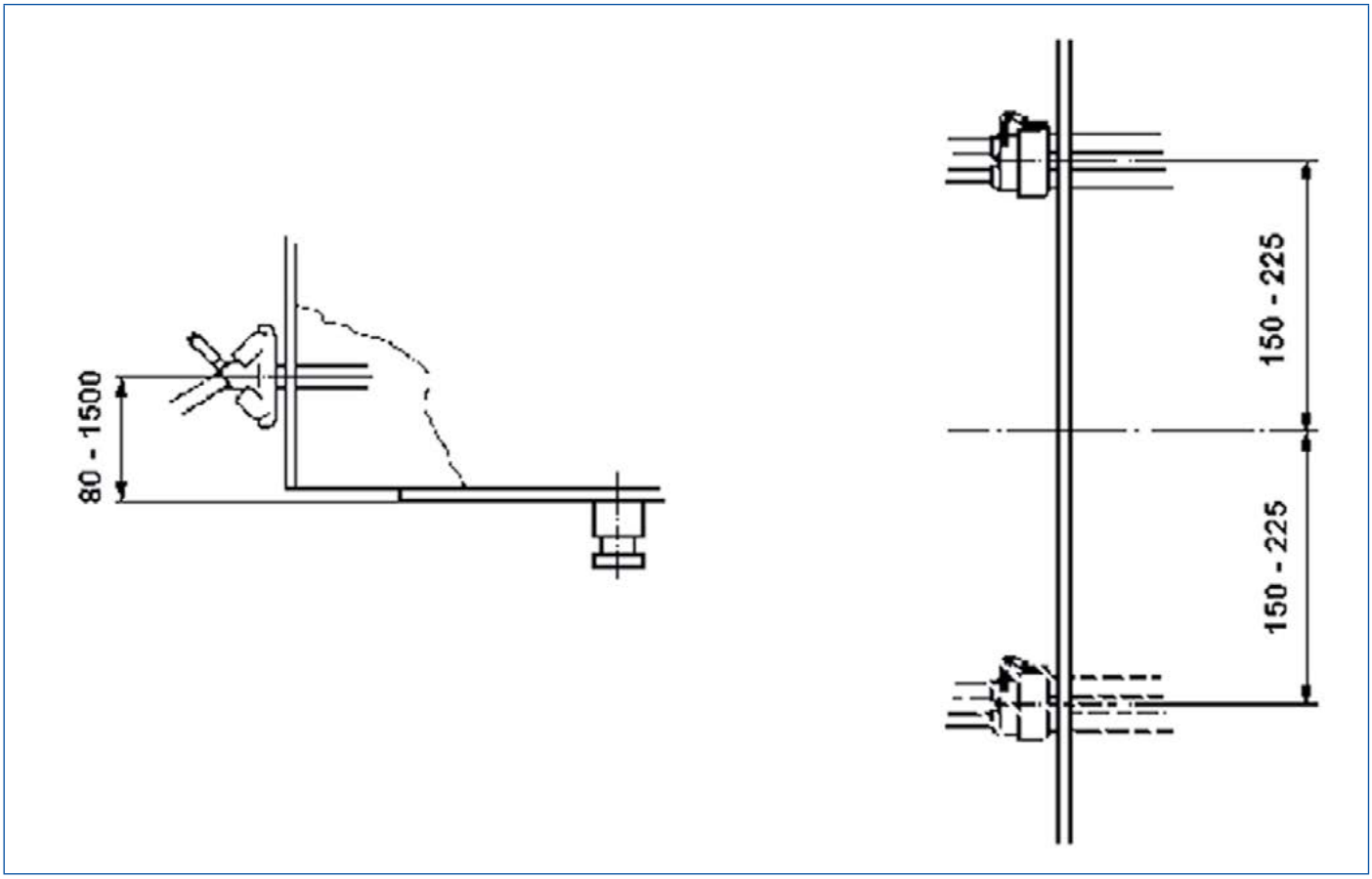
Installation recommendation

– Install the Duo-Matic quick-coupling according to ISO 1728 (see following installation diagram).

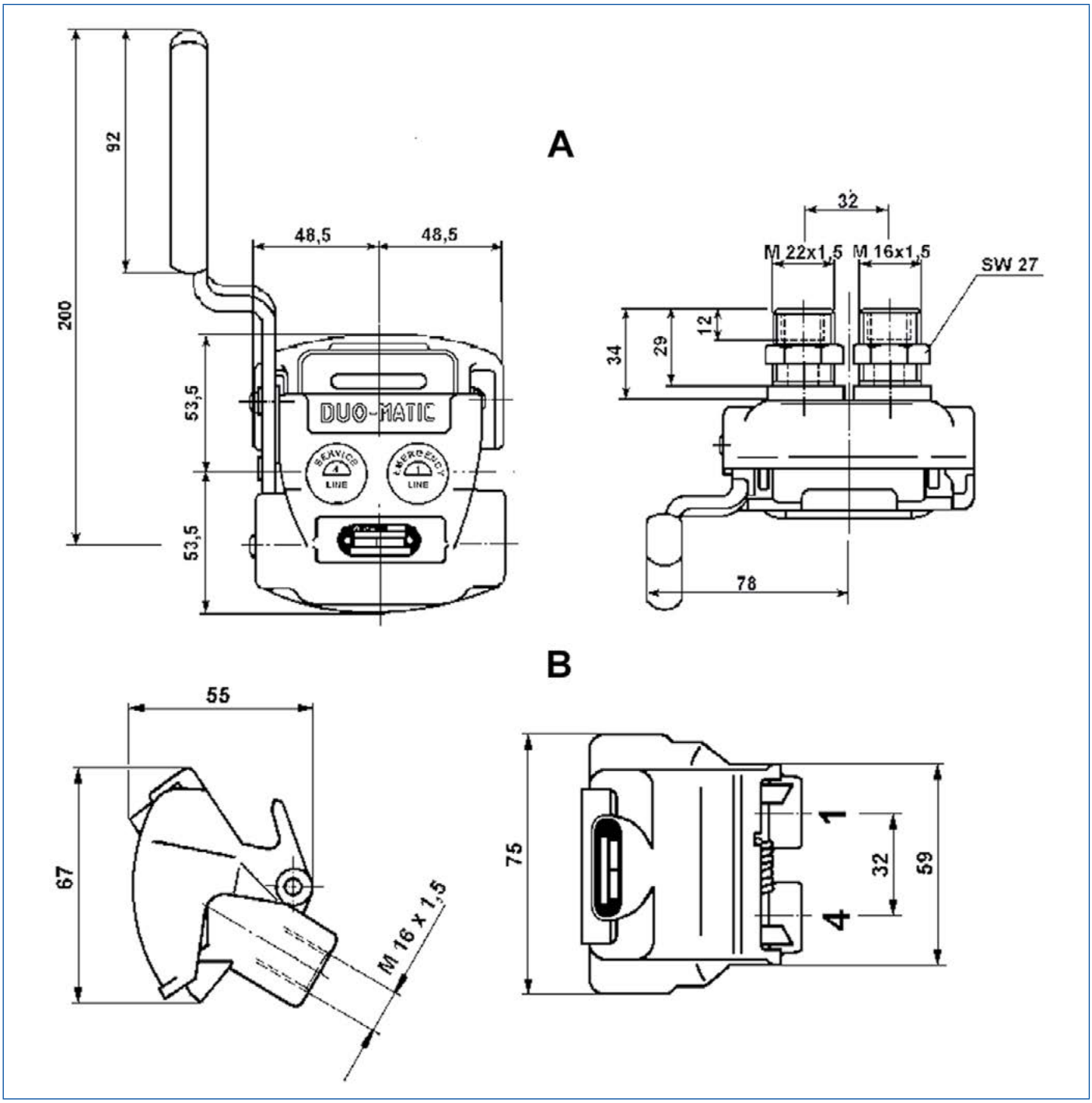
Installation diagram for drawbar trailers



Installation diagram for semitrailers

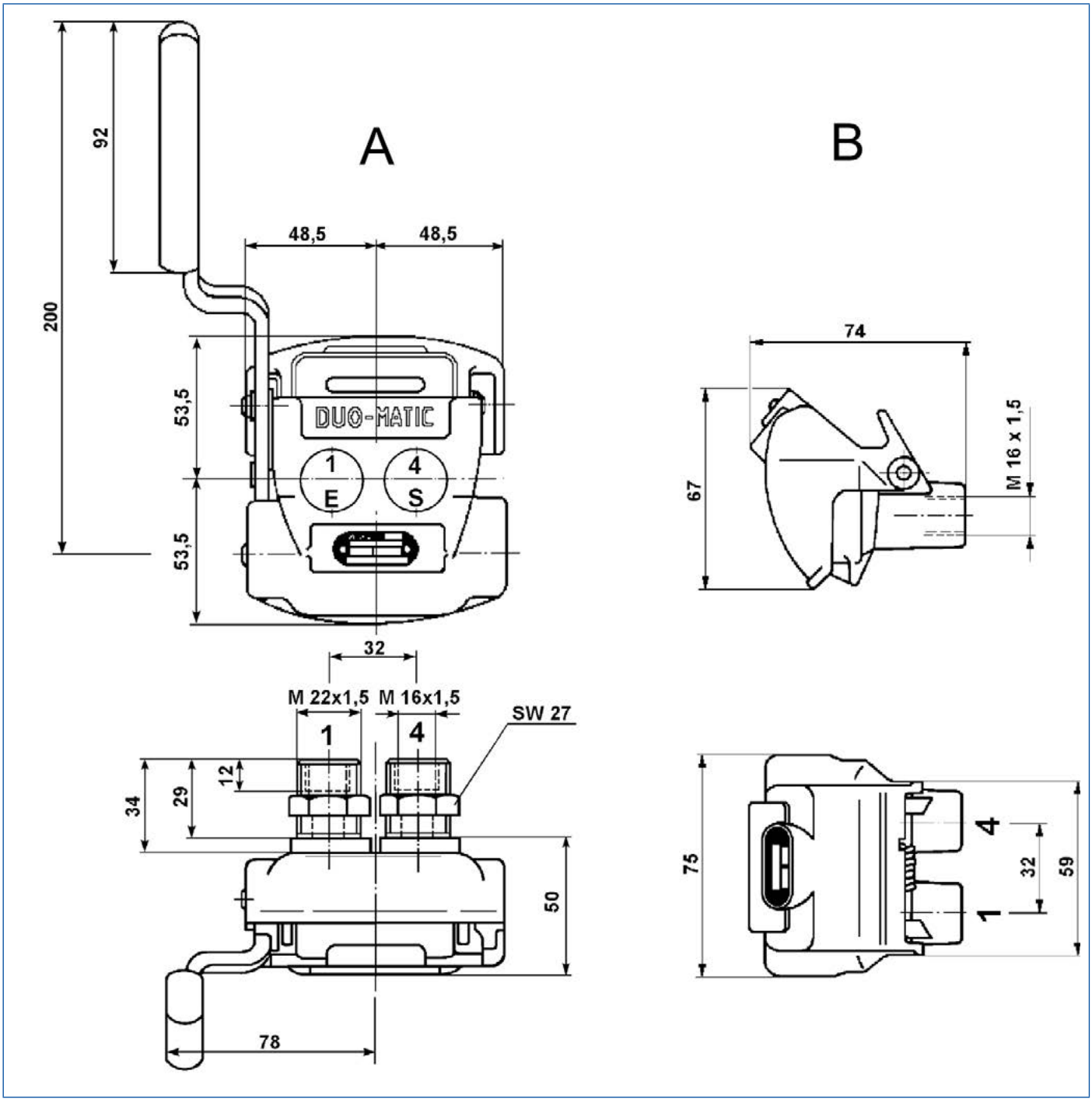


Installation dimensions for drawbar trailers



LEGEND							
1	Energy supply	**4**	Control connection	**A**	Vehicle part	**B**	Drawbar trailer part

Installation diagram for semitrailers



LEGEND							
1	Energy supply	**4**	Control connection	**A**	Vehicle part	**B**	Semitrailer part

Technical data

ORDER NUMBER	FOR DRAWBAR TRAILERS		FOR SEMITRAILERS			
	452 802 009 0	452 804 012 0	452 803 005 0	452 805 004 0	452 802 007 0	452 803 004 0
	VEHICLE PART	DRAWBAR TRAILER PART	SEMITRAILER PART	VEHICLE PART	SEMITRAILER PART	VEHICLE PART
Quick connector	No		No		Yes	
Max. operating pressure	10 bar		10 bar			
Nominal diameter	9 mm		9 mm			
Permissible medium	Air		Air			
Thermal range of application	-40 °C to +80 °C		-40 °C to +80 °C			
Weight	1.0 kg	0.2 kg	1.0 kg	0.3 kg	1.08 kg	1.17 kg

5.14 Rotary slide valve 463 032

463 032 1XX 0

Application

Air-suspension vehicles with conventional control. With air-suspension with suspension paths of > 300 mm, a version of deadman switch is required (variants 463 032 1XX 0).

Purpose

Control of lifting and lowering air-suspension vehicles with a hand lever.

On variants with deadman switch, the hand lever is automatically moved back into idle position when it is released to prevent accidents.

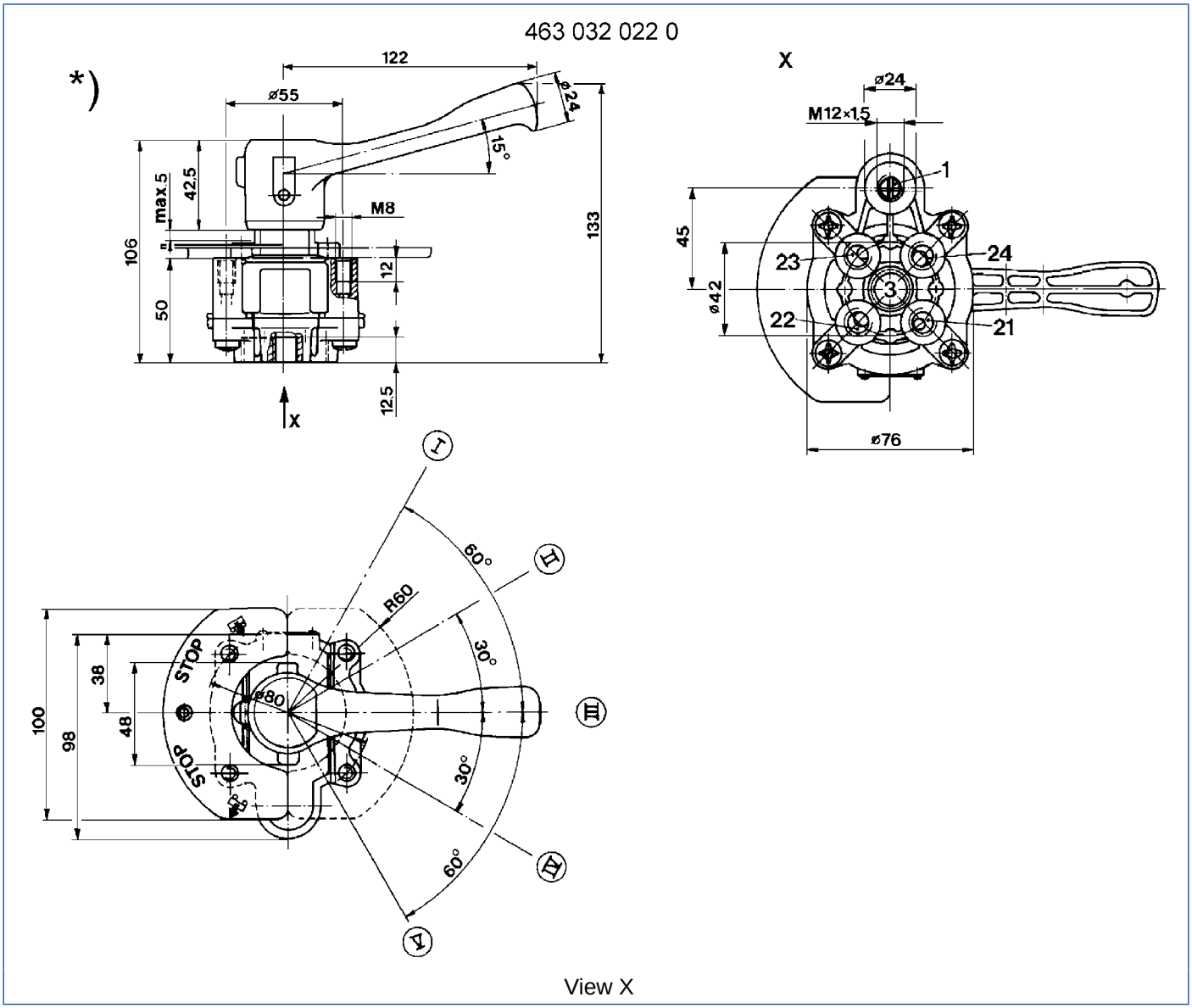
Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

- Install the rotary slide valve vertically so that the vent 3 points downward.
- Fasten the rotary slide valve with two M8 bolts.
- Attach the provided sign displaying the lever settings under the lever (see following installation dimensions as well).

Installation dimensions for 463 032 022 0

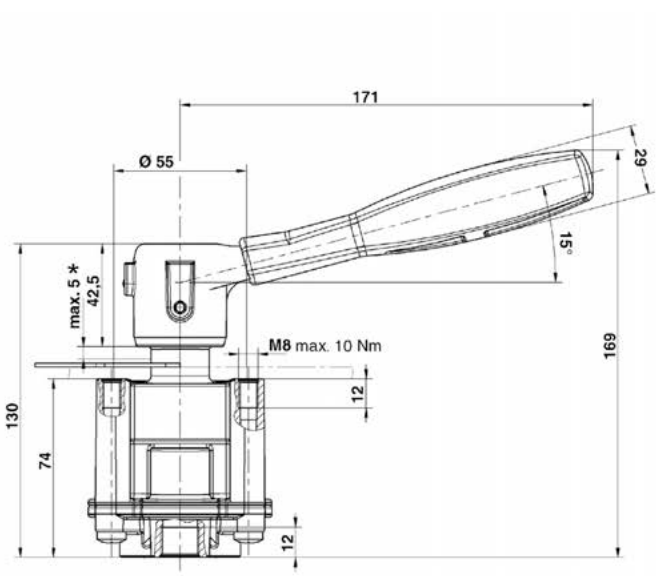


View X

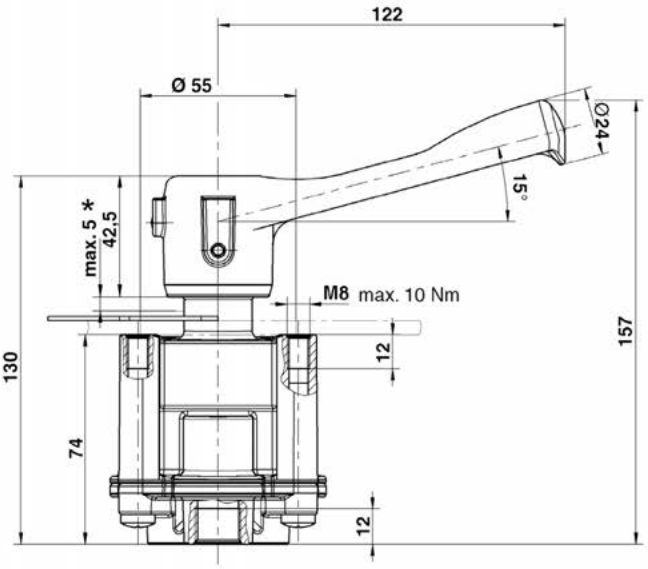
LEGEND							
1	Reservoir	**3**	Venting	**21**	Levelling valve	***)**	Valve marked as closed: By pressing the button down, the blockage is released.
22	Air suspension bellows	**23**	Levelling valve	**24**	Air suspension bellows		

Installation dimensions for 463 032 120 0 and 463 032 130 0

463 032 120 0



463 032 130 0



LEGEND	
*	Stroke for park position

Technical data

ORDER NUMBER	463 032 020 0	463 032 120 0	463 032 130 0	463 032 220 0	463 032 023 0
Max. operating pressure	10 bar	8.5 bar		10 bar	
Nominal diameter	21, 23 = 12.6 mm² (Ø 4 mm) 22, 24 = 28.3 mm² (Ø 6 mm) 1, 3 = 63.6 mm² (Ø 9 mm)				1-circuit variant 21 = 12.6 mm² 22 = 28.3 mm² 1, 3 = 63.6 mm²
Port threads	M 12x1.5-12 deep 1 = M 16x1.5-12 deep			M 12x1.5 -12 deep 1 = M 16x1.5 -12 deep	M 12x1.5 - 12 deep
Integrated check valve (port 1)	yes	no		yes	
Permissible medium	Air				
Thermal range of application	-40 °C to +80 °C				
Max. actuation torque	7 Nm	9 Nm		7 Nm	7 Nm
Weight	1.4 kg	1.5 kg		1.4 kg	1.4 kg
Quickfit connections	–	–	–	5x Ø8x1	–

5.15 3/2 directional control valve 463 036

Application

Multiple applications in compressed air systems. Switching connected devices on and off manually.

Purpose

Alternating the connections for operational lines (devices) with the pressure line or the venting line, whereby the valve is seated in both positions.

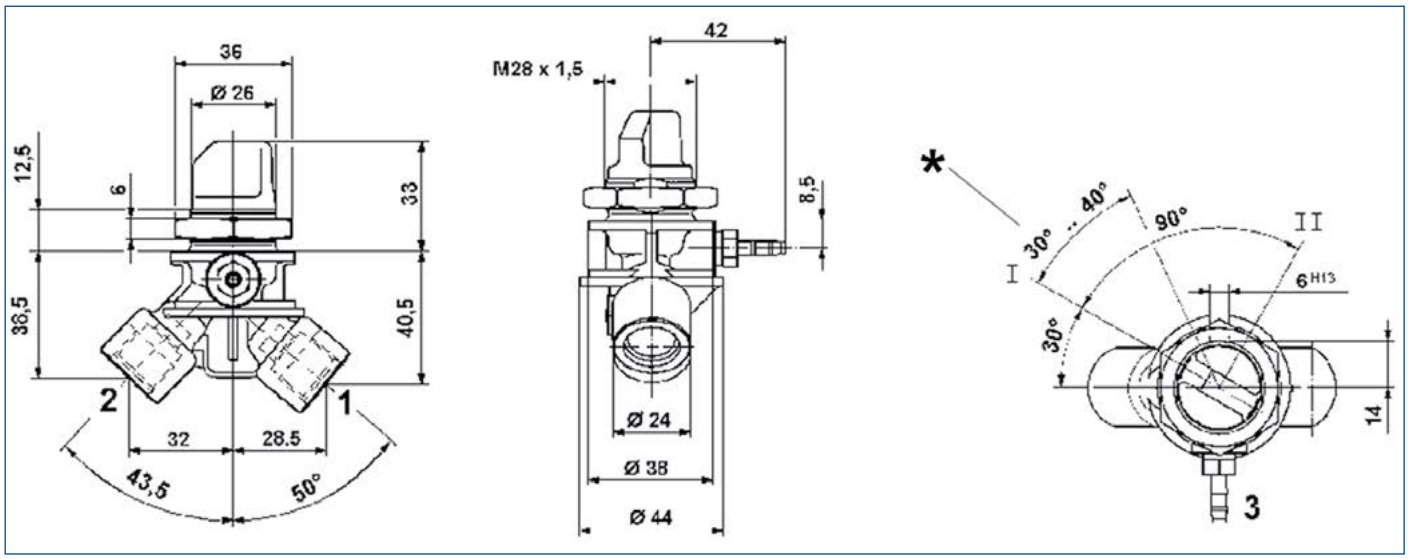
Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

- Install the 3/2-way valve in the pipe line system so that the vent 3 points downward.
- Fasten the 3/2-way valve on a bracket (hole Ø 28) with counternut M 28x1.5.

Installation dimensions



CONNECTIONS						LEGEND	
1	Energy supply	2	Energy discharge	3	Venting	*	Ventilation begin

Technical data

Order number	463 036 016 0
Max. operating pressure	10 bar
Port threads	M 16x1.5 - 12 deep for VOSS plug connection
Nominal diameter	4 mm
Permissible medium	Air
Thermal range of application	-40 °C to +80 °C
Weight	0.25 kg

5.16 Lifting axle control valve 463 084

5.16.1 2-circuit lifting axle control valve 463 084 0XX 0

463 084 000 0

mechanical

463 084 010 0

electric

463 084 020 0

pneumatic

Application

Semitrailer or drawbar trailer with lifting axle.

Control conventional or via ECAS / Trailer EBS

Purpose

The lifting axle compact valve is responsible for lowering or lifting the lifting axle(s) manually and again automatically, as soon as the axle(s) that are down have reached their maximum permissible load.

Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

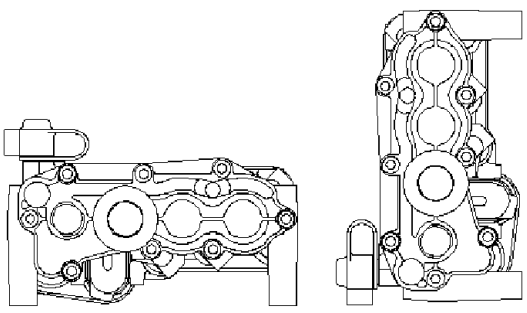
Installation recommendation

– Fasten the lifting axle control valve using the three stud bolts M6 (A = tightening torque 10 Nm) or with two bolts M8 (B = tightening torque 20 Nm), see following figure "Installation position".
The unit is equipped with 9 mm holes for mounting.

Installation position

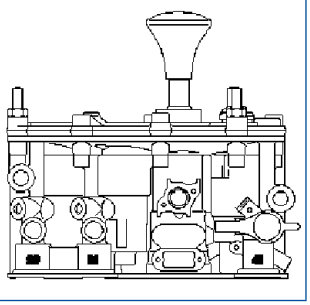
Optionally A, B

Top view

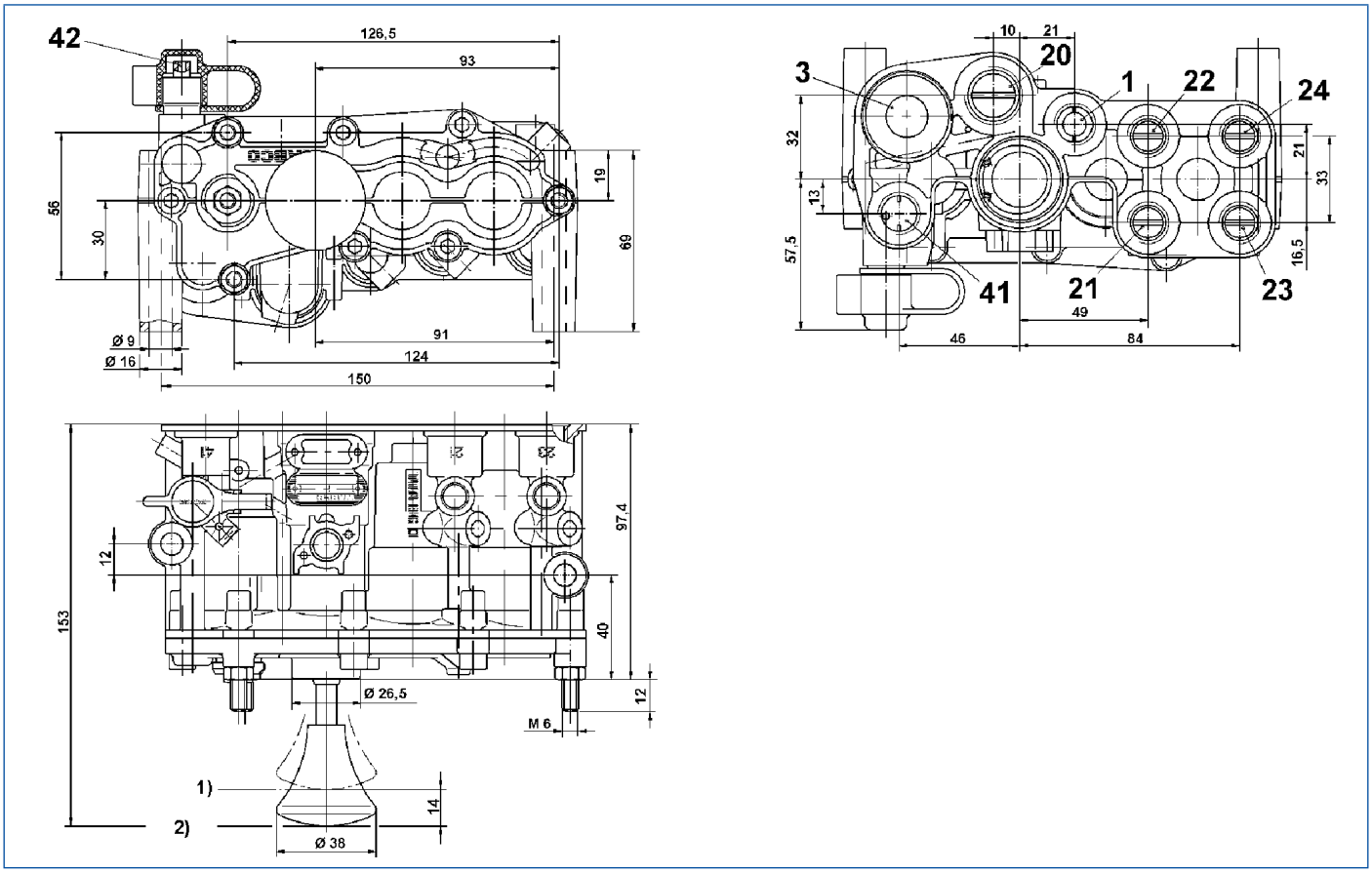


Only A

Front view



Installation dimensions for 463 084 000 0

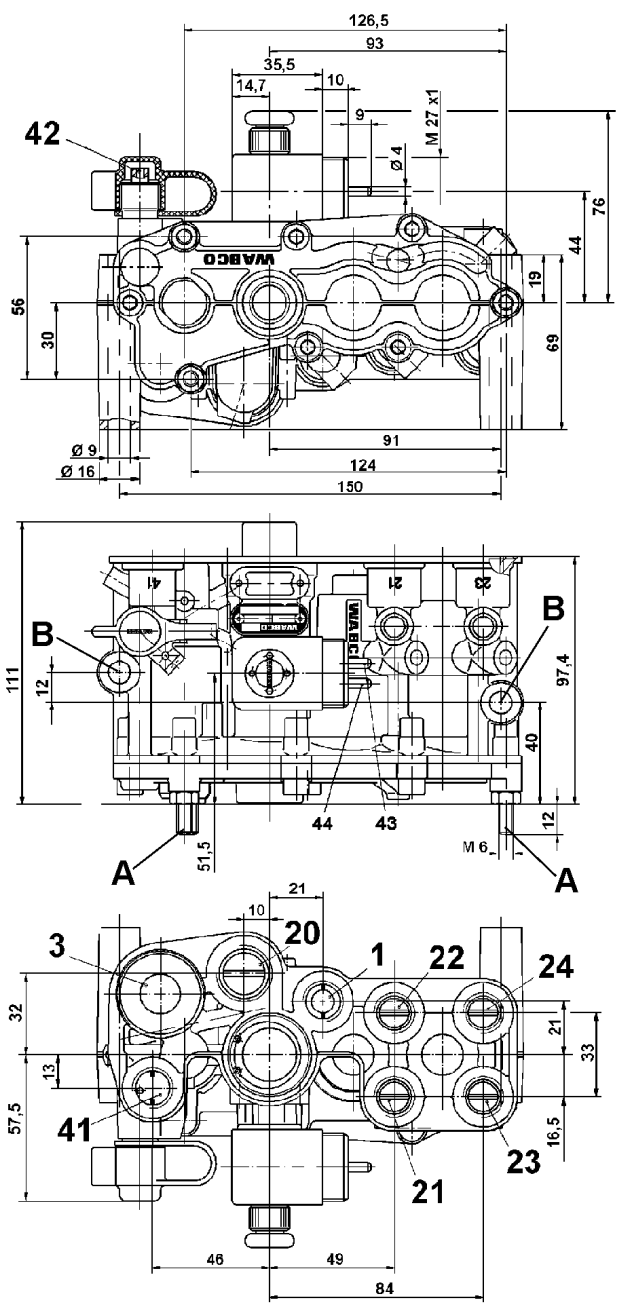


LEGEND			
1)	Lifting	**2)**	Lowering

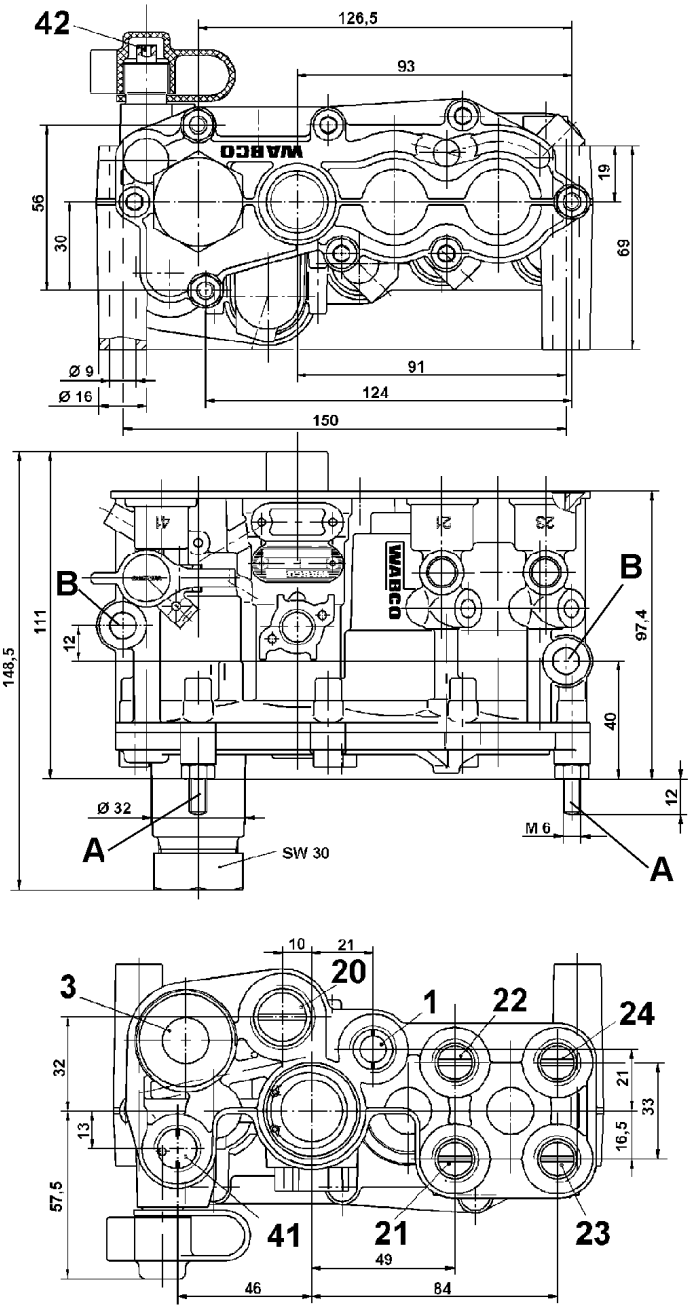
CONNECTIONS				PORT THREADS	
1	Supply	**3**	Venting	**1, 21, 22, 23, 24, 41**	M 16x1.5
20	Port lifting bellow	**21, 23**	Air-suspension bellows "Vehicle"	**20**	M 22x1.5
22, 24	Air-suspension bellows "Lifting axle"	**41**	Damping volume	**42**	M 16x1.5 (ISO 3583)
42	Test valve for setting the switching pressures				

Installation dimensions

463 084 010 0



463 084 020 0



LEGEND			
A	Stud bolt	**B**	Screw

CONNECTIONS				PORT THREADS	
1	Supply	**3**	Venting	**1, 21, 22, 23, 24, 41**	M 16x1.5
20	Port lifting bellow	**21, 23**	Air-suspension bellows "Vehicle"	**20**	M 22x1.5
22, 24	Air-suspension bellows "Lifting axle"	**41**	Damping volume	**42**	M 16x1.5 (ISO 3583)
42	Test valve for setting the switching pressures				

Setting instructions

After the valve has been installed according to the fixing instruction and the scheme, the adjustment of the switch pressure has to be made.

circuit diagrams

- Open the WABCO website www.wabco-auto.com.
- Click on Product Catalogue INFORM => Product number.
- Enter the number of the desired circuit diagram into the search field.
- Click on the Start button.

Figure 1

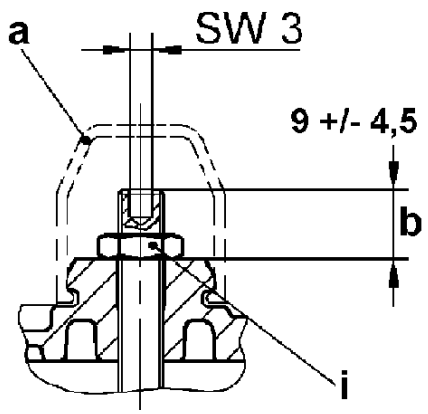
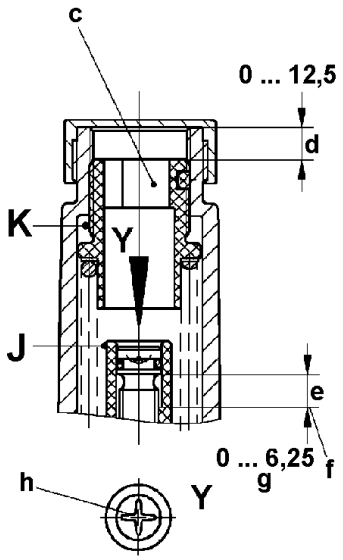


Figure 2



View Y

LEGEND					
a	Provided cap	**b**	Setting range	**c**	Width across flats 12 M max. = 15 Nm
d	Lowering	**e**	Lifting	**f**	End stop
g	corresponds with 5 full turns	**h**	Size 2 / M max. = 1.5 Nm	**i**	Width across flats 10 / M = 4 ±1 Nm

5.16.1.1 Mechanically actuated lifting axle control valve 463 084 000 0

See circuit diagram 841 801 448 0.

– Press the actuation button (a).

– Set the switch pressure for lowering the lifting axle according to the pressure, at which it is made sure, that the permissible axle load is not exceeded. This is done by connecting a test hose with pressure gauge and pressure reduction valve with test connection 42.

⇨ The compressed air flows via duct (f) into chamber B. By increasing the pressure of the test hose the switching point on which the actuation button springs out is detected, port 20 is getting pressureless (lifting axle lowers) and the air supply of the bellows on the lifting axle sets in.

– You can change the switching pressure with set screws: If the switching pressure is too high, turn the screw outward; if the switching pressure is too low, turn the screw inward.
While checking the test pressure always has to be increased starting from 0 bar to switch off the hysteresis.

– When the setting is completed successfully, counter-lock the adjustment screw and cover it with the provided cap.

5.16.1.2 Electrically actuated lifting axle control valve 463 084 010 0

See circuit diagram 841 801 447 0.

– Connect pressure switch 441 042 000 0 (setting range 1.0 to 5.0 bar) according to the circuit diagram.

– Set the pressure switch in the same way as the mechanically actuated lifting axle control valve.

5.16.1.3 Fully automatic pneumatic lifting axle control valve 463 084 020 0

See circuit diagram 841 801 449 0.

Two switching pressures must be set.

– First remove the protective cap with an SW 30 spanner (M = 45 ±5 Nm).

– Thread the Philips screw J (Size 2) inward to the stop (see figure 2).

– Set the switching pressure for lowering the lifting axle (screw K) with an Allen key 12 mm the same as the version that is actuated mechanically (see figure 2).

– Set the switching pressure for automatic lifting using a Philips screwdriver (size 2). This requires lowering the test pressure of 8.0 bar again.

⇨ The pressure difference of the switch pressures for the automatic lowering and raising has to be 0.4 bar higher than the difference in pressures for the air suspension bellows between lifted and non-lifted axle.

Technical data

ORDER NUMBER	463 084 000 0	463 084 010 0	463 084 020 0
Max. operating pressure	13 bar		
Actuation	mechanical	electric	pneumatic
Nominal diameter	7 mm		
Permissible medium	Air		
Thermal range of application	-40 °C to +80 °C		
Switching pressure setting "lowering"	2.5 to 7 bar	–	2.5 to 7 bar

ORDER NUMBER	463 084 000 0	463 084 010 0	463 084 020 0
Adjusted switch pressure	4 ±0.2 bar	–	Lowering 4.5 ±0.2 bar Lifting 2.5 ±0.2 bar
Adjustable hysteresis	–	–	1.5 to 4 bar
Voltage	–	24 V $^{+6\ V}_{-4,4\ V}$	–
Current type	–	Direct current	–
Nominal current	–	IN = 0.22 A	–
Weight	2.3 kg		
vehicle is being loaded	automatic lowering	automatic lowering	automatic lowering
vehicle is being unloaded	lift by pressing button	electric lifting	automatic lifting

5.16.2 Single circuit lifting axle compact valve (spring-returned) 463 084 031 0

463 084 031 0

Application

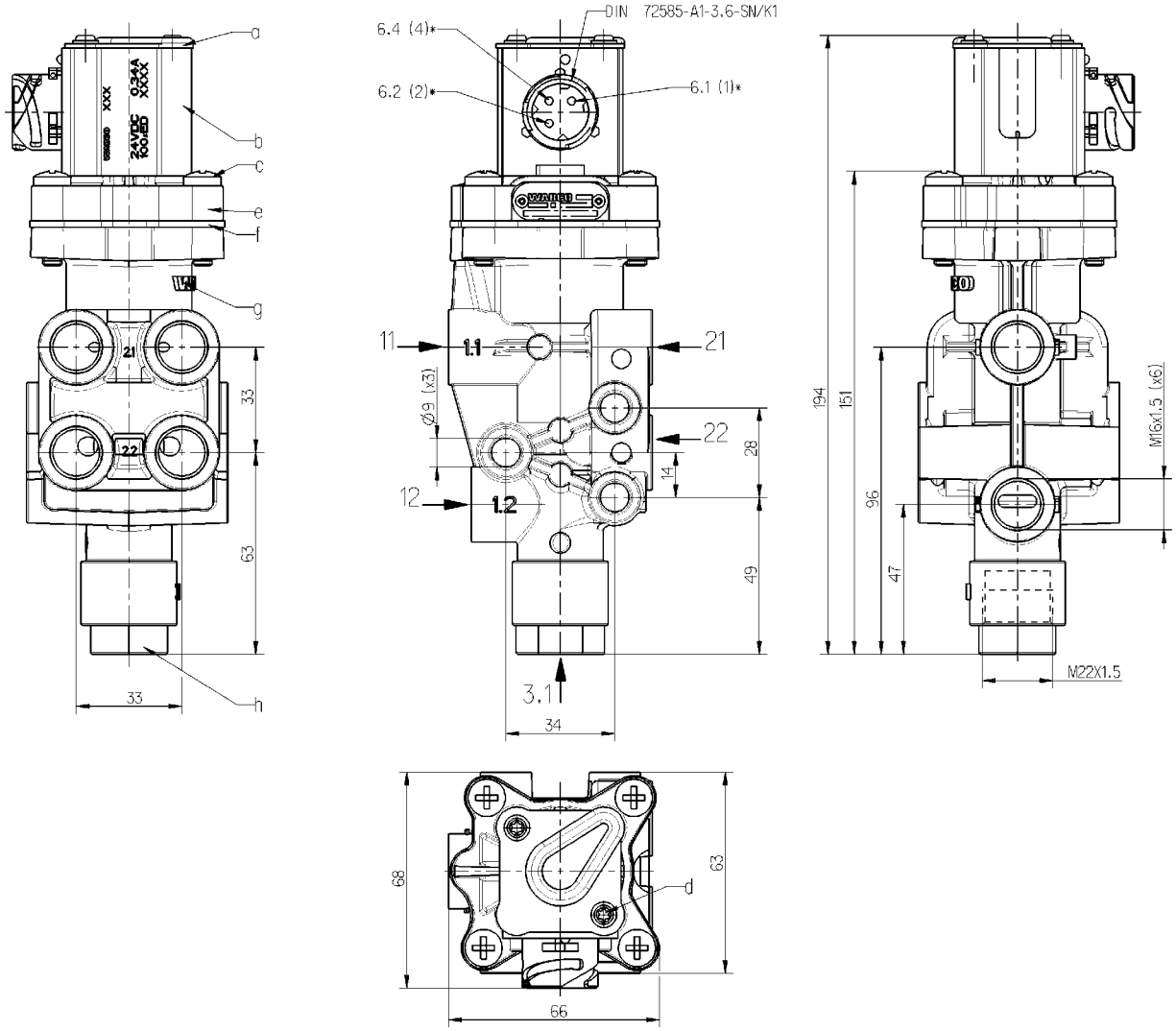
Semitrailer or drawbar trailer with lifting axle. Control via ECAS or Trailer EBS. Because of the single-circuit, only suitable for rigid trailer axles.

Purpose

The conventional lifting axle valve series (spring-returned) has been expanded with the single circuit variant. One lifting axle is actuated automatically depending on the axle load. The "Traction help" function can also be actuated by the Trailer EBS or Trailer ECAS depending on the current axle load. This variant can be used on rigid axles, for which the support bellows can be connected pneumatically for the left and right vehicle sides. Here the specifications of the axle manufacturer must be observed.

Lifting axle control valve 463 084

Installation dimensions for 463 084 031 0



CONNECTIONS						PORT THREADS	
11	Supply	**12**	Air-suspension bellows "Vehicle"	**21**	Port lifting bellow	**11, 12, 21, 22**	M 16x1.5
22	Air-suspension bellows "Lifting axle"	**31, 32**	Venting				

Technical data

ORDER NUMBER	463 084 031 0	463 084 041 0	463 084 042 0
Max. operating pressure	13 bar		
Nominal diameter	Ø 8 mm		
Permissible medium	Air		
Thermal range of application	-40 °C to +80 °C	-40 °C to +65 °C	
Voltage	24 V +6 V/-6 V		

ORDER NUMBER	463 084 031 0	463 084 041 0	463 084 042 0
Current type	Direct current		
Nominal current	IN = 0.22 A		
Weight	0.9 kg		
Quickfit connections	–	4x Ø8x1	3x Ø8x1 1x Ø12x1.5

The electrical connection to the Trailer EBS or ECAS is made via system cables, see Cable Overview or ECAS System Description/EBS System Description for more information.

– Open the WABCO website www.wabco-auto.com.
– Click on Product Catalogue INFORM => Index.
– Enter EBS, ECAS or Overview.
– Click on the Start button.

To lower the lifting axle, the current to the solenoid coil is interrupted and armature (d) closes inlet (c). The compressed air upon piston (a) is exhausted via solenoid coil and vent 32. The compression spring raises piston (a) and the lifting axle control valve is back in its initial position where the ports are connected; 12 with 22 and 21 with 31.

If the lifting axle valve for the traction help is used with residual pressure maintenance in combination with Trailer EBS, the vent must be removed. To do this, a line is routed from the vent to the 3/2-way solenoid valve for residual pressure maintenance and port IN/OUT 1 of the modulator must be connected via cable 449 764 XXX 0. The lifting axle valve vent (connection 3) is shut off by a two-way valve, vented accordingly by the Trailer EBS modulator and the maximum possible bellows pressure is maintained. The traction help can be activated by a button.

See circuit diagram 841 802 191 0.

5.16.3 Two-circuit lifting axle control valve (pulse-controlled) 463 084 100 0

Application

Semitrailer or drawbar trailer with lifting axle. Control via Trailer EBS and ECAS. Enables Traction Help, dynamic wheelbase control and immobilizer functionality.

Purpose

With pulse-controlled valves, a special lifting axle actuation is possible, e.g. the lifting axle can be kept in the raised position after the ignition is switched OFF. This is not possible using spring-returned lifting axle valves.

Lifting axle control valve 463 084

Technical data

ORDER NUMBER	463 084 100 0
Max. operating pressure	13 bar
Nominal diameter	Connection 1, 21, 22 (Ø 10 mm); Connection 23, 24, 25 (Ø 8 mm); Connection 32 (Ø 8.7 mm)
Permissible medium	Air
Thermal range of application	-40 °C to +65 °C
Voltage	$24\ ^{+6\ V}_{-4,4\ V}$
Current type	Direct current
Nominal current	IN = 0.34 A
Weight	2.3 kg

5.17 TASC – Return-to-Ride valve 463 090

463 090 012 0	463 090 020 0	463 090 021 0
		

Application

For air-suspension commercial vehicles with Trailer ABS or Trailer EBS.

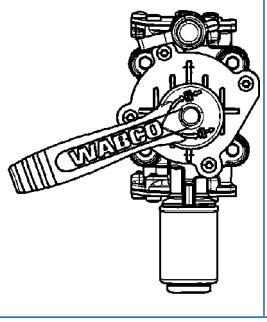
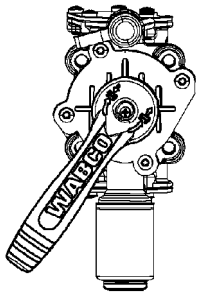
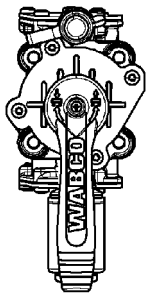
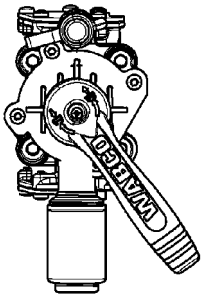
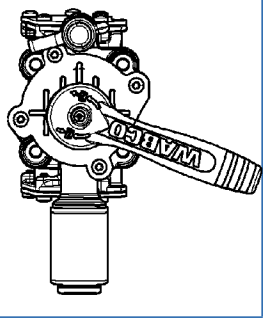
Purpose

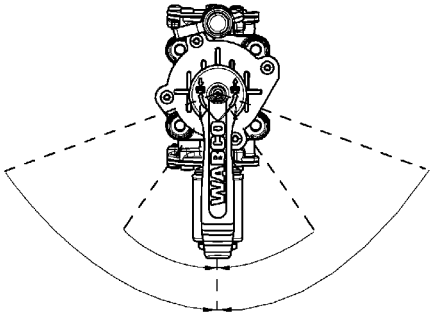
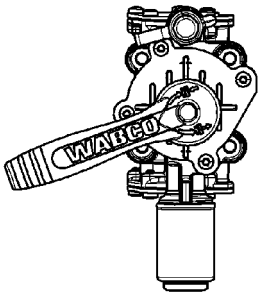
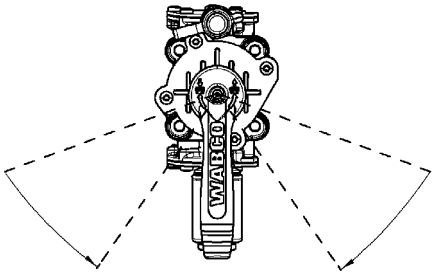
TASC can be used to raise and lower the vehicle – in the same way as with a rotary slide valve. The chassis is also automatically returned to normal driving level as soon as the vehicle starts driving (RTR – Return-To-Ride).

The lifting/lowering process is started by simply turning the handle right or left. To halt this process the handle is moved back into the stop position. The system keeps the chassis at the set level.

TASC can be operated in combination with or without levelling valve with height limitation. TASC can be connected directly if levelling valves with height limitation are used. This avoids the bellows being permanently connected to the air reservoir at the upper stop position.

Handle positions

Lowering	Stop	Drive	Stop	Lifting
				

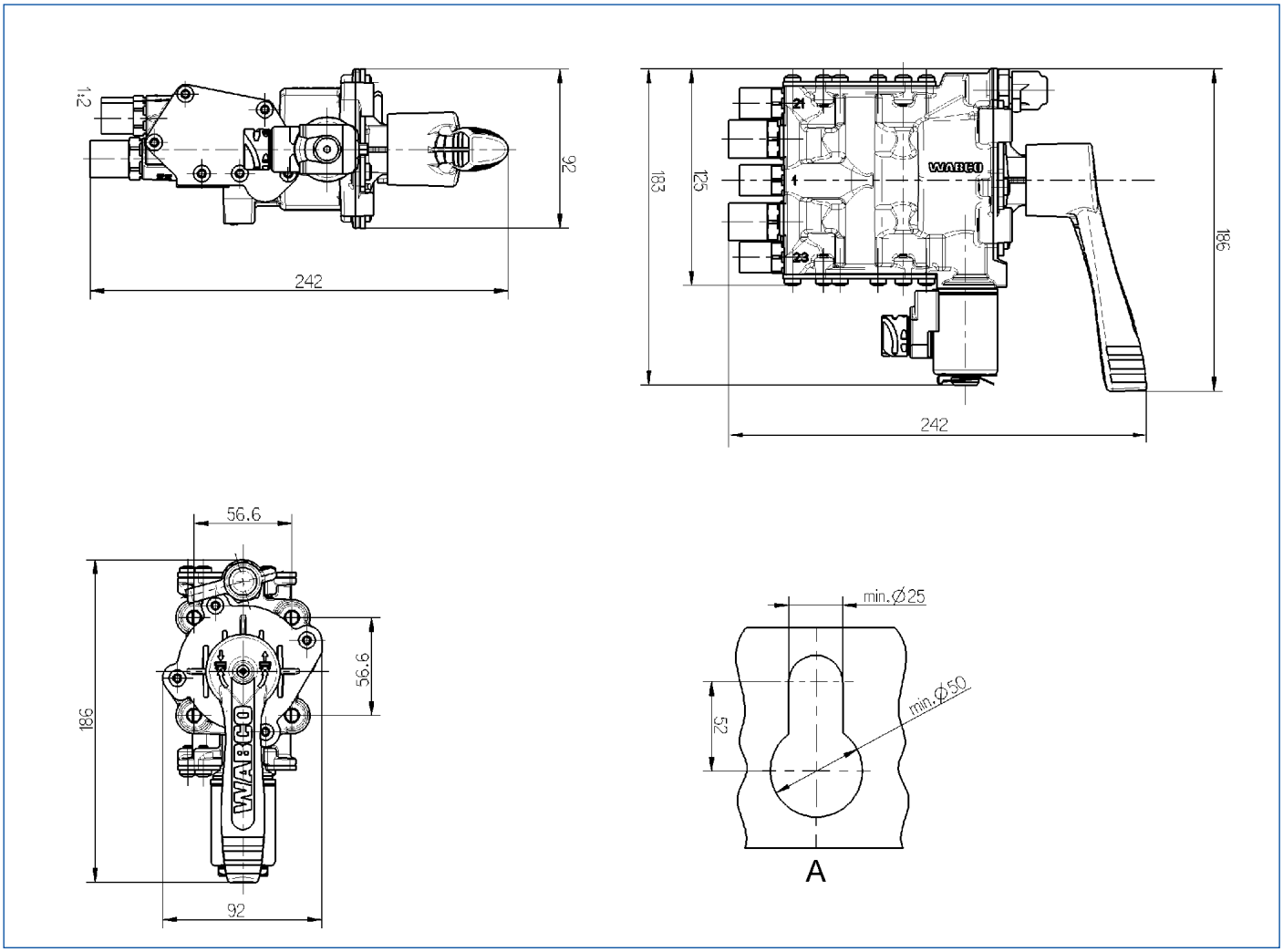
Return to normal driving level (RTR)	Locking in lowering	Dead-man's safety system
		

Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation

TASC can be fitted to the operating panel on the trailer.



Depending on the clearance, the unit can be rotated through 90° on installation. The TASC handle can then be turned accordingly so it is easy for the user to operate.

Electrical connection
TASC with Return-to-Ride is controlled by a speed pulse from the ABS-/EBS system. Retrofitting TASC (when replacing a rotary slide valve or similar product) may require a diagnostic tool as well as training for the new system. One of the cables listed below is required for WABCO systems.

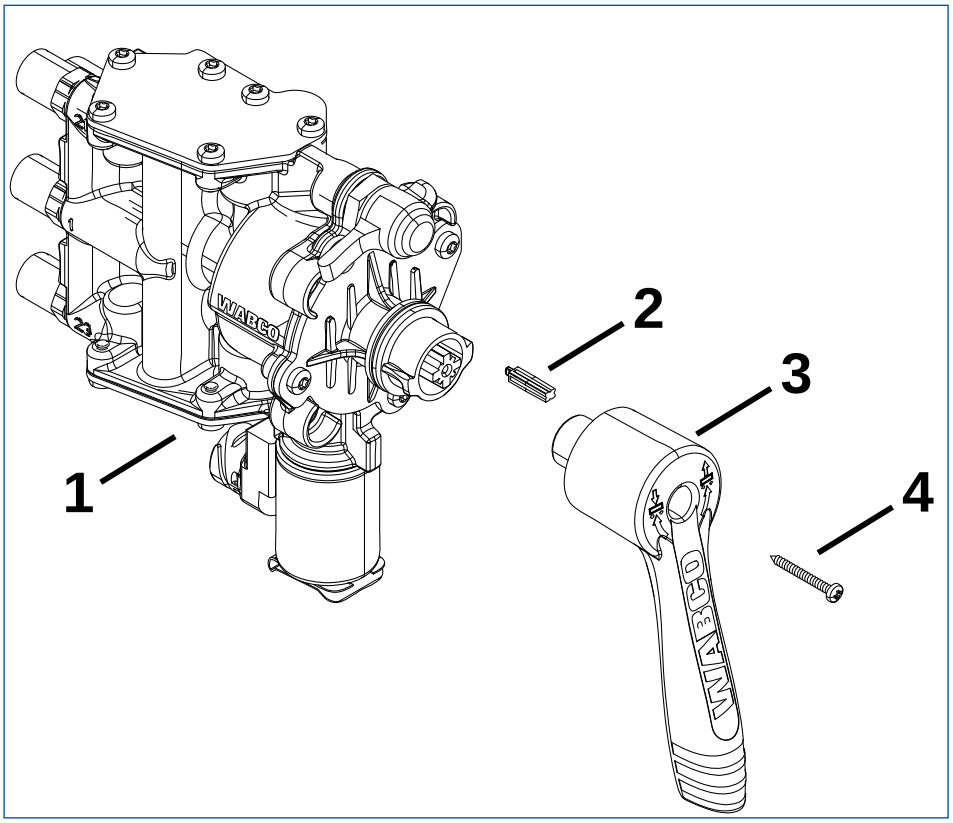
CABLE	SYSTEM	LENGTH
449 623 XXX 0	VCS II	6 m/6 m; 10 m/10 m
449 435 030 0	EBS D	3 m
449 443 XXX 0	EBS E	0.8 m; 1 m; 2 m; 4 m; 6 m; 10 m

Technical data

PART NUMBER	463 090 020 0 DUAL CIRCUIT	463 090 021 0 DUAL CIRCUIT	463 090 023 0 DUAL CIRCUIT	463 090 123 0* DUAL CIRCUIT	463 090 012 0 SINGLE CIRCUIT
RTR function	x	x	x	x	x
Locking in lowering position	x	x	x	–	x
Pneumatic connection	8x1	8x1	M 16x1.5	M 16x1.5	M 16x1.5
Test connection	x	–	–	–	x
Operating pressure	3.5 … 10 bar				
Voltage	18 ... 32 V				
Thermal range of application	-40 … 65 °C				
Electrical connection	DIN 72585-B1-3.1-Sn/K2 - bayonet				

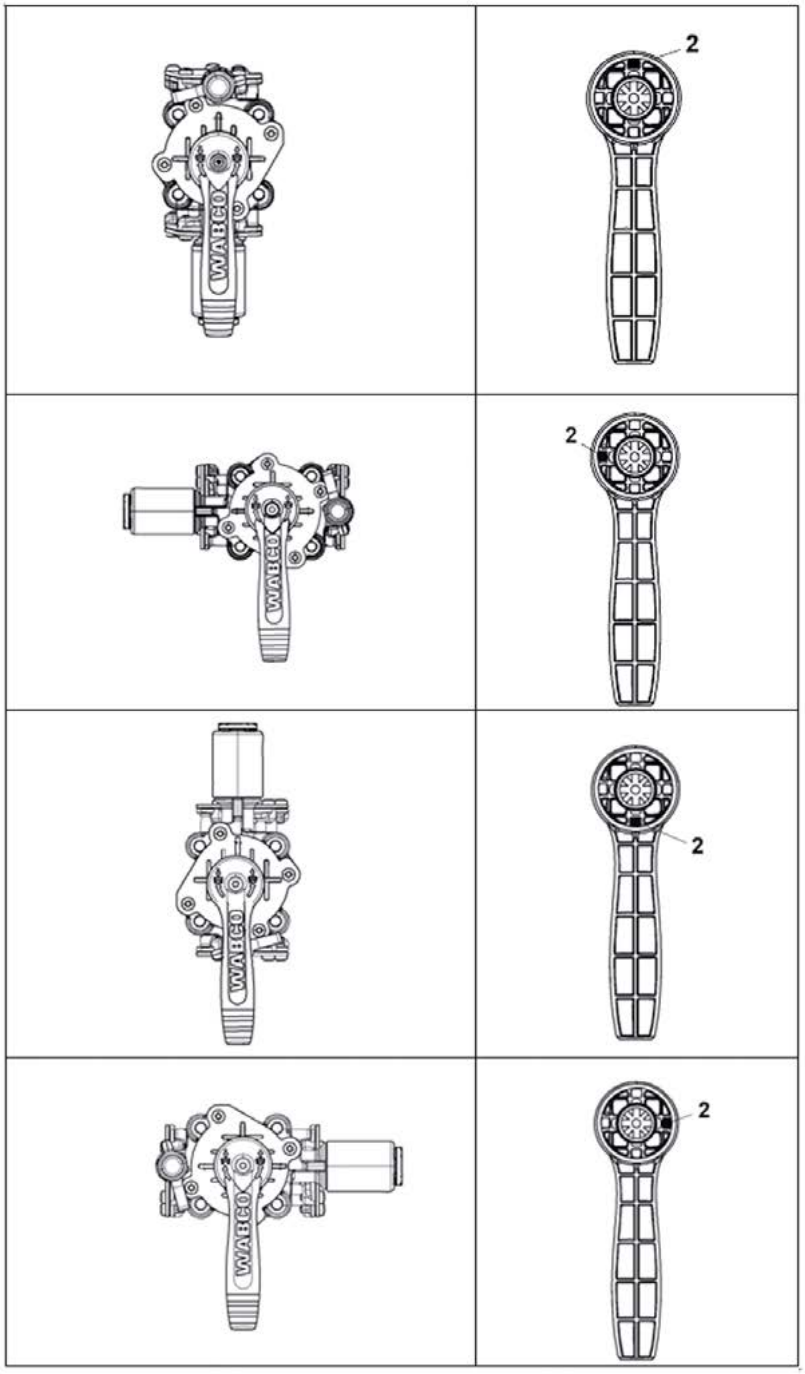
LEGEND	
*	Dead-man's safety system for vehicles with a stroke exceeding 300 mm

Housing lever adjustment



LEGEND							
1	TASC	**2**	Pin	**3**	Lever	**4**	Screw

TASC – Return-to-Ride valve 463 090



5.18 Damping reservoir 463 084 020 2

Application

Mainly used in combination with the lifting axle control valves 463 084 000 0, 463 084 010 0 and 463 084 020 0.

the damping reservoir is a low cost solution since it is directly fitted to port 41 of lifting axle control valves.

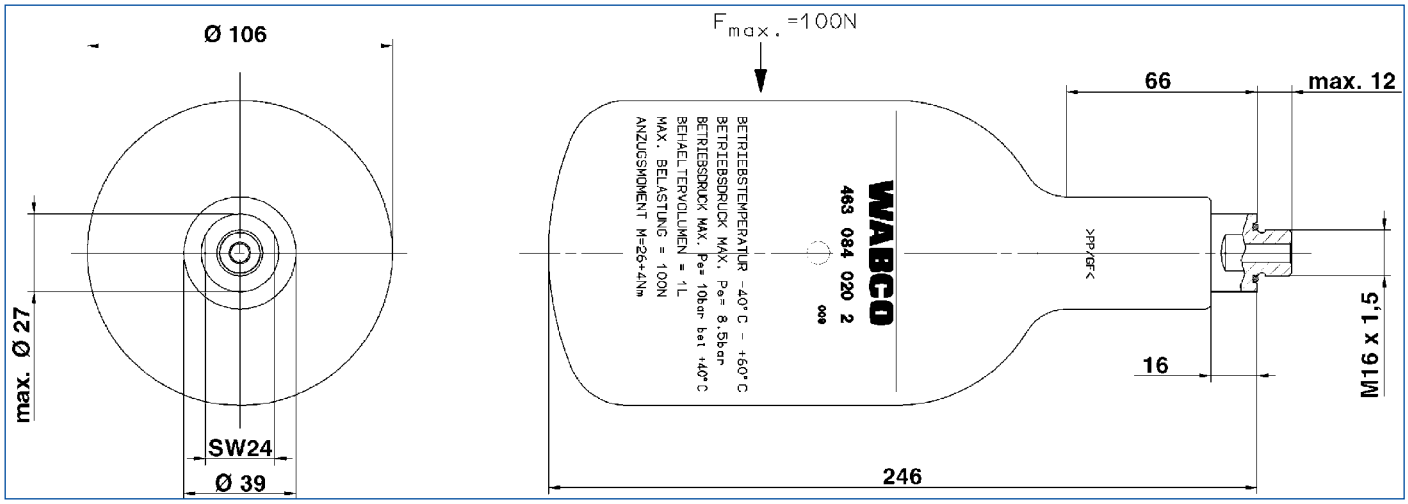
Purpose

In order to prevent accidental lowering of the lifting axle, if e.g. only because of road irregularities, the switching pressure for lowering the lifting axle is achieved briefly, a damping volume is required.

Technical data

ORDER NUMBER	463 084 020 2
Volume	1 dm^3
Ambient temperature	-40 °C to +60 °C
Max. operating pressure	8.5 bar at 60 °C 10 bar at 40 °C
Tightening torque	26^{+4} Nm
Material	Plastic
Colour	Black
Male stud thread	M 16x1.5
Installation position	Optional

Installation dimensions



5.19 Test connection 463 703

Application

All vehicles. Can be used on control and brake lines.

Purpose

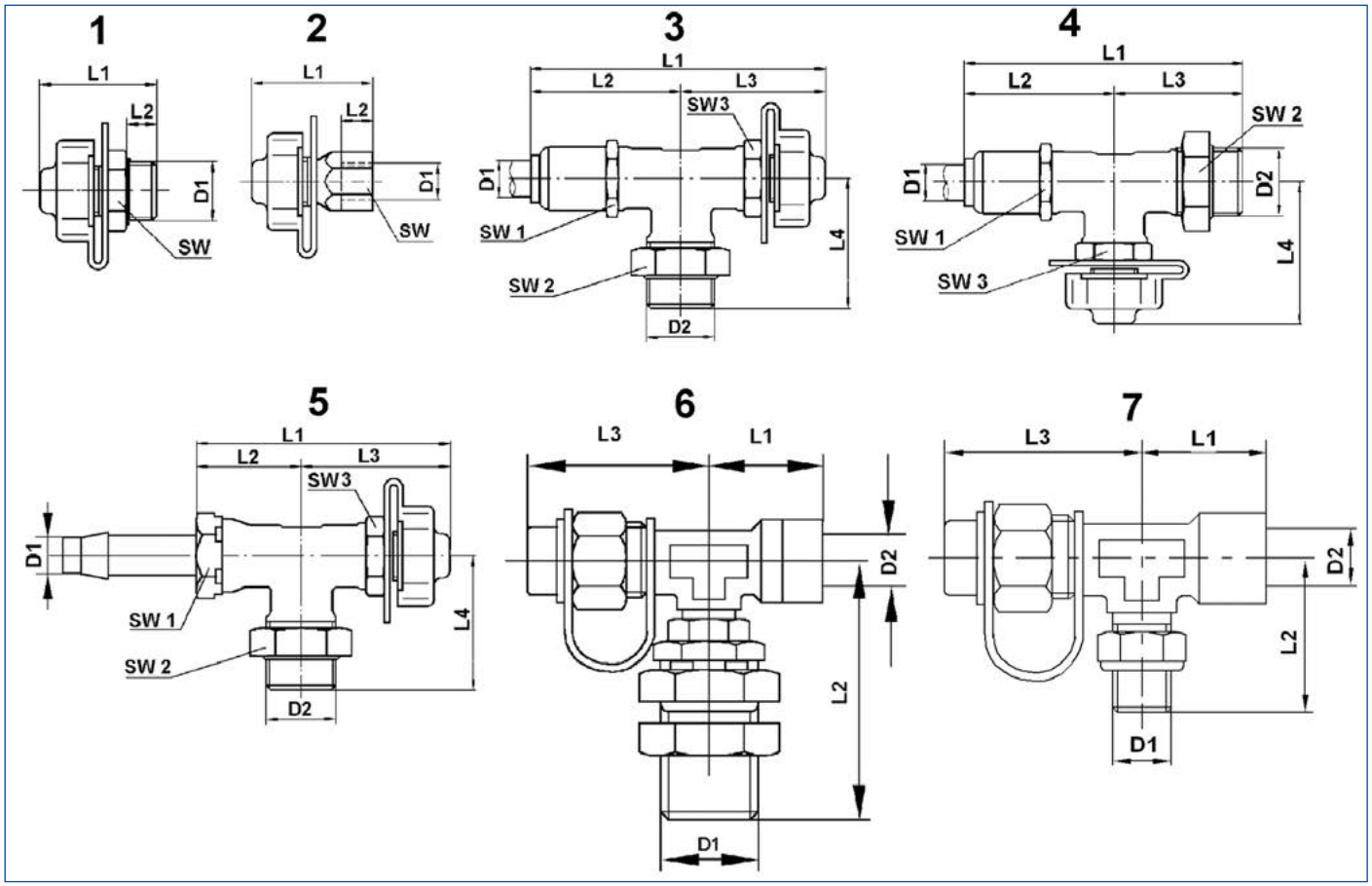
Temporary connection of pressure measurement devices for testing systems or certifying vehicles.

Maintenance

– Check valve regularly for proper closing.

Test connection 463 703

Installation dimensions



ORDER NUMBER	D1	D2	L1	L2	L3	L4	SW 1	SW 2	SW 3	FIG.
463 700 002 0	M 18x1.5	–	46.3	22.5	–	–	22	–	–	1
463 703 005 0	10x1*	10x1 [1)]	60	30	30	49	19	19	17	4
463 703 007 0	12x1.5*	M 12x1.5 [1)]	64	32	32	51	22	22	17	4
463 703 024 0	8x1*	M 12x1.5	65	28	33	52	17	17	–	4
463 703 114 0	M 16x1.5	–	36	9	–	–	22	–	–	1
463 703 301 0	12x1.5*	M 22x1.5	96	45	51	42	27	27	17	3
463 703 303 0	M 22x1.5	M 22x1.5	96	42	54	42	27	27	17	3
463 703 306 0	12x1.5*	M 16x1.5	94.5	33	61.5	37	22	22	17	3
463 705 103 0	M 22x1.5	–	36	10	–	–	27	–	–	1
463 703 316 0	3/8"-18 NPTF	–	45	14	–	–	19	–	–	1
463 703 995 0	M 12x1.5	–	43	7	–	–	17	–	–	2
463 705 105 0	M 16x1.5, 1:16 Coned	–	36	10	–	–	17	–	–	1

LEGEND	
*	Outer diameter x wall thickness

5.20 Levelling valve 464 006

Application

Vehicles with conventionally controlled air-suspension.

Purpose

Adjusting the level to a constant chassis ride height by air-spring air intake when compressing (loading the vehicle) and by venting them when decompressing. The height is measured via the angle of the lever that is connected to the axle over linkage.

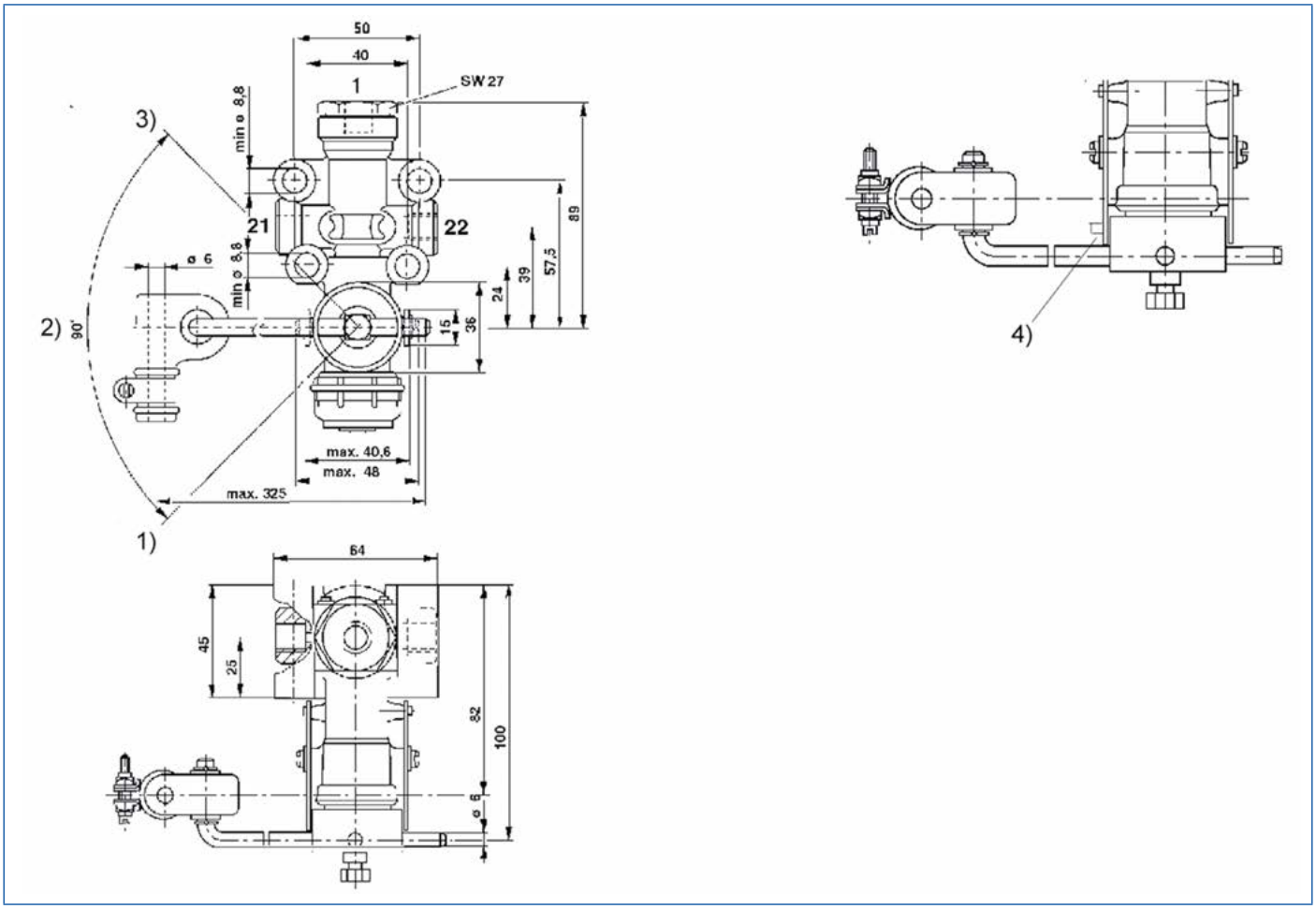
Height limitation: The levelling valves 464 006 100 0, 464 006 101 0 and 464 006 201 0 have an additional 3/2-way valve that closes as of a certain adjustable lever angle and switches to a venting function upon actuating the lever again. This "Height limitation" prevents the vehicle from being raised above a permitted level with the rotary slide valve.

Zero point adjustment: The ride height can be adapted to special application conditions of the vehicle with an operating cylinder integrated in the linkage.

Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

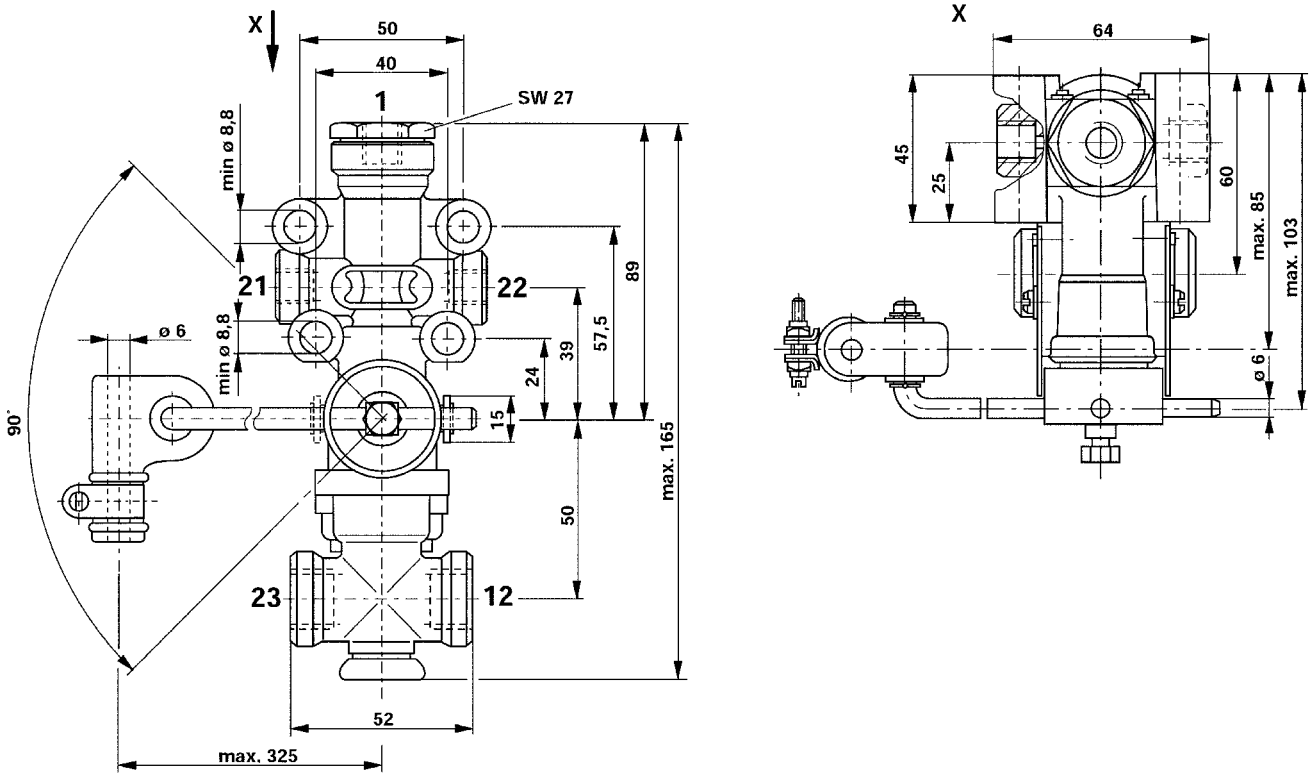
Installation dimensions for 464 006 002 0



LEGEND							
1)	Vent	**2)**	Operating range	**3)**	Charge	**4)**	Fixing the valve in end position with ≥7 bar supply pressure and ≤3 bar bellows pressure by inserting a Ø3h8 locator pin or a Ø3h8 x 24 DIN7 parallel pin

CONNECTIONS						PORT THREADS
1	Energy supply (Reservoir)	**3**	Venting	**21/22**	Energy discharge (Air suspension bellows)	M 12x1.5 - 12 deep

Installation dimensions for 464 006 100 0

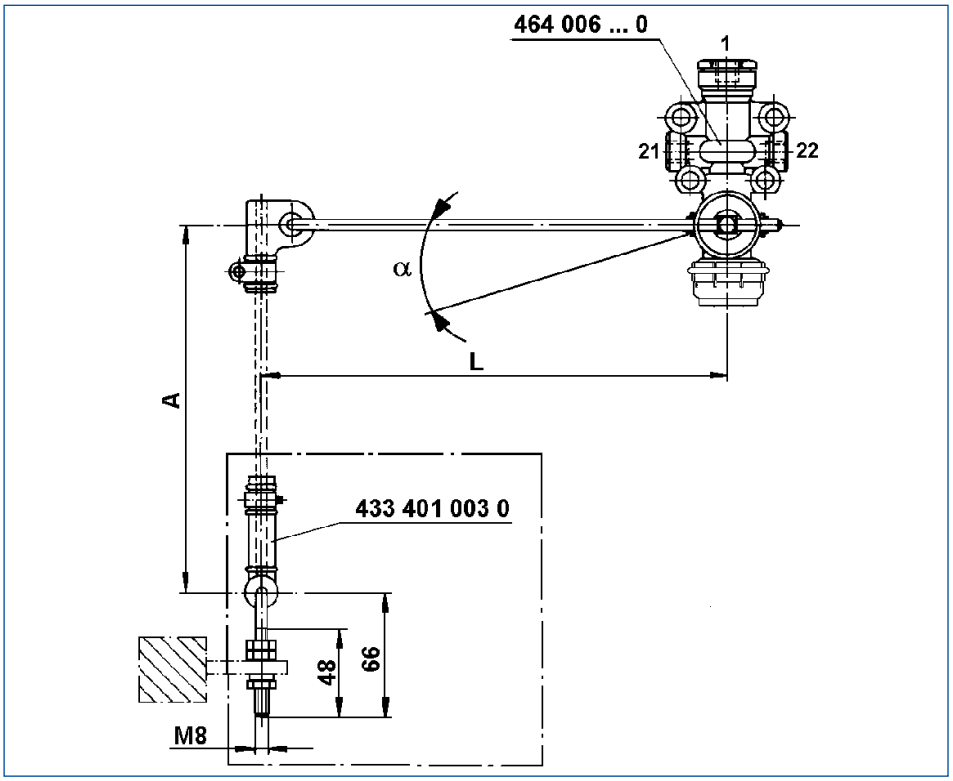


View X

CONNECTIONS						PORT THREADS	
1	Energy supply (Reservoir)	**3**	Venting	**12**	Energy supply (Supply)	**1 21 22**	M 12x1.5 - 12 deep
21/22	Energy discharge (Air suspension bellows)	**23**	Energy discharge (Rotary slide valve)			**12, 23**	M 16x1.5

Levelling valve 464 006 XXX 0 – Linkage 433 401 003 0

The linkage 433 401 003 0 must be ordered separately.



LEGEND					
α	Deflection of the levelling valve lever max. 45°.	**A**	A is the dimension between axle mounting point and the connection to the levelling valve lever (α-character).	**L**	Lever length (at least 150 mm)

For adjusting the valve at the vehicle it is decisive which total spring travel the axle permits.

Approximate value:

The ratio "lever length L / rod length A" should be ≤1.2 if the closing angle of maximum 45° is not exceeded.

The lever length L should be 150 to 295 mm. If a shorter lever has to be used, a higher air consumption of the levelling valve has to be concerned.

Installation recommendation and setting information

- Fasten the levelling valve vertically or horizontally with two M8 bolts on the chassis.
  If installed vertically, the exhaust must point to the bottom.
  If installed horizontally, the exhaust must point to the driving direction (towards the rear of the vehicle).
- To make installation and setting of the lever and linkage easier, you can insert a Ø 3h8 locator pin or a Ø 3h8 x 24 DIN 7 parallel pin into neutral position to position the air-suspension valve shaft (see previous installation dimensions).
- Install the linkage if the vehicle is positioned at normal level.

  ⇨ The linkage has to be aligned vertically.
- Mount the levelling valve at maximum lever length if possible.

– You can clamp the lever at the desired length with the hexagon head bolt seated on the fastener for the round bar.
Depending on the installation position, various cranks of the lever are possible.

– By accordingly fixing or turning the lever for 180° the levelling valve can be optionally operated from right or left.

– Depending on the final installation position - vertical or horizontal - the lever is to be inserted through one of the two bores in the operating shaft which are offset by 90° to one another.
The levelling valve 464 006 100 0 is set to a closing angle of 30° ±2° in the factory.
The setting adjustments lie between 15° and 45°. A closing angle of < 15° is not permitted.

Note the adjustment data of the vehicle manufacturer when replacing.

– For adjustment of the closing angle the rubber plug underneath the 3/2-Directional Control Valve has to be removed to adjust the adjusting screw with a Torx T30 screwdriver.
Counterclockwise means a reduction of the closing angle, clockwise means an increase.
One rotation means an approx. 13° angle change.

The following table can be used to define the height increase of the vehicle up to shutting the supply air off to the rotary slide valve as a function of the closing angle and for determining the lever length.

– After the vehicle has been lowered to its buffers with the help of a rotary slide valve, measure the height of the chassis.

– Then raise the chassis with the rotary slide valve.

⇨ If the permissible full suspension travel is achieved before the height limitation of the levelling valve is applied, cancel the raising process and lower the vehicle.
Turning the set screw counterclockwise reduces the closing angle and also the suspension travel. If the height limitation sets in before the chassis is at the required hub height, the vehicle has to be lowered slightly as well in this case.
Turning the self-locking set screw clockwise increases the closing angle and the suspension travel.
Repeat the process until the required suspension travel (equal or less than the maximum suspension travel specified by the axle manufacturer) is achieved.

Installation dimensions

LEVER LENGTH L [mm]	STROKE HEIGHT H [mm]					
	α = 15°	α = 20°	α = 25°	α = 30°	α = 35°	α = 45°
125	32	43	53	62	72	88
150	39	51	63	75	86	106
175	45	60	74	87	100	124
200	52	68	84	100	115	141
225	58	77	95	112	129	159
250	65	85	106	125	143	177
275	71	94	116	137	158	194
295	76	101	125	147	169	209

STROKE HEIGHT H [mm]	LEVER LENGTH L [mm]					
	α = 15°	α = 20°	α = 25°	α = 30°	α = 35°	α = 45°
50	193	146	118	100	87	71
60	232	176	142	120	105	85

STROKE HEIGHT H [mm]	LEVER LENGTH L [mm]					
	α = 15°	α = 20°	α = 25°	α = 30°	α = 35°	α = 45°
70	271	205	166	140	122	99
80	309	234	189	160	140	113
90		263	213	180	157	127
100		293	237	200	174	141
110			260	220	192	156
120			284	240	209	170
130			308	260	227	184
140				280	244	198
150				300	262	212
160					279	226
170					297	241
180						255
190						269
200						283

Technical data

ORDER NUMBER	464 006 002 0	464 006 100 0	464 006 101 0	464 006 102 0	464 006 201 0
3/2 directional control valve	no	yes	yes	no	yes
Max. operating pressure	13 bar				
Max. dynamic bellows pressure	15 bar				
Permissible medium	Air				
Thermal range of application	-40 °C to +80 °C				
Linkage	Round lever Ø 6 mm				
Nominal width Levelling valve	2x Ø 3 mm				
Nominal width Shut-off valve	–	Ø 6 mm	–	–	–
Weight	0.41 kg	0.51 kg	0.51 kg	0.53 kg	0.70 kg
Quickfit connections	–	–	–	5x Ø8x1	5x Ø8x1

For the zero point adjustment on the levelling valve, the following operating cylinders can be used:

- 421 410 023 0, stroke 25 mm
- 421 410 054 0, stroke 45 mm
- 421 411 304 0, stroke 85 mm; with piston rod facing upward, use bellows (Accessories pack 421 411 530 2)

5.21 Plug-in couplings for levelling valves 893 000

893 000 058 2

893 000 078 2

Application

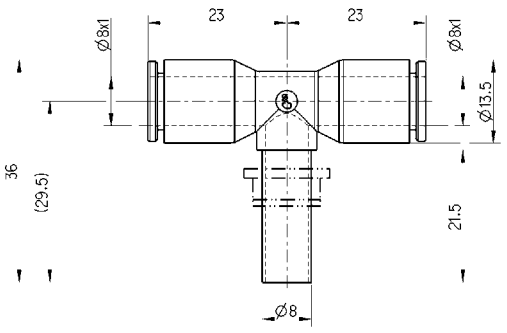
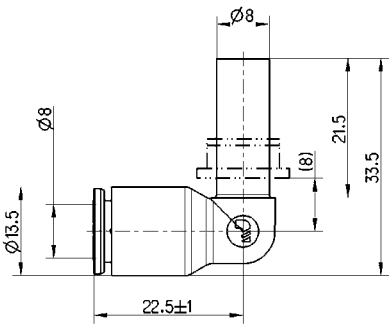
Vehicles with composite variants of the trailer chassis levelling valves.

ORDER NUMBER	NAME	PORT THREADS
893 000 058 2	T-pieces	8x1
893 000 078 2	Angle	8x1

Compatibility

BASIC	HEIGHT LIMITATION
464 006 500 0 464 006 540 0 464 006 580 0	464 006 520 0

Installation dimensions

893 000 058 2	893 000 078 2
	

5.22 3/2 directional control valve 472 1XX

Venting 3/2-way solenoid valves

Charging 3/2-way solenoid valve

Application

Multiple applications, i.e. controlling operating cylinders.

Purpose

Venting 3/2-way solenoid valve: To vent an air line when current is supplied to the solenoid.

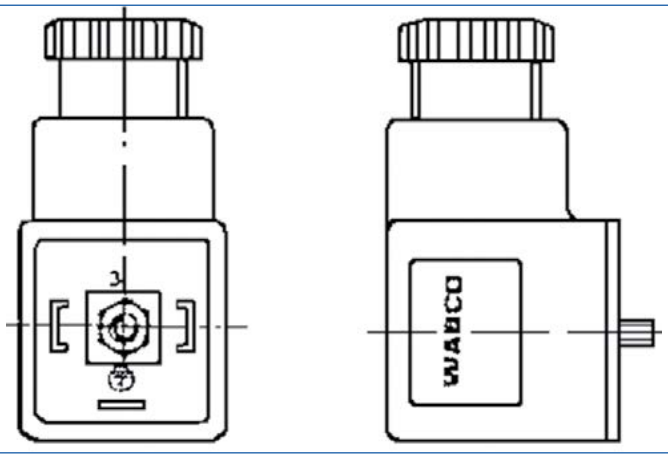
Charging 3/2-way solenoid valve: To pressurise an air line when current is supplied to the solenoid.

Maintenance

No special maintenance is required.

Installation recommendation

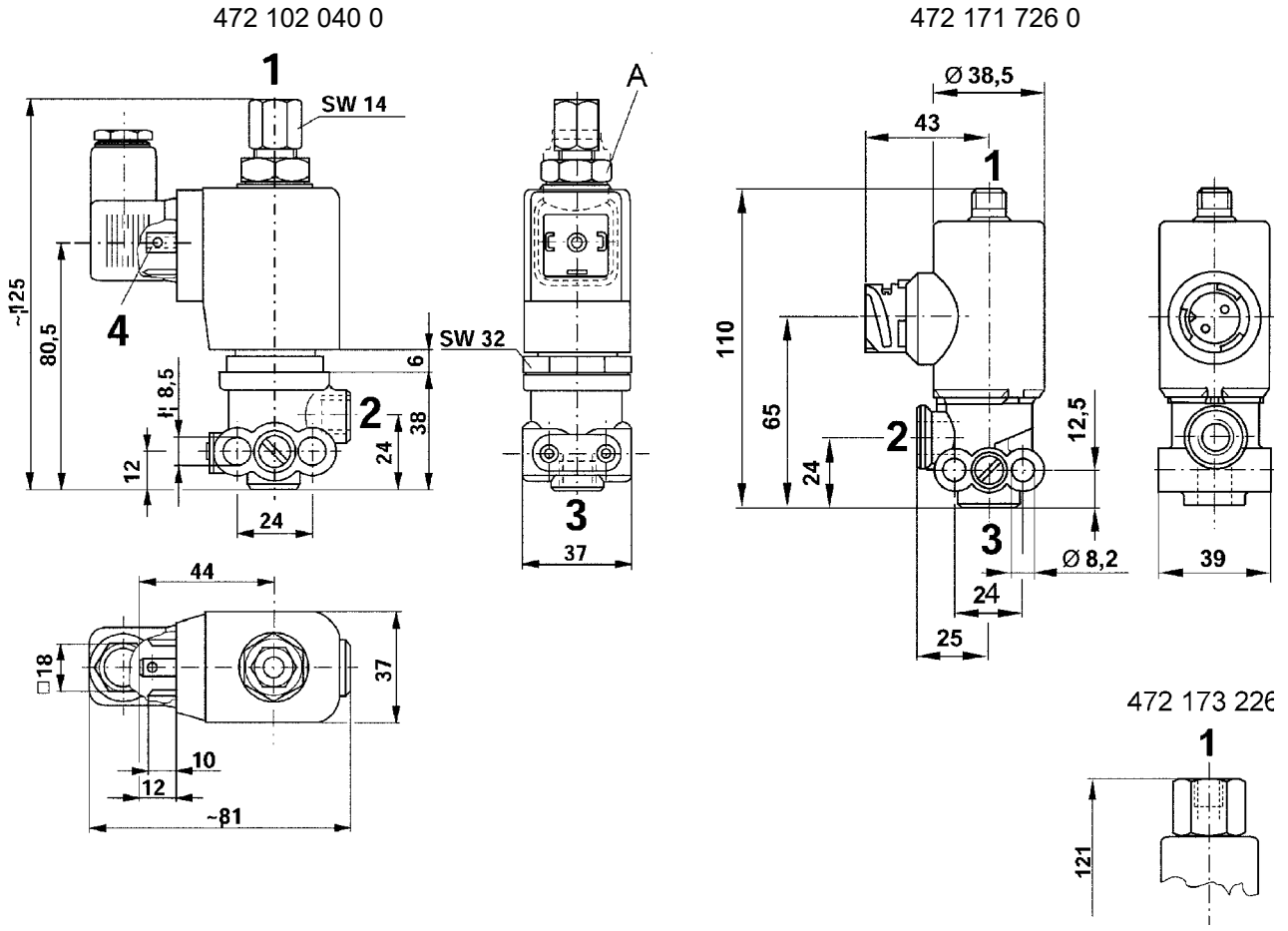
- Install the 3/2 directional control valve in any position.
- Fasten the 3/2 directional control solenoid valve with two M8 screws.
- If solenoids without any protective circuitry are being used, use diode plug 894 101 620 2.



In trailers which have electronic systems (e.g. ABS, ECAS) fitted, no solenoid valves may be installed without protective wiring if they have the same source of power as the electronics.

Installation dimensions

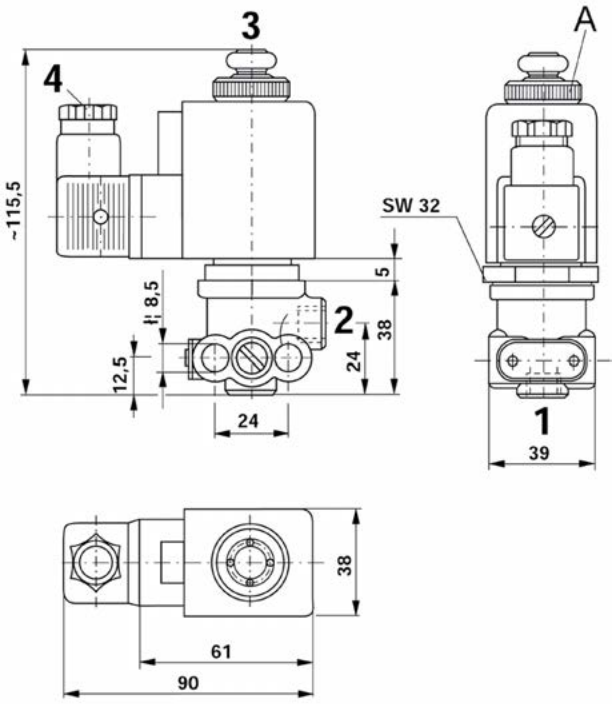
Venting 3/2-way solenoid valves



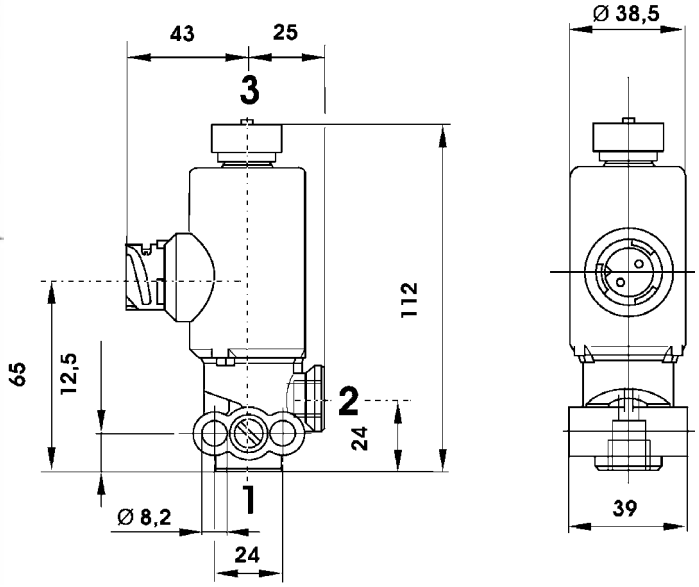
LEGEND					
1	Energy supply	**2**	Energy discharge	**A**	Loosen the SW 19 hexagon nut to turn the magnets
3	Venting	**4, 6**	Electrical control connection		

Charging 3/2-way solenoid valves

472 127 140 0

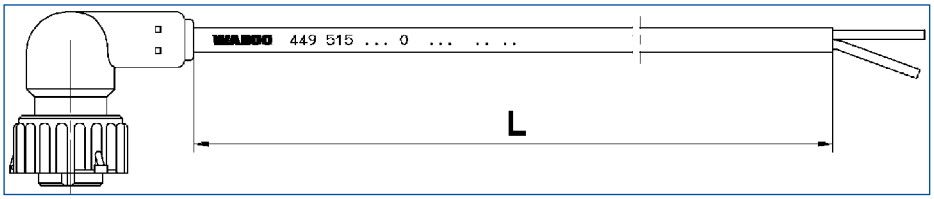


472 170 606 0



LEGEND					
1	Energy supply	**2**	Energy discharge	**A**	To turn the magnets, loosen the knurled nut.
3	Venting	**4, 6**	Electrical control connection		

Cable with DIN bayonet 449 515XXX 0



Length L on request

Technical data

ORDER NUMBER		VENTING 3/2-WAY SOLENOID VALVES				
		472 102 040 0	472 171 700 0	472 171 726 0	472 173 226 0	472 173 700 0
Operating voltage (DC)		10.8 V to 28.8 V	24 $^{+8}_{-6,5}$ V			
Nominal diameter	Charging	Ø 2.6 mm	Ø 2.2 mm		Ø 4 mm	
	Venting	Ø 2.2 mm				
Nominal current		at 10.8 V = 0.33 A at 28.8 V = 0.87 A	0.41 A		0.69 A	

ORDER NUMBER	VENTING 3/2-WAY SOLENOID VALVES				
	472 102 040 0	472 171 700 0	472 171 726 0	472 173 226 0	472 173 700 0
Duty cycle	100 %				
cut-out voltage	–	< I 65 I V		< I 80 I V	
Port threads	2, 3 = M 12x1.5 - 10 deep	M 12x1.5	1 = M 12x1.5 - 7 deep 2, 3 = M 12x1.5 - 10 deep	M 12x1.5 - 10 deep	M 12x1.5
Max. operating pressure	8 bar	11 bar			
Permissible medium	Air				
Thermal range of application	-40 °C to +70 °C	-40 °C to + 100 °C		-40 °C to +80 °C	
Connector		M 27x1	DIN bayonet		M 27x1
Weight	0.6 kg	0.5 kg			

ORDER NUMBER		CHARGING 3/2-WAY SOLENOID VALVES				
		472 127 140 0	472 170 600 0	472 170 606 0	472 172 600 0	472 172 626 0
Operating voltage (DC)		10.8 V to 28.8 V	24 V $^{+8}_{-6,5}$			
Nominal diameter	Charging	Ø 2.2 mm	Ø 4 mm		Ø 2.2 mm	
	Venting				Ø 3 mm	
Nominal current		at 12 V = 0.33 A at 24 V = 0.65 A	0.69 A		0.41 A	
Duty cycle		100 %				
cut-out voltage		–	< I 80 I V		< I 65 I V	
Port threads		M 12x1.5 - 10 deep	M 12x1.5	M 12x1.5 - 10 deep	M 12x1.5	M 12x1.5 - 10 deep
Max. operating pressure		8.5 bar	10.2 bar	11 bar		
Permissible medium		Air				
Thermal range of application		-40 °C to +70 °C	-40 °C to +80 °C		-40 °C to + 100 °C	
Connector		–	M 27x1	DIN bayonet	M 27x1	DIN bayonet
Weight		0.5 kg				

5.23 Pressure reduction valve 473 301

473 301 002 0

Application

Multiple applications, e.g. reducing braking pressures on a trailing steering axle.

Purpose

Reducing the input pressure in a certain ratio, and quick venting of the downstream brake unit.

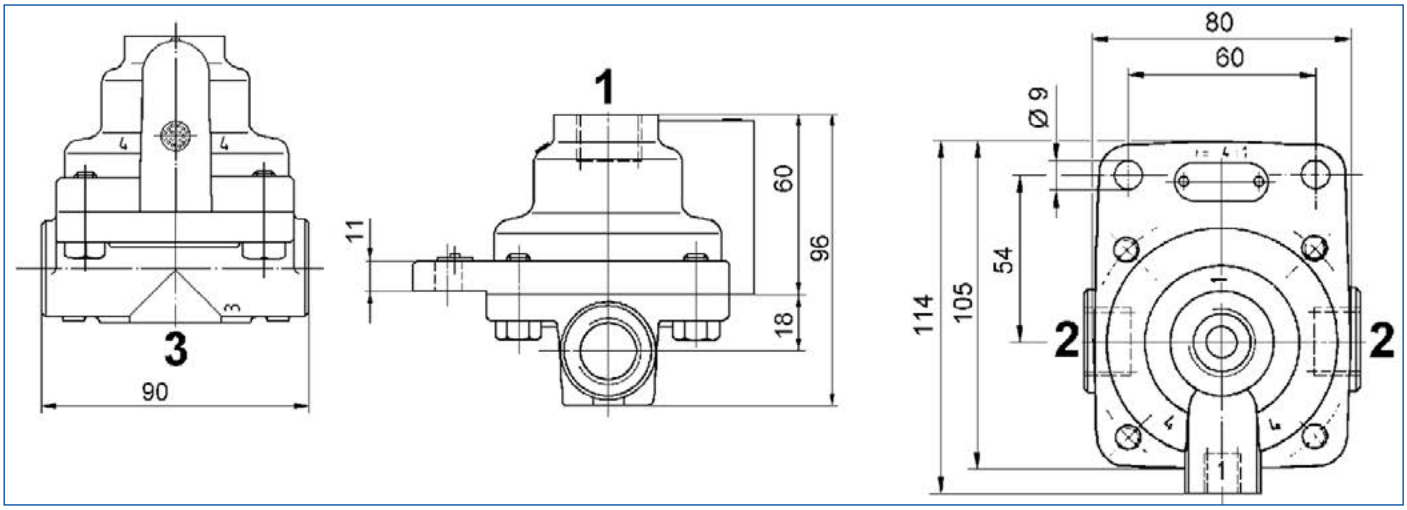
Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

- Install the pressure reducing valve vertically so that the drain 3 points downward.
- Fasten the pressure reduction valve with two M8 screws.

Installation dimensions



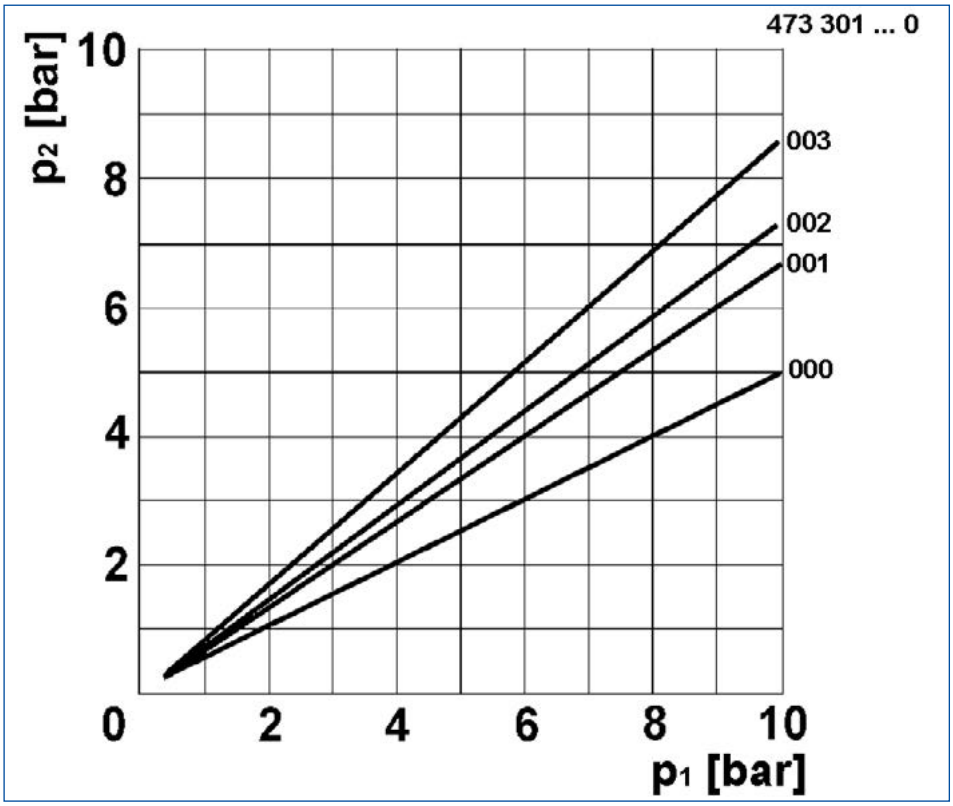
CONNECTIONS					
1	Energy supply	**2**	Energy discharge	**3**	Venting

Pressure reduction valve 473 301

Technical data

ORDER NUMBER	473 301 000 0	473 301 001 0	473 301 002 0	473 301 003 0
Pressure reduction ratio	2:1	1.5:1	1.35:1	1.15:1
Port threads	M 22x1.5 - 15 deep			
Max. operating pressure	10 bar			
Permissible medium	Air			
Thermal range of application	-40 °C to +80 °C			
Weight	0.9 kg			

Diagram



LEGEND			
p_1	Output pressure	p_2	Input pressure

5.24 Quick release valve 473 501 / 973 500

473 501 00X 0

973 500 0XX 0

473 501 004 0

Application

Vehicles with long brake lines and large-volume brake cylinders.

Purpose

Rapid evacuation of longer control lines or brake lines and brake cylinders. The brake is therefore released without a delay.

Maintenance

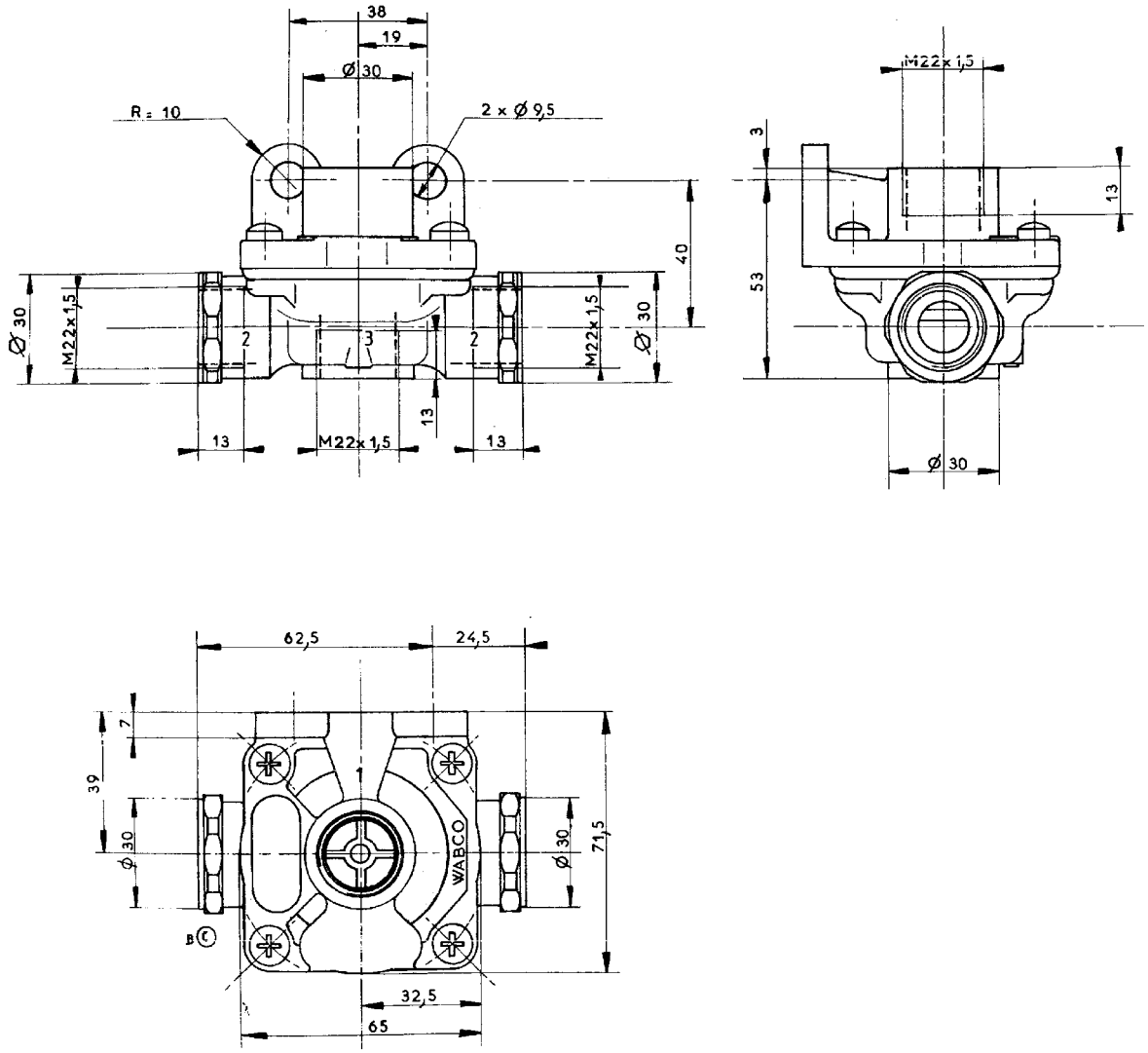
Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

- Install the quick release valve so that vent 3 points downward.
- Fasten the quick release valve with two M8 bolts.

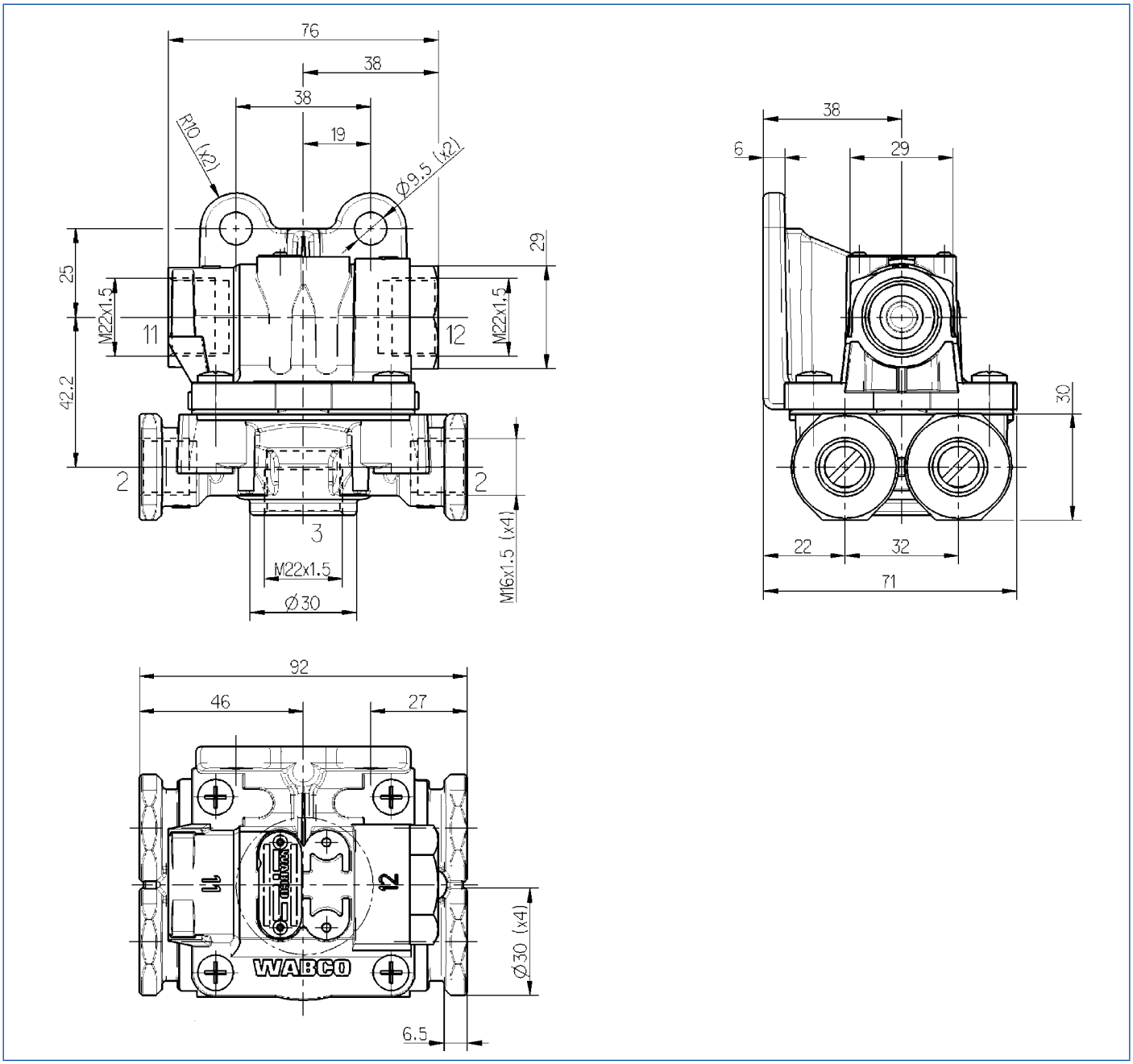
Quick release valve 473 501 / 973 500

Installation dimensions for 973 500 000 0



CONNECTIONS						PORT THREADS
1	Energy supply	**2**	Energy discharge	**3**	Venting	M 22x1.5 - 13 deep

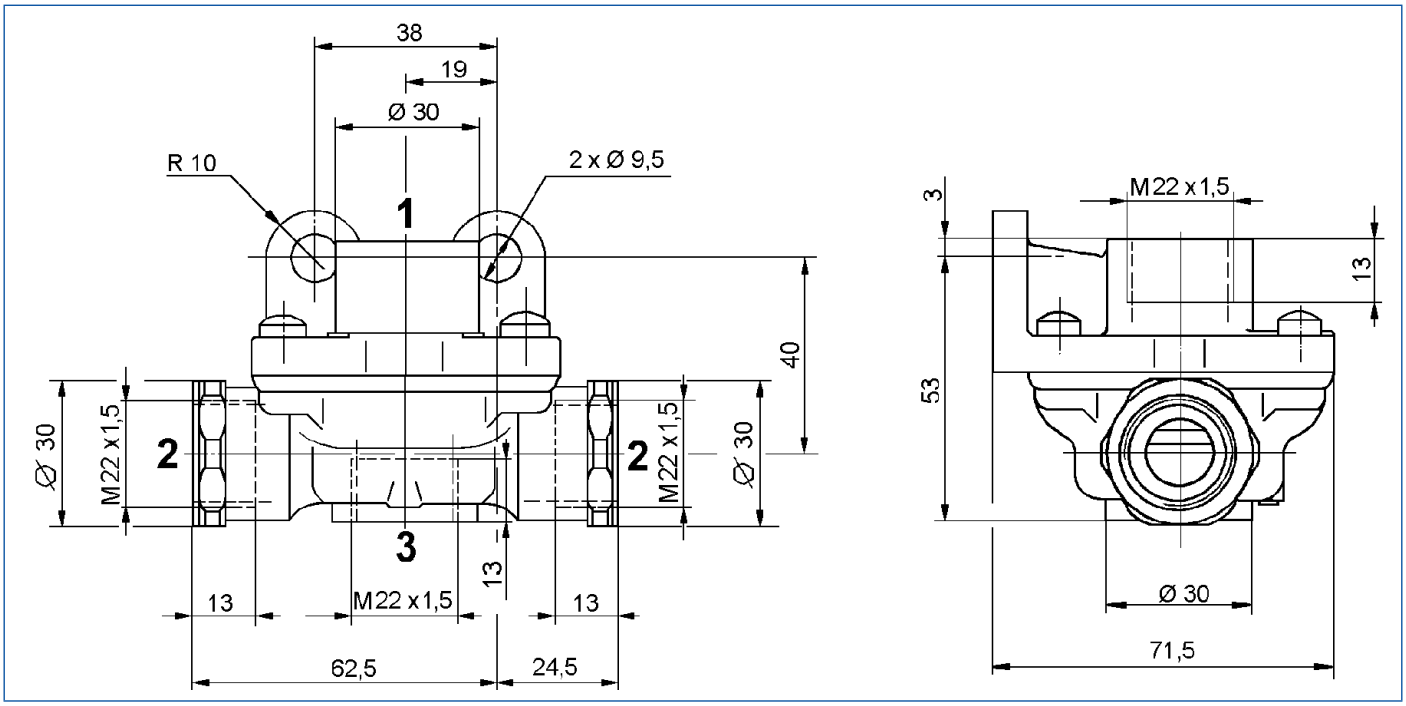
Installation dimensions for 973 500 051 0



CONNECTIONS				PORT THREADS	
11, 12	Energy supply	**3**	Venting	**3 11 12**	M 22x1.5 - 13 deep
2	Energy discharge			**2**	M 16x1.5 - 13 deep

Quick release valve 473 501 / 973 500

Installation dimensions for 473 501 004 0



CONNECTIONS					
1	Energy supply	**2**	Energy discharge	**3**	Venting

Technical data

ORDER NUMBER	473 501 000 0	473 501 001 0	473 501 004 0	973 500 000 0	973 500 051 0
Port 1, 2 with filter	no	no	yes	no	no
Max. operating pressure	10 bar			12 bar	
Nominal diameter	Ø 14 mm				
Permissible medium	Air				
Thermal range of application	-40 °C to +80 °C				
Weight	0.3 kg				0.43 kg

5.25 Pressure limiting valve 475 010

475 010 3XX

Application

Multiple applications, on a lifting axle e.g. for limiting the pressure on the lifting bellows.

Purpose

To limit the output pressure to a set level.

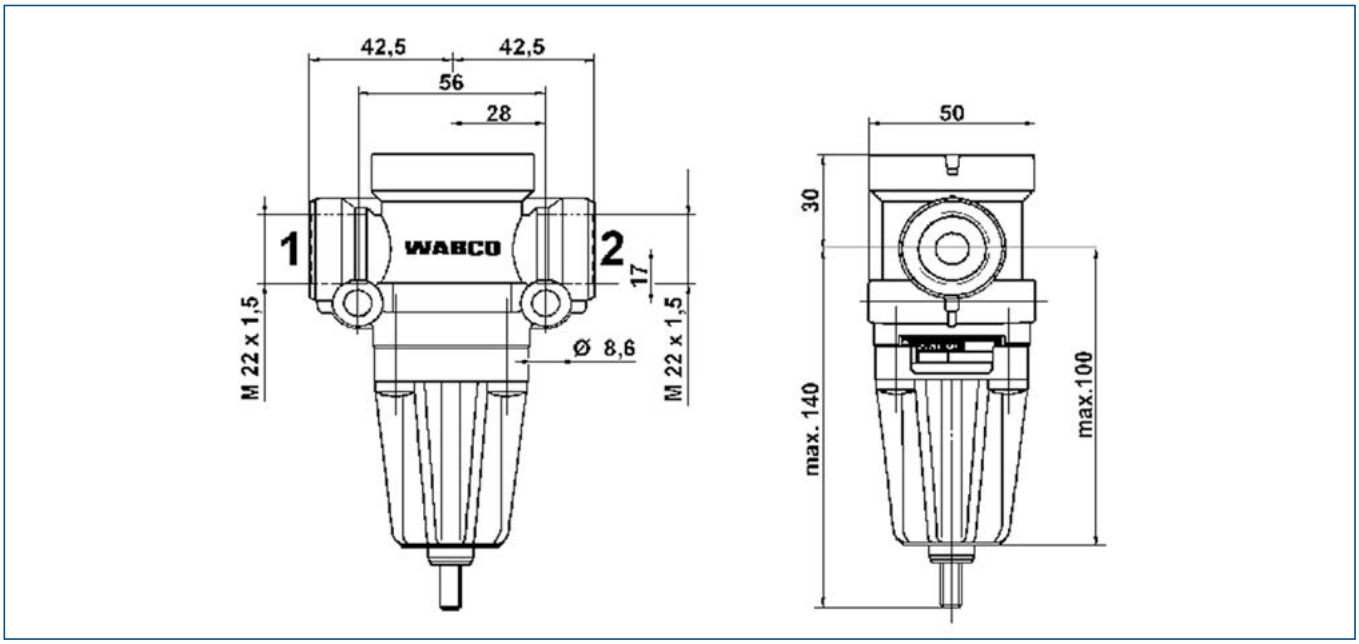
Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

- Install the pressure limiting valve vertically so that the vent 3 points downward.
- Fasten the pressure limiting valve with two M8 screws.

Installation dimensions



CONNECTIONS					
1	Energy supply	**2**	Energy discharge	**3**	Venting

Pressure limiting valve 475 010

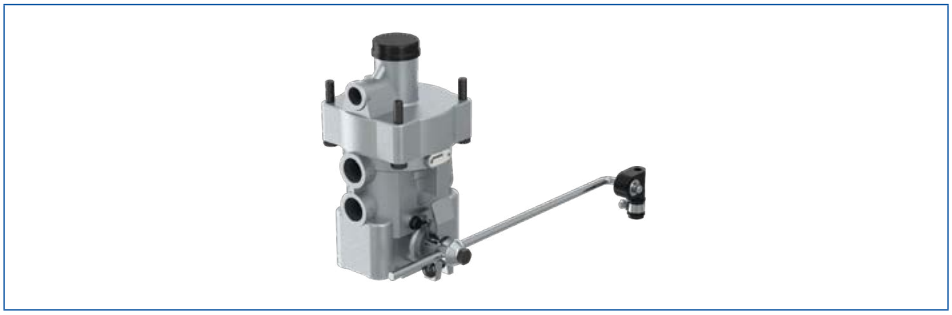
Technical data

Max. operating pressure	20 bar
Port threads	M 22x1.5 - min. 12 deep
Permissible medium	Air
Thermal range of application	-40 °C to +80 °C
Weight	0.37 kg

ORDER NUMBER	INPUT PRESSURE p_1	OUTPUT PRESSURE p_2	SETTING RANGE AT p_1 = 7.5 bar
475 010 302 0	7.5 bar	5,3 +0.3 bar	1.5 - 6.0 bar
475 010 303 0		1,8 +0.3 bar	1.5 - 6.0 bar
475 010 305 0		6,0 +0.3 bar	6.0 - 7.5 bar
475 010 309 0		5,7 +0.3 bar	1.5 - 6.0 bar
475 010 310 0		4,0 +0.3 bar	1.5 - 6.0 bar
475 010 312 0		5,5 +0.2 bar	1.5 - 6.0 bar
475 010 313 0		3,3 +0.3 bar	1.5 - 6.0 bar
475 010 307 0	8.0 bar	1,8 +0.3 bar	1.5 - 6.0 bar
475 010 324 0		1,4 +0.3 bar	0.5 - 1.6 bar
475 010 311 0	8.5 bar	3,5 +0.3 bar	1.5 - 6.0 bar

5.26 Load sensing valve (LSV) 475 71X

5.26.1 LSV 475 712



Application

LSV controller with integrated trailer brake valve for leaf-spring semitrailers (mainly in Italy, France and the UK)

Purpose

Control of the two-line trailer braking systems when actuating the braking system of the towing vehicle.
Automatic control of the braking force based on the load status of the vehicle with the integrated LSV.
Actuation of the automatic trailer braking with partial or total pressure drop in the supply line.

Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

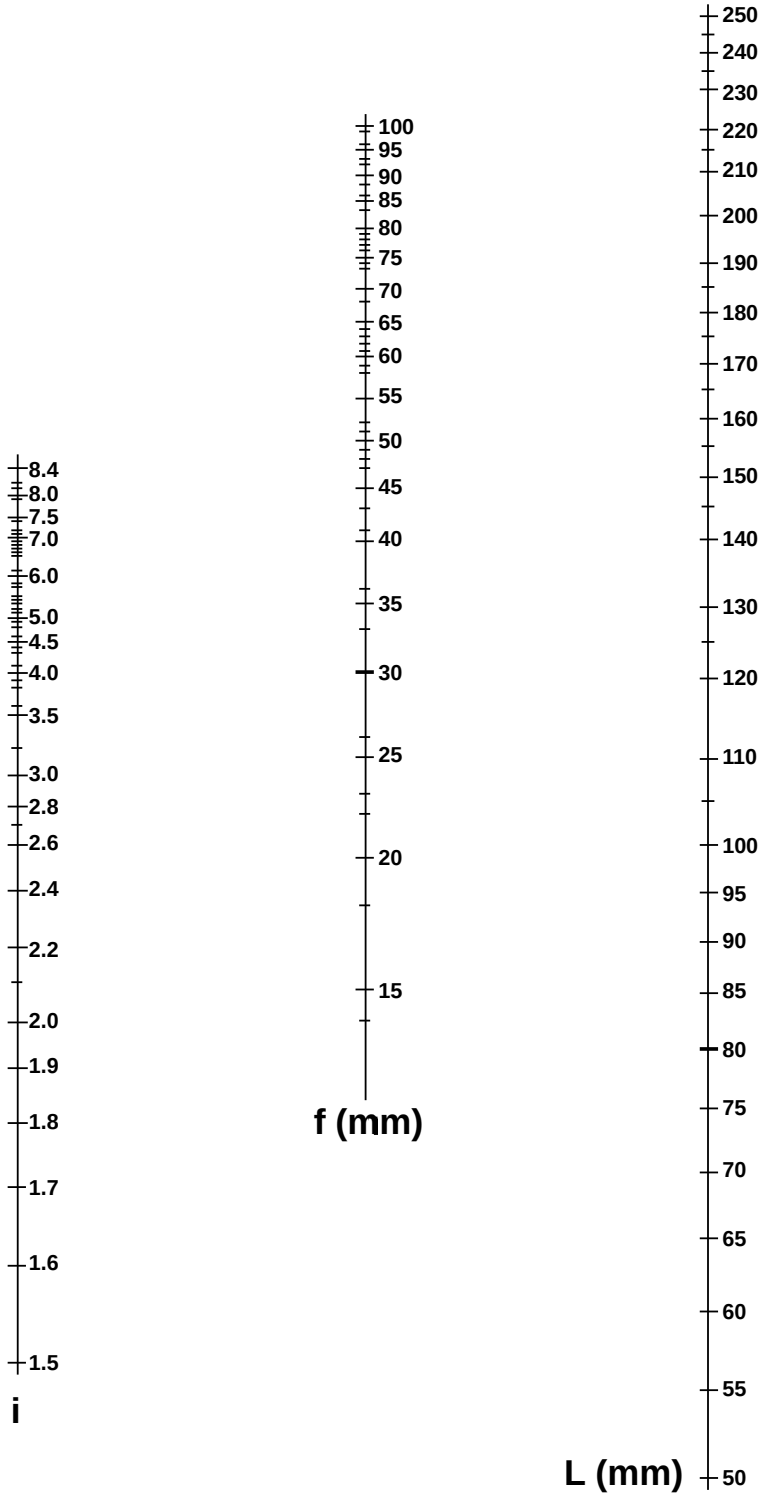
Installation recommendation

– Install the LSV vertically so that the vent points downwards.
The setscrews on the top of the housing are used for fastening.
For the linkage, use knuckle joint 433 306 003 0 if necessary.

– To determine the lever length L, draw a line in the respective nomograph using the scale for control ratio i (e.g. 2.8) to the scale for spring deflection f (e.g. 30).

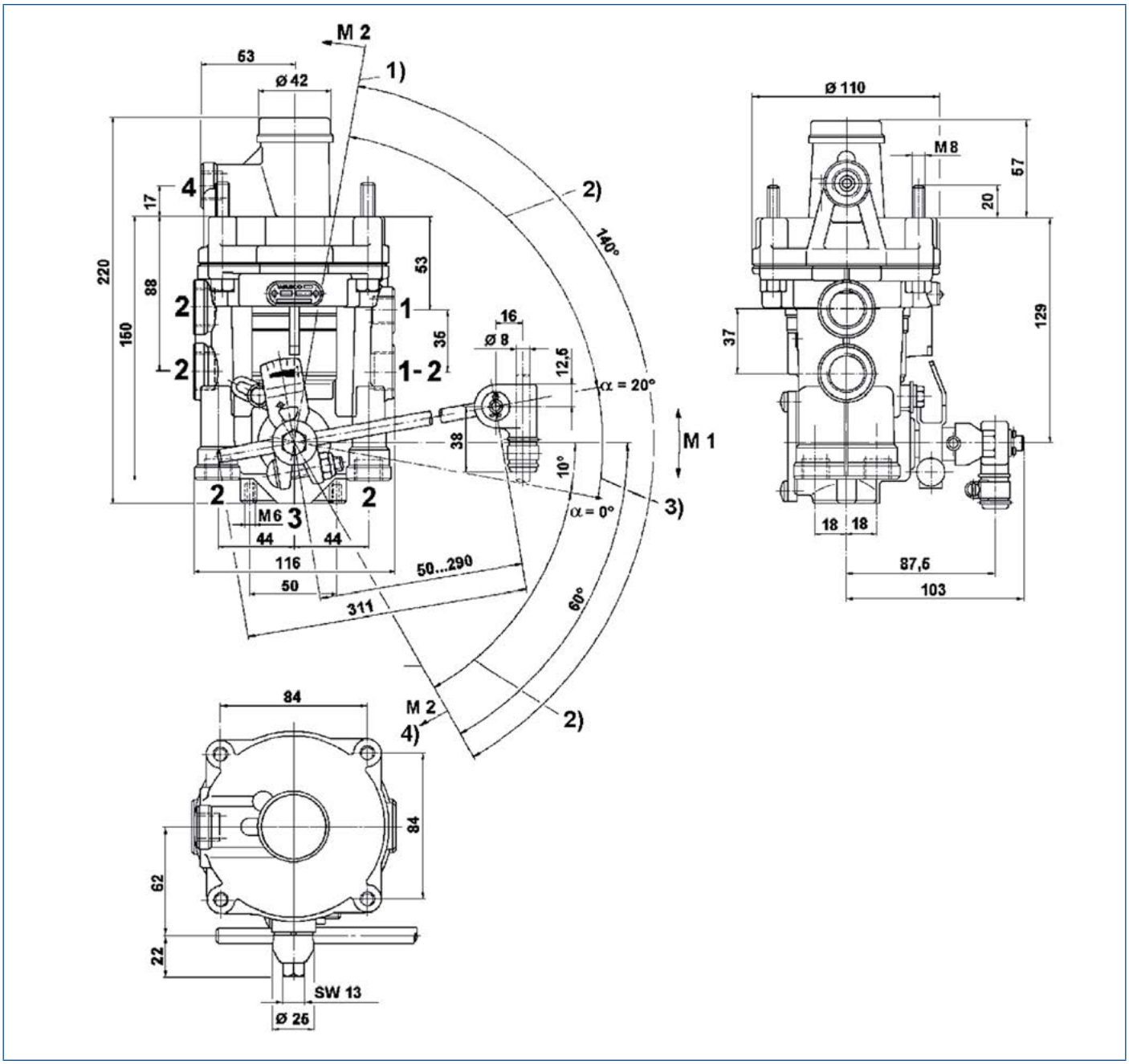
⇨ Extending this line crosses the scale for lever length L at 140 mm.

Nomograph



LEGEND					
i	Control ratio = p_{on} -0.8 / p_{off} -0.5	**f**	Spring deflection	**L**	Lever length

Installation dimensions for 475 712 000 0



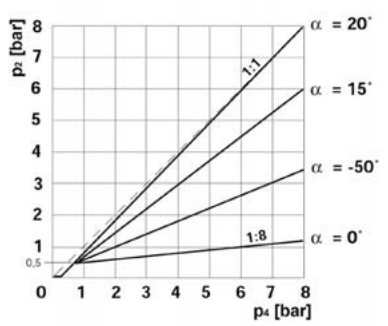
CONNECTIONS		PORT THREADS		LEGEND	
1-2	Energy supply or release (supply reservoir)	**1, 4**	M 16x1.5 - 12 deep	**1)**	End stop at linkage break
1	Energy supply	**1-2**	M 22x1.5 - 13 deep	**2)**	Overstroke
2	Energy discharge	**2**	M 22x1.5 - 13 deep (side)	**3)**	Control stroke
3	Venting	**2**	M 16x1.5 - 122 deep (bottom)	**4)**	End stop
4	Control connection				

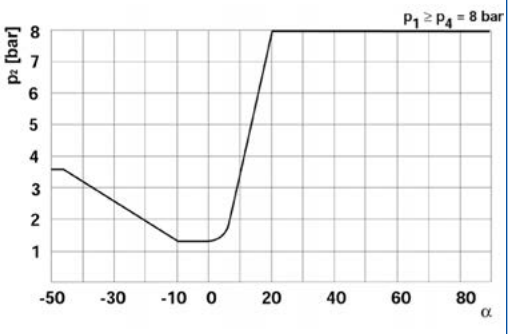
Technical data

ORDER NUMBER	475 712 000 0	475 712 004 0
Max. operating pressure	10 bar	
Control range, dynamic effect	α = 20°	α = 30°
Usable lever length	50 to 290 mm	50 to 275 mm
Linkage	via linkage (see Fig. "Installation Dimensions")	with integrated knuckle joint, see 475 713
Port 1, 1-2, 4 with filter	–	X
Max. permissible adjustment torque M2	20 Nm	
Thermal range of application	-40 °C to +80 °C	
Weight	2.2 kg	2.6 kg

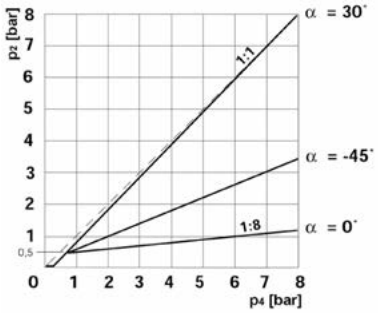
Pressure diagrams

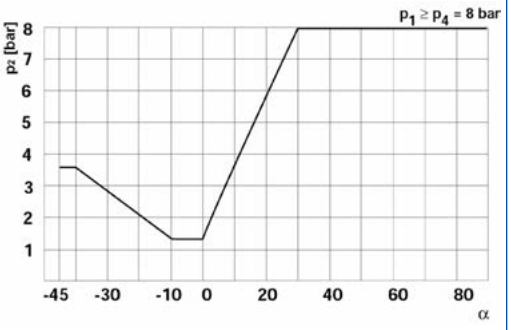
475 712 000 0



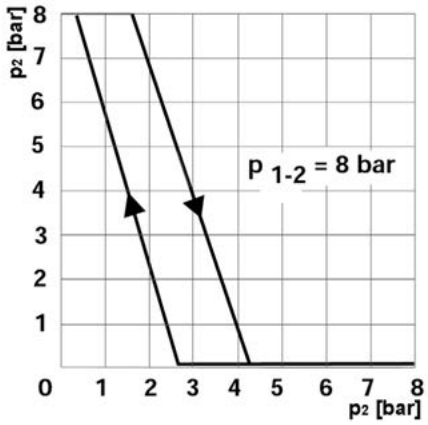


475 712 004 0



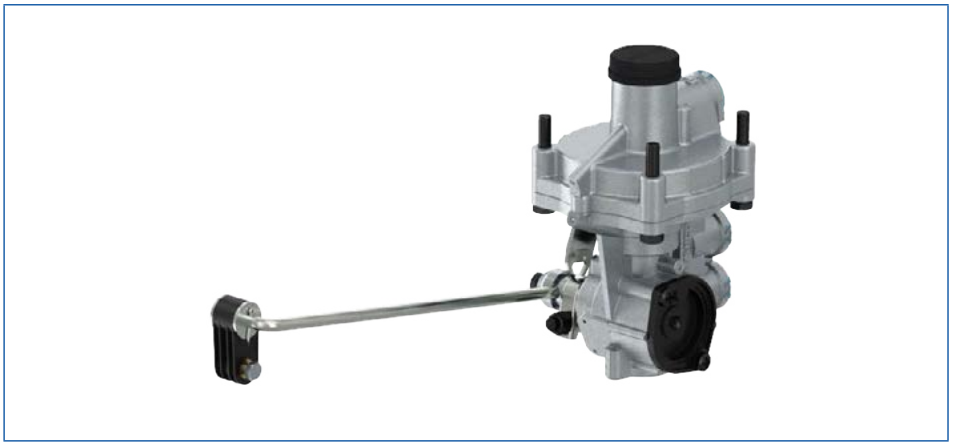


Automatic braking



LEGEND			
p_1	Input pressure	p_4	Control pressure
p_2	Output pressure	α	Lever travel [degrees]

5.26.2 LSV 475 713



Application

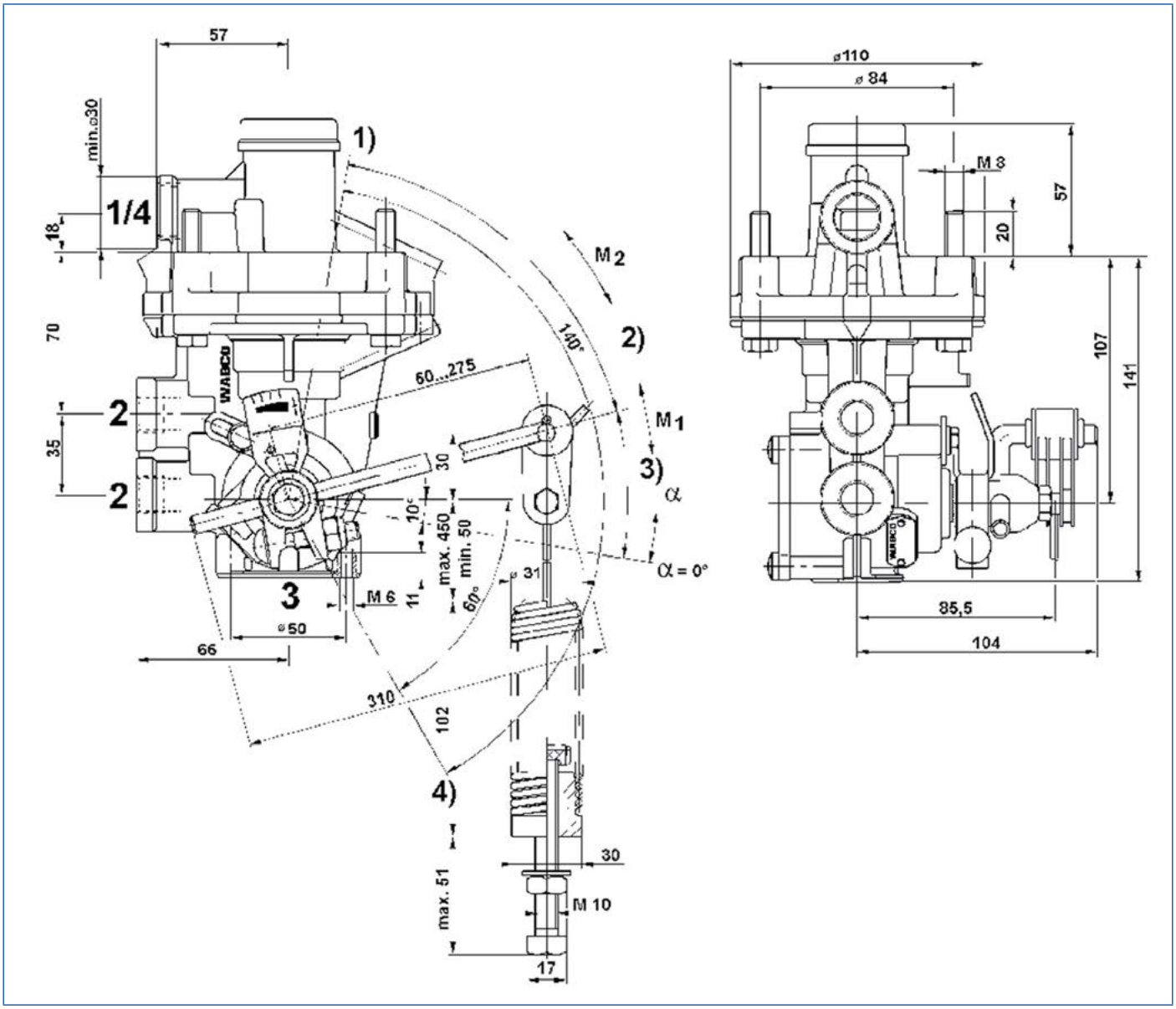
Static LSV for mechanical suspension vehicles (single-axles/axle assemblies) without EBS.

With axle assemblies, only in combination with trailer brake valve or relay valve to meet timing requirements in accordance with ECE R13.

Purpose

Automatic control of the braking force in pneumatic brake cylinders depending on the vehicle's load status.

Installation dimensions for 475 713 500 0



CONNECTIONS		PORT THREADS		LEGEND			
1/4	Energy supply	**1/4**	M 22x1.5 - 13 deep	**1)**	End stop at linkage break	**3)**	Control stroke
2	Energy discharge	**2**	M 16x1.5 - 12 deep	**2)**	Overstroke	**4)**	End stop
3	Venting						

Setting instructions

Load sensing valve program (LSV)

The required lever length can be also determined with our calculation program instead of using nomographs.

– Open the WABCO website www.wabco-auto.com.

– Then click on the links Services and Support => WABCO Workshop Solutions => Diagnostics Download Center => WABCO LSV.

The nomographs below are used to determine the LSV lever lengths to be set on the unit. Using an adjustment tool and a Ø 3 mm pin, you can set the empty braking pressure at a certain input pressure (e.g. 6 bar) and clamp with the bolt SW 10. Before adjustments can be made on LSV (cable length, lever position, etc.), there is to be no pressure on the LSV.

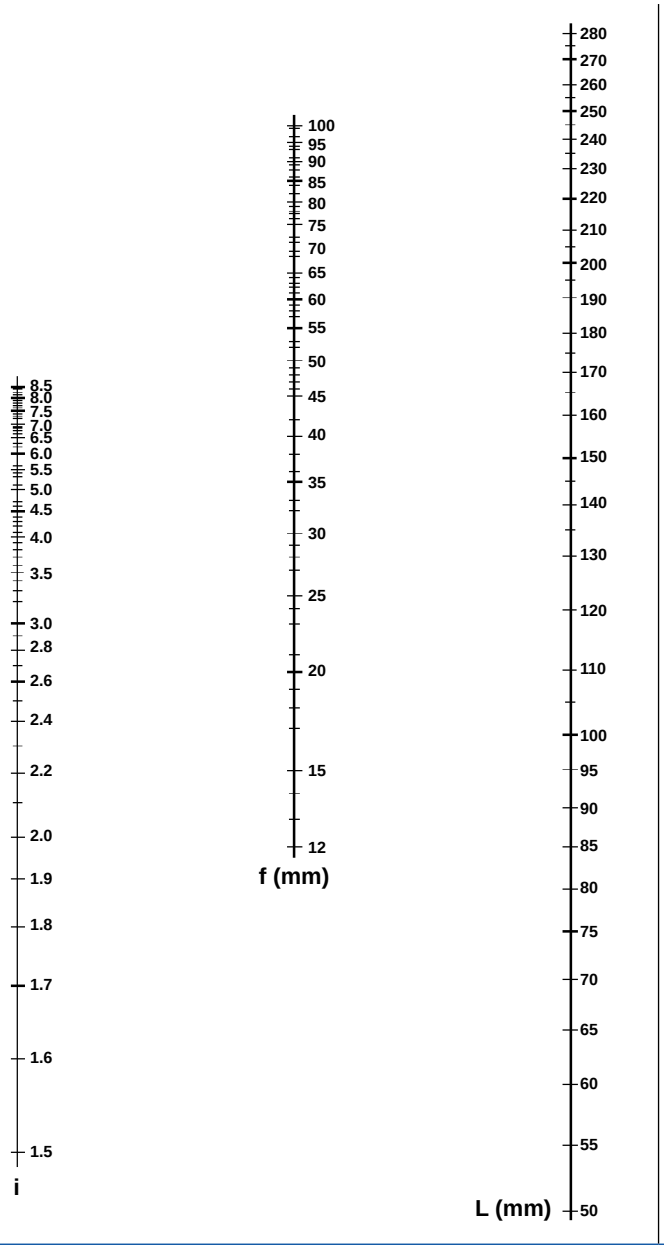
After fitting the LSV in the vehicle (empty) and the knuckle joint on the axle shaft (In the process, the spring of the knuckle joint has to be prestressed by 15 mm using the fastening bolt) and after tightening and fixing the connecting cable (cable length Min. 50 mm, Max. 450 mm), the connecting cable must hang vertically below its fastening on the lever. When the pin is removed and the LSV is again pressurised, its output pressure must be the LSV unladen pressure.

Make small corrections to the unladen braking pressure by threading the fastening bolt in or out (max. 5 mm). If the unladen braking pressure is correct, the knuckle joint is prestressed or increased by the sum of the suspension travel of the trailer (path differential loaded – unloaded). When the LSV is charged again, it must output the input pressure. If the output pressure is less than the input pressure, either the lever is too long or the suspension travel is too short. In the case of the output pressure being the same as the input pressure, the lever is lowered by approx. 10% of the spring excursion towards "empty". The resulting output pressure must be less than the input pressure. If this is not the case, either the LSV lever is too short or the suspension travel is too great.

Load sensing valve (LSV) 475 71X

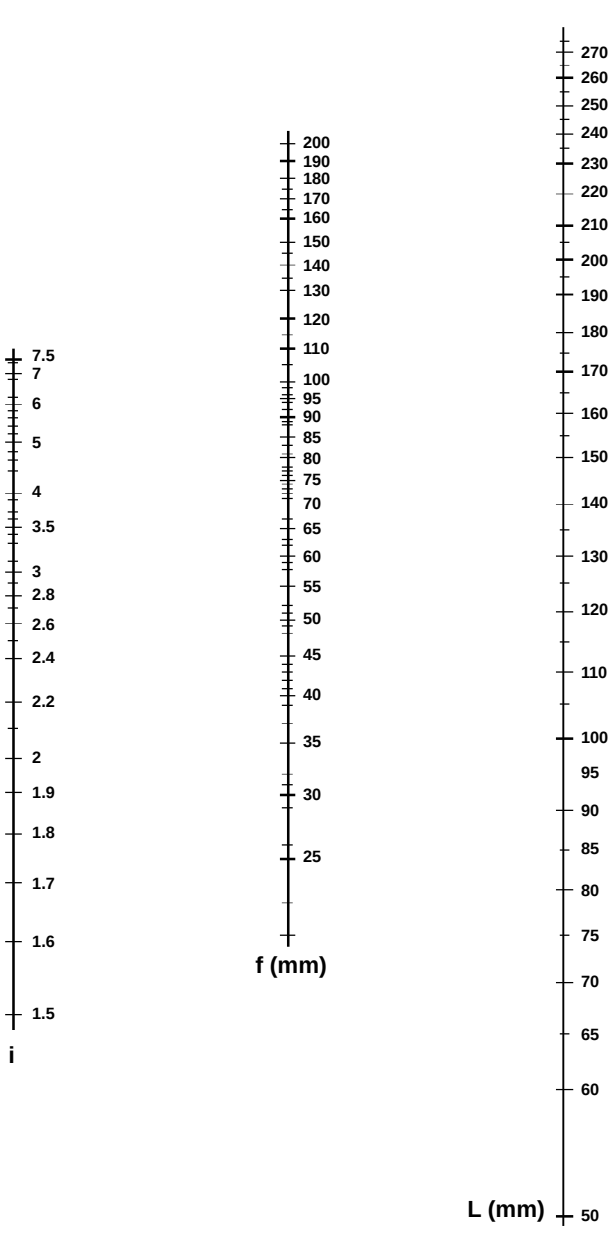
Nomograph for LSV

475 713 500 0



Nomograph for LSV

475 713 501 0



LEGEND					
i	Control ratio p_{on} -0.8 / p_{off} -0.5	**f**	Spring deflection	**L**	Lever length

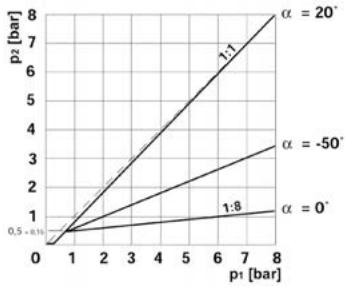
Load sensing valve (LSV) 475 71X

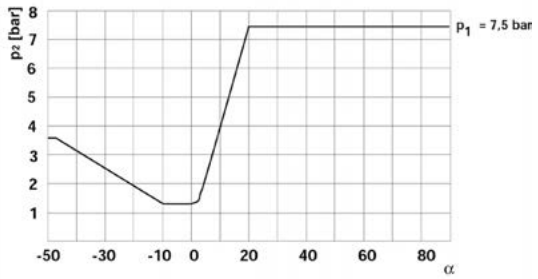
Technical data

ORDER NUMBER	475 713 500 0	475 713 501 0
Max. operating pressure	10 bar	
Max. control ratio	8:1	
Nominal diameter	Ø 10 mm	
Max. permissible adjustment torque M_2	20 Nm	
Control stroke	α = 20°	α = 33°
Thermal range of application	-40 °C to +80 °C	
Weight	1.8 kg	

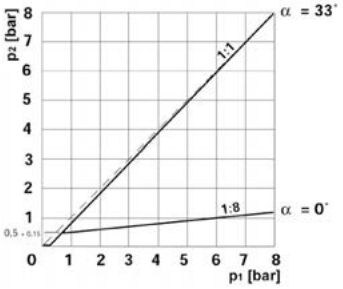
Pressure diagrams

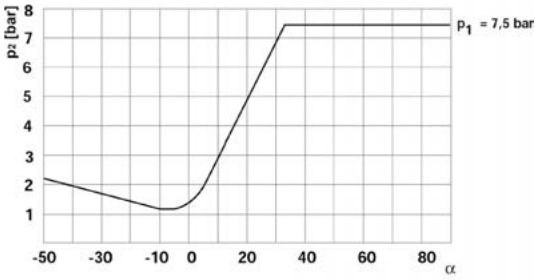
475 713 500 0





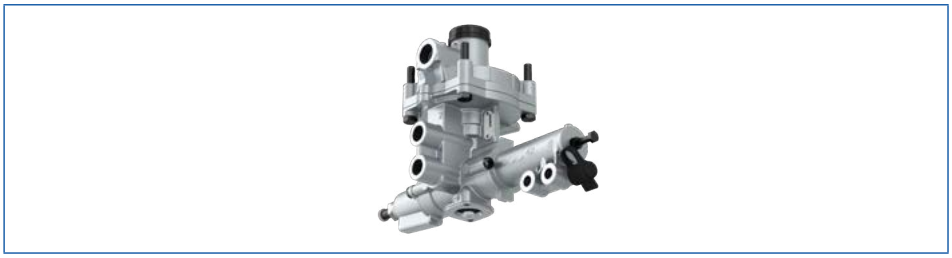
475 713 501 0





LEGEND					
p_1	Control pressure	p_2	Output pressure	**α**	Lever travel [degrees]

5.26.3 LSV 475 714



Application

Static controller for air-suspension vehicles without EBS.

Purpose

Automatic control of braking pressure from air brake cylinders on air-suspension axles (axle assemblies) depending on the control pressure of the air-suspension bellows (air-bags).

Maintenance

– To test the LSVs, fasten a test hose to connection 43.

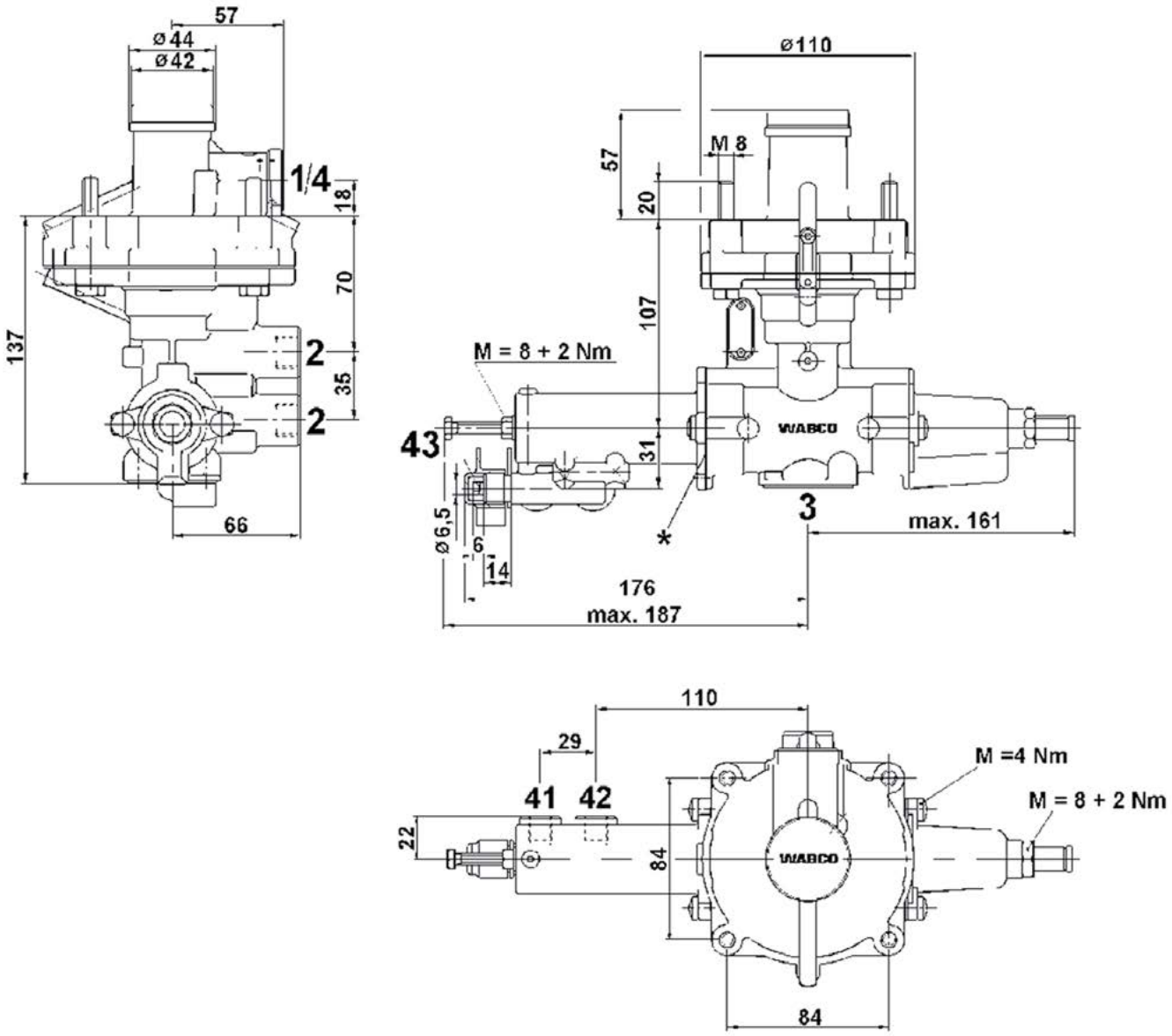
⇨ Screwing on presses the piston (n) into the housing, thereby interrupting connections 41 and 42 to the pistons (m and k). At the same time, a compressed air connection from connection 43 to the pistons (m and k) is created. In this state, the LSV sets itself to a control position corresponding to the air pressure in the test hose.

Installation recommendation

– Fasten the LSV onto the frame of the vehicle so that vent 3 faces downward.

– Make connections 41 and 42 with the air-suspension bellows (air-bags) on the right and left vehicle sides.

Installation dimensions for 475 714 500 0



LEGEND	
*	When releasing the air from the device, air can escape at the sealing surfaces.

Setting instructions

Load sensing valve program (LSV)

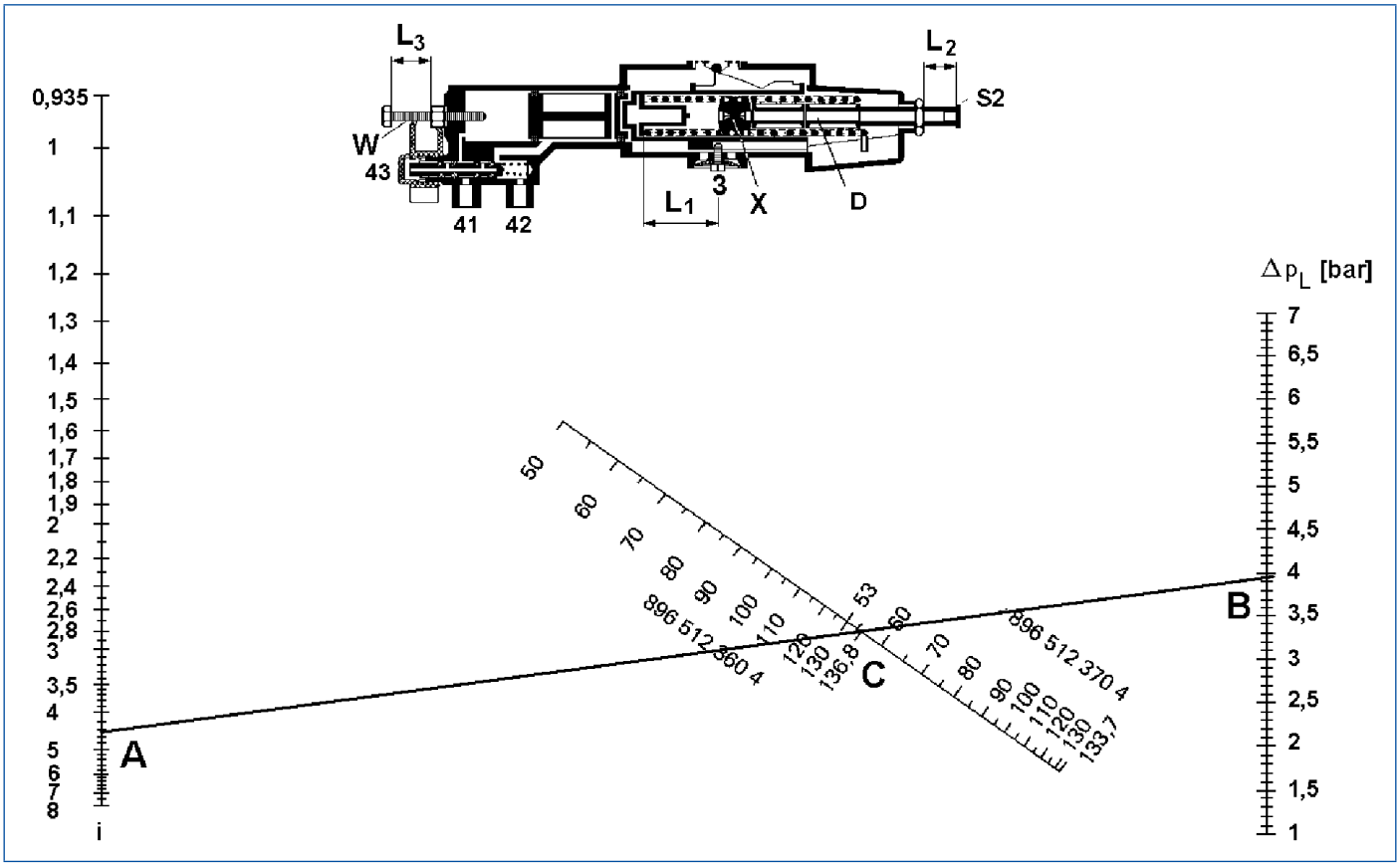
The required lever length can be also determined with our calculation program instead of using nomographs.

– Open the WABCO website www.wabco-auto.com.

– Then click on the links Services and Support => WABCO Workshop Solutions => Diagnostics Download Center => WABCO LSV.

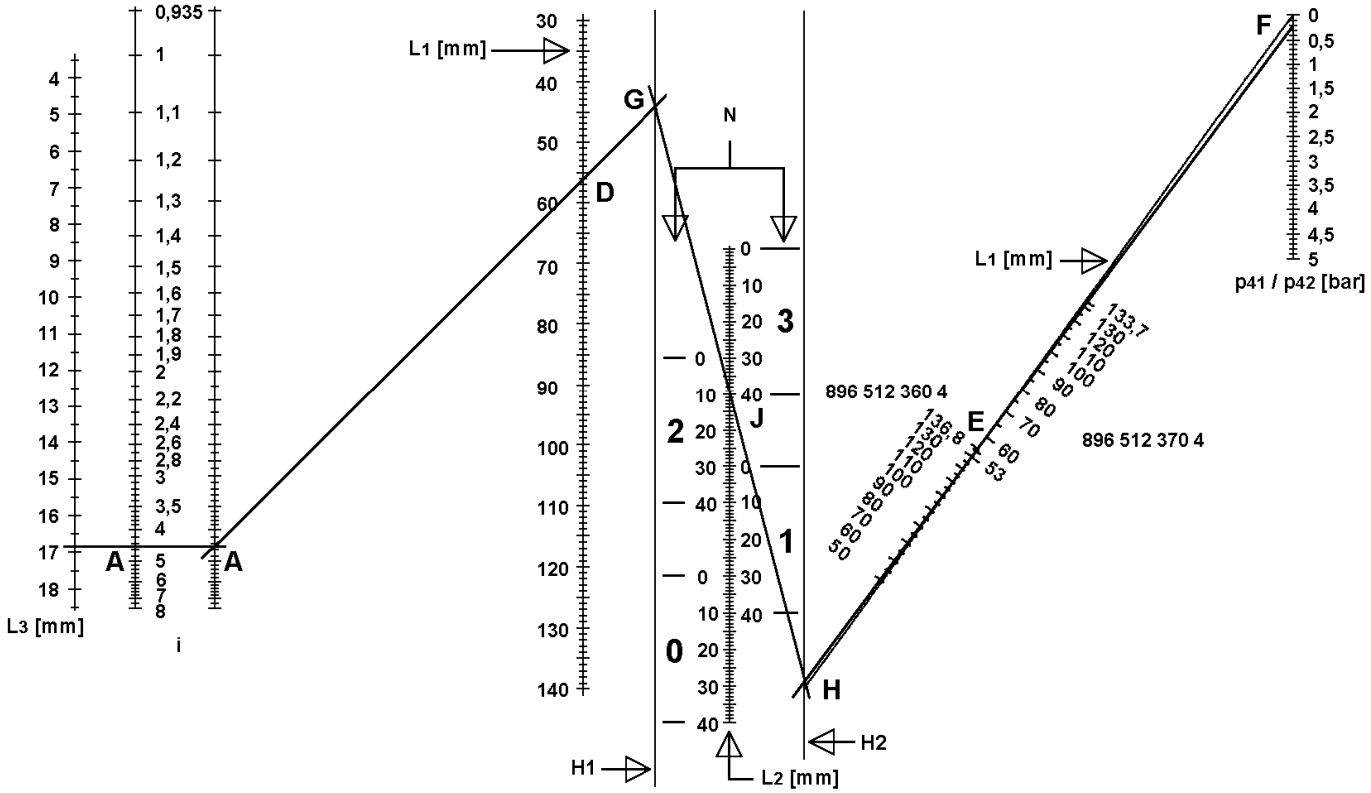
Description of the nomographs I and II for setting the LSVs 475 714 500 0:

Nomograph I for determining the compression spring and spring length L_1



LEGEND					
i	p_{on} -0.8 / p_{off} -0.5	**S2**	Screw	**896 512 360 4**	Compression spring (wire Ø 4 mm)
Δp_L	Air cushion - pressure differential; Unladen - Laden	**D**	Spacer	**896 512 370 4**	Compression spring (wire Ø 3.2 mm)

Nomograph II for determining the screw setting length L_2 and the spacers N as well as L_3



LEGEND							
L_1	Spring length	N	Number of spacers	H1	Reference line 1	**896 512 370 4**	Compression spring
L_2	Screw length	i	Control ratio $(p_{on} - 0.8) / (p_{off} - 0.5)$	H2	Reference line 2	**896 512 360 4**	Compression spring
L_3	Unladen stop bolt (W)	$p_{41/p42}$	Air cushion pressure "unladen"				

Determining the compression springs and setting length L_1

REQUIRED ADJUSTMENT VALUES	
p_{on} (p_1) = 6.5 bar	$p_{Bellows\ laden}$ = 4.1 bar
$p_{Bellows\ unladen}$ = 0.2 bar	p_{off} = $p_{2\ unladen}$ = 1.75 bar

– Calculating the control ratio:

$$i = (p_{on} - 0.8) / (p_{off} - 0.5) = (6.5 - 0.8) / (1.75 - 0.5) = 4.56$$

– Enter the control ratio in nomographs I and II (point A).

– In addition, mark the air cushion pressure differential in nomograph I ($p_{Bellows\ laden}$ - $p_{Bellows\ unladen}$), here 3.9 bar (point B).

– Connect points A-B to obtain point C at the cross-point with the identified suspension.

⇨ You can now read the spring length L_1 (free hanging) and the springs to be used here.

– In nomograph II, enter the spring length L_1 (point D) and the used spring with spring length L_1 (point E).

– After you have entered the air cushion pressure for the unladen vehicle (point F), connect points A-D and E-F together and extend them past D and E up to reference lines 1 and 2.

  ⇨ Connect the resulting points G and H with one another.
  At the crossing point with the help lines, you have point J, at which you can read the required number of spacers and the length of bolt L_2.
  The values that are determined using the nomograph are guidelines and may have to be corrected.

Setting the LSVs

Before each adjustment of the screws and pressure p_4, port 1 must be depressurised, otherwise the LSV cannot be adjusted to the required values due to the integrated statics.

Due to production tolerances and the hysteresis, after adjusting the pressures (p_1 and $p_{41/42}$) it is always practicable to readjust the input starting from 0 bar if nothing else is specified.

– After you have installed the right springs with clamp X (set dimension L_1) and the number of spacers N in the LSV, screw in screw 2 (L_2) until you can feel a noticeable resistance.

Setting the unladen end stop screw

After charging p_1 with the calculated pressure (in this case 6.5 bar), the LSV must output the unladen braking pressure (in this case 1.75 ± 0.1 bar) at the port 2.

If the unladen braking pressure is too high, unscrew the unladen end stop screw W (L_3); if the unladen braking pressure is too low, screw in the unladen end stop screw.

Unscrew the unladen end stop screw W up to max. 23 mm.

Setting the unladen braking pressure

After charging the ports 41 and 42 with the unladen air cushion pressure + 0.2 bar (in this case 0.4 bar) and the port 1 with the calculated pressure, the LSV must output a pressure that is 0.2 bar higher than the unladen braking pressure with a tolerance of ± 0.1 bar (in this case 1.95 ± 0.1 bar).

– If the pressure is too low, unscrew screw 2; if the pressure is too high, screw in screw 2.

– Lock the screw 2.

Setting the braking pressure for the laden vehicle

After charging the ports 41 and 42 with the bellows pressure for the laden vehicle -0.1 bar (in this case 4.0 bar), the LSV must output the input pressure -0.3 bar with a tolerance of ± 0.2 bar (in this case 6.2 ± 0.2 bar).

Output pressure too low

– Determine Δp (pressure differential between the nominal value and actual value).

– Lower the input pressure to 0 bar.

– Lower the bellows pressure to 0 bar and increase the value for the unladen vehicle +0.2 bar (in this case 0.4 bar).

– Unscrew the screw 2 (Δp = 0.1 bar corresponds to 3 mm).

– Unscrew the spring clamp until the nominal value (in this case 1.95 ± 0.1 bar) is attained.

– Repeat the test "Setting the braking pressure for the laden vehicle".

Output pressure too high

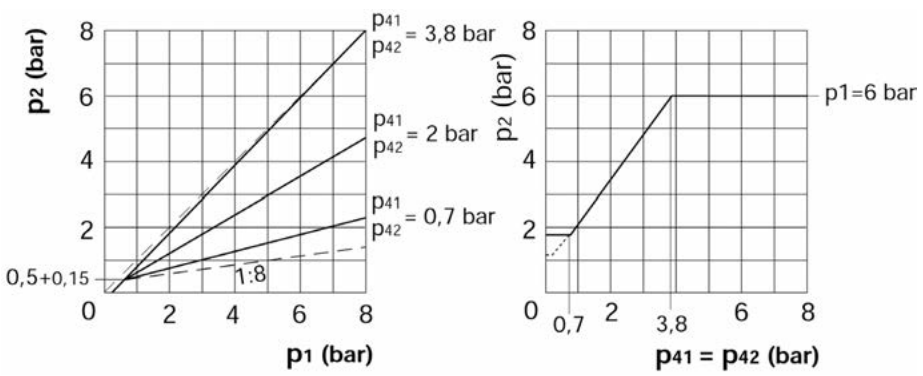
- Determine Δp.
- Lower the input pressure to 0 bar.
- Lower the bellows pressure to 0 bar and increase to the value for the unladen vehicle +0.2 bar (in this case 0.4 bar).
- Screw in the screw 2 (Δp = 0.1 bar corresponds to 3 mm).
- Screw in the spring clamp until the nominal value (in this case 1.95 ± 0.1 bar) is attained.
- Repeat the test "Setting the braking pressure for the laden vehicle".
- Actuate all the test points again after setting the LSV.
- Tighten the lock nuts on the screws W and 2 to the specified torque (8 + 2 Nm).
- Enter the data on the LSV plate (order number 899 144 631 4) and fasten it onto the vehicle.

Technical data

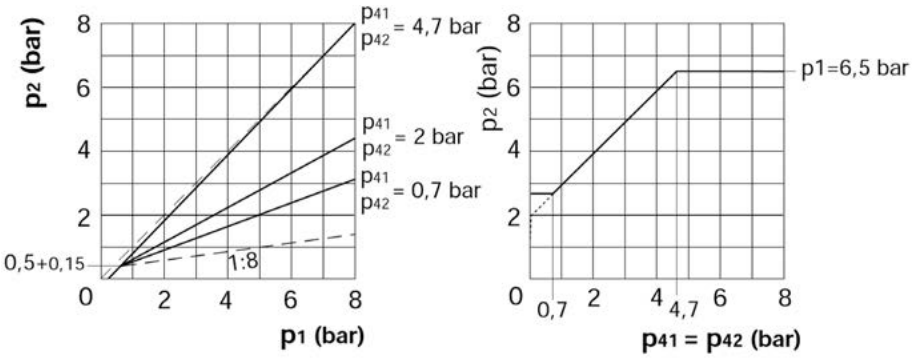
ORDER NUMBER	475 714 500 0	475 714 509 0
Max. operating pressure p_1	10 bar	
Max. control ratio	8:1	
Max. control pressure $p_{41\,/\,42}$	12 bar	
Thermal range of application	-40 °C to +80 °C	
Weight	1.8 kg	

Pressure diagrams

475 714 500 0

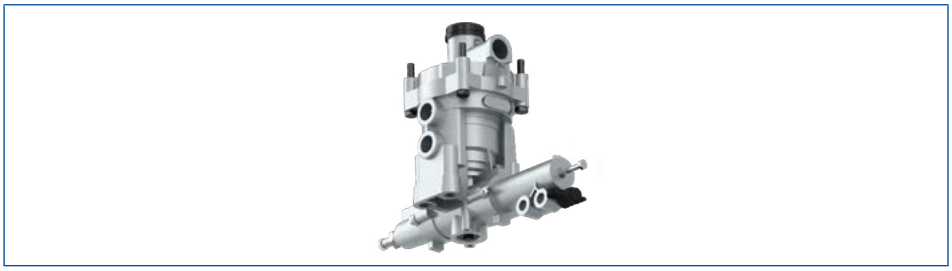


475 714 509 0



LEGEND					
p_1	Input pressure	p_2	Output pressure	$p_{41} = p_{42}$	Control pressure

5.26.4 LSV trailer brake valve 475 715



Application

Static LSV with integrated trailer brake valve for air-suspension semitrailers with multiple axles without Trailer EBS.

Purpose

Control of the two-line trailer braking systems when actuating the braking system of the towing vehicle.

Automatic control of braking force with the integrated LSV depending on the load status of the vehicle and therefore from the control pressure of the air-suspension bellows (air-bags).

Actuation of the automatic trailer braking with partial or total pressure drop in the supply line.

The LSV trailer brake valve is specially designed for air-suspension semitrailers with multiple axles.

Maintenance

– To test the LSVs, fasten a test hose to connection 43.

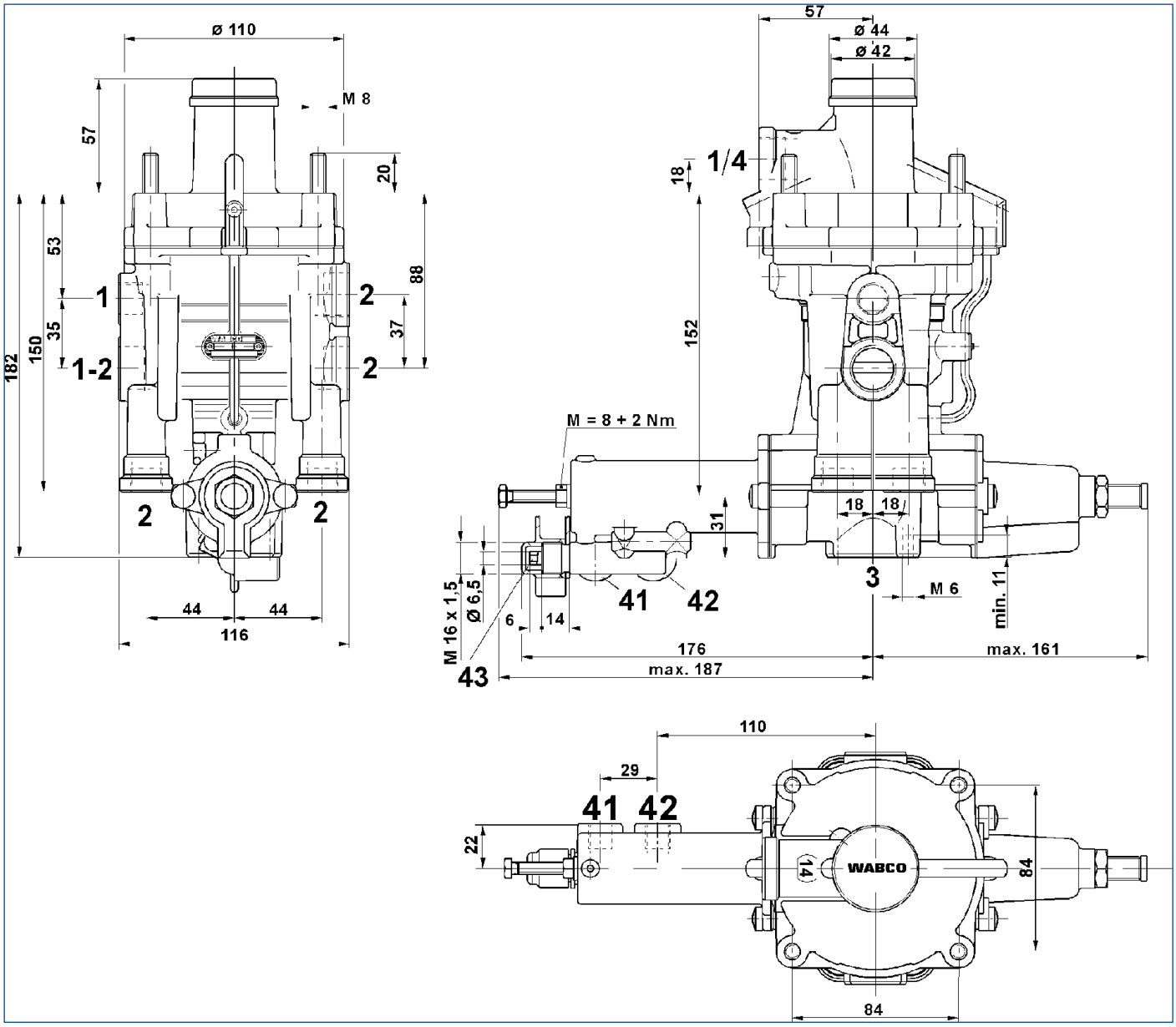
  ⇨ Screwing on presses the piston (q) into the housing, thereby interrupting connections 41 and 42 to the pistons (p and o). At the same time, a compressed air connection from connection 43 to the pistons is created. In this state, the LSV sets itself to a control position corresponding to the air pressure in the test hose.

Installation recommendation

– Fasten the LSV trailer brake valve onto the frame of the vehicle so that vent 3 faces downward.

– Make connections 41 and 42 with the air-suspension bellows (air-bags) on the right and left vehicle sides.

Installation dimensions



CONNECTIONS				PORT THREADS			
1-2	Energy supply / Energy discharge	**1, 1-4**	Energy supply	**1**	M 16x1.5 - 12 deep	**1-2, 1/4**	M 22x1.5 - 13 deep
2	Energy discharge	**3**	Venting	**2**	M 16x1.5 - 12 deep (bottom)	**2**	M 22x1.5 - 13 deep (side)
41, 42	Control connection	**43**	Test connection	**41, 42**	M 12x1.5 - 10 deep		

Setting instructions

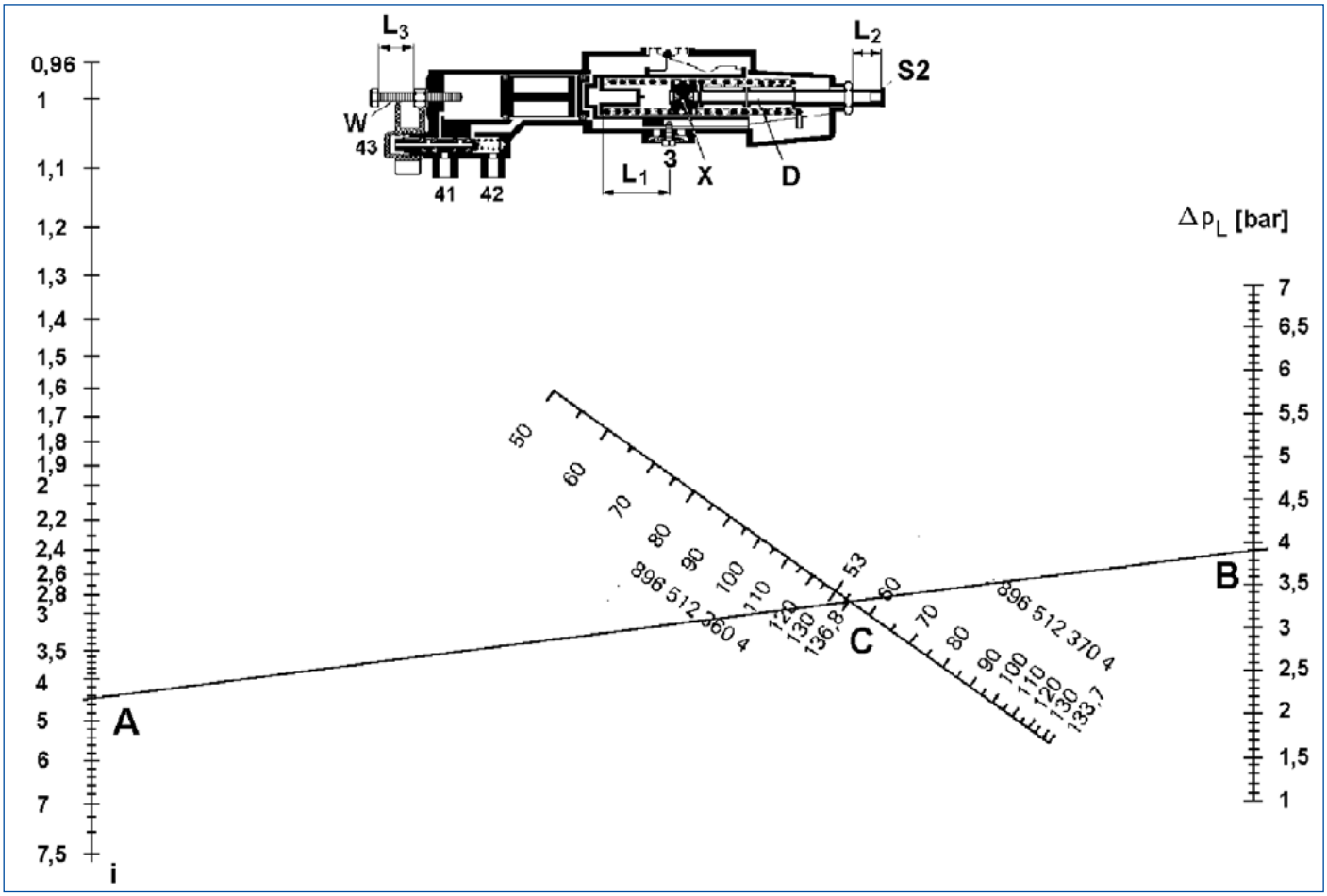
Load sensing valve program (LSV)

The required lever length can be also determined with our calculation program instead of using nomographs.

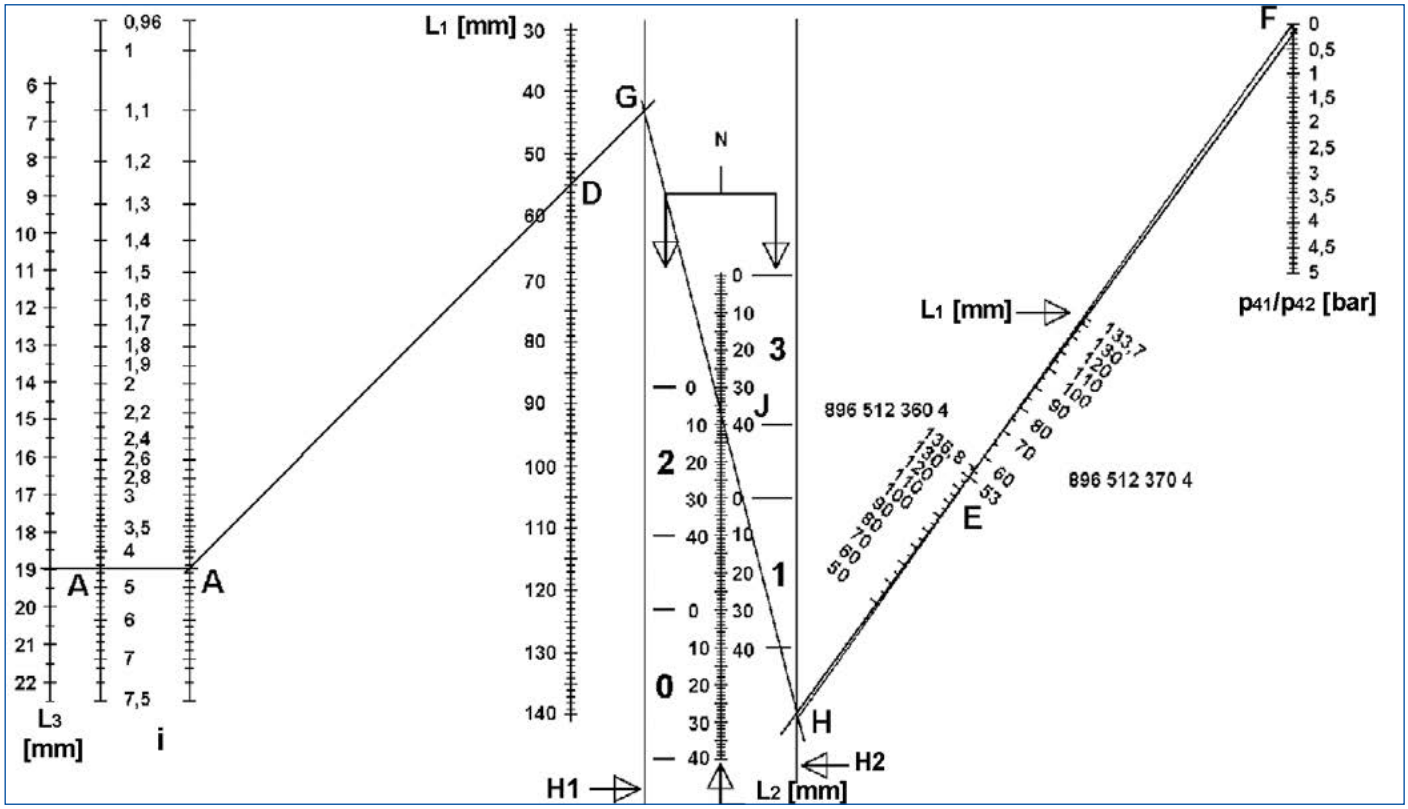
– Open the WABCO website www.wabco-auto.com.

– Then click on the links Services and Support => WABCO Workshop Solutions => Diagnostics Download Center => WABCO LSV.

Description of the nomographs I and II for setting the LSV trailer brake valve 475 715 5XX 0



LEGEND					
i	Control ratio $(p_{on} - 0.8) / (p_{off} - 0.5)$	**D**	Spacer	**896 512 360 4**	Compression spring (wire Ø 4 mm)
S2	Screw	**Δp_L**	Air cushion - pressure differential; $p_{Bellows\ laden} - p_{Bellows\ unladen}$	**896 512 370 4**	Compression spring (wire Ø 3.2 mm)



LEGEND							
L_1	Spring length	**H1**	Reference line 1	**N**	Number of spacers	**896 512 360 4**	Compression spring
L_2	Screw length	**H2**	Reference line 2	**i**	Control ratio $(p_{on} - 0.8) / (p_{off} - 0.5)$	**896 512 370 4**	Compression spring
L_3	Unladen stop bolt (W)	$p_{41/p42}$	Air cushion pressure "unladen"				

Determining the compression springs and set length L_1 and the number of spacers

REQUIRED ADJUSTMENT VALUES	
p_{on} (p_1) = 6.5 bar	$p_{Bellows\ laden}$ = 4.1 bar
$p_{Bellows\ unladen}$ = 0.2 bar	p_{off} = $p_{2\ unladen}$ = 1.75 bar

– Calculate the control ratio:

$$i = (p_{on} - 0.8) / (p_{off} - 0.5) = (6.5 - 0.8) / (1.75 - 0.5) = 4.65$$

– Enter the control ratio in nomographs I and II (point A).

– In addition, mark the air cushion pressure differential in nomograph I ($p_{Bellows\ laden}$ - $p_{Bellows\ unladen}$), here 3.9 bar (point B).

– Connect points A-B to obtain point C at the cross-point with the identified suspension.

⇨ You can now read the spring length L_1 (free hanging) and the springs to be used here.

– In nomograph II, enter the spring length L_1 (point D) and the used spring with spring length L_1 (point E).

– After you have entered the air-suspension bellows pressure for the unladen vehicle (point F), connect points A-D and E-F together and extend them past D and E up to help-lines 1 and 2.

⇨ Connect the resulting points G-H with one another.
At the crossing point with the help lines, you have point J, at which you can read the required number of spacers and the length of bolt L_2.
The values that are determined using the nomograph are guidelines and may have to be corrected.

Setting the LSVs

Before each adjustment to the bolts and pressure $p_{41/p42}$, connection 4 must be depressurised, otherwise the LSV trailer brake valve 475 715 5XX 0 cannot be adjusted to the required values due to the integrated statics.

Due to production tolerances and the hysteresis, after adjusting the pressures (p_1 and $p_{41/42}$) it is always practicable to readjust the input starting from 0 bar if nothing else is specified.

– After you have installed the right springs with clamp X (set dimension L_1) and the number of spacers N in the LSV, thread in bolt 2 until you can feel a noticeable resistance.

Setting the unladen end stop screw

After charging p_4 with the calculated pressure (in this case, 6.5 bar), the LSV trailer brake valve must apply the unladen braking pressure (in this case, 1.75 ±0.1 bar) at port 2.

– If the unladen braking pressure is too high, unscrew the unladen stop bolt W (L_3); if the unladen braking pressure is too low, screw the unladen stop bolt in

Unscrew the unladen end stop screw W up to max. 23 mm.

Setting the unladen braking pressure

After charging connections 41 and 42 with the unladen bellows pressure +0.2 bar (in this case, 0.4 bar) and connection 4 with the calculated pressure, the LSV trailer brake valve must apply a pressure that is 0.2 bar higher than the unladen braking pressure with a tolerance of ±0.1 bar (in this case 1.95 ±0.1 bar).

– If the pressure is too low, unscrew screw 2; if the pressure is too high, screw in screw 2.

– Lock the screw 2.

Setting the braking pressure for the laden vehicle

After charging the ports 41 and 42 with the bellows pressure for the laden vehicle -0.1 bar (in this case 4.0 bar), the LSV must output the input pressure -0.3 bar with a tolerance of ± 0.2 bar (in this case 6.2 ± 0.2 bar).

Output pressure too low

– Determine Δp (pressure differential between the nominal value and actual value).

– Lower the input pressure to 0 bar.

– Lower the bellows pressure to 0 bar and increase to the value for the unladen vehicle +0.2 bar (in this case 0.4 bar).

– Screw out bolt 2 (Δp = 0.1 bar = 3 mm).

– Unscrew the spring clamp until the nominal value (in this case 1.95 ± 0.1 bar) is attained.

– Repeat the test "Setting the braking pressure for the laden vehicle".

Output pressure too high

– Determine Δp.

– Lower the input pressure to 0 bar.

– Lower the bellows pressure to 0 bar and increase to the value for the unladen vehicle +0.2 bar (in this case 0.4 bar).

– Screw in bolt 2 (Δp = 0.1 bar = 3 mm).

– Screw in the spring clamp until the nominal value (in this case 1.95 ± 0.1 bar) is attained.

– Repeat the test "Setting the braking pressure for the laden vehicle".

– Actuate all the test points again after setting the LSV.

– Tighten the lock nuts on the screws W and 2 to the specified torque (8 + 2 Nm).

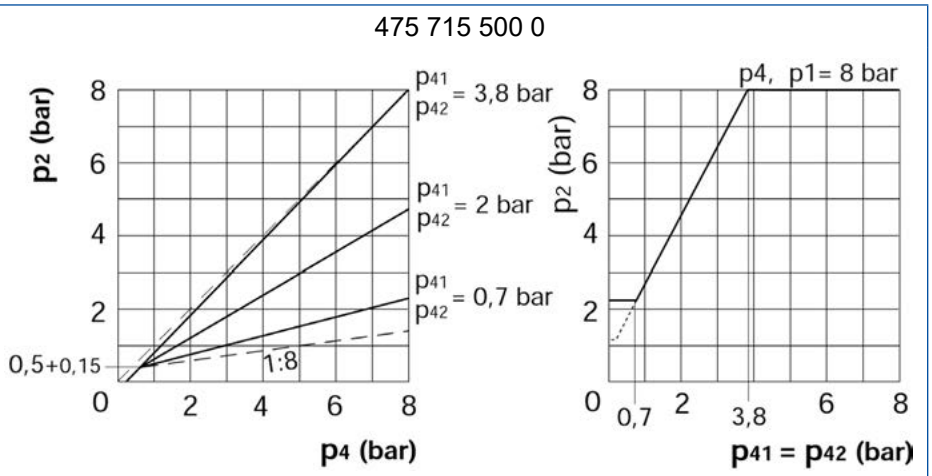
– Enter the data on the LSV plate (order number 899 144 631 4) and fasten it onto the vehicle.

Technical data

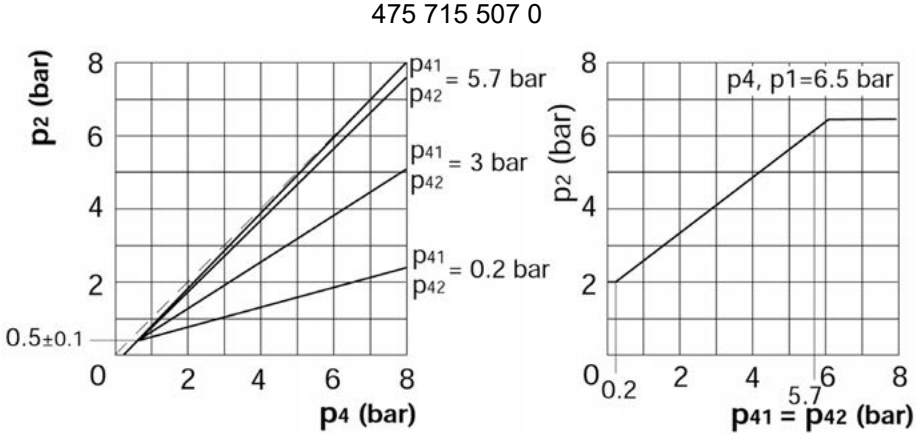
ORDER NUMBER	475 715 500 0	475 715 507 0	475 715 513 0	475 715 514 0
Max. operating pressure $p_{1/4}$	10 bar			
Max. control ratio	8:1			
Max. control pressure $p_{41.42}$	12 bar			
Thermal range of application	-40 °C to +80 °C			
Weight	1.8 kg			

Pressure diagrams

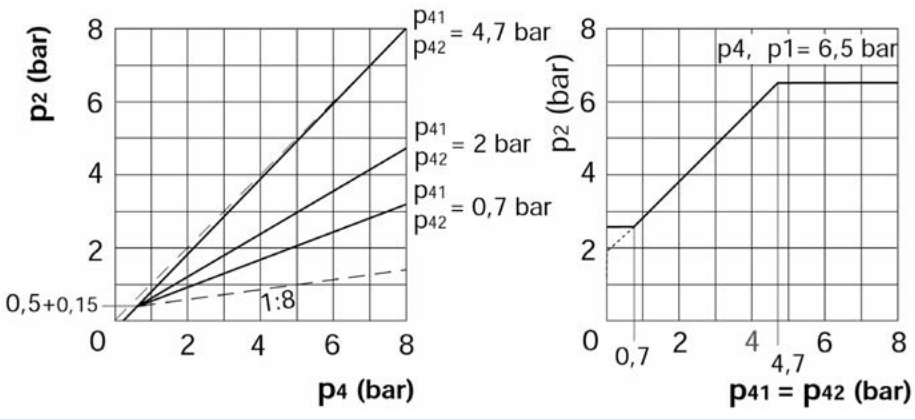
475 715 500 0



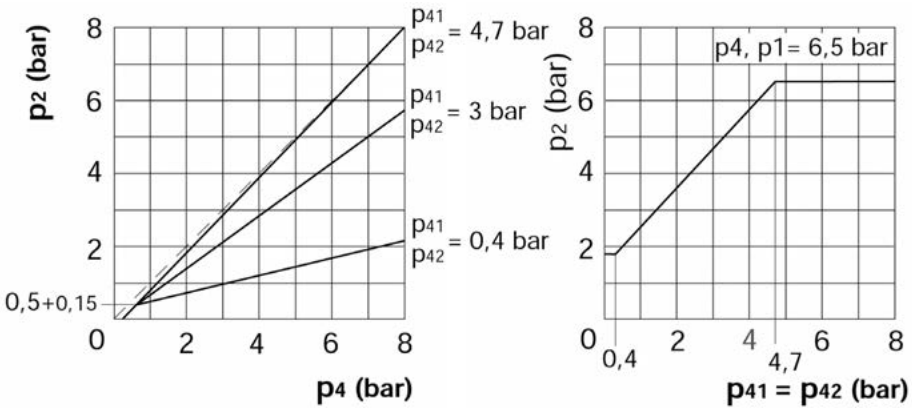
475 715 507 0



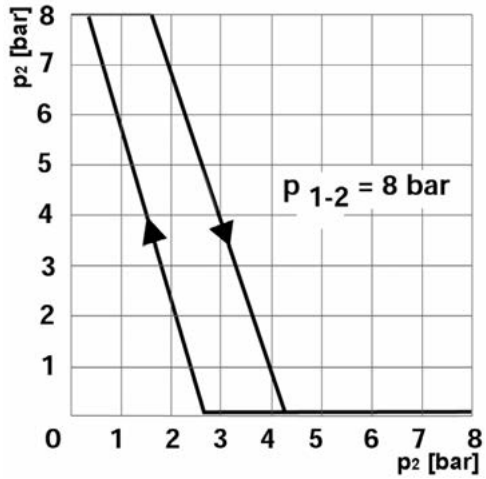
475 715 513 0



475 715 514 0



Automatic braking



LEGEND					
p_2	Output pressure	p_4	Input pressure	$p_{41} = p_{42}$	Control pressure

5.26.5 Plates "Set values LSV " 899 144 63X 4

The vehicle is to be equipped according to the required LSV specifications conforming with EC Guideline 71/320 EWG Appendix II Annex to II/1.1.4.2 Paragraph 7 and the ECE provision No. 13 Appendix 10 Paragraph 7. The respective signs can be obtained from WABCO (see following figures). These signs correspond with the draft for standards DIN 74267 of September 1982 Form C and D. They are provided in three languages and offer the capability for table entries for axle loads and the output pressures of the LSV.

The pressures to be entered in the LSV plate must be measured immediately before and after the LSV, so that it is not influenced by the characteristics of other devices of the braking system.

In the configuration of the braking systems, test connections are to be designed according to standard ISO standard 3583/1974 before and after the LSV controller.

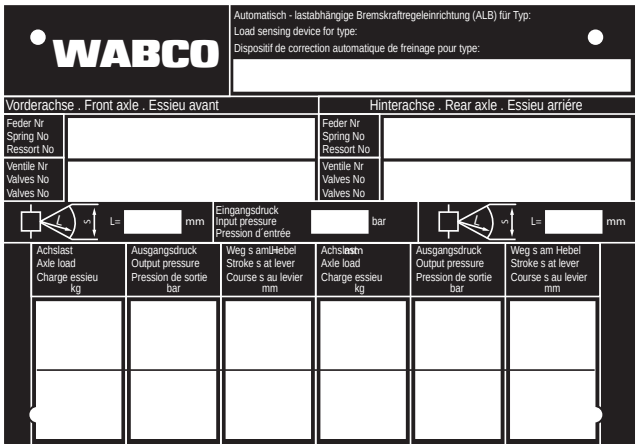
On control connection 41 or 42 from pneumatically hydraulically actuated LSVs, a special test connection is required. It blocks the control pressure from the air-suspension bellows or the overflow cylinders when the test hose is connected.

When the trailer is empty, any load status can be simulated with the help of test apparatus 435 008 000 0.

With mechanically hinged LSVs, the required load status for checking the LSVs is achieved with a manual adjustment.

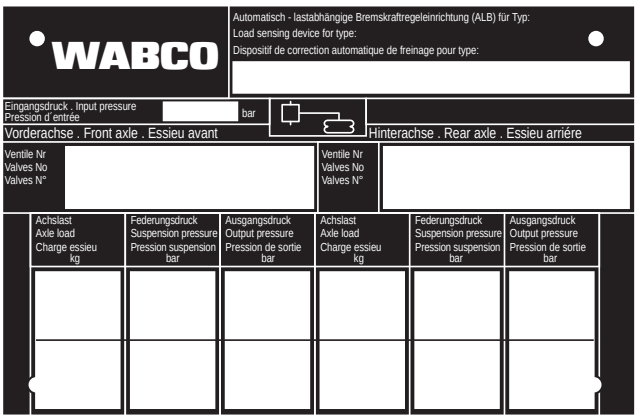
LSV plate 899 144 630 4

for mechanically controlled LSVs



LSV plate 899 144 631 4

for pneumatically or hydraulically controlled LSV



With two LSVs with different input pressure, both pressures are to be noted on the LSV plate, e.g. 6.5/5.7.

Nomographs

Nomographs

– Open the WABCO website www.wabco-auto.com.
– Click on Product catalogue INFORM => Product number.
– Enter the desired LSV number into the search field.
– Click on the Start button.
– Click the link Publications.

LSV	NOMOGRAPHS
475 710 040 0	475 710 902 3
475 712 000 0	475 710 902 3
475 713 50X 0	475 713 902 3
475 714 5XX 0	475 714 902 3
475 715 XXX 0	475 715 902 3

5.27 Load-dependent control valve 475 800

475 800 303 0

Application

Vehicles with leaf-spring suspension and trailing steering axle.

Purpose

Control of the steering stabilisation on a trailing steering axle depending on the spring deflection and thus on the load status of the vehicle.

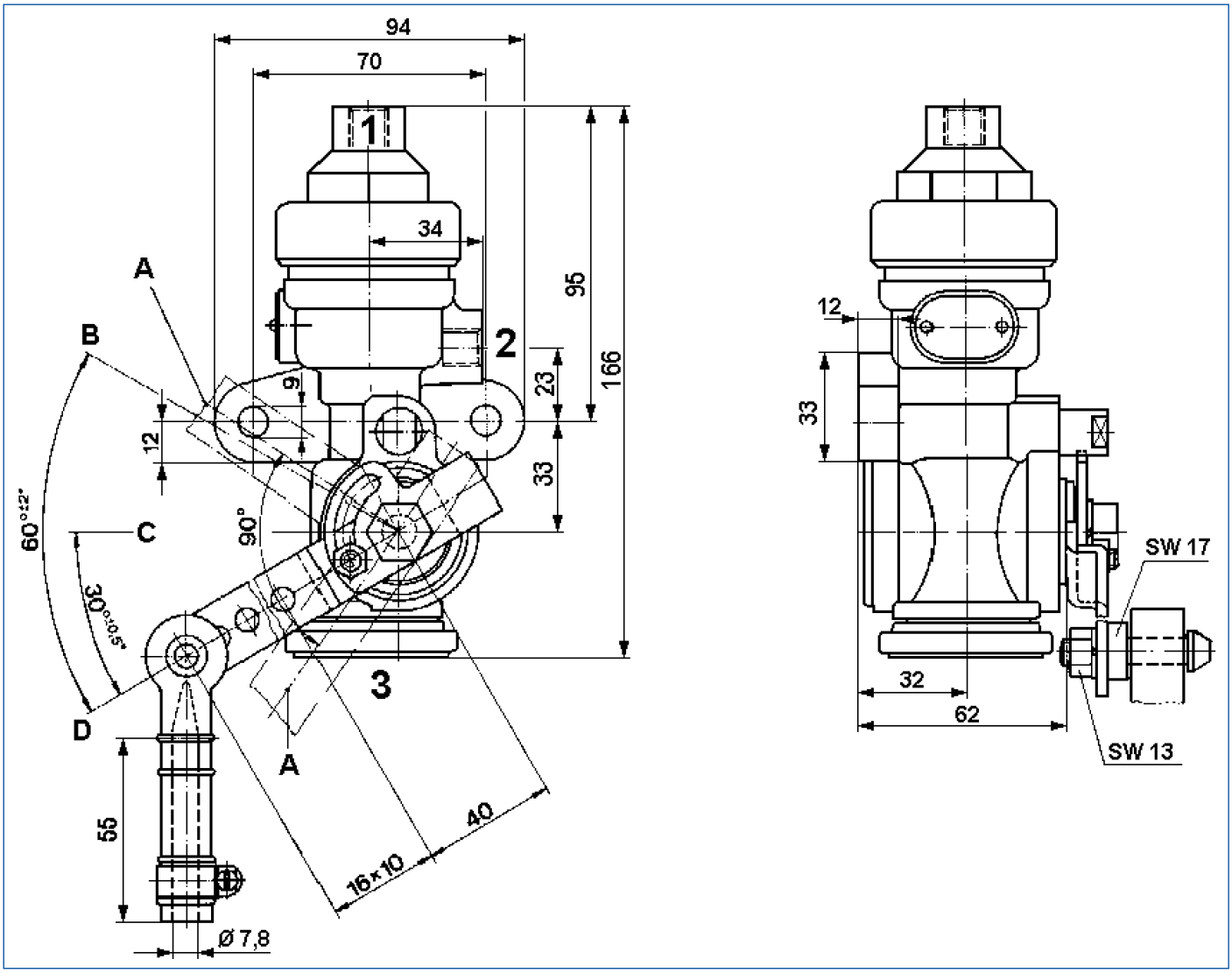
Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

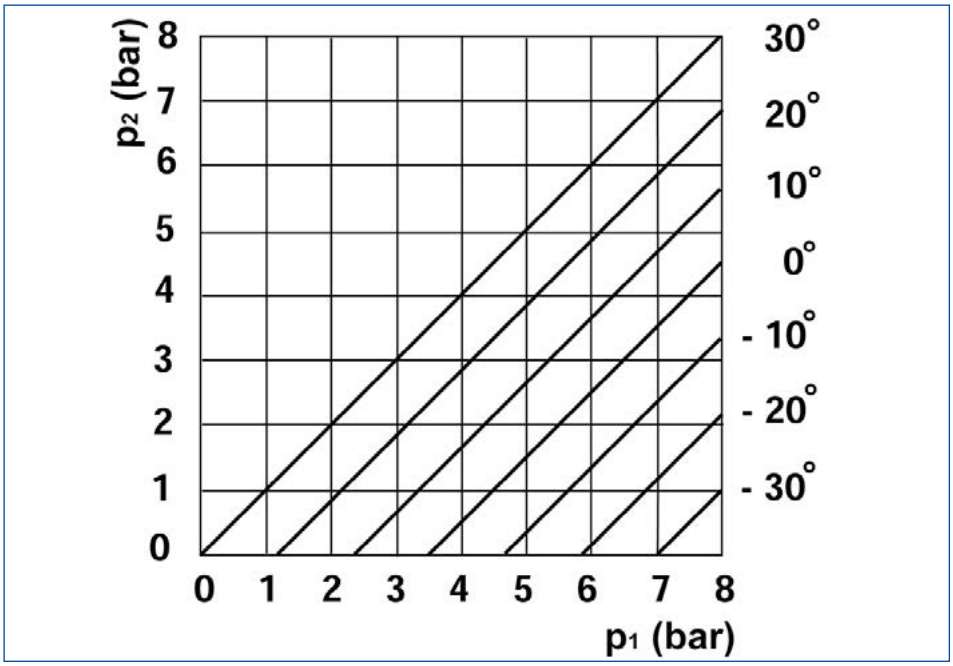
- Install the load-dependent control valve vertically so that the vent 3 points downward.
- Fasten the load-dependent control valve with two M8 bolts on the respective flange.

Installation dimensions



CONNECTIONS				PORT THREADS	LEGEND			
1	Energy supply	**3**	Venting	M 12x1.5 - 12 deep	**A**	Overstroke	**B**	Fully laden position
2	Energy discharge				**C**	Central position	**D**	Unladen position

Diagram



LEGEND					
p_1	Input pressure	p_2	Output pressure	**-30° to 30°**	Lever travel

Determining lever length L

For determining the lever length L, the following values must be known:

Spring deflection f = ... mm	Output pressure "unladen" $p_{2\ unladen}$ =...bar
Supply pressure p_1 = ... bar	Output pressure "laden" = $p_{2\ laden}$ = ...bar

– For determining scale point A (output pressure p_2) subtract $p_{2\ unladen}$ from $p_{2\ laden}$.

– Then subtract the determined pressure difference Δp_2 from the supply pressure p_1.

⇨ The resulting value p_2 is the starting point A for a line that is made to point B (scale for spring deflection f).
The extension of these lines cross the scale of lever length L, at which the lever length at point C can then be read.

Example

f = 40 mm

p_1 = 7.0 bar

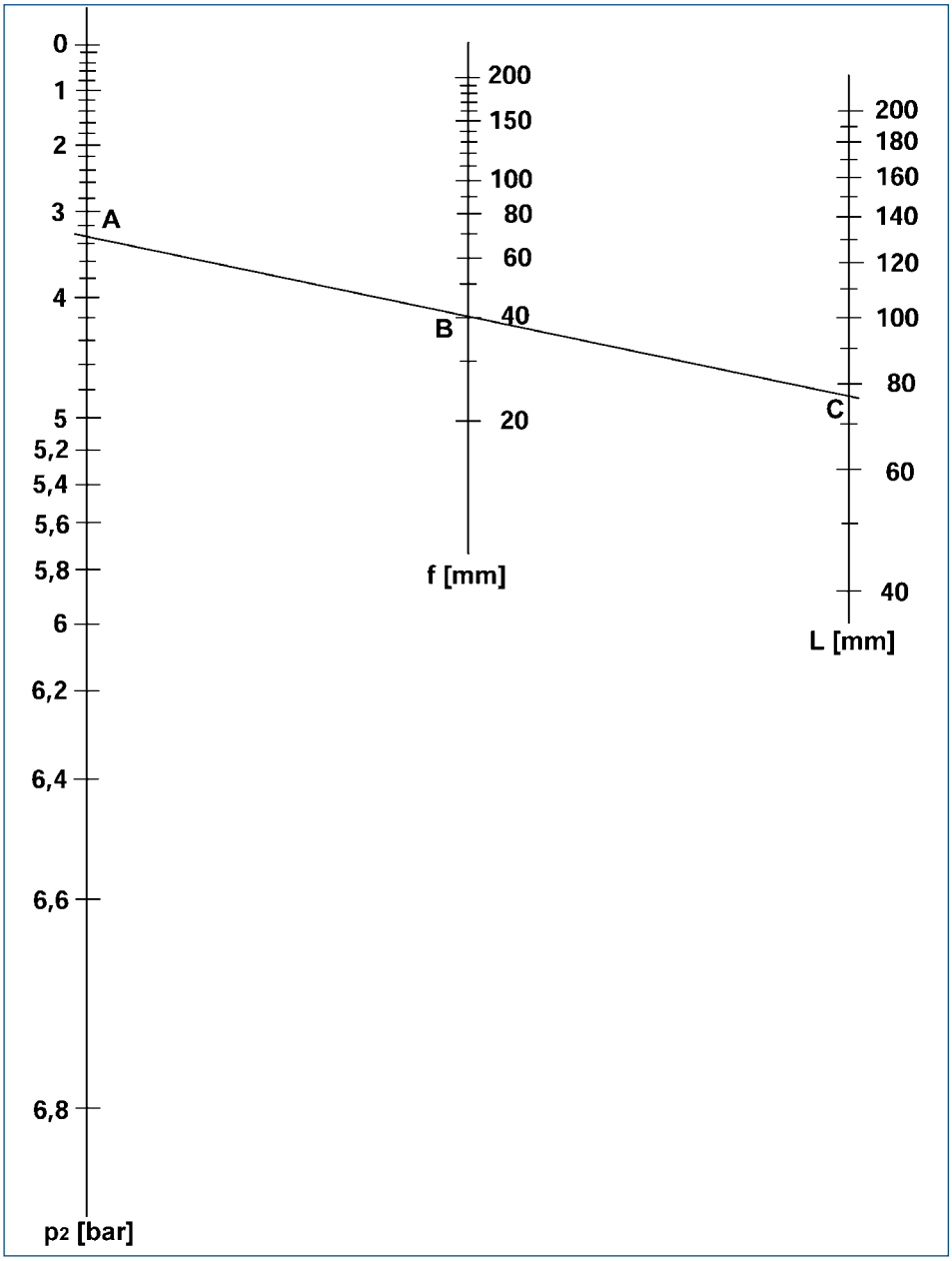
$p_{2\ unladen}$ = 1.8 bar

$p_{2\ laden}$ = 5.5 bar

$\Delta p_2 = p2_{laden} - p2_{unladen} = 5.5 - 1.8 = 3.7$ bar

$p_2 = p1 - \Delta p_2 = 7.0 - 3.7 = 3.3$ bar

In the following nomograph, a line is made from scale point A = 3.3 bar to scale point B = 40 mm. Extending this line crosses the scale for lever length L in point C at 75 mm.



LEGEND					
f	Spring deflection	**L**	Lever length	**p_2**	Output pressure for p_1 = 7 bar

Technical data

ORDER NUMBER	475 800 301 0
Max. operating pressure	8 bar
Control range	0 to 7.2 bar
Permissible medium	Air
Thermal range of application	-40 °C to +80 °C
Weight	1.1 kg

5.28 Tristop® Cylinder 925 XXX

DDSB
Drum brake

Drum brake

DDSB
Disc brake

Disc brake

Application

Utilisation on at least one vehicle axle.

Purpose

Combined spring brake - diaphragm brake chambers (Tristop ® Cylinders) are used to generate the brake force for the wheel brakes. They consist of the diaphragm portion for the service braking system and the spring-loaded portion for the auxiliary and parking braking systems.

Installation instructions for Tristop® cylinders

The approval of the axle manufacturer is necessary for installing Tristop® cylinders. WABCO is available for any enquiries regarding testing methods.

Mounting bracket

To ensure enduring bolt tension, the following points must be considered:

- A flat mounting surface (deviation of maximum 0.4 mm) over a breadth of at least 146 mm and a height of at least 40 mm above and below the fastening bolts is necessary.
- The mounting surface of the bracket is only to be primed and not painted.
- Direct contact is required between bracket/cylinder and cylinder/nut.
- Do not use reinforcement strips, intermediate plates, washers, spring lockwashers and other locking elements.

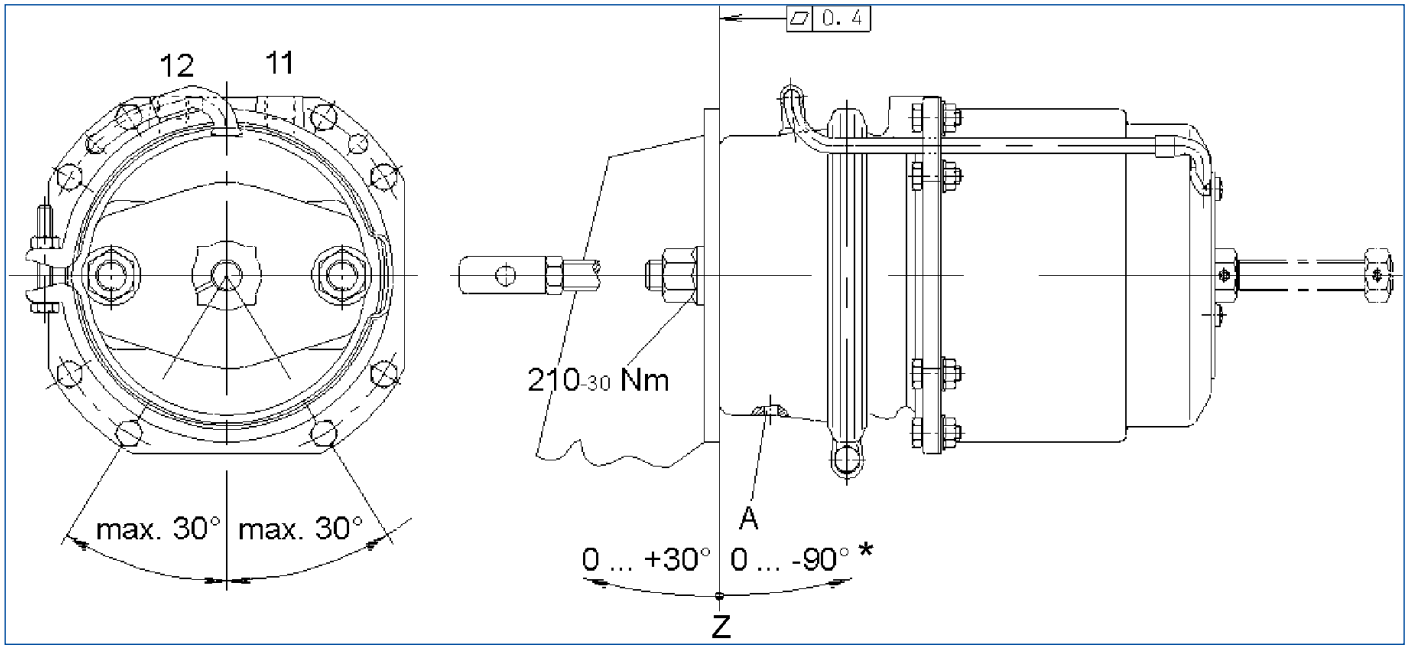
Installation

– Install the Tristop® cylinder with up to a 30° slant between horizontal upward facing and vertical downward facing piston rod.
The open drain/breather hole must point downwards (maximum permissible deviation ±30°).

Install the Tristop® cylinder with gaiter seal with the piston rod at a maximum of a 60° downward angle.

– Seal additional drain holes (exception TSL cylinder!).

– Seal the opening for the release screw.
The bleed line between the service brake part and the spring brake part must run in the area of the upper half of the Tristop® cylinder.
The maximum permitted displacement of the piston rod is 3° on all sides.



LEGEND					
A	Drain hole	**Z**	Permissible installation position	*	0 to -60° using Tristop® cylinder with gaiter

Fastening

Fastening the Tristop® cylinder requires the use of nuts M16x1.5 – strength class 8 – DINEN28673, ISO8673 (in accessories pack, WABCO No. 423 903 532 2).

- Thread on both nuts by hand until the Tristop® cylinder makes full contact.
- Tighten the nuts to approximately 120 Nm (e.g. with an impact wrench).
- Tighten the nuts to 210 Nm (tolerance -30 Nm) using a torque wrench.
  Increase the tightening torque appropriately when using self-locking nuts.
- Check the tightening torque of 210 Nm in accordance with the maintenance intervals of the axle manufacturer.

Steering axle specifics

When installing Tristop® cylinders on steering axles, ask the axle manufacturer about the respective installation situation.

Replacement

When replacing a brake chamber, check the bracket for any damage and replace according to the axle manufacturer's recommendations if necessary.

Installing a larger cylinder than type 30/30

Types 36/36 and 36/30 are not to be mounted using horizontally positioned fastening bolts. In this case, a vertical position with a deviation of ±30° is permitted.

General

WABCO Tristop® cylinders are delivered with the springs under tension. Release the springs before commissioning the vehicle.
With the TSL types, fasten the release screw in the hole provided on the side. Close the hole, on the cover with the cap attached to the device.

Installation instructions for Tristop® cylinders (disc brake)

Installation

– Install the Tristop® cylinder horizontally.
Permissible deviation: 10° with push rod showing upward and 30° showing downwards.
The open drain/breather hole must point downwards (maximum permissible deviation ±30°).

– Remove the lower plastic plug.
The connecting line between the service brake part and the spring brake part must run in the area of the upper half of the Tristop® cylinder.

Fastening

Fastening the Tristop® cylinder requires using nuts M16x1.5 – Strength class 8 – DIN934 (WABCO No. 810 304 031 4).

– Thread on both nuts by hand until the Tristop® cylinder makes full contact.
Make sure that the piston rod goes into the calotte of the brake lever.
Make sure that the flange surfaces and sealing surfaces of the cylinder and the disc brake are clean and undamaged.
Make sure that the gaiters are not damaged and are seated properly together with the back-up ring.

– Tighten both nuts to approximately 120 Nm (e.g. with an impact wrench).

– Tighten both nuts to 210 Nm (tolerance -30 Nm) using a torque wrench.

– Move the release bolt to drive position after fastening (secure with 25^{+20} Nm).

Install dimensions - Double diaphragm spring brake actuator for S-cam drum brake

Outline drawing with install dimensions

– Open the WABCO website www.wabco-auto.com.

– Click on Product catalogue INFORM => Product number.

– Enter the order number of the desired double diaphragm spring brake actuator into the search field.

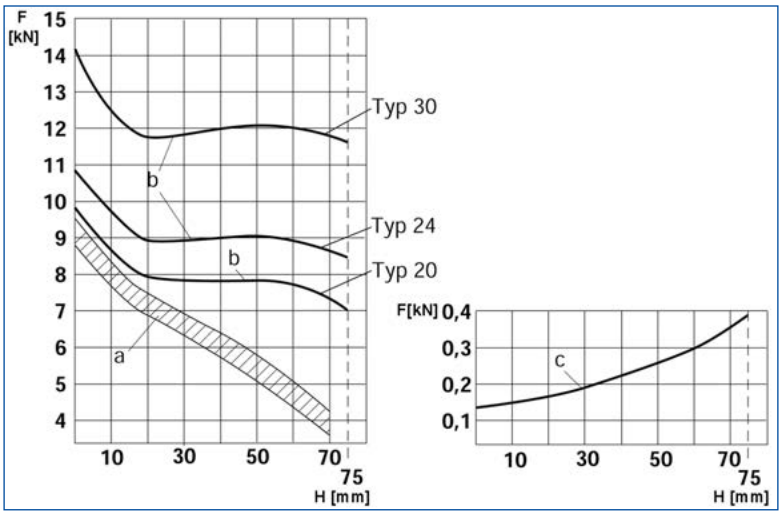
– Click on the Start button.

Technical Data - Double diaphragm spring brake actuator for S-cam drum brake

ORDER NUMBER	TYPE	MAX. STROKE [mm] DIAPHRAGM CYLINDER AND SPRING ACTUATOR CYLINDER	DISPLACEMENTOFPUSH ROD IN ANY DIRECTION	VOLUME-STROKE OF THE BRAKE CHAMBER AT 2/3 STROKE [litres]	VOLUME STROKE OF THE SPRING CHAMBER CYLINDER [litres]	MAX. OPERATING PRESSURE [bar]	THERMAL RANGE OF APPLICATION	INSTALLATION DIMENSIONS D [mm]	OUTPUT FORCE OF THE SPRING CHAMBER AT STROKE 30 mm [kN]	WEIGHT [kg]
925 375 100 0	20/30	75	6°	0.9	2.12	8.5	-40 °C to +80 °C	149	6.6 ± 0.3	9.2
925 376 100 0	24/30	75	6°	1.9	2.12			162		9.7
925 376 101 0	24/30	75	6°	1.09	2.12			162		9.7
925 376 103 0	24/30	75	6°	1.09	2.12			162		9.9
925 376 106 0	24/30	75	6°	1.16	2.12			162		10.3
925 376 107 0	24/30	75	6°	1.09	2.12			162		9.9
925 376 110 0	24/30	75	6°	1.09	2.12			162		9.9
925 376 200 0	24/30	64	6°	0.9	1.92			161		9.3
925 377 100 0	30/30	75	6°	1.32	2.12			182		10
925 377 101 0	30/30	75	6°	1.32	2.12			182		10
925 377 102 0	30/30	75	6°	1.32	2.12			182		10
925 377 103 0	30/30	75	6°	1.32	2.12			182		10.2
925 377 105 0	30/30	75	6°	1.32	2.12			182		10.2

423 903 535 2 Yoke end without fastening nut / 423 903 532 2 Yoke end with nut

Pressure diagrams - Double diaphragm spring brake actuator for S-cam drum brake



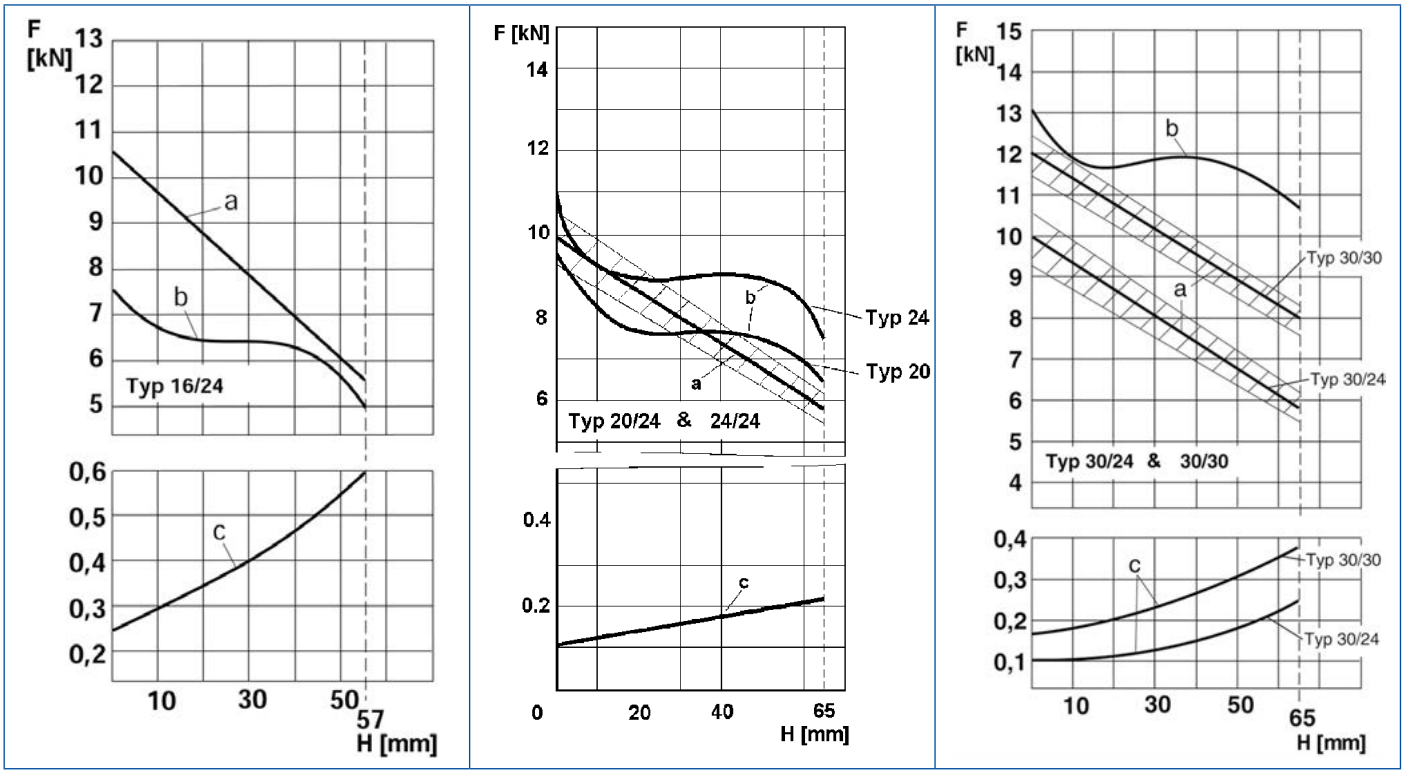
LEGEND			
a	Output force of the spring chamber, release pressure p_e = 4.6 ±0.3 bar	**F**	Force
b	Output force of the service brake part at p_e = 6.5 bar	**H**	Stroke
c	Return-spring force of the service brake part		

Technical data – Tristop® Cylinder (cam)

ORDER NUMBER	TYPE	MAX. STROKE [mm] DIAPHRAGM CYLINDER AND SPRING ACTUATOR CYLINDER	RELEASE TORQUE [Nm] RELEASE DEVICE TIGHTENING TORQUE [Nm]		DISPLACEMENT OF PUSH ROD IN ANY DIRECTION	VOLUME-STROKE OF THE BRAKE CHAMBER AT 2/3 STROKE [litres]	VOLUME STROKE OF THE SPRING CHAMBER CYLINDER [litres]	MAX. OPERATING PRESSURE	THERMAL RANGE OF APPLICATION	OUTPUT FORCE OF THE SPRING CHAMBER AT STROKE 30 mm [kN]	WEIGHT [kg]
925 494 041 0	16/24	65	15 $^{+20}$	25 $^{+20}$	3°	1.13	1.8	8.5 bar	-40 °C to +80 °C	7.9	11.5
925 490 105 0	20/24	65	15 $^{+20}$	70	3°	0.8	1.4			8 ±0.4	9.8
925 491 114 0	24/24	65	15 $^{+20}$	70	3°	0.8	1.4			8 ±0.4	9.8
925 491 111 0	24/30	65	15 $^{+20}$	70	3°	0.8	1.4			10.2 ±0.4	9.9
925 492 204 0 *	30/24	65	15 $^{+20}$	70	3°	1.13	1.4			8 ±0.4	9.2
925 492 208 0	30/30	65	15 $^{+20}$	70	3°	1.13	1.8			10.2 ±0.4	11.5
925 492 300 0**	30/30	65	15 $^{+20}$	70	3°	1.13	1.8			10.2 ±0.4	9.9

LEGEND			
*	Installation position +90° / -30°	**	Installation position +50° / -10°

Pressure diagrams – Tristop® Cylinder (cam)



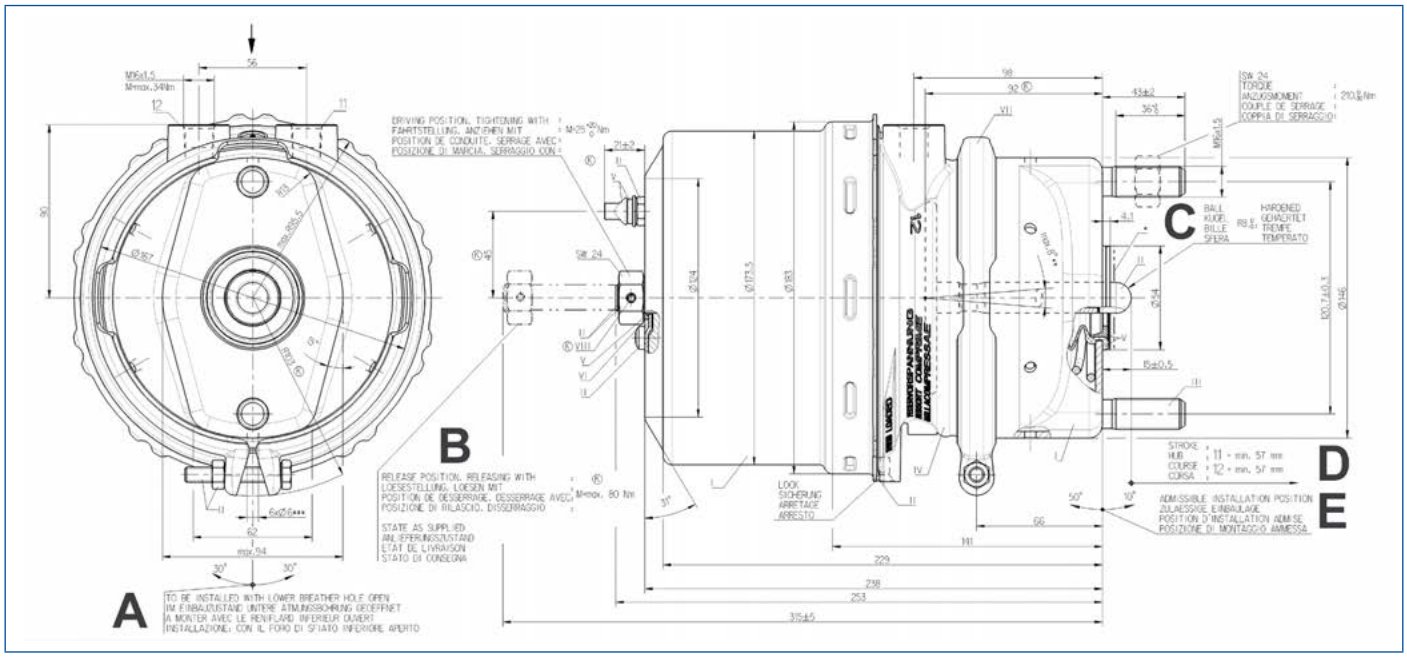
LEGEND			
a	Output force of the spring chamber, release pressure p_e = 4.6 ±0.3 bar	**F**	Force
b	Output force of the service brake part at p_e = 6.5 bar	**H**	Stroke
c	Return-spring force of the service brake part		

Technical data

Order number	Type	Max. stroke [mm]
925 384 001 0	16/24	57
925 380 101 0	20/24	64

Max. operating pressure	8.5 bar
Volume-stroke of the brake chamber at 2/3 stroke [litres]	0.51
Volume stroke of the spring chamber cylinder [litres]	0.754
Min. nominal diameter	Ø 11.5
Thermal range of application	-40 °C to +80 °C
Weight	6.6 kg

Installation dimensions for 925 464 500 0 – Tristop® cylinder (disc brake)



PORT THREADS	LEGEND									
M 16x1.5	**A**	In mounted position lower breather hole ± 30°	**B**	Release position as supplied	**C**	Ball	**D**	Stroke	**E**	Permissible installation position

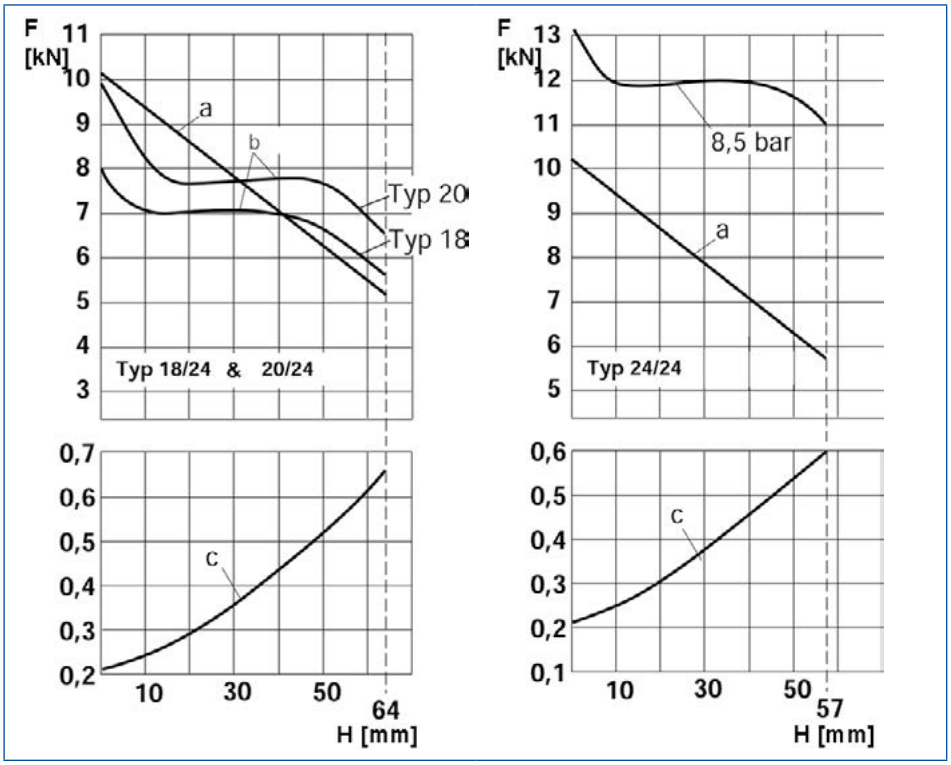
TYPE	Installation dimensions [mm]													
	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	D_1	D_2	D_3	R_1	α	β
16/16	320	252	237	227	64	90	96	90	146	167	158.5	101	45°	90°
16/24	318	253	237	227	64	92	96	90	146	167	173.5	101	45°	90°
18/24	328	258	243	233	65	96	99	90	153	175	173.5	106	36°	90°
20/24*	328	258	243	233	65	96	99	90	153	175	173.5	106	45°	90°
20/24**	320	253	238	229	65	92	98	90	153	175	173.5	106	90°	110°

LEGEND			
*	925 480 960 0	**	925 460 032 0

Technical data – Tristop® cylinder (disc brake)

ORDER NUMBER			TYPE	MAX. STROKE [mm]	VOLUME-STROKE OF THE BRAKE CHAMBER AT 2/3 STROKE [litres]	VOLUME STROKE OF THE SPRING CHAMBER CYLINDER [litres]	MAX. OPERATING PRESSURE SERVICE BRAKE SYSTEM SPRING CHAMBER CYLINDER	THERMAL RANGE OF APPLICATION	WEIGHT [kg]
α = RIGHT β = LEFT	α = LEFT β = RIGHT	UNIVERSAL: CONNECTIONS TOP β = LEFT							
925 464 450 0	925 464 451 0	925 464 452 0	16/16	57	0.54	1.2	8.5 bar	-40 °C to +80 °C	7.0
925 464 461 0 α = 90°, β = 70°			16/16	57	0.54	1.2			7.0
925 464 500 0	925 464 501 0		16/24	57	0.54	1.4			8.0
925 463 500 0	925 463 501 0	925 463 502 0	18/24	64	0.8	1.4			9.1
925 460 100 0	925 460 101 0	925 480 960 0	20/24	64	0.8	1.4			9.2
		925 460 032 0	20/24	57	0.6	1.4			8.0
925 461 050 0	925 461 051 0	925 461 052 0	24/24	64	0.8	1.4			9.2

Pressure diagrams – Tristop® cylinder (disc brake)



LEGEND			
H	Stroke	F	Force

5.29 Drain valve 934 300 / 934 301

Drain valve 934 300	Automatic drain valve 934 301
	

Application

On drain and pressure reservoirs.

Purpose

Protection of the compressed-air equipment from ingress of condensate by means of automatic or manual draining of the air reservoir.

Maintenance

Drain valve 934 300

– If the valve does not close or open upon actuation, it must either be cleaned or replaced.

Automatic drain valve 934 301

Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

Drain valve 934 300

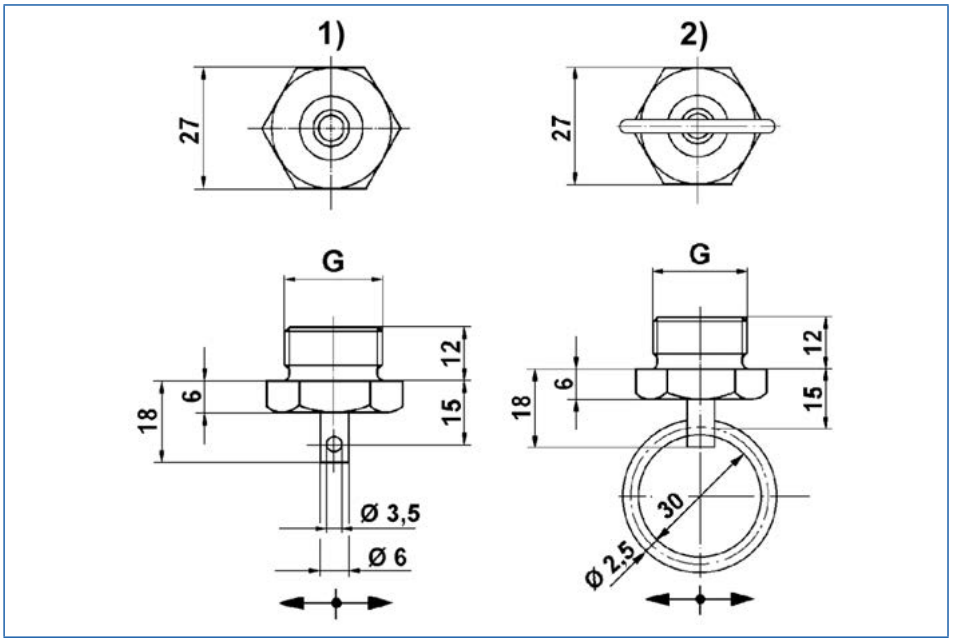
– Equip the drain valve with a seal ring A 22x27 DIN 7603 Al, order number 811 401 080 4 and thread it into the base connection for the air reservoir (tightening torque = 45 Nm).
The actuating pin is provided with a hole for attaching the pull-wire (934 300 003 0 with actuating ring).

– Do not mount any devices under the drain valve to ensure that the condensation will not become contaminated when draining.

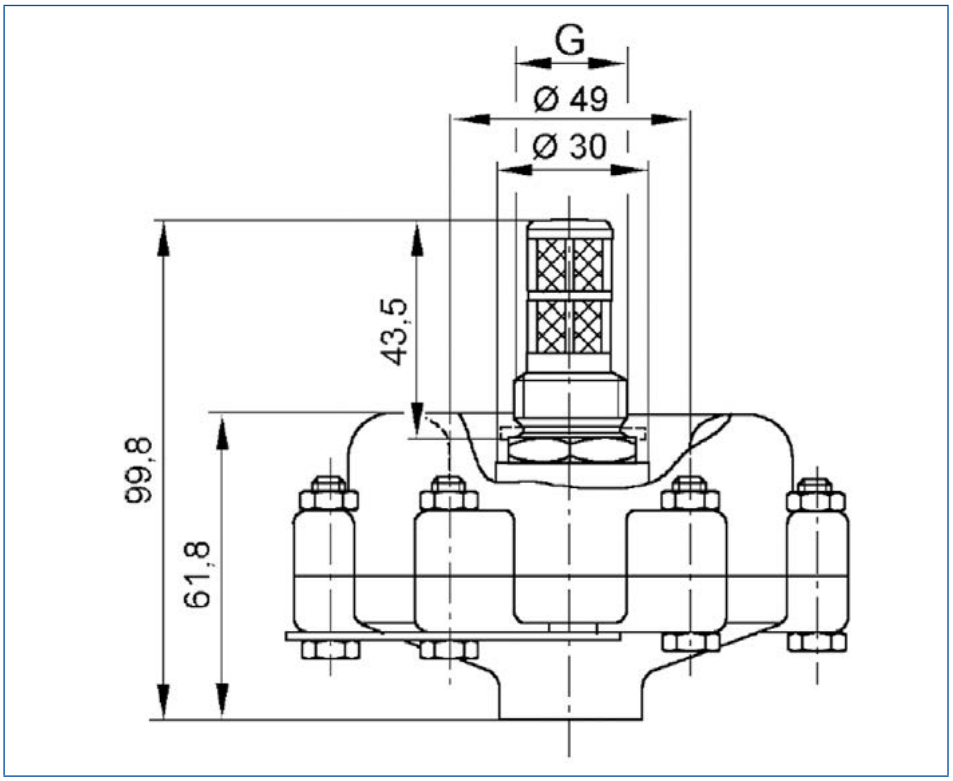
Automatic drain valve 934 301

Special maintenance that extends beyond the legally stipulated inspections is not required.

Install dimensions for 934 300



Install dimensions for 934 301



Technical data

ORDER NUMBER	934 300 001 0	934 300 002 0	934 300 003 0
Max. operating pressure	22 bar	20 bar	
Version (see Fig. "Installation Dimensions")	1)		2)
Connecting thread G (see Fig. "Installation Dimensions")	M 22x1.5	R 1/2" DIN 259	M 22x1.5
Permissible media	Air, water, mineral oil		
Thermal range of application	-40 °C to +80 °C		
Corresponds to standard	B DIN 74 292	–	C DIN 74 292
Material	Brass		
Weight	0.05 kg	0.06 kg	0.05 kg

ORDER NUMBER	934 301 000 0
Max. opening pressure	20 bar
Connecting thread G (see Fig. "Installation Dimensions")	M 22x1.5
Permissible media	Air, water, mineral oil
Thermal range of application	-40 °C to +80 °C
Weight	0.46 kg

5.30 Air reservoir 950 XXX

Application

For all vehicles with compressed air braking systems.

Purpose

Storage of the compressed air delivered from the compressor.

Design

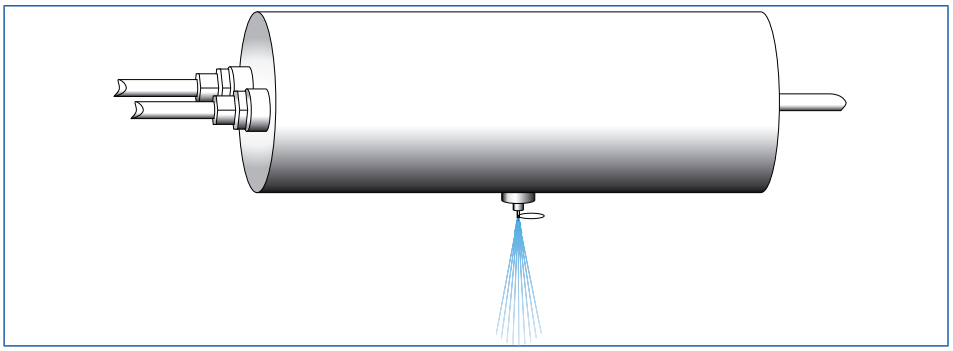
The reservoir consists of the cylindrical portion in the centre with welded-in arched bases and screw necks for connecting pipes.

A further port is located at the centre section where a draining facility can be attached for regular draining of condensation water.

The material for the plates is R St 37-2. The inner wall of the container is protected against corrosion by a synthetic resin paint. The outside surface is primed with a synthetic resin.

A plate is located at one end, indicating the name and address of the supplier, the supplier's part number, the year of manufacture, the maximum operating pressure [bar], the capacity [litres], the serial number, test mark, the volume x diameter and – for some types only – DIN 74 281.

Maintenance



– Drain the air reservoir daily.

We recommend using drain valves which are available for both manual and automatic actuation.

Installation recommendation

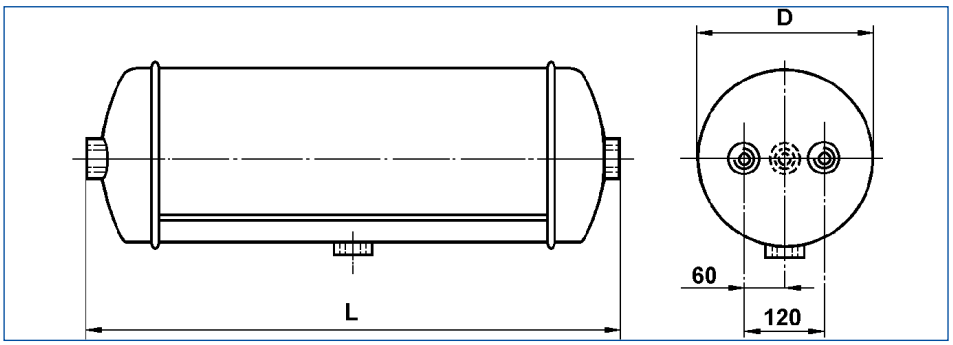
– Attach the clamp bands so that the connecting seams do not touch the base and the reservoir is not subjected to any tension that could jeopardise operational safety.
The fastening is done using straps or the brackets of the reservoir.
Put insulation strips between the reservoir and the straps if necessary.

– Install the reservoir horizontally or vertically.
Make sure that one drain pipe is located at the lowest point of the reservoir.
Make sure that any condensation can be emptied and/or the collection of condensation is prevented.

⇨ The reservoir plate must be easily legible in the specified installation position when the reservoir is installed.

No heat treatment or welding is to be done on the walls of the reservoir that are under pressure.

Installation dimensions



PORT THREADS
M 22x1.5 - 12 deep

Technical data

ORDER NUMBER	CONTENT [litres]	LENGTH L [mm]	DIAMETER D [mm]	MAX. OPERATING PRESSURE [bar]	WEIGHT [kg] ±10 %
950 405 001 0	4.5	185	206	15.5	3.0
950 410 004 0	10	368	206	15.5	4.7
950 420 003 0	20	691	206	15.5	8.0
950 520 003 0	20	495	246	15.5	7.2
950 530 002 0	30	709	246	15.5	10.0
950 537 001 0	37	862	246	15.5	11.9
950 540 001 0	40	927	246	15.5	12.7
950 740 002 0	40	758	276	14.5	11.5
950 560 002 0	60	1365	246	15.5	18.0
950 760 002 0	60	1108	276	14.5	16.2
950 060 003 0	60	893	310	12.5	15.2
950 060 004 0	60	580	396	12.5	16.3
950 080 002 0	80	750	396	12.5	20.5
950 100 002 0	100	915	396	12.5	24.5

CLAMPING BAND	CYLINDER Ø	ORDER NUMBER
	206	451 999 206 2
	246	451 999 246 2
	276	451 999 276 2
	310	451 999 310 2
	396	451 999 396 2

Rubber spacer: 451 999 999 0 (50 m)

5.31 Coupling head 952 20X / 452 XXX

5.31.1 Coupling head 952 20X

952 200 021 0	952 200 022 0
for the supply line A1	for brake line A2
with red closing cap	with yellow closing cap
	

Application

In the supply- and brake-line between the towing vehicle and the trailer.

Purpose

Connect the two lines with cross-coupling safeguard.

The hose couplings conform to the ISO 1728 standard.

Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

If automatic hose couplings are used, the shut-off cock normally required is not required. Whenever the trailer parts from its towing vehicle, the lines will always rupture. The hose couplings do not become disconnected.

After unhitching the vehicle, the plastic cover (red or yellow) must be screwed onto the coupling head opening to prevent dirt from entering.

Test

For leakages only.

Technical data

ORDER NUMBER	952 200 021 0	952 200 022 0
Design	For the supply line A1 with red closing cover and an axial safeguard against cross-coupling	For brake line A2 with yellow closing cover and a lateral safeguard against cross-coupling
Method of utilisation	Semitrailer	Truck Tractor
Max. operating pressure	10 bar	
Thermal range of application	-40 °C to +80 °C	
Weight	0.22 kg	0.18 kg

Dummy coupling: Order number 452 402 000 0

Overview

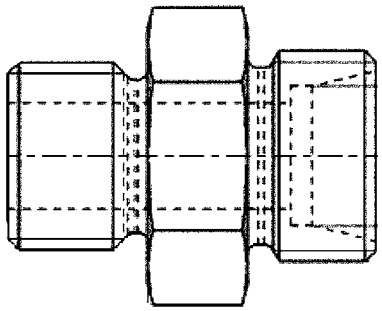
Coupling heads of the older 452 200 series can be connected to coupling heads of the 952 200 series without any problem.

COUPLING HEADS				
TOWING VEHICLE	TRAILER	THREAD	COLOUR	COMMENT
For Swiss type braking systems				
452 303 031 0	452 203 031 0	M 22x1.5	red	Supply line
452 303 032 0	452 203 032 0	M 22x1.5	yellow	Brake line
Dual line braking system				
	452 200 000 0	M 22x1.5	–	without closing cover
	452 200 004 0	M 22x1.5	black	Black closing cover
452 200 211 0	452 200 011 0	M 22x1.5	red	Supply
952 200 221 0	952 200 021 0	M 16x1.5		
452 200 212 0	452 200 012 0	M 22x1.5	yellow	Brake line
952 200 222 0	952 200 022 0	M 16x1.5		
	952 200 040 0	M 16x1.5 with test port	yellow	Brake line
952 200 210 0		2x M 16x1.5	red	Supply
Duo-Matic				
452 802 009 0	452 804 012 0	M 22x1.5 / M 16x1.5		Towing vehicle / **Trailer**
452 805 004 0	452 803 005 0	M 22x1.5 / M 16x1.5		Tractor unit / **semitrailer**
452 802 007 0	452 803 004 0	M 22x1.5 / M 16x1.5		Tractor unit / semitrailer (with quick-connect)

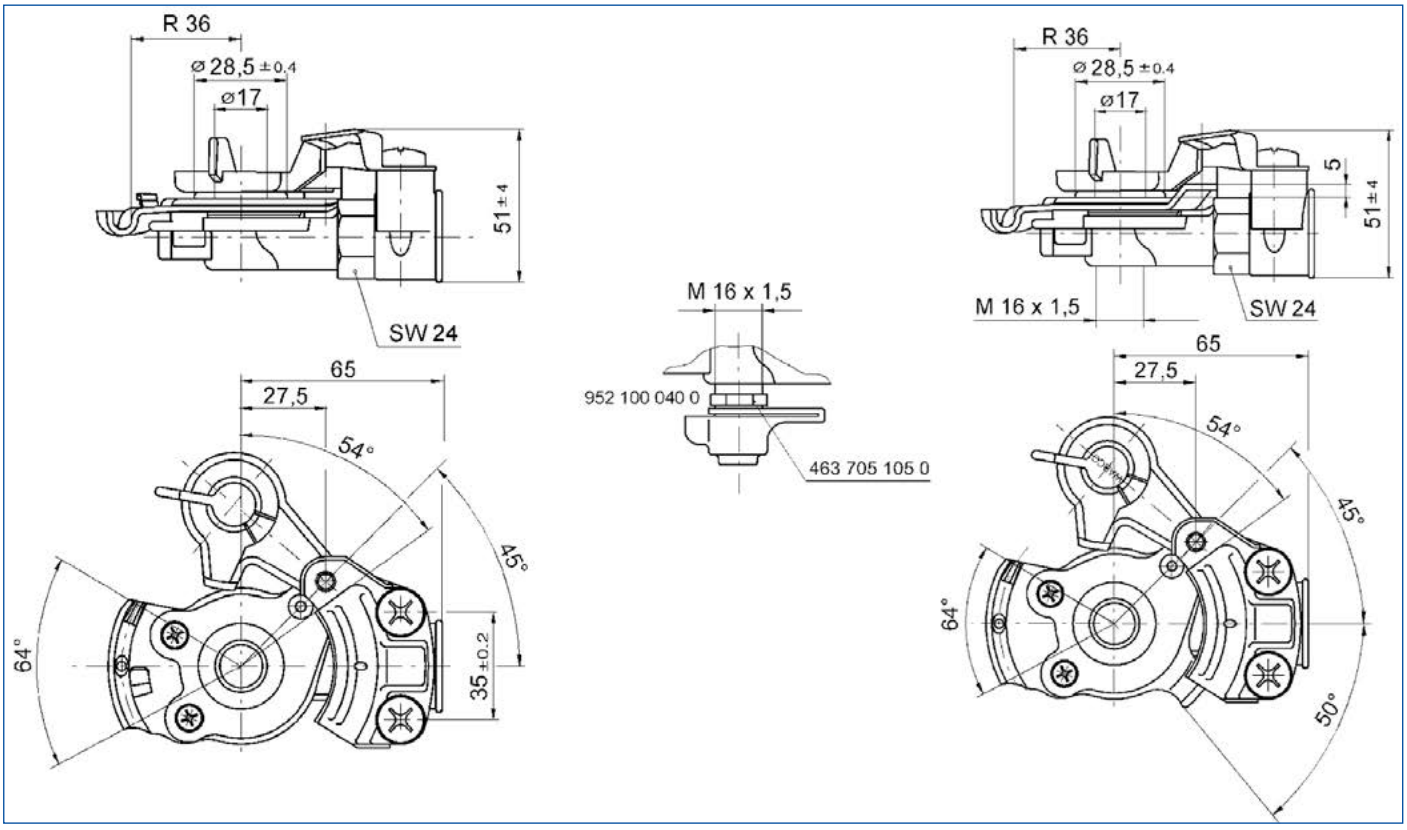
Coupling head 952 20X / 452 XXX

Using doubled pipe 893 100 138 4, the coupling head with an M 22x1.5 thread can be replaced with a head with an M 16x1.5 thread.

893 100 138 4

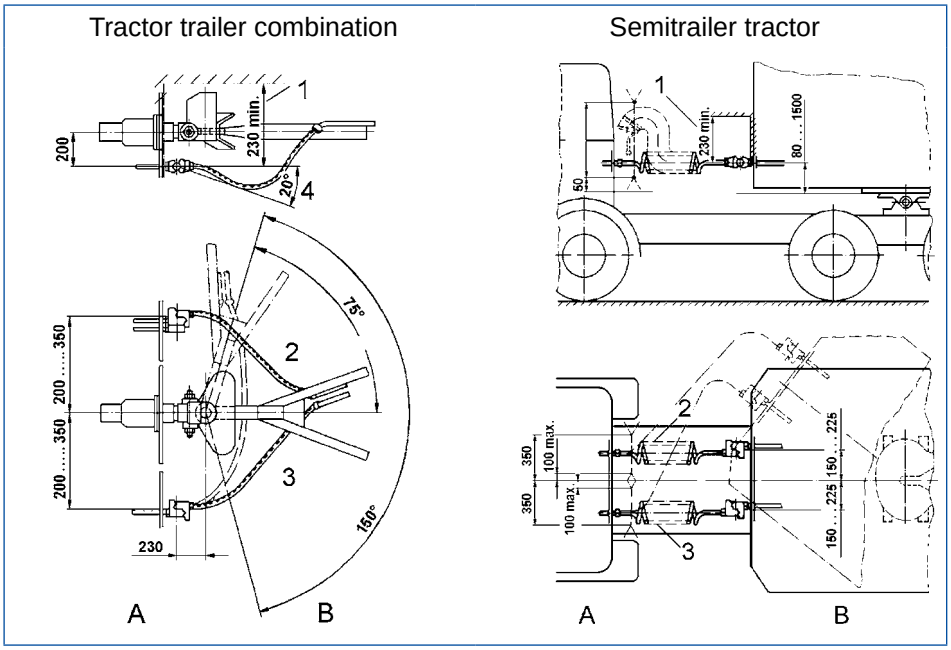


Installation dimensions



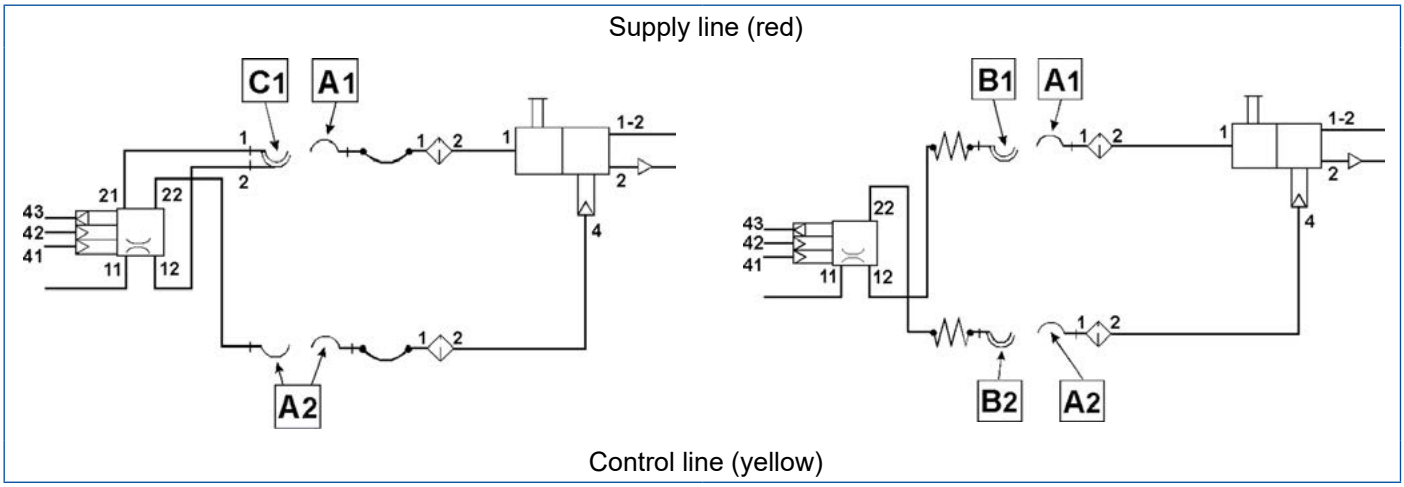
Installation recommendation

The hose couplings must be installed according to ISO 1728, see the following drawings.



LEGEND							
1	Free space for coupling	**2**	Supply line	**3**	Brake line	**4**	Max. deviation from horizontal

Installation diagram



5.31.2 Coupling head with integrated line filters 952 201

Application

In the supply- and brake-line between the towing vehicle and the trailer.

Purpose

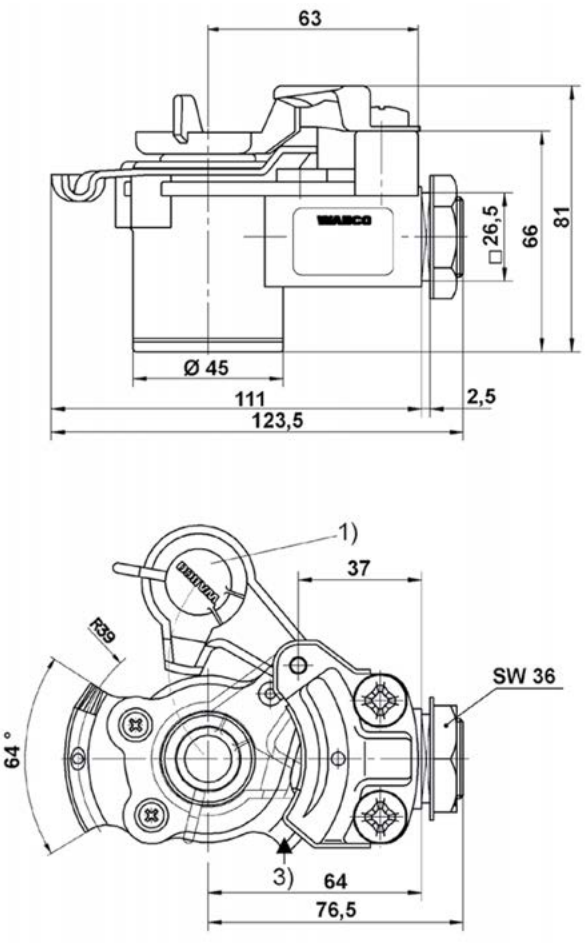
When making the coupling, the hose couplings on the towing vehicle and the trailer are connected with one another. This occurs by twisting and interlocking the opposing guides at the same time.

An additional line filter is not required.

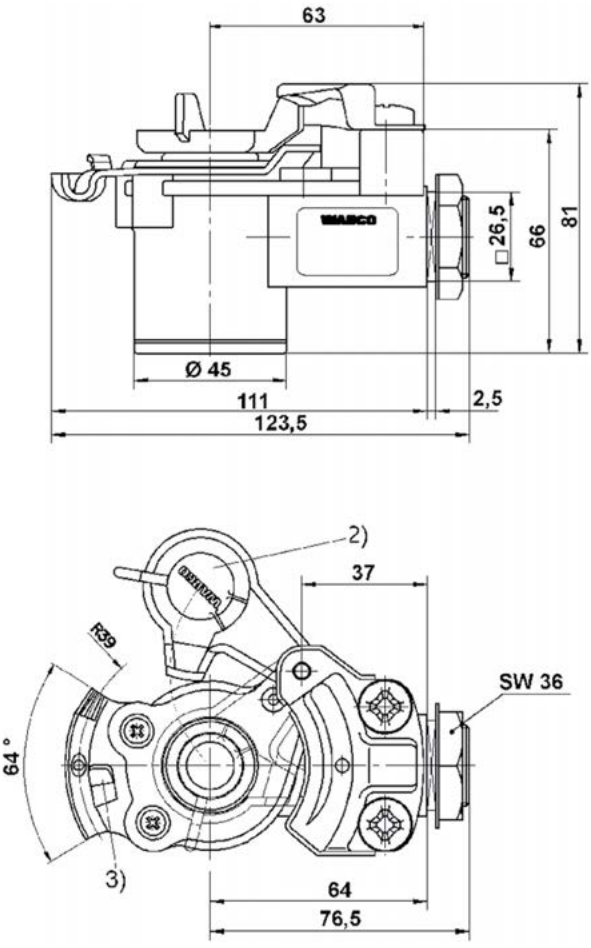
Combining important functions in a single product.
Benefits: fewer accessories, lower space requirements, fewer parts, quick and easy installation.

Installation dimensions

Brake line A1

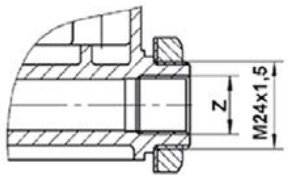
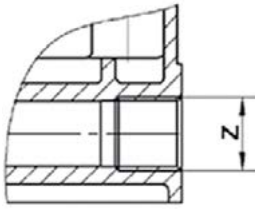
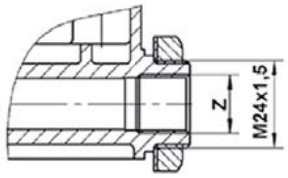
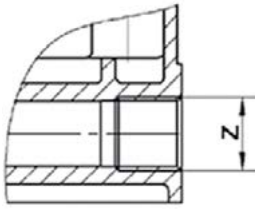
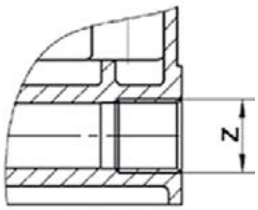
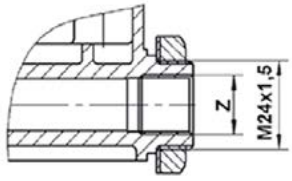


Supply line A2



PORT THREADS	LEGEND			
Z = M 16x1.5	**1)**	Yellow cap	**3)**	Interchange catch
	2)	Red cap		

Coupling head 952 20X / 452 XXX

ORDER NUMBER	DESIGN		VARIANT	MAX. OPERATING PRESSURE	THERMAL RANGE OF APPLICATION
	SUPPLY LINE (RED CAP)	BRAKE LINE (YELLOW CAP)			
952 201 001 0		X		8.5 bar	-40 °C to +80 °C
952 201 003 0		X			
952 201 002 0	X				
952 201 004 0	X				
952 201 007 0		X			
952 201 008 0		X			
952 201 011 0		X			
952 201 012 0	X				
952 201 013 0		X			
952 201 014 0		X	Only outer thread		
952 201 015 0	X				
952 201 016 0	X		No thread		
952 201 017 0		X			

5.32 Double release valve 963 001 / Trailer release valve 963 006

963 001 012 0
963 001 013 0

963 001 051 0
963 001 053 0

963 006 001 0
963 006 003 0
963 006 005 0

Application

For trailers

Purpose

Release the braking system to move the semitrailer when not coupled.

Technical data

ORDER NUMBER	963 001 012 0	963 001 013 0	963 006 001 0	963 006 003 0	963 006 005 0	963 001 051 0 963 001 053 0
Max. operating pressure	8.5 bar					
Min. nominal diameter 1-1 => 2	Ø 8		Ø 8			-
Min. nominal diameter 1-2 => 2	Ø 6		Ø 6			-
Port threads	M 16x1.5 - 13 deep	M 22x1.5 - 13 deep				
Installation dimensions L_1	51 mm	54.5 mm				
Installation dimensions L_2	104.5 mm	107 mm				
Installation dimensions L_3	36.7 mm	39 mm				
Colour of the actuation button	black		black	red	green	Two buttons: black / red
Permissible medium	Air					
Thermal range of application	-40 °C to +80 °C					
Weight	0.13 kg	0.21 kg	0.15 kg			0.73 kg

The trailer release valve 963 006 003 0 has a red actuation button, in connection 1-1 a vent valve and is suitable for Tristop® cylinders like the double release valve 963 001 051 0.
The trailer release valve 963 006 005 0 is identical to the 963 006 003 0 but with a green actuation button for lifting axles.

Installation recommendation

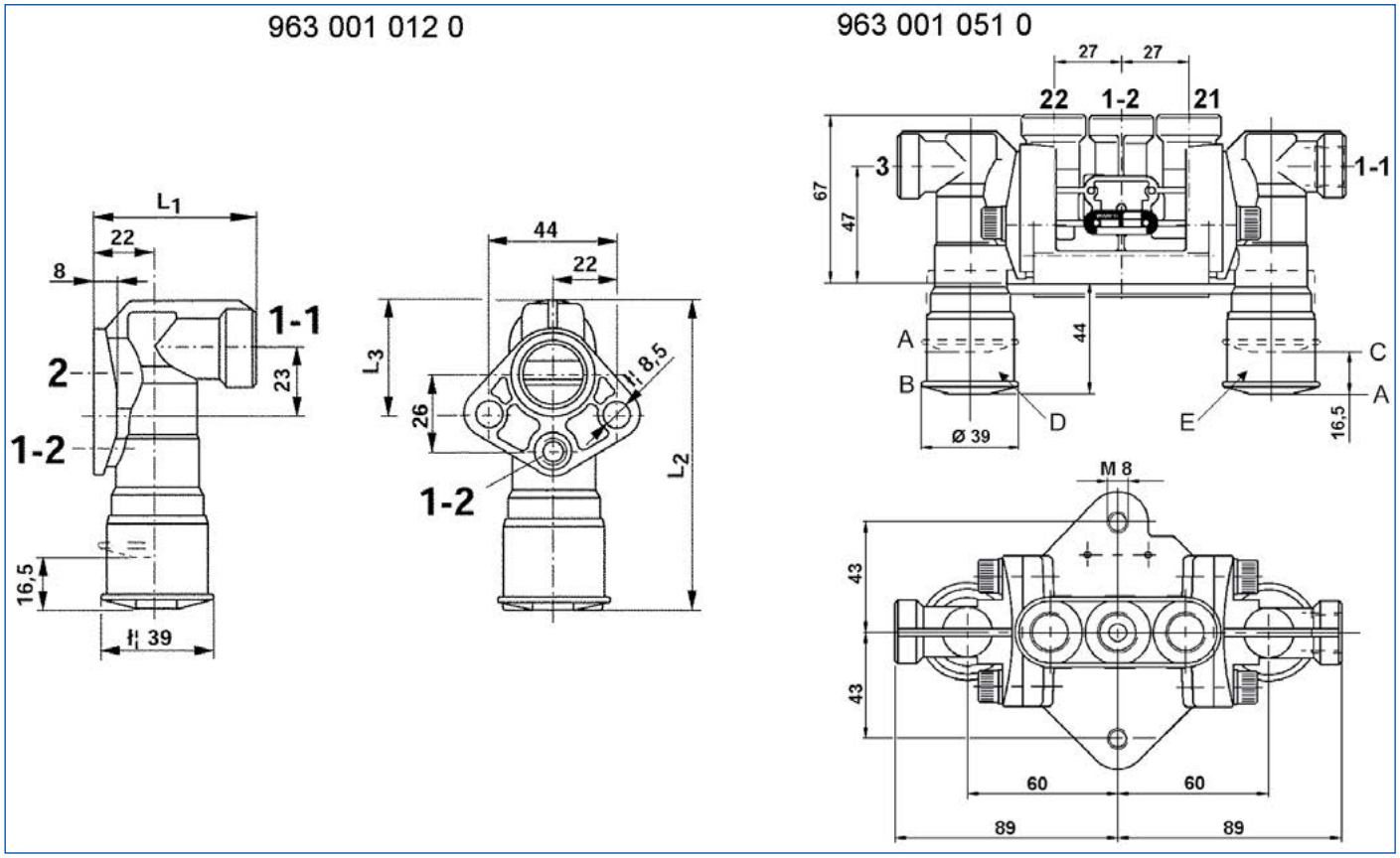
- Mount the trailer release valves 963 006 001 0, 963 006 003 0 and 963 006 005 0 as well as the double release valves 963 001 051 0 and 963 001 053 0 easily accessible in the front area of the trailer.
- Flange the trailer release valve 963 001 012 0 and 963 001 013 0 directly onto the trailer brake valve.

– Install the trailer release valve vertically so that the actuation button faces downward. Permissible installation position: ± 90°

– Fasten the trailer release valve with two M8 bolts.

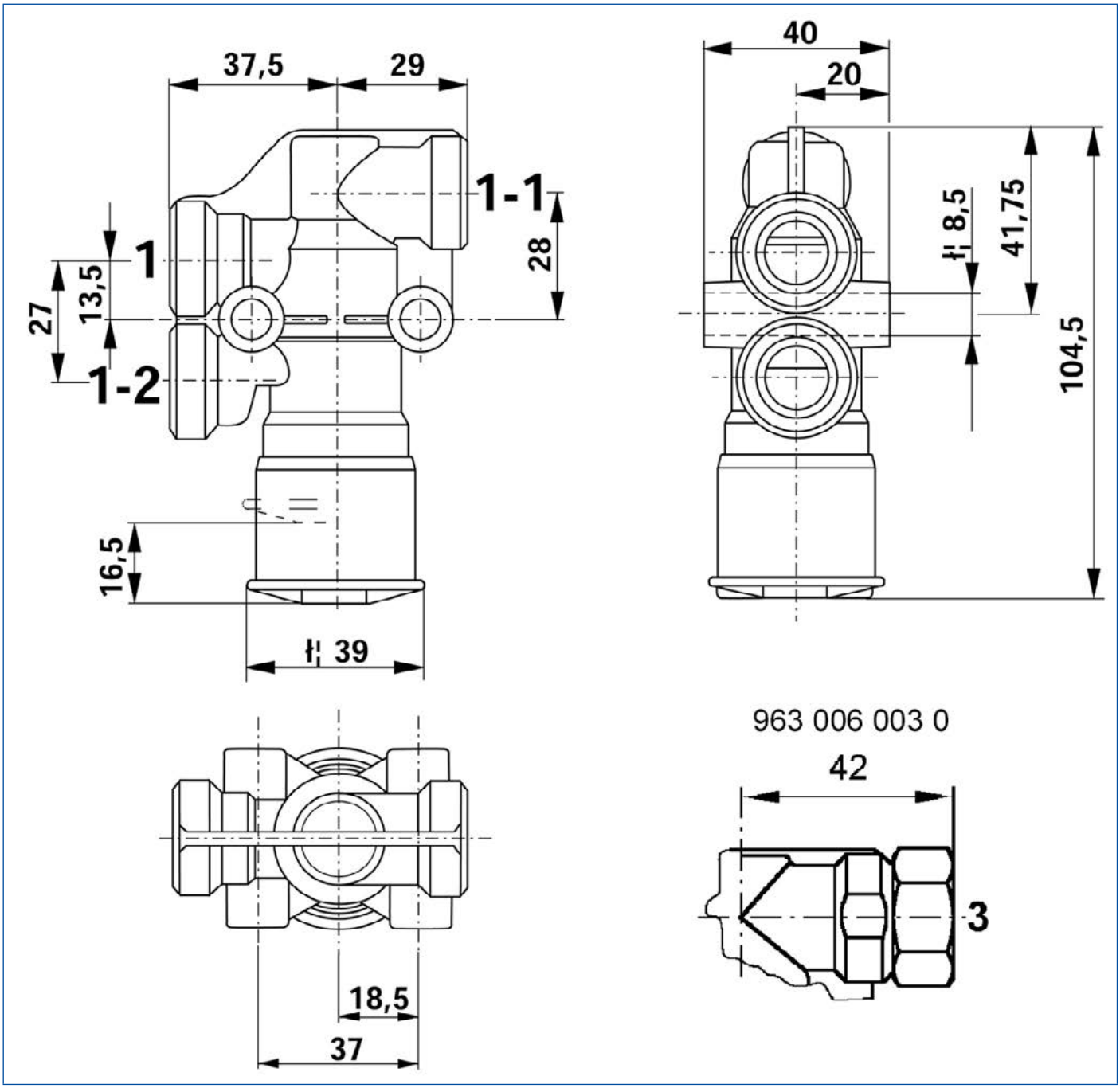
Installation dimensions for 963 001 012 0

Installation dimensions for 963 001 051 0



CONNECTIONS				LEGEND			
1-1	Energy supply	**1-2**	Energy supply (Reservoir)	**A**	Driving position	**D**	Black actuating knob
2	Energy discharge	**3**	Venting	**B**	Parking position	**E**	Red actuating knob
21	Predominance (trailer brake valve)	**22**	Energy discharge (Spring chamber cylinder)	**C**	Release position	**X**	View

Installation dimensions for 963 006 001 0

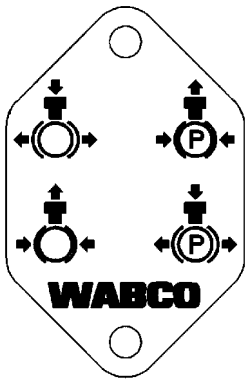


LEGEND					
1-1	Energy supply	**1-2**	Energy supply (Reservoir)	**2**	Energy discharge

Plates with parking and driving symbols

899 200 695 4 (supplied unassembled)

For double release valves 963 001 051 0 and 963 001 052 0



Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

5.33 Shut-off valve 964 001

Application

Vehicles with special equipment for dropping swap-trailers.

Purpose

Stroke limit on vehicles with lift equipment.

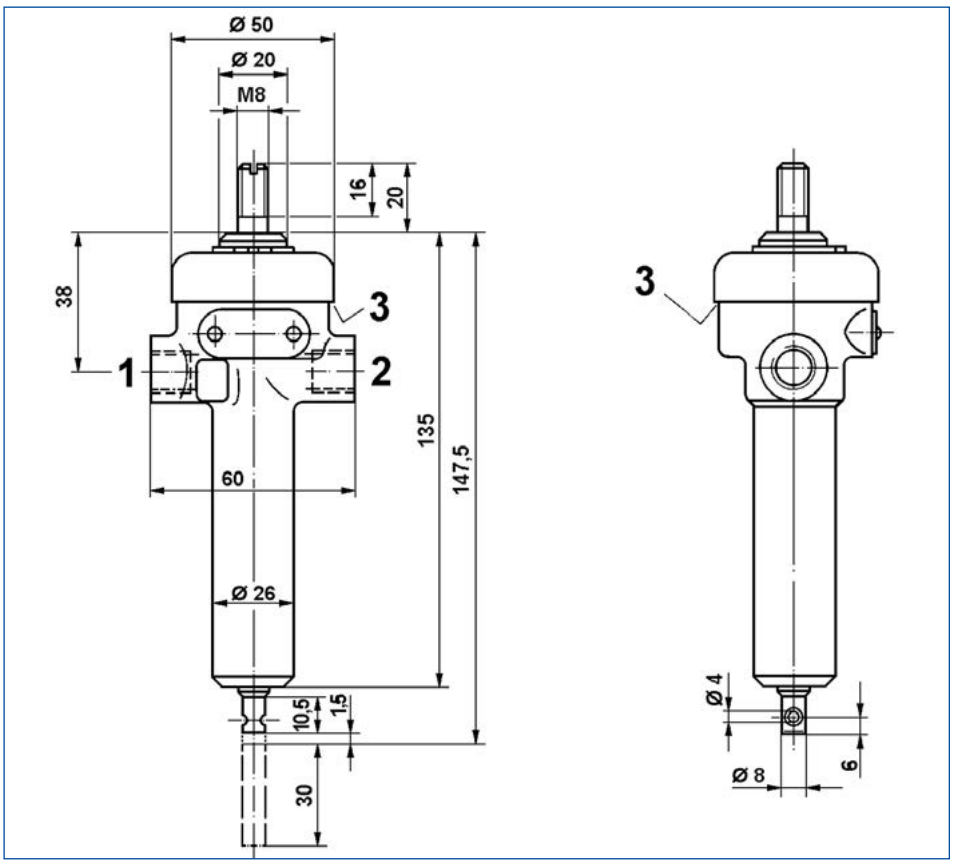
Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

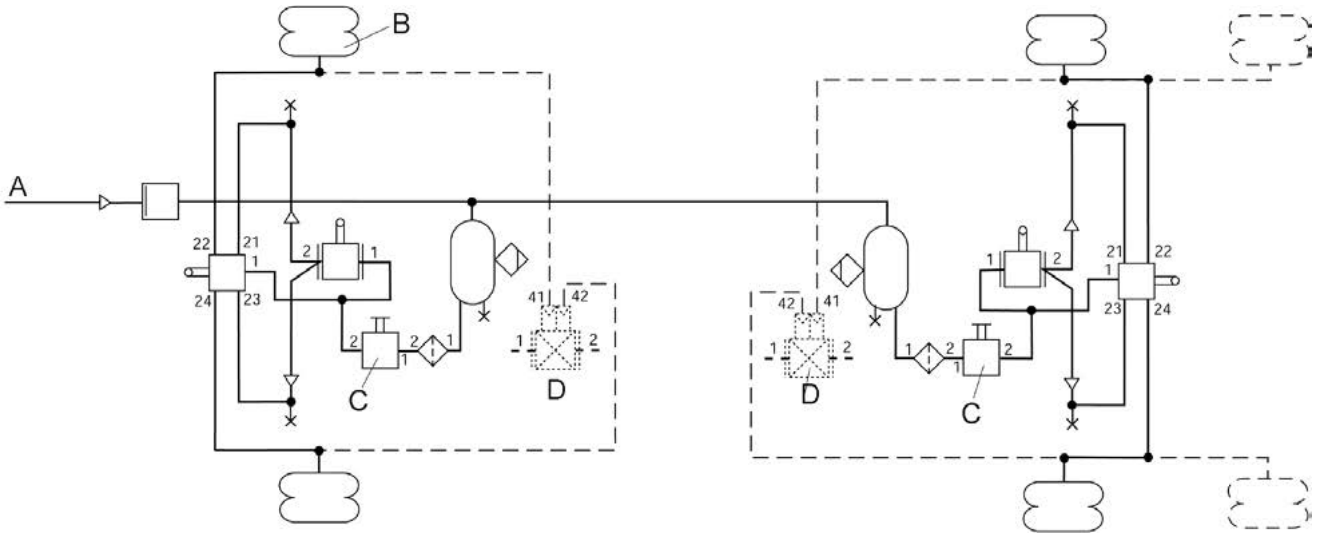
– Install the shut-off valve so that the fastening bolts are only stressed in the longitudinal direction.

Installation dimensions

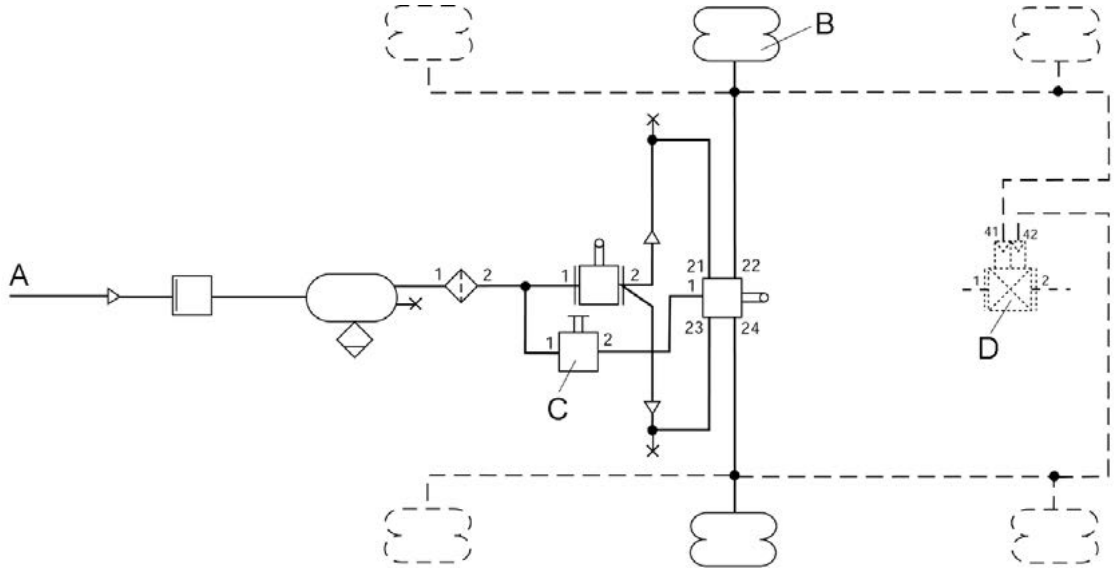


Installation diagram

Drawbar trailer (lifting and lowering)



Semitrailer (Lifting and lowering)

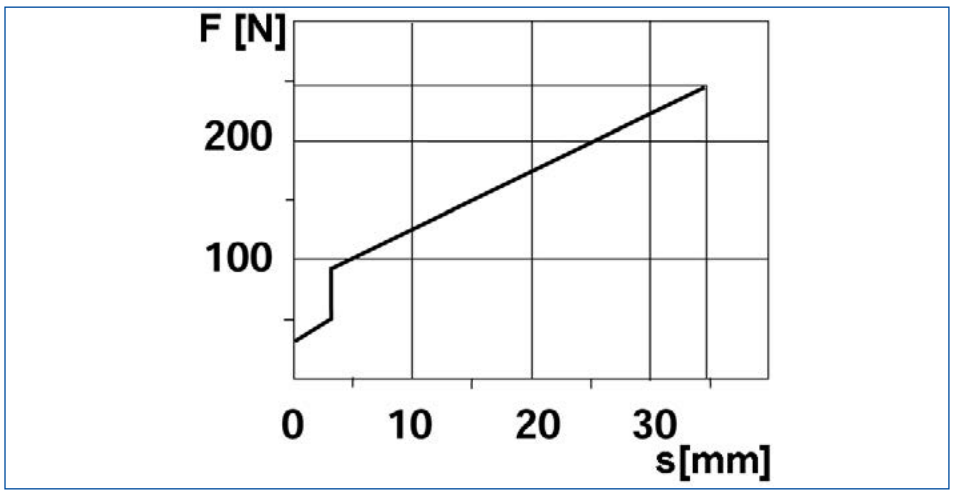


LEGEND							
A	Supply, from the service brake system	**B**	Air suspension bellows	**C**	Non-return valve	**D**	LSV controller

Technical data

ORDER NUMBER	964 001 002 0
Max. operating pressure	12 bar
Nominal diameter	7 mm
Permissible medium	Air
Thermal range of application	-40 °C to +80 °C
Weight	0.4 kg

Diagram



LEGEND			
F	Actuating force	s	Tappet travel

5.34 Trailer brake valve with adjustable predominance 971 002

Application

Vehicles with conventional two-lien brake control (not Trailer EBS).

Purpose

To control the dual-line air braking system of the trailer.

Maintenance

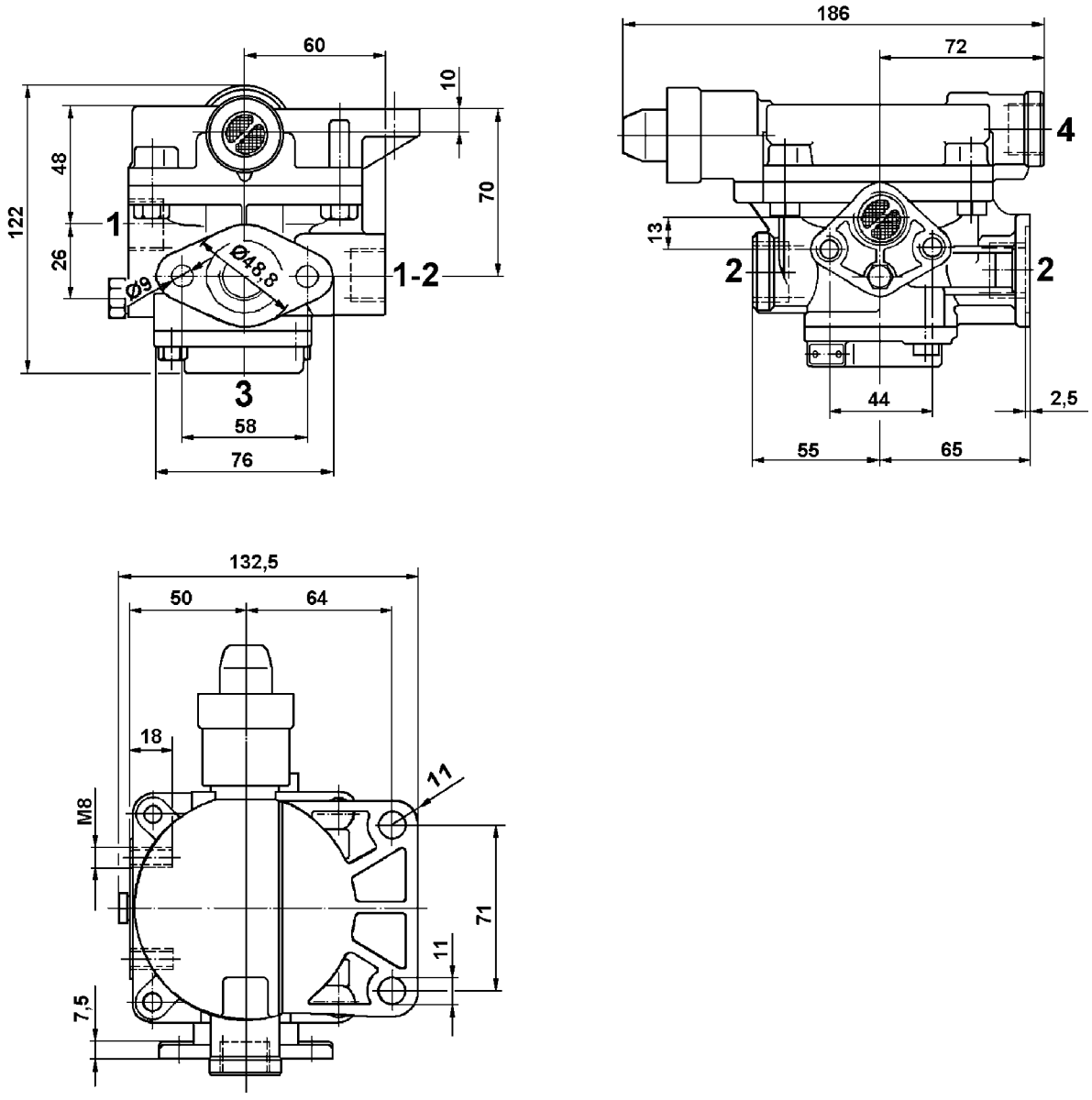
– Check the status of the filters in connection 4 and 1.
  ⇨ Replace the filter if necessary.

Installation recommendation

– Install the trailer brake valve vertically so that vent 3 faces downward.
– Fasten the trailer brake valve with two M10 screws.

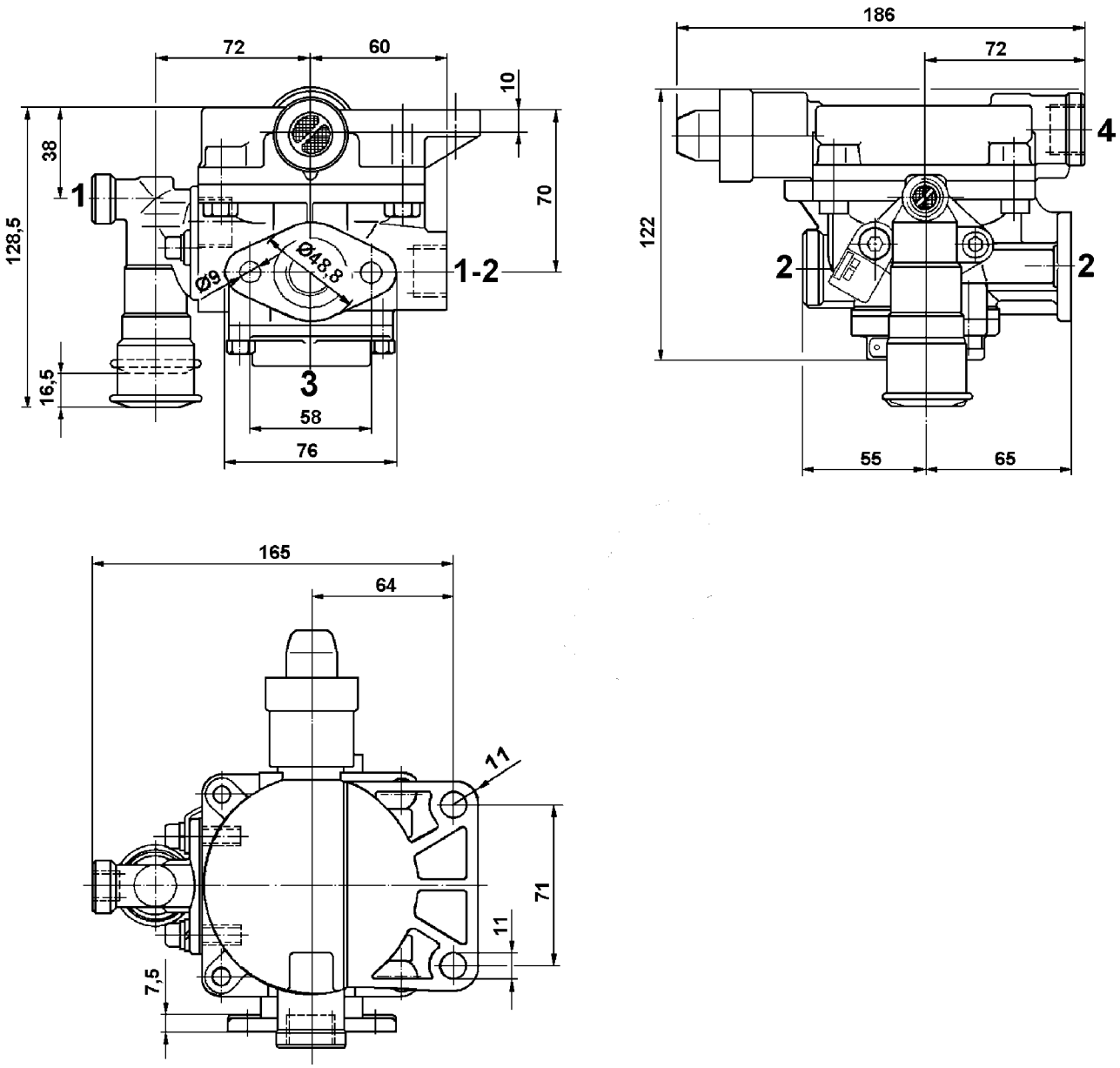
Trailer brake valve with adjustable predominance 971 002

Installation dimensions for 971 002 150 0



LEGEND						
1	Energy supply	**1-2**	Energy supply or discharge (Reservoir)	**4**	Control connection	**M 22x1.5 - 15 deep**
2	Energy discharge	**3**	Venting			

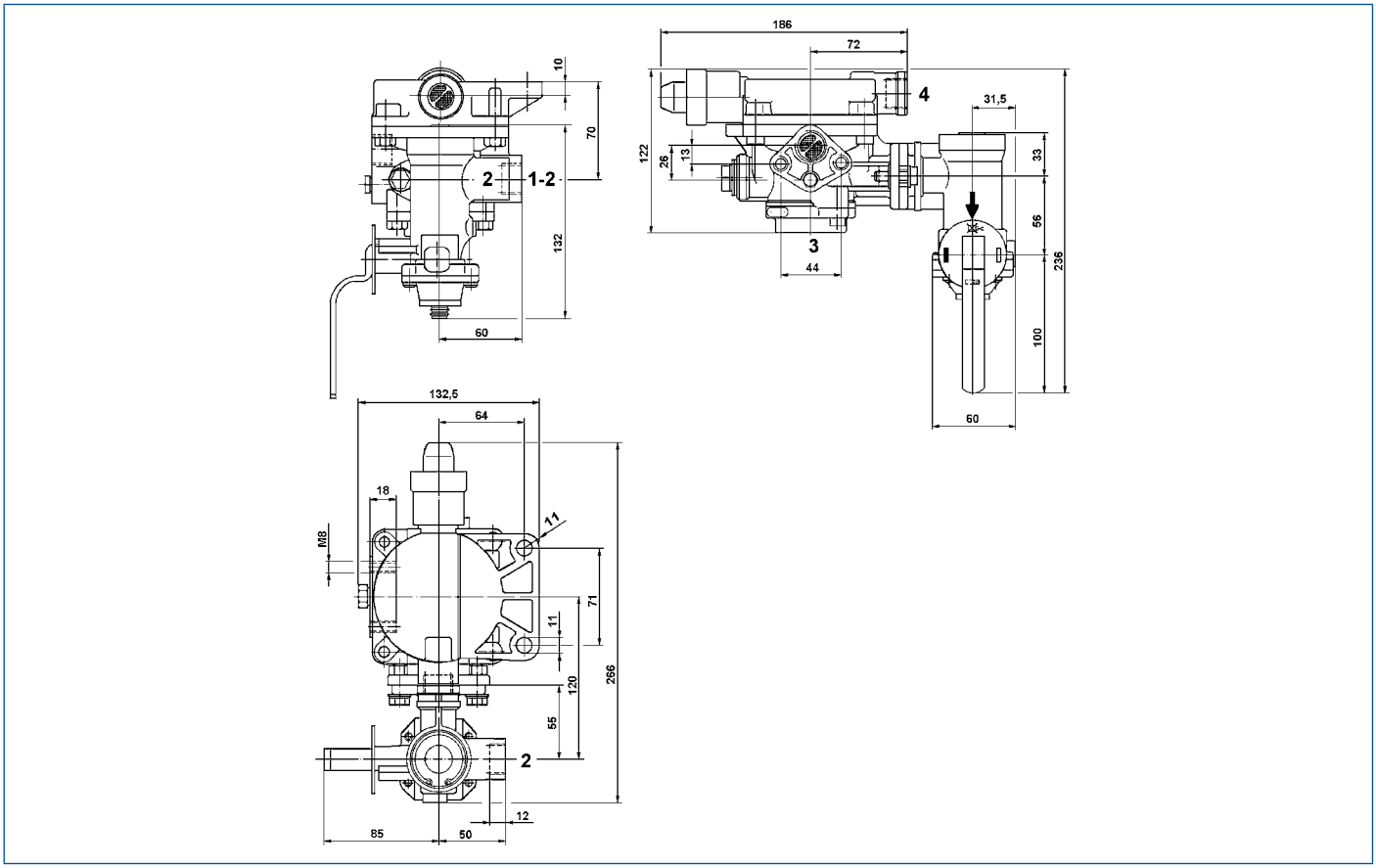
Installation dimensions for 971 002 531 0: Combination trailer brake valve 971 002 150 0 with release valve 963 001 012 0



LEGEND							
1	Energy supply	**1-2**	Energy supply or discharge (Reservoir)	**4**	Control connection		M 22x1.5 - 15 deep
2	Energy discharge	**3**	Venting			**1**	M 16x1.5 - 13 deep

WHEN NOT IN USE, SECOND PORT 2 MUST BE CLOSED USING	ORDER NUMBER
Screw plug M 22x1.5	893 010 070 4
Ring seal A 22x27 DIN 7603-Al	811 401 080 4

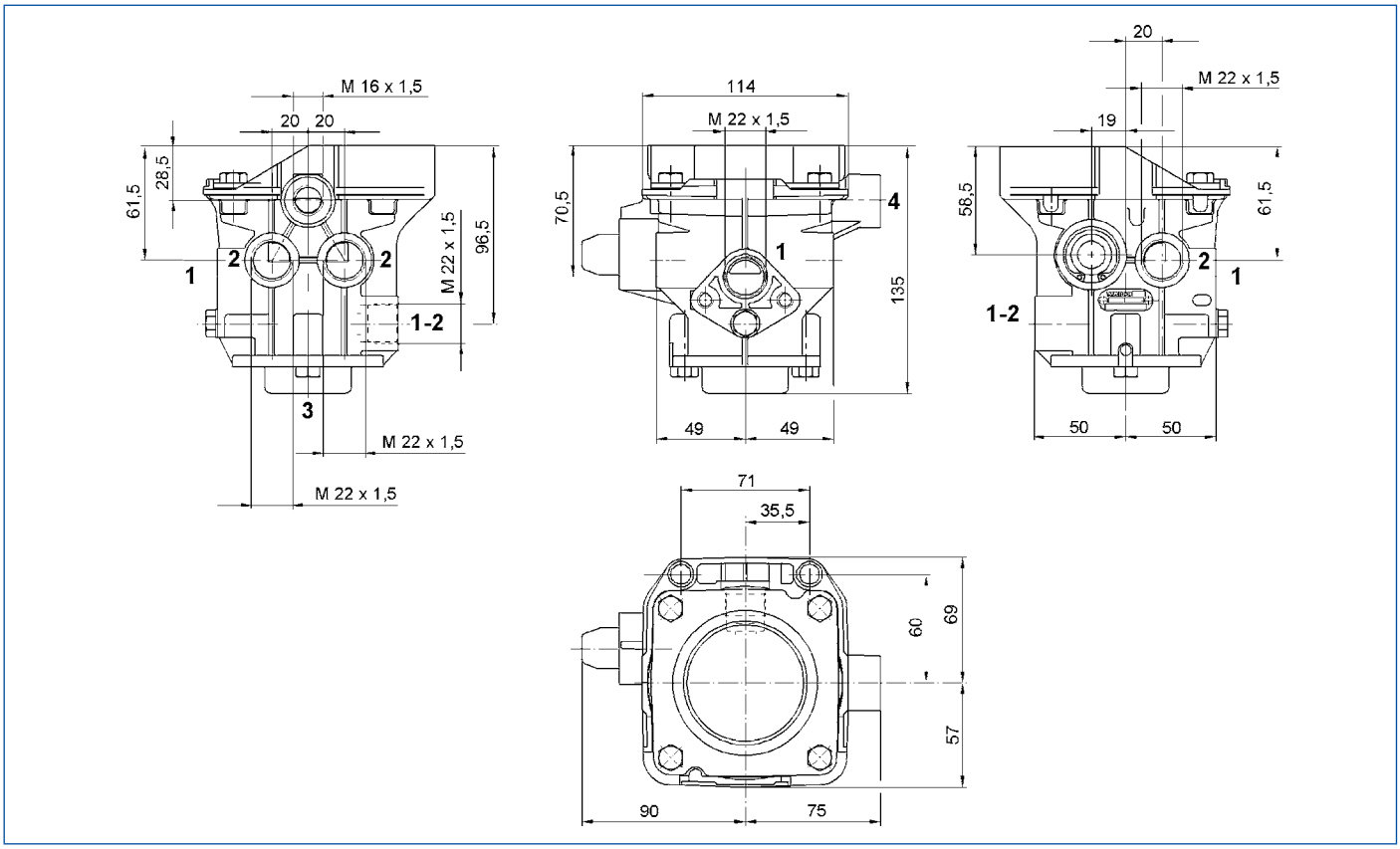
Installation dimensions for 971 002 570 0: Combination trailer brake valve 971 002 150 0 with load-sensing valve 475 604 011 0



LEGEND						
1	Energy supply	**1-2**	Energy supply or discharge (Reservoir)	**4**	Control connection	**M 22x1.5 - 15 deep**
2	Energy discharge	**3**	Venting			

SYMBOLS	
	Release position
	Unladen
	Half laden
	Fully laden

Installation dimensions 971 002 300 0



LEGEND									
1-2	Energy supply or discharge (supply reservoir)	**1**	Energy supply	**2**	Energy discharge	**3**	Venting	**4**	Control connection

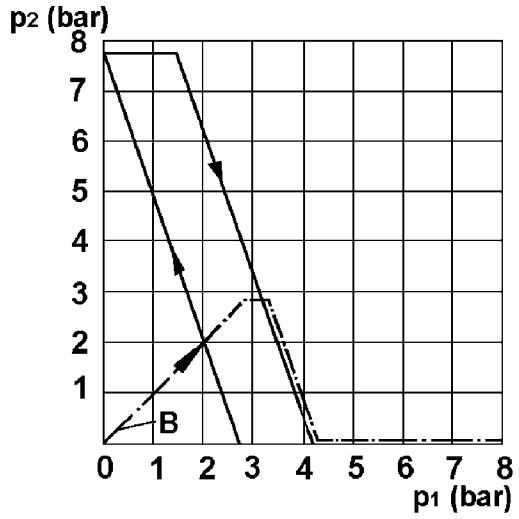
Technical data

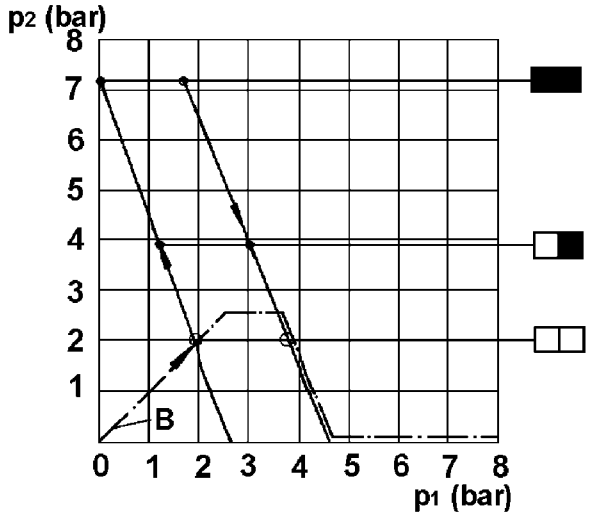
ORDER NUMBER	971 002 150 0	971 002 300 0	971 002 301 0
Max. operating pressure	10 bar	8.5 bar	
Factory setting of predominance	0 bar		without
Dead volume	0.205 litres	–	
Thermal range of application	-40 °C to +80 °C		
Port 4	–	M 16x1.5	
Weight	1.8 kg	1.4 kg	

Trailer brake valve with adjustable predominance 971 002

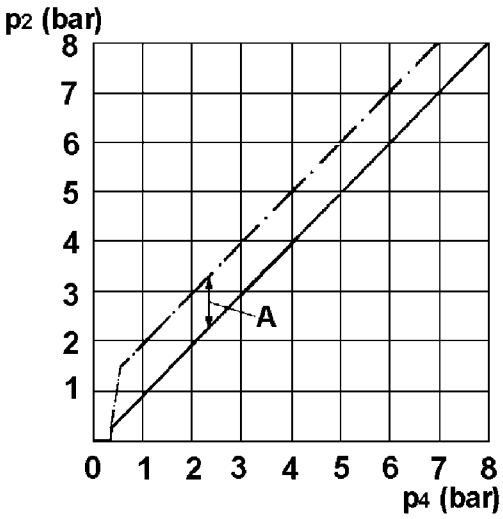
Diagram

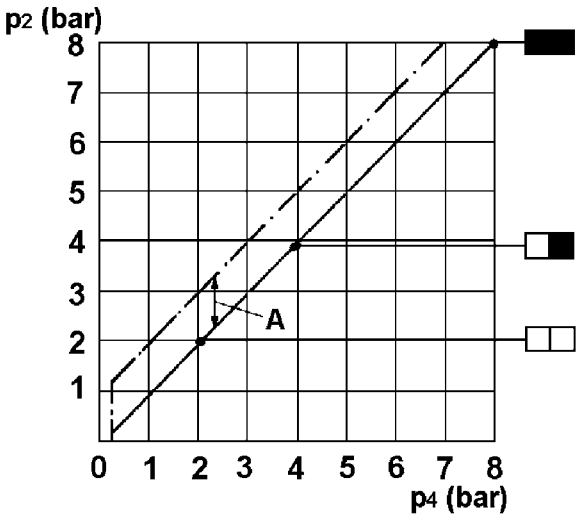
Automatic braking





Service brake application





LEGEND									
p_1	Input pressure	p_2	Output pressure	p_4	Control pressure	A	Setting range	B	Initial fill

5.34.1 Trailer brake valve 971 002 152 0

Application

Application especially in long semitrailers with multiple axles.

Purpose

Control of the two-line semitrailer braking systems when actuating the braking system of the towing vehicle. Triggering of the automatic semitrailer braking with partial or total pressure drop in the supply line.

Maintenance

– Check the status of the filters in connection 4 and 1.

  ⇨ Replace the filter if necessary.

Installation recommendation

– Install the trailer brake valve vertically so that vent 3 faces downward.

– Fasten the trailer brake valve with two M10 screws.
  The connection from connection 1-2 to the supply reservoir should be kept as short as possible and have the largest cross-section possible.

– Install a trailer release valve in the supply line between the coupling head and the trailer brake valve.

– Install the LSV controller in the brake line before connection 4 of the trailer brake valve.

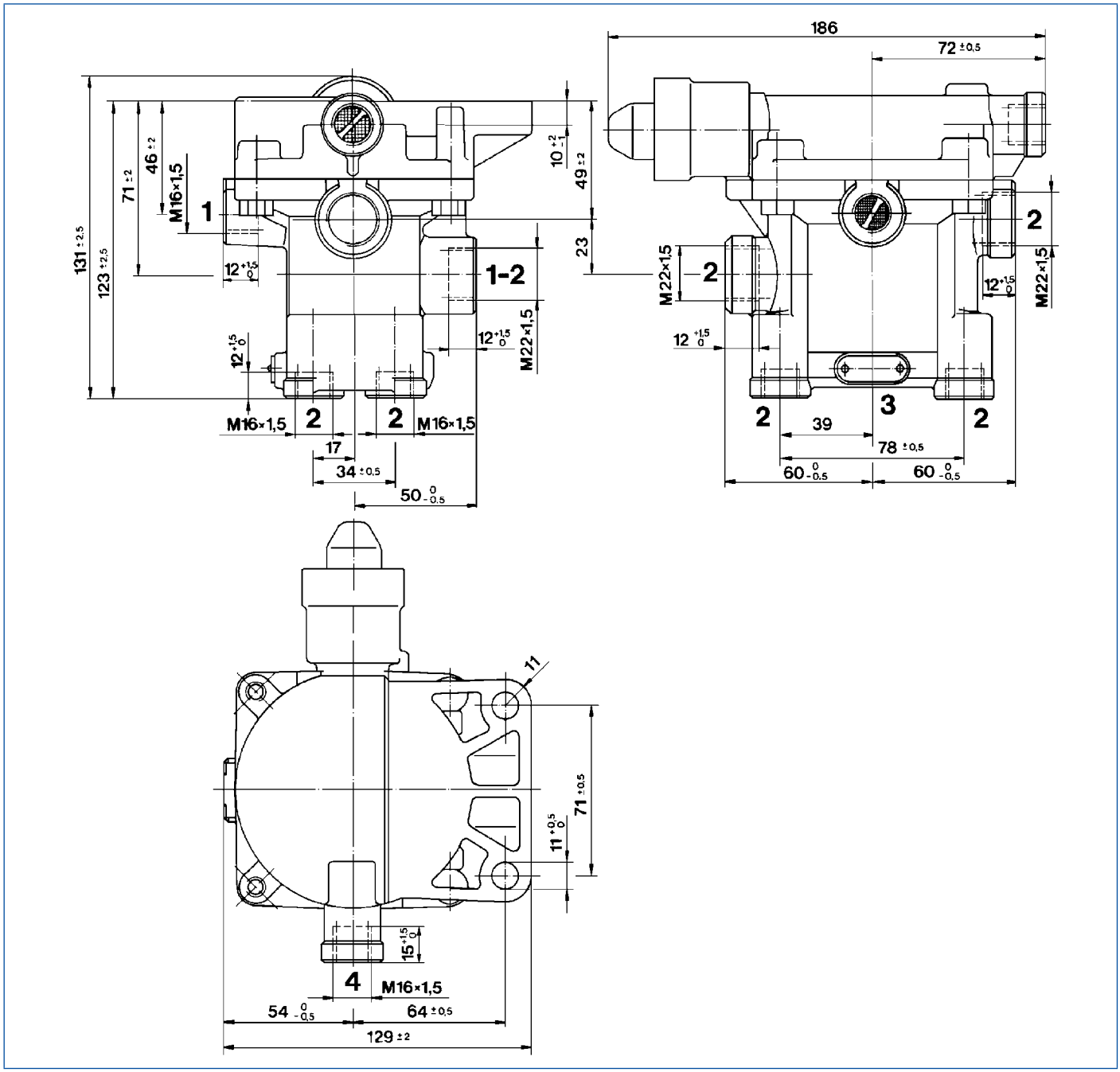
On 3-axle semitrailers connect the four down-facing connections 2 (with thread M 16x1.5) directly with the four brake cylinders on the 1st and 2nd axles with hoses. Connect the 5th connection 2 (thread M 22x1.5) via a common line and then via separated hoses with the cylinders on the third axle.

On 2-axle semitrailers, connect the connection 2 with thread M 22x1.5 using a screw plug.

On 1-axle semitrailers, you must close off two other connection 2 with screw plugs M 16x1.5.

Trailer brake valve with adjustable predominance 971 002

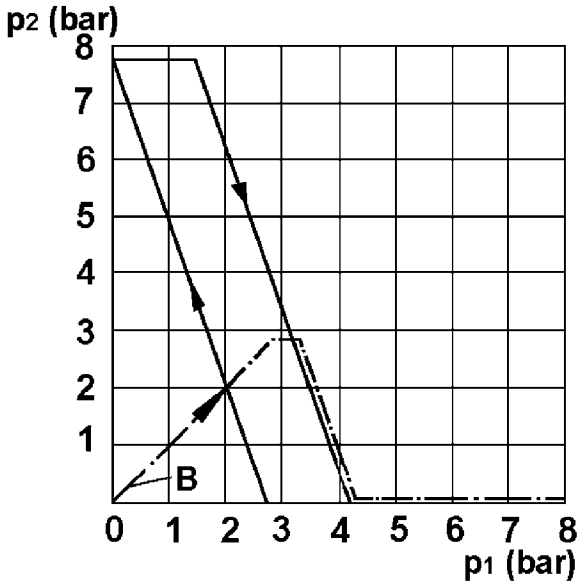
Installation dimensions for 971 002 152 0



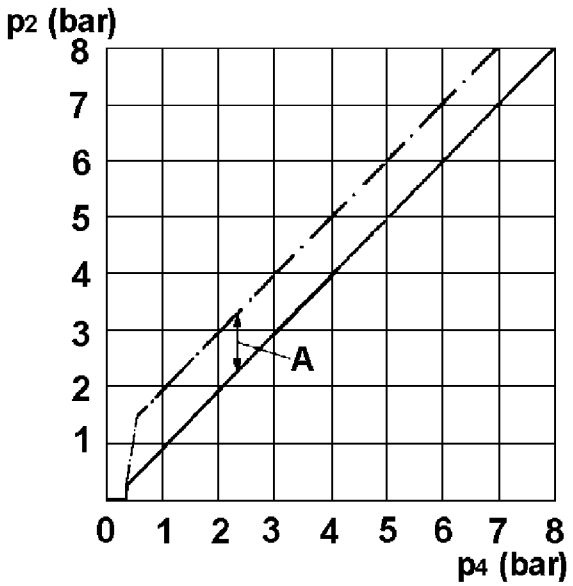
LEGEND									
1-2	Energy supply or discharge (Reservoir)	**1**	Energy supply	**2**	Energy discharge	**3**	Venting	**4**	Control connection

Pressure diagrams

Automatic braking



Service brake application



LEGEND									
p_1	Input pressure	p_2	Output pressure	p_4	Control pressure	A	Setting range	B	Initial fill

Technical data

ORDER NUMBER	971 002 152 0
Max. operating pressure	10 bar
Dead volume	0.205 litres
Thermal range of application	-40 °C to +80 °C
Weight	1.66 kg

5.35 Park release emergency valve (PREV) 971 002

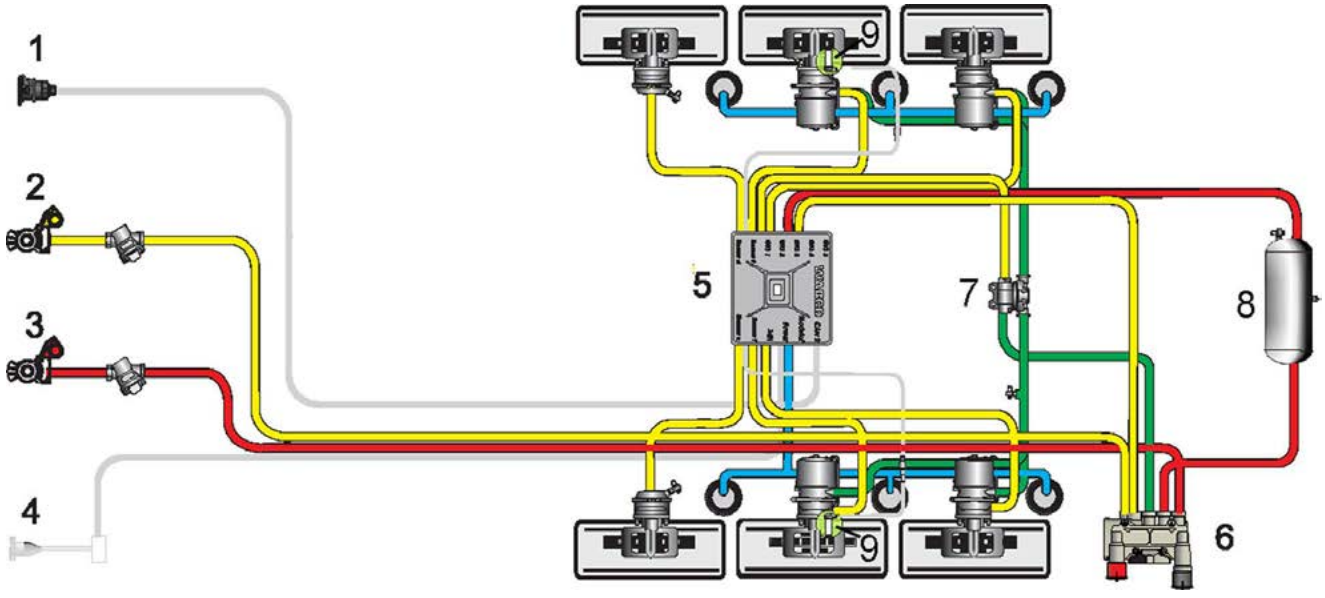
Application

Vehicle with Trailer EBS version D and E.

Purpose

The park release emergency valve replaces the trailer brake valve and the twin release valve, used till now in the trailer braking systems of the EBS D generation. This valve simplifies the trailer braking system by the elimination of one device and realises the functions typically for the trailer braking valve, as tear-off function or pressure restraint when the (semi-)trailer has been unhitched.

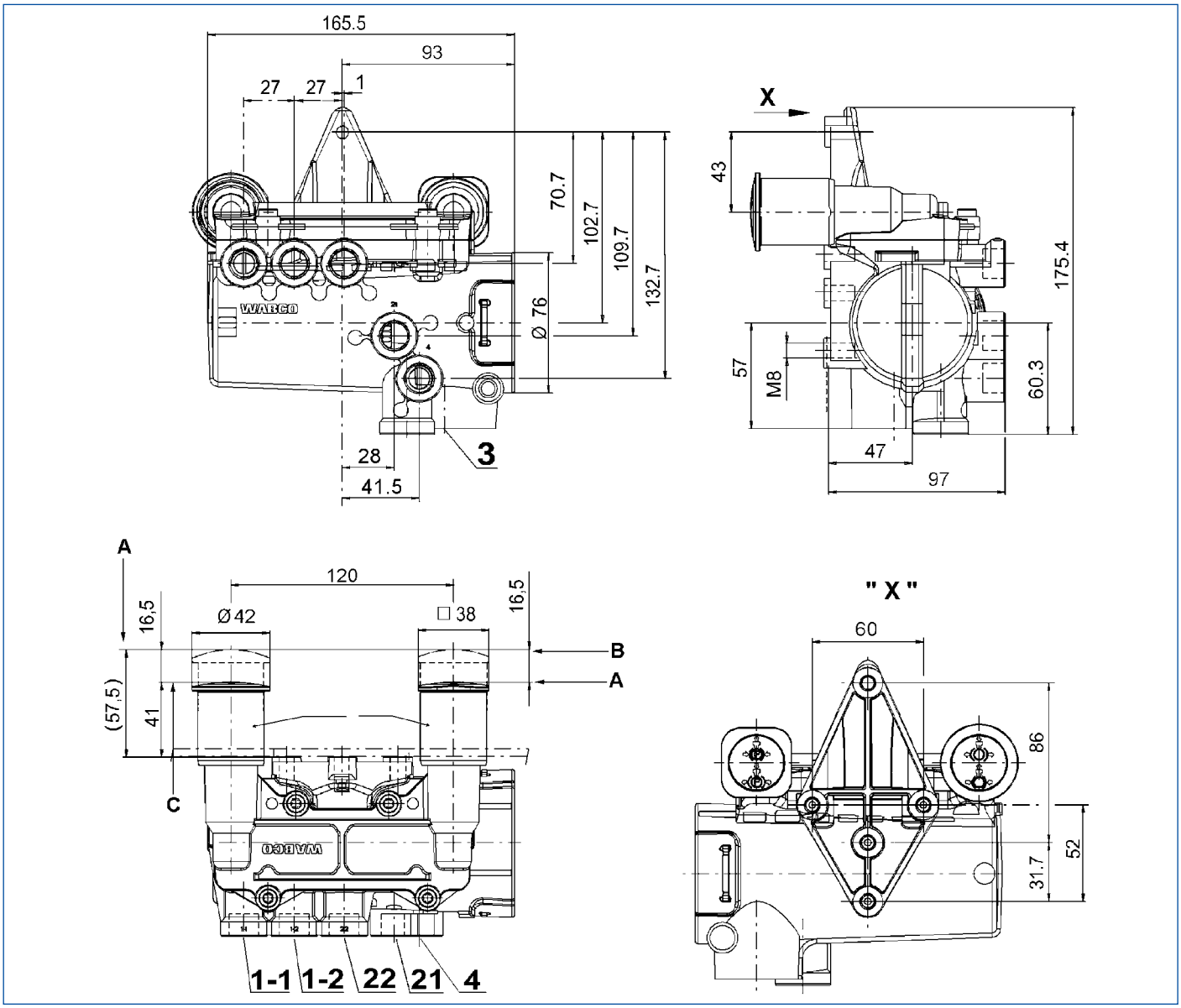
Installation diagram – Trailer EBS E



2S/2M system

LEGEND					
1	Power supply via ISO 7638	**2**	Brake line	**3**	Supply line
4	Stop light supply via ISO 1185 (optional)	**5**	Trailer EBS E modulator	**6**	Park release emergency valve (PREV)
7	Overload protection valve	**8**	Tank	**9**	Sensors

Installation dimensions



LEGEND					
A	Driving position	**B**	Parking position	**C**	Release position

Technical data

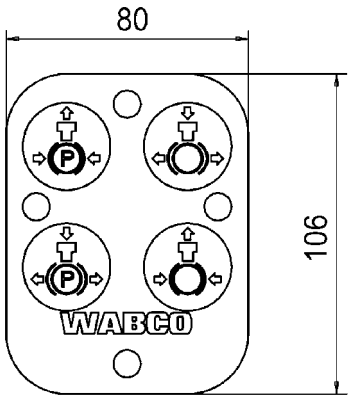
ORDER NUMBER	971 002 900 0	971 002 902 0	971 002 910 0	971 002 911 0	971 002 912 0	971 002 913 0
Operating pressure	$p_{1\text{-}1}$ 8.5 bar					
Max. permissible operating pressure (brief)	$p_{1\text{-}1}$ 10 bar					
Installation restrictions	Maximum deviation of the device from the vertical ± 15°					

Park release emergency valve (PREV) 971 002

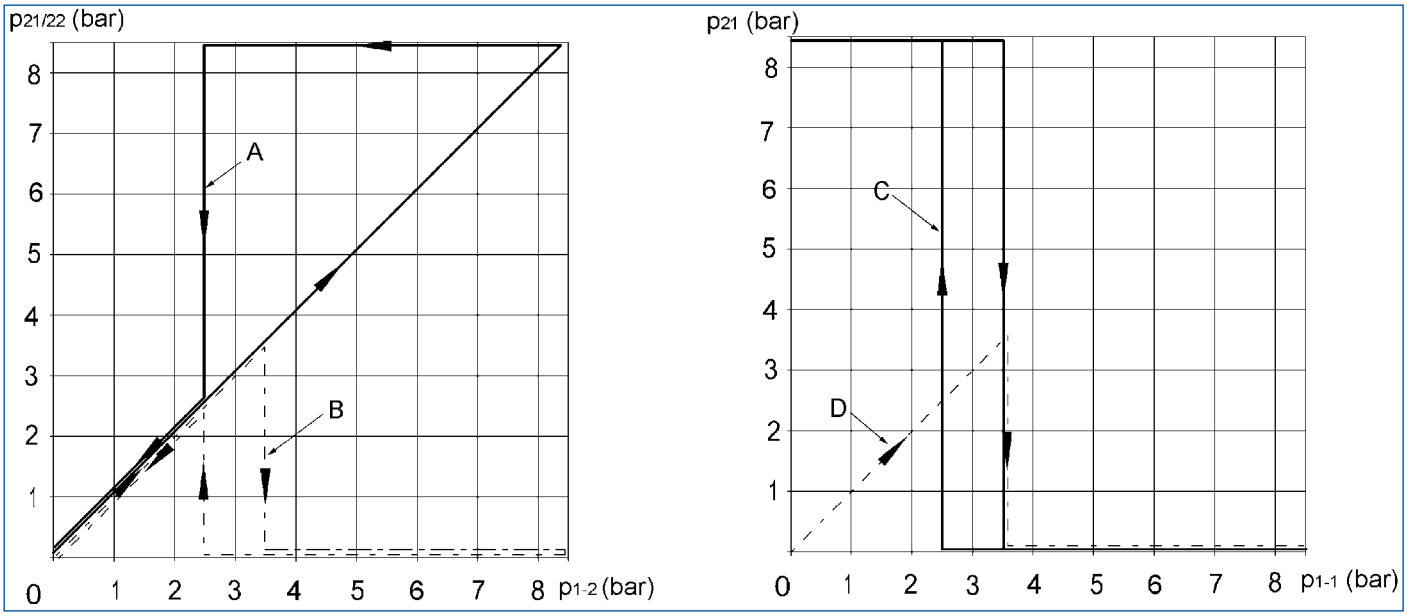
ORDER NUMBER	971 002 900 0	971 002 902 0	971 002 910 0	971 002 911 0	971 002 912 0	971 002 913 0
Thermal range of application	-40 °C to +65 °C					
Weight	1.6 kg		1.8 kg		1.9 kg	1.8 kg
Quickfit connections	no		yes			

Plate with parking and driving symbols

971 002 103 4 (supplied unassembled)



Pressure diagrams



LEGEND					
p_{1-1}	Input pressure	**A**	Spring chamber cylinder 22	**B**	Modulator 21
p_{1-2}	Connection	**C**	Automatic braking	**D**	Initial fill
p_{21}; $p_{21/22}$	Output pressure				

5.36 Relay valve 973 0XX

973 001 010 0
973 001 020 0

973 011 000 0

Application

With especially large brake cylinder volumes

Purpose

To rapidly increase or decrease the pressure of compressed air equipment and to shorten the response and pressure build-up times in air braking systems

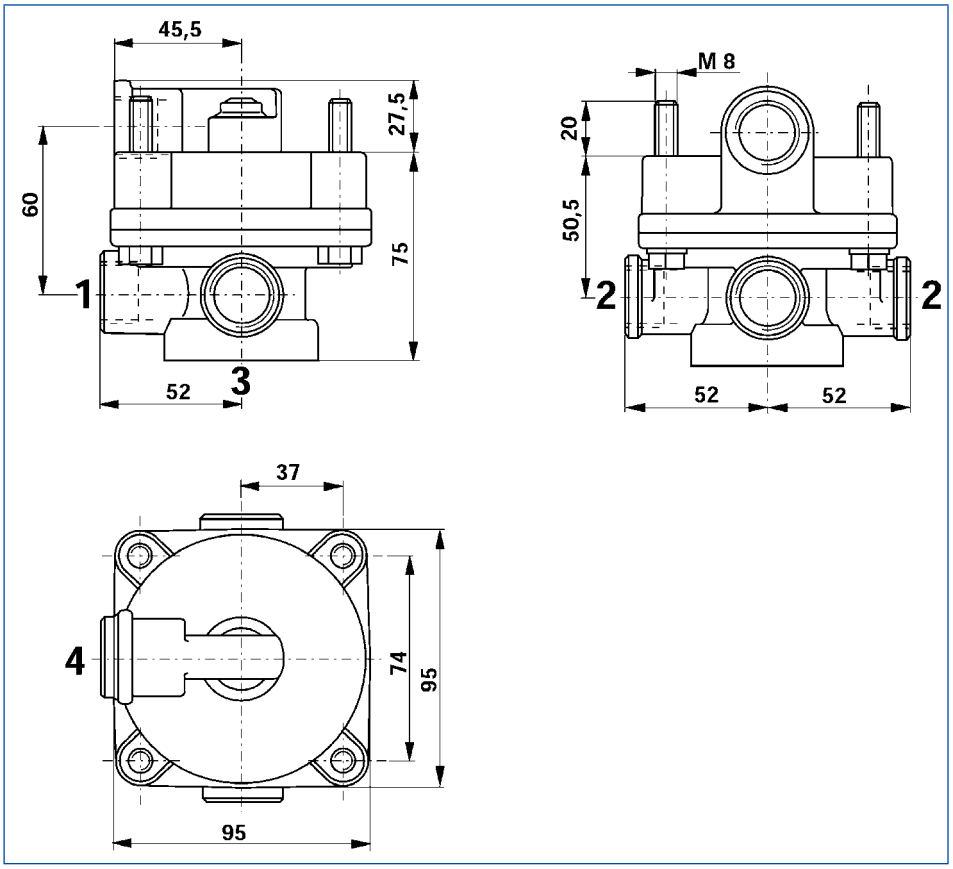
Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

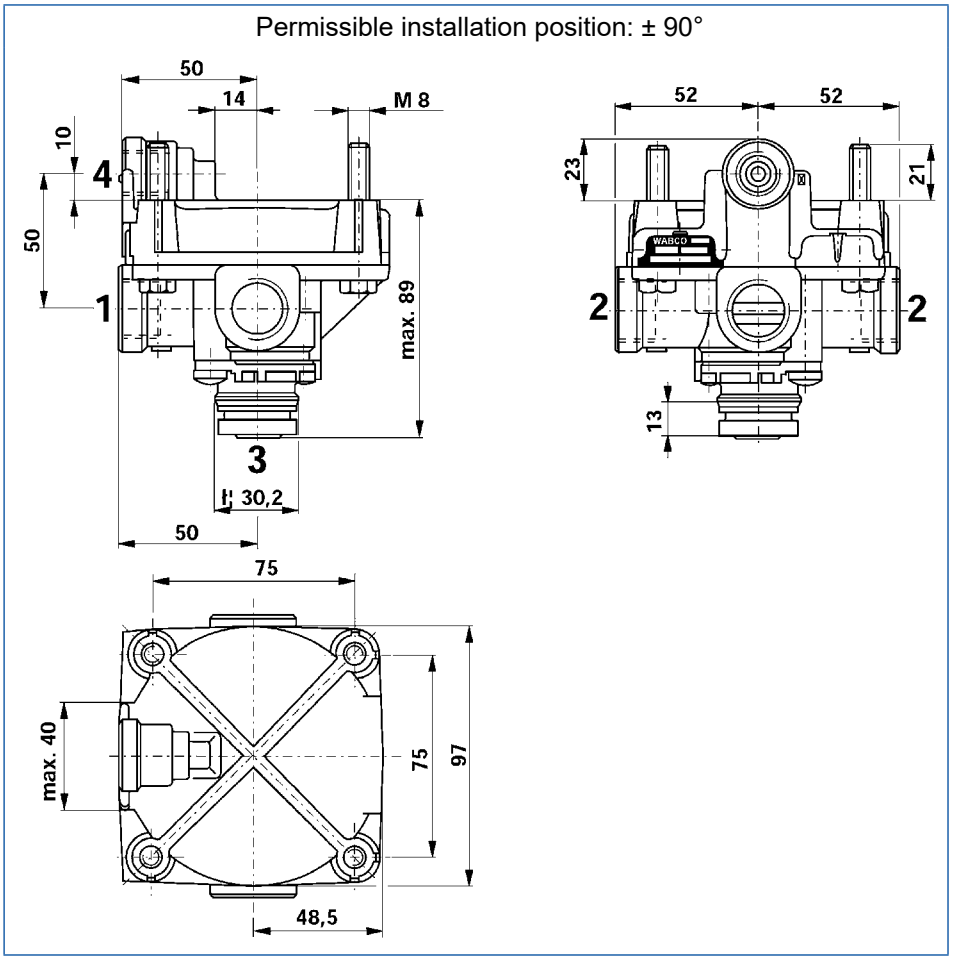
- Install the relay valve so that vent 3 points downward.
- Fasten the relay valve with either two of the four housing fastening bolts M8.

Installation dimensions for 973 001 010 0



LEGEND							
1	Energy supply	**2**	Energy discharge	**3**	Venting	**4**	Control connection

Installation dimensions for 973 011 000 0



LEGEND							
1	Energy supply	**2**	Energy discharge	**3**	Venting	**4**	Control connection

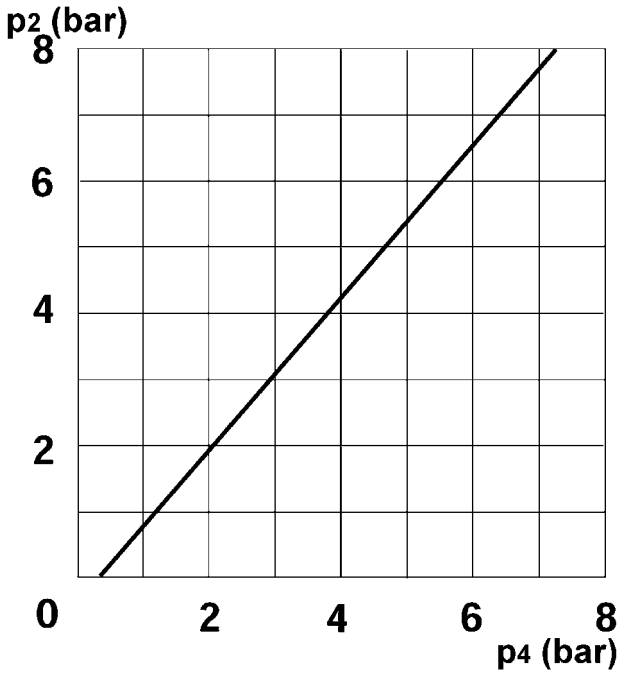
Technical data

ORDER NUMBER	973 001 010 0	973 001 020 0	973 011 000 0
Max. supply pressure	22 bar		13 bar
Output pressure p_2	8 bar		10 bar
Control pressure p_4	8 bar (Max. operating pressure: 10 bar)	8 bar	10 bar
Port threads	M 22x1.5 - 14 deep	1 = M 22x1.5 - 14 deep 2, 4 = M 16x1.5 - 14 deep	1, 2 = M 22x1.5 - 13 deep 4 = M 16x1.5 - 12 deep
Thermal range of application	-40 °C to +80 °C		
Weight	1.1 kg		0.62 kg

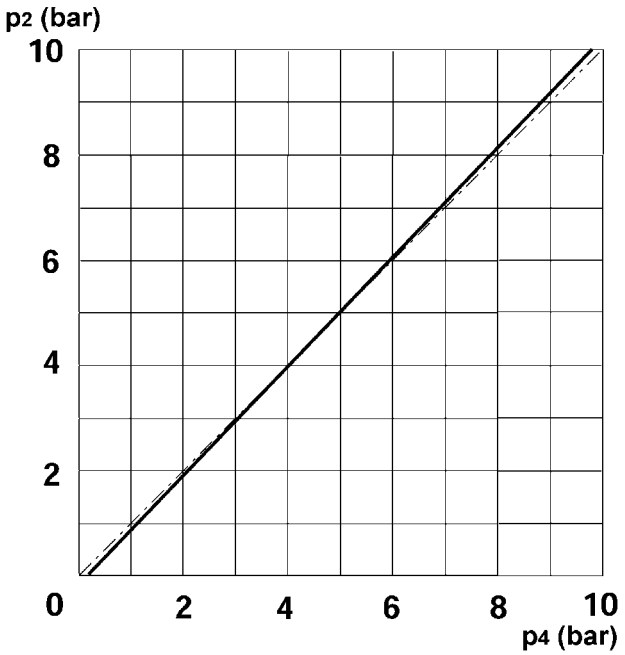
Pressure diagrams

973 001 010 0

973 001 020 0



973 011 000 0



LEGEND			
p_2	Output pressure	p_4	Control pressure

5.36.1 Overload protection valve 973 011 201 0

Application

Especially with drum-brake vehicles

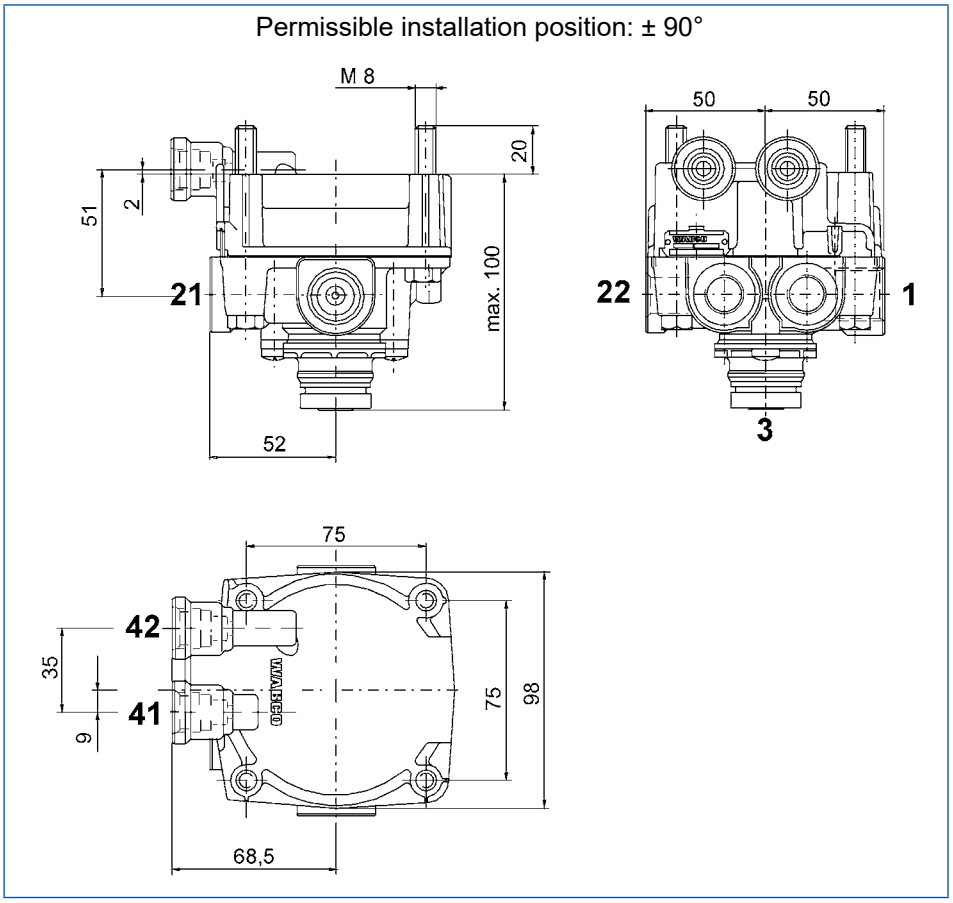
Purpose

For the protection of the wheel brake from overload (added force) when service and parking brake are actuated simultaneously,

Quick charge and venting of the spring chamber diaphragm cylinders (Tristop® cylinders).

Trailer EBS E with PEM: The overload relay valve is already integrated in the pneumatic extension module (PEM).

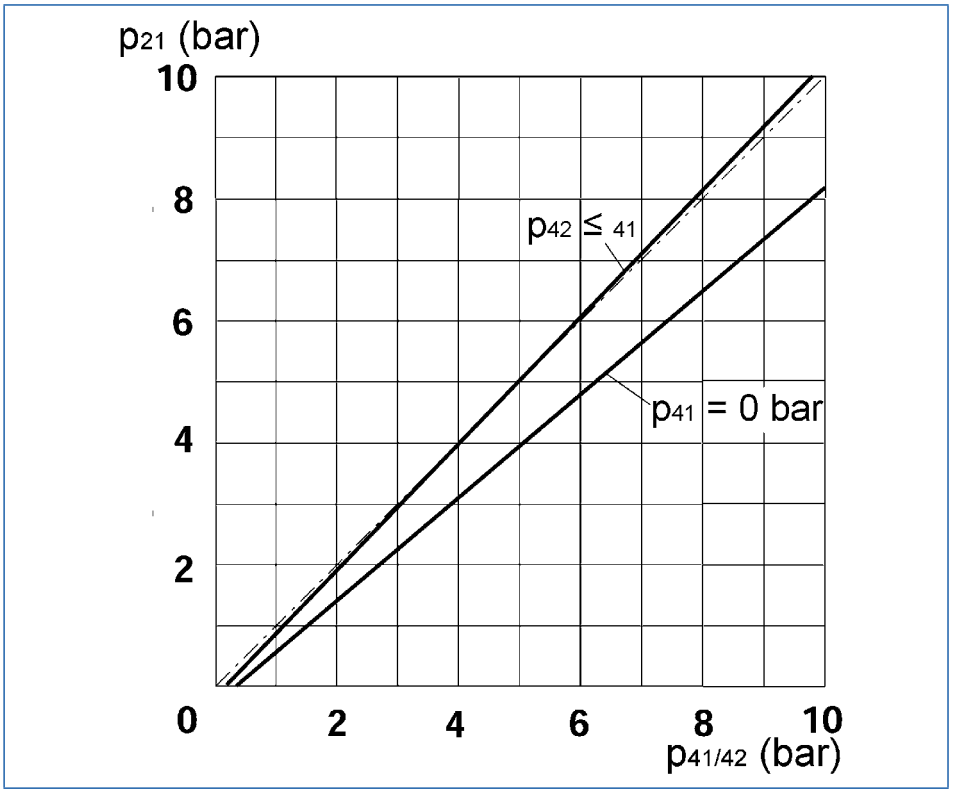
Installation dimensions for 973 011 201 0



Technical data

ORDER NUMBER	973 011 201 0
Max. supply pressure	12 bar
Max. control pressure $p_{41\,/\,42}$	10 bar
Port threads	1 = M 22x1,5 ($M_{max.}$ = 53 Nm) M 16x1.5 ($M_{max.}$ = 34 Nm)
Thermal range of application	-40 °C to +80 °C

Pressure diagram 973 011 201 0



LEGEND			
p_{21}	Output pressure	$p_{41/42}$	Control pressure

5.37 Proportioning pressure regulator 975 001 / 975 002

5.37.1 Proportioning pressure regulator with straight characteristic curve 975 001

Application

For trailers that require adapting to different brake pad wear on different axles.

Purpose

To reduce the braking force of the axle to be adapted during partial brake applications and rapid exhausting of brake cylinders.

Trailers being operated in mountainous regions and frequently covering downhill journeys always show increased wear on the brake linings of the front wheels because the arrangement of the larger front wheel brake cylinders required for stopping will cause excess braking on the front axle. By using the pressure ratio valve, the braking force on the front axle is reduced to the extent that both axles are braked evenly; this does not, however, in any way impair the brake force during full braking.

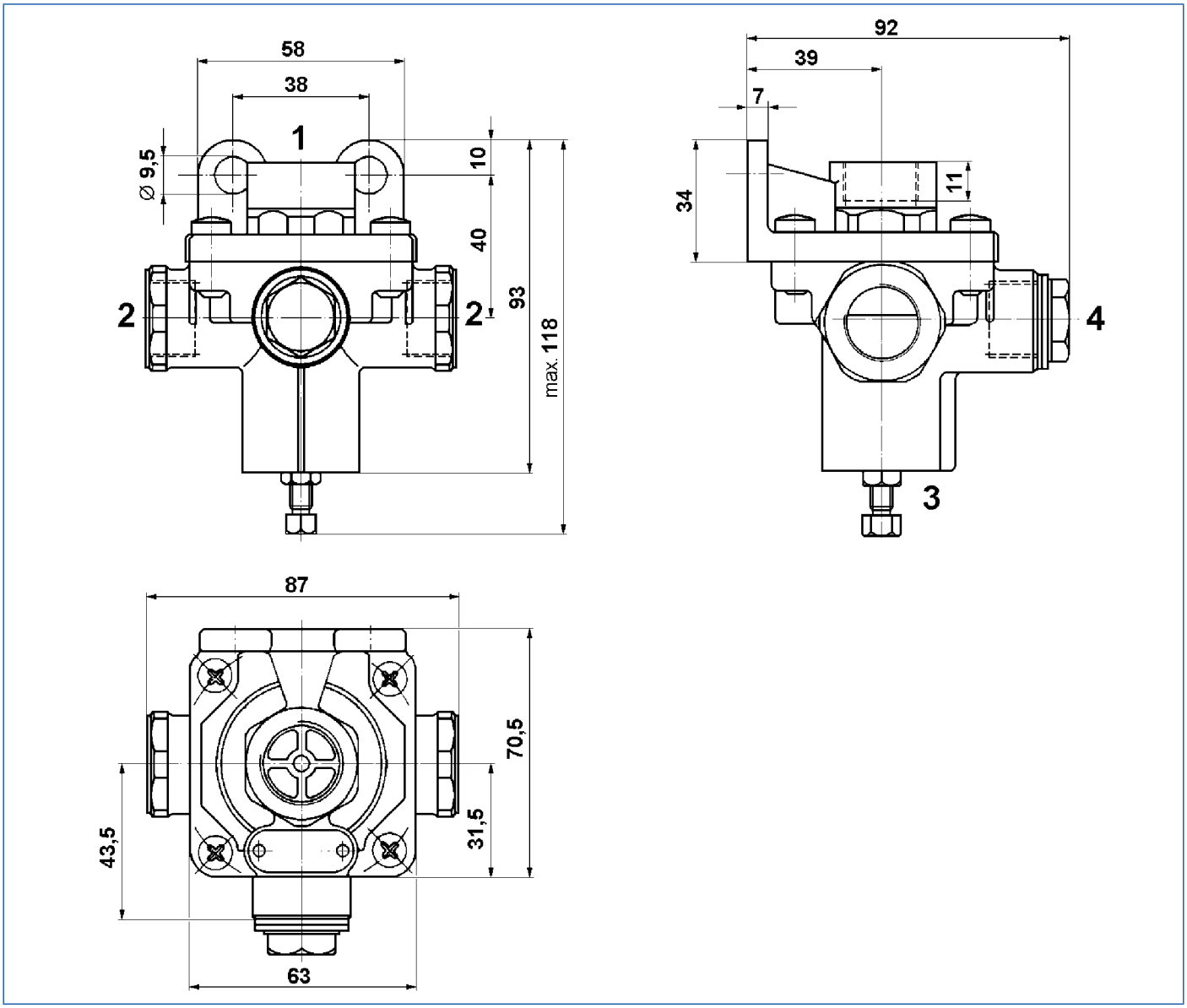
Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

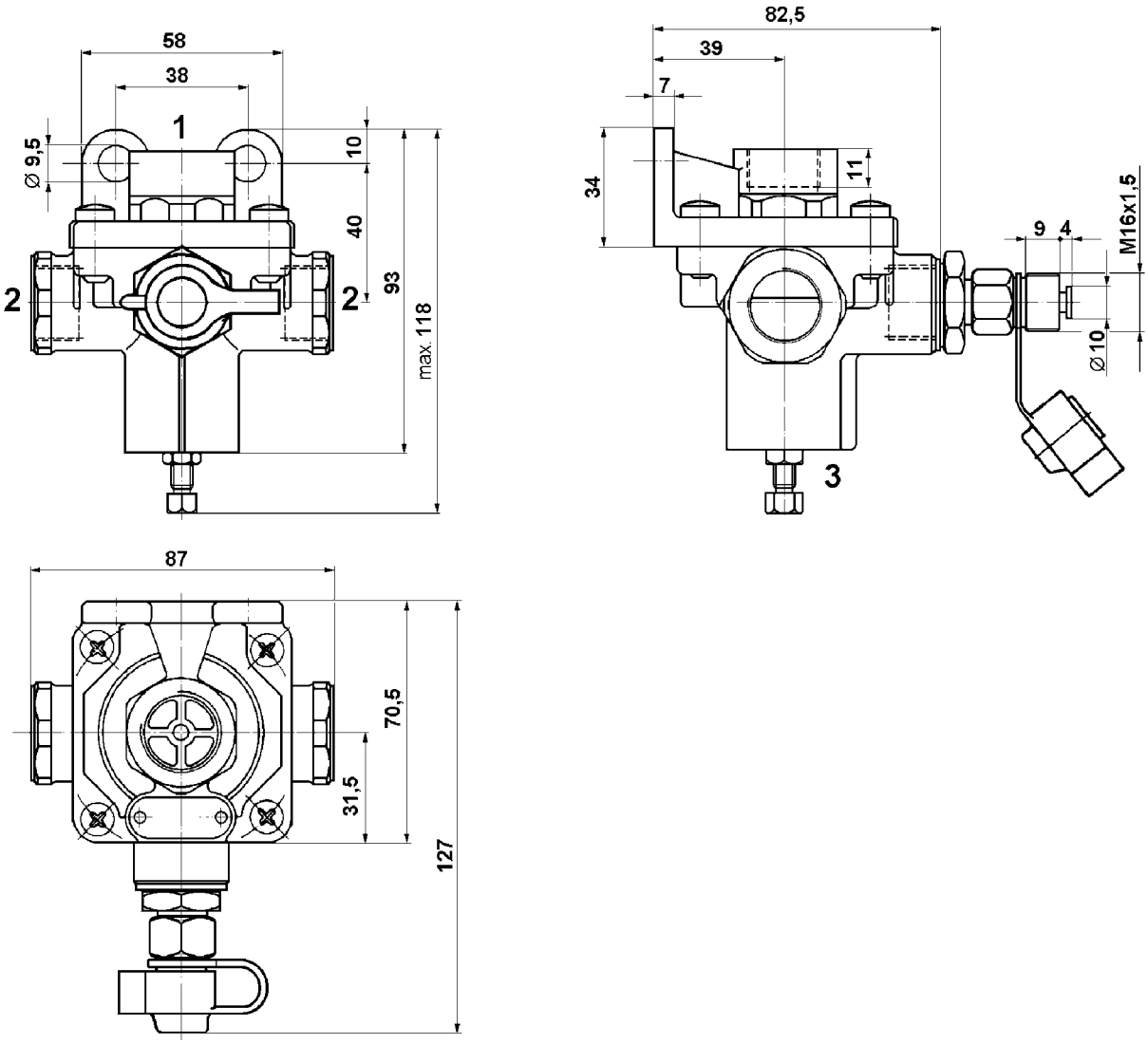
- Mount the adapter valve half way between the two brake cylinders of the axle to be adapted.
- Install the proportioning pressure regulator so that vent 3 points downward.
- Fasten the pressure ratio valve with two M8 screws.

Installation dimensions for 975 001 000 0



CONNECTIONS						PORT THREADS
1	Energy supply	**2**	Energy discharge	**3**	Venting	M 22x1.5 - 15 deep

Installation dimensions for 975 001 500 0: Combination pressure ratio valve 975 001 XXX 0 with test valve 463 703 XXX 0



CONNECTIONS						PORT THREADS
1	Energy supply	**2**	Energy discharge	**3**	Venting	M 22x1.5 - 15 deep

Proportioning pressure regulator 975 001 / 975 002

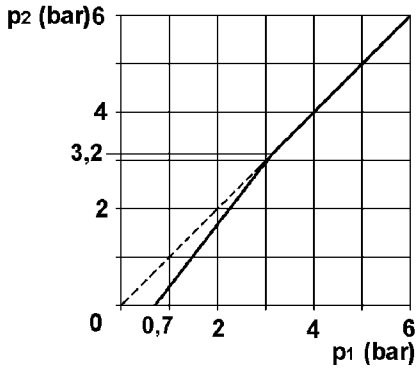
Technical data

ORDER NUMBER	975 001 000 0	975 001 001 0	975 001 002 0	975 001 500 0
Max. operating pressure	10 bar			
Setting range	0.3 to 1.1 bar			
To be set at	0.7 ±0.1 bar	1 ±0.1 bar	0.5 ±0.1 bar	0.7 ±0.1 bar
Nominal diameter	12 mm			
Permissible medium	Air			
Thermal range of application	-40 °C to +80 °C			
Weight	0.55 kg			0.65 kg

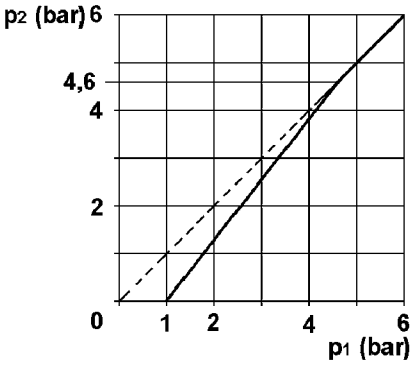
Pressure diagrams

975 001 000 0

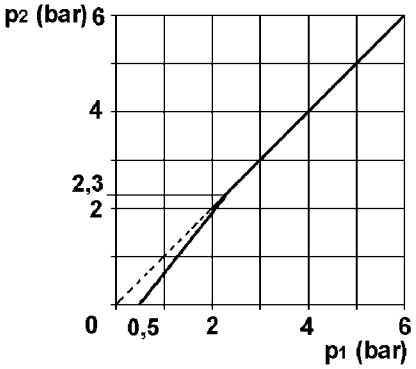
975 001 500 0



975 001 001 0



975 001 002 0



5.37.2 Proportioning pressure regulator with drop characteristic curve 975 002

Application

For trailers, the brake force distribution of which must be adapted on one axle.

Purpose

To reduce the braking force of the axle to be adapted during partial brake applications and rapid exhausting of brake cylinders.

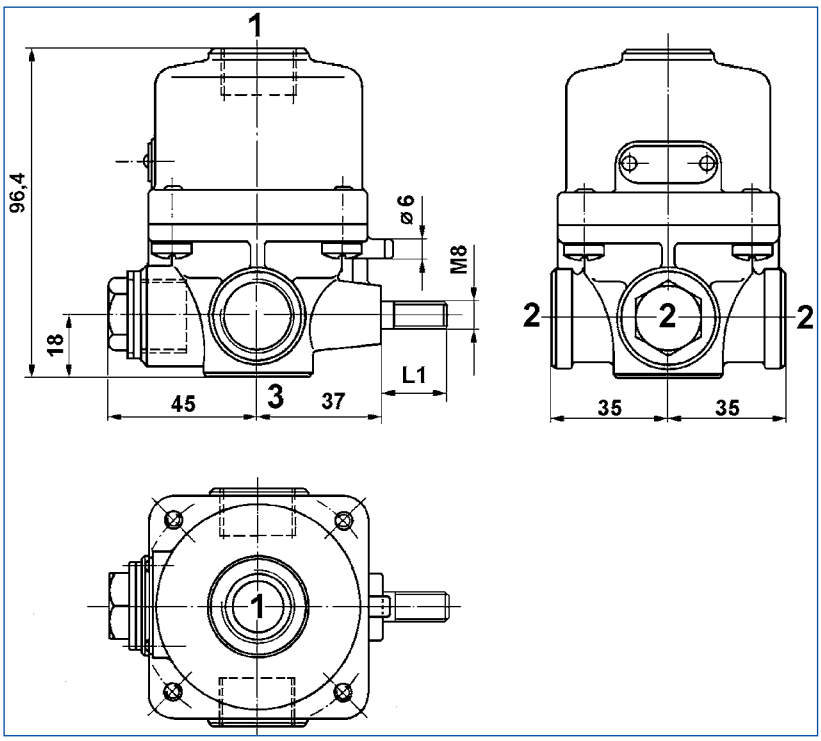
Maintenance

Special maintenance that extends beyond the legally stipulated inspections is not required.

Installation recommendation

- Mount the adapter valve half way between the two brake cylinders of the axle to be adapted.
- Install the proportioning pressure regulator so that vent 3 points downward.
- Fasten the proportioning pressure regulator with the set screw on the side and an M8 nut.

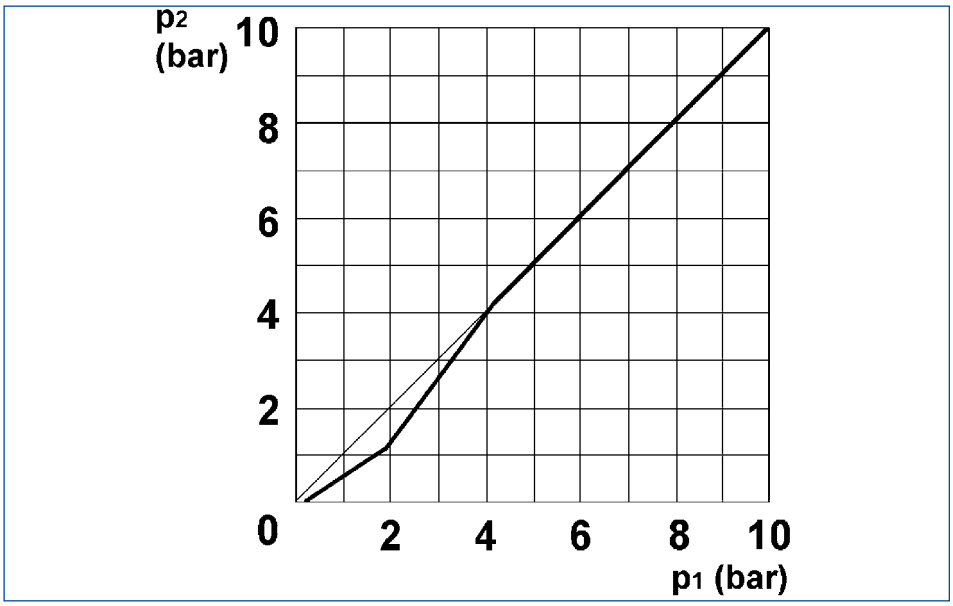
Installation dimensions



Technical data

ORDER NUMBER	975 002 017 0
Max. operating pressure	10 bar
Nominal diameter	7.5 mm
L1 (see Fig. "Installation Dimensions")	25 mm
Permissible medium	Air
Thermal range of application	-40 °C to +80 °C
Weight	0.60 kg

Diagram



Notes

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Please contact your WABCO partner for further information: www.wabco-auto.com/Get-in-touch

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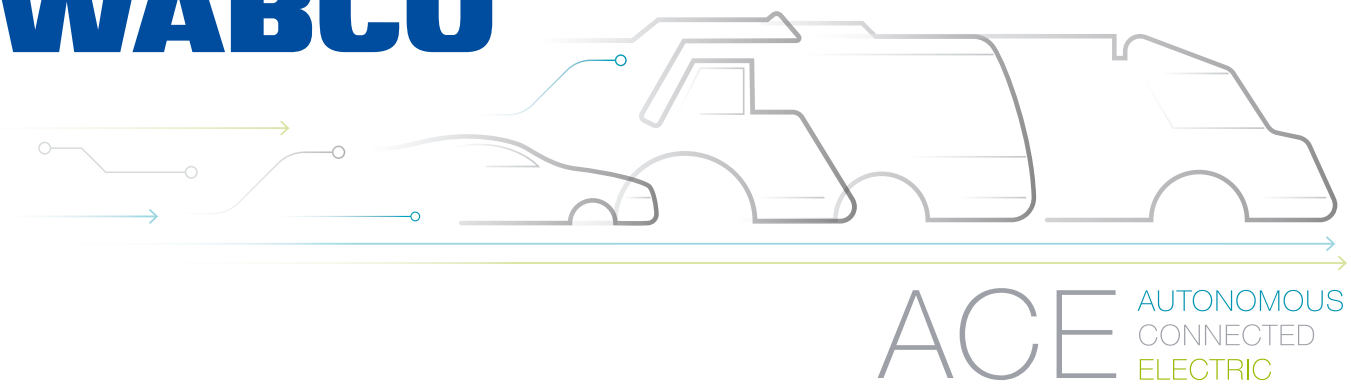

ZF Friedrichshafen AG

ZF is a global technology company and supplies systems for passenger cars, commercial vehicles and industrial technology, enabling the next generation of mobility. ZF allows vehicles to see, think and act. In the four technology domains Vehicle Motion Control, Integrated Safety, Automated Driving, and Electric Mobility, ZF offers comprehensive solutions for established vehicle manufacturers and newly emerging transport and mobility service providers. ZF electrifies different kinds of vehicles. With its products, the company contributes to reducing emissions and protecting the climate.

ZF, which acquired WABCO Holdings Inc. on May 29, 2020, now has 162,000 employees worldwide with approximately 260 locations in 41 countries. In 2019, the two then-independent companies achieved sales of €36.5 billion (ZF) and $3.4 billion (WABCO).

With the integration of WABCO, the leading global supplier of braking control systems and other advanced technologies that improve the safety, efficiency and connectivity of commercial vehicles ZF will create a new level of capability to pioneer the next generation of solutions and services for original equipment manufacturers and fleets globally. WABCO, with almost 12,000 people in 40 locations worldwide, will now operate under the ZF brand as its new Commercial Vehicle Control Systems division.

WABCO