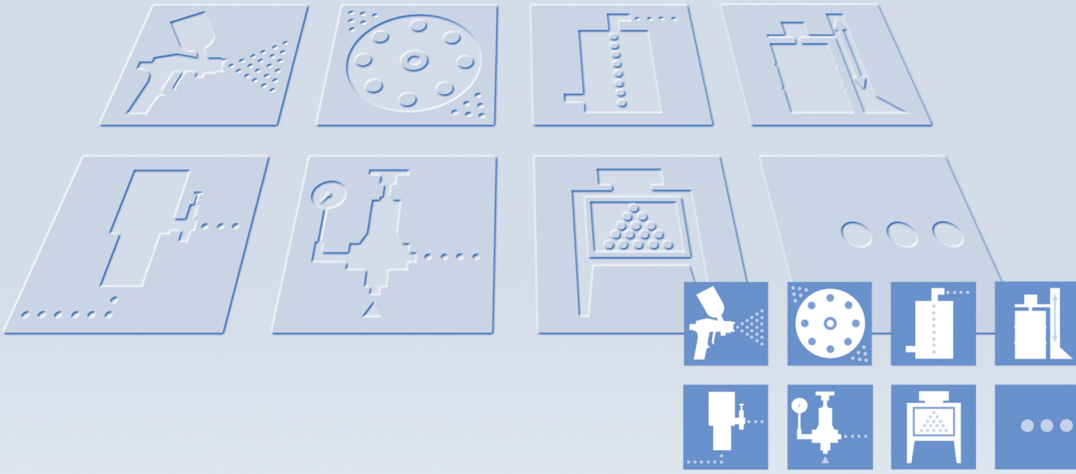
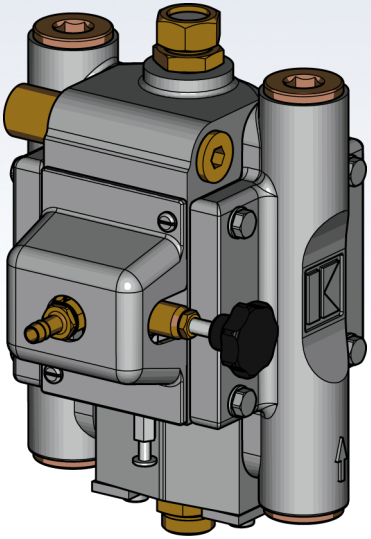




GB

Operating instructions
Diaphragm pump MP-400

Article No. 200-0102
Original operating instructions

T-Dok-236-EN-Rev.0-web

Krautzberger

Thank you for selecting a Krautzberger product.

This product has been manufactured according to the latest manufacturing procedures and with extensive quality assurance measures. We promise you a product of the highest quality

If you have questions, desires or suggestions, please contact us; we are always glad to assist you.

Information about the topic of Ex protection

Many of our competitors have been identifying their products with the Ex symbol for a while now.

Krautzberger does not do this.

We construct and manufacture our products according the currently-valid guidelines.

If the marking on the product is required, then it is affixed on the product as the result of the necessary analysis of ignition sources. If no marking is affixed, then the required analysis of ignition sources as well as previous experience with the assessment of the applicability of the products in the Ex area showed that the product described in these operating instructions provides no potential source of ignition with the exception of the electrostatic charge.

Taking into account the potential equalisation (due to proper earthing), use in the Ex area is admissible according to the currently-valid guidelines.

Table of contents

1 Safety

Safety instructions

DANGER!

This combination of symbol and signal word indicates an immediately dangerous situation which causes death or severe injuries if it is not avoided.

WARNING!

This combination of symbol and signal word indicates a possibly dangerous situation which can cause death or severe injuries if it is not avoided.

CAUTION!

This combination of symbol and signal word indicates a possibly dangerous situation which can cause slight injuries if it is not avoided.

NOTICE!

This combination of symbol and signal word indicates a possibly dangerous situation which can cause property and environmental damage if it is not avoided.

This symbol highlights useful tips and recommendations as well as information for efficient and fault-free operation.

Symbol	Explanation
	Indicates step-by-step instructions.
⇨	Indicates a condition or an automatic sequence as the result of an action.
	Indicates references to sections of these instructions and other applicable documents.
■	Indicates enumerations and list entries without a specified sequence.

1.1 DESIGNATED USE

The MP-400 diaphragm pump is a pump operated with compressed air and is used exclusively

- for the conveying of liquid and low-viscosity coatings from non-pressurised storage containers.
- for the supply of material to spray guns. automatic spray guns, metering devices and similar.

It is mainly used for painting and coating operations.

Designated use also includes observance of all details in these instructions.

Any use beyond the designated use or any other use counts as misuse.

WARNING!

Danger due to misuse!

Misuse of the diaphragm pump can cause dangerous situations.

- Always observe the valid safety, accident prevention, occupational safety and environmental protection regulations valid for the area of application of the diaphragm pump.
- Only use sharply abrasive, chemically-aggressive, very hot or very cold spray media in consultation with Krautzberger GmbH.
- Only use the manufacturer's original spare parts.
- Only operate the diaphragm pump while adhering the values specified in the *Chapter 2 'Technical data' on page 7*.
- Only operate the diaphragm pump after proper fastening on a suitable carrier construction.
- Do not hold the diaphragm pump in your hand during operation.
- Heed the spray media manufacturer's safety data sheets.
- Do not use the diaphragm pump in the food or pharmaceutical sectors.

Claims of any type due to damage based on misuse are excluded.

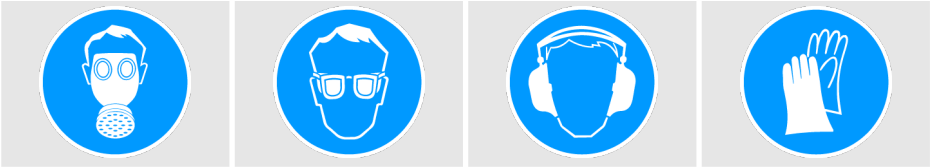
1.2 Personnel requirements

Ensure the use of the device by skilled employees! Only skilled employees can independently detect and avoid possible dangers during use based on their professional training, experience and knowledge of the relevant regulations.

1.3 Personal safety equipment and clothing

When using the device, always wear breathing, eye and ear protection!

Only wear approved protective gloves during cleaning work with solvents!



1.4 Disposal

When the useful life of the device has been exhausted, dispose of it in commercial waste. In order to prevent damage to the environment, dispose of any remains of spray fluid properly separately from the device.

2 Technical data

2.1 Dimensions

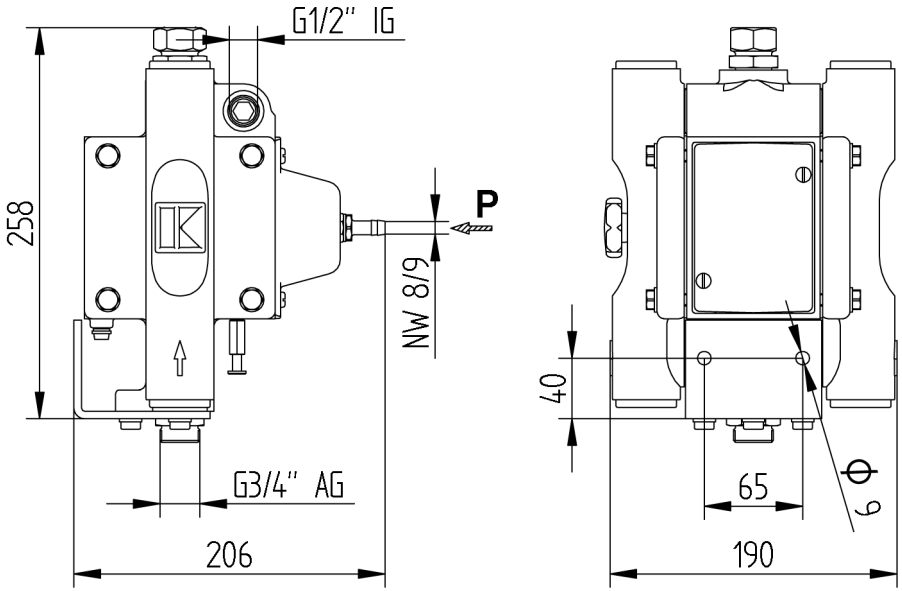


Fig. 1: Dimensions

2.2 General specifications

Data	Value	Unit
Pump capacity (with respect to water, free flow)	20	l/min
Material connection (outlet)	Thread 1/2 female thread	Inches
Max. temperature of the coating material used	0 ... +50	°C
Max. pressure	8 (116)	bar (psi)
Max. operating pressure	8 (116)	bar (psi)
Compressed air connection (hose sleeve)	8 or 9	mm
Min. air intake pressure	4 (58)	bar (psi)
Max. air intake pressure	8 (116)	bar (psi)
Material pressure (depends upon the material)	approx. 0.5 up to 8 (7.3 up to 116)	bar (psi)

Data	Value	Unit
Max. stroke (double strokes)	120	DS/min
Recommended number of strokes (double strokes)	100	DS/min
Weight	7.5	kg
Air consumption (at 8 bar)	160	l/min
Noise pressure level (at 8 bar and100 DS)	78	dB(A)
Transformation ratio	1:1	
Compressed air supply	oil-free, filtered	

2.3 Material delivery properties

Material	Suitability
Paint (with solvent)	good
Water-based paint, dispersions, wood preservatives	good
Water	good
Oils, heating oils, diesel fuel	good
Emulsions, soap, detergents	good
Alcohol, glazes, latex	limited
Lime sludge	limited
Cell and fibre materials	unsuitable
Sludge, mash, pastes	unsuitable

In case of doubt about suitability, inquire about materials not listed. In special cases we will determine the suitability in an experiment.

3 Structure and function

3.1 Overview

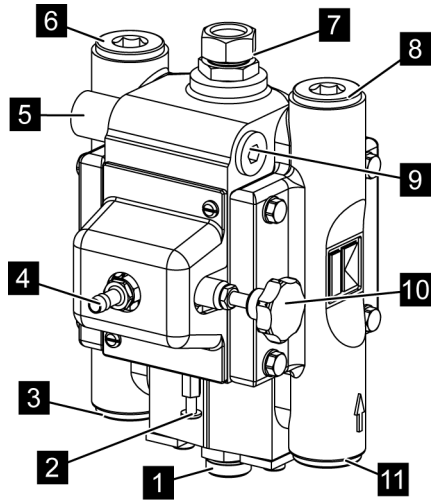


Fig. 2: Overview

1 Material intake connection (material entry)
2 Auxiliary control
3 Screw plug
4 Compressed air connection
5 Material pressure connection (material outlet)
6 Screw plug
7 Surge tank connection
8 Screw plug
9 Screw plug
10 Compressed air controller
11 Screw plug

3.2 FUNCTIONAL DESCRIPTION

The pressure required at the extraction point can be adjusted continuously variably using the compressed air controller (Fig. 2/10). As soon as the set material pressure has been reached, the diaphragm pump switches off automatically. The material pressure is maintained until material is extracted at the extraction point. The diaphragm pump switches on automatically and keeps the set material pressure constant.

4 Installation and connection

4.1 Installing the diaphragm pump

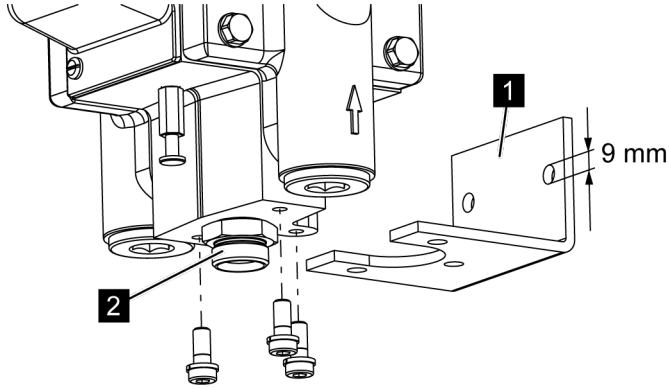


Fig. 3: Installation

1. Fit the bracket (Fig. 3/1) to a wall or supporting construction with the appropriate screw so that the material suction connection (Fig. 3/2) faces vertically downwards after assembly.

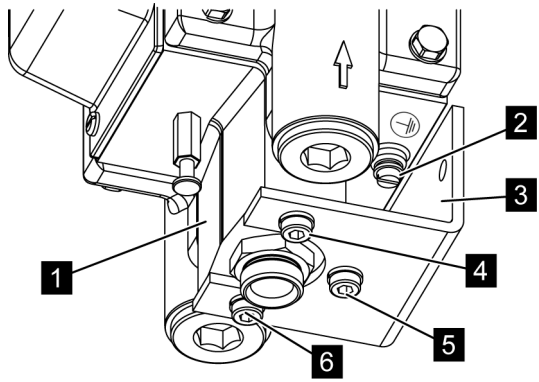


Fig. 4: Installation

2. Lightly grease the screws (Fig. 4/4 to 6)

3. Fit the diaphragm pump (Fig. 4/1) to the bracket (Fig. 4/2) with the screws (Fig. 4/4 to 6).

4. Screw the earthing to the earthing screws (Fig. 4/2).

WARNING!

Risk of fatal injury from electrostatic charge!

Electrostatic charges can cause shocks and spark formation and thus explosions.

- Ensure proper earthing.
- Use conducting hose line (< 1 MΩ).

4.2 Connection example

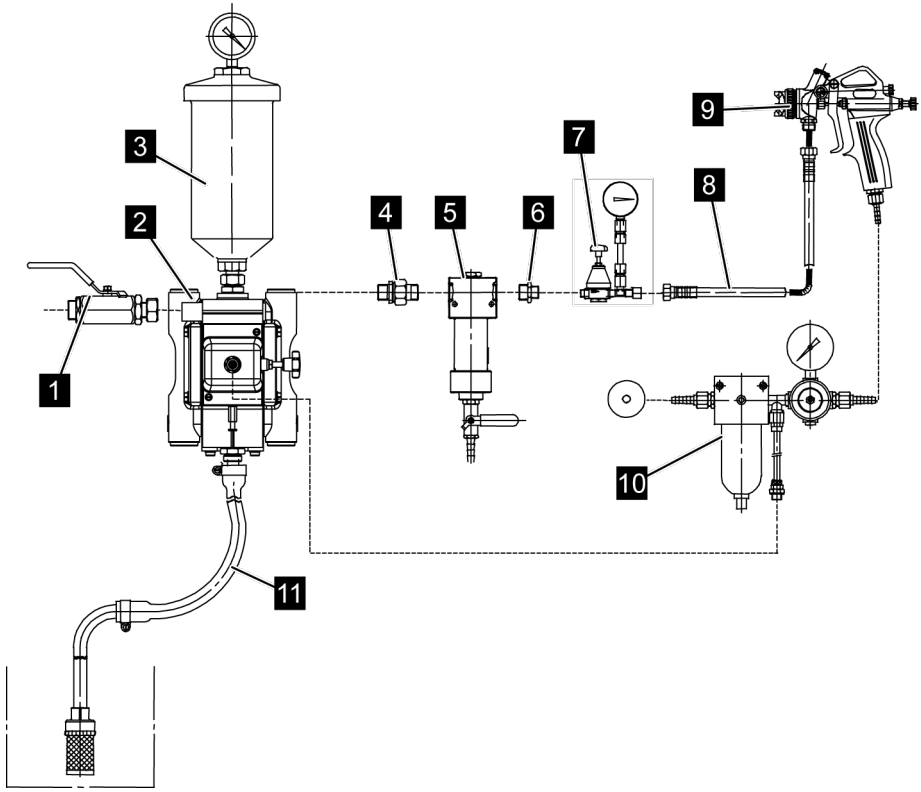


Fig. 5: Connection example

1 Ball cock
2 MP-400 diaphragm pump
3 Surge tank
4 Screw connection
5 Material filter
6 Reduction
7 Material controller
8 Low pressure material hose tube with fitting
9 Spray gun
10 Air controller unit with filter
11 Intake hose with suction cage

4.3 Connecting the diaphragm pump

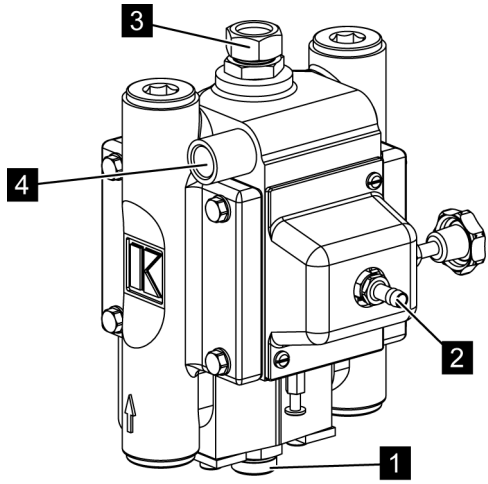


Fig. 6: Connection

1. Connect the material intake hose to the material intake connection (Fig. 6/1).
2. Connect the material pressure hose to the material pressure connection (material outlet) (Fig. 6/4).

> *The material pressure connection can be made on the left or right.*

3. If necessary, connect the surge tank to the connection (Fig. 6/3).
4. Connect the compressed air supply to the compressed air connection (Fig. 6/2).

> *The compressed air supply must be dry, free of oil and secured by an excess pressure safety valve.*

5. Check all connections to ensure a tight fit.

5 Operation

WARNING!

Risk of injury due to improper operation!

- Only perform operation in accordance with the steps shown in these operating instructions.
- Never point the compressed air at people.
- Check the material and compressed air hose lines before each use for damage and tight fit.
- Make sure that the hose lines used fulfil the requirements with respect to pressure, chemical and mechanical loads.
- Make sure that the connected compressed air is oil-free and free of solid matter.
- Observe the details of the spray media manufacturer on the safety data sheet.

5.1 Commissioning

Observe the operating instructions for the components in question.

1. Check the material and compressed air lines to make sure they are whole and fit tightly.
2. Switch on the compressed air supply.
3. Make sure that there is air pressure of 4 to 8 bar.
4. Make sure that the material intake hose is dipped into the material.

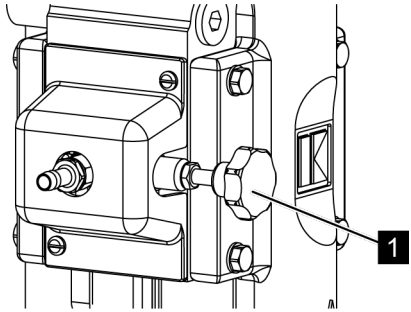


Fig. 7: Compressed air controller

5. **NOTICE!**

   Increased wear if run in idle!

   On initial commissioning, there is still air in the diaphragm pump and the supply lines. In idle, the diaphragm pump wears especially.

   To bleed the pressure controller (Fig. 7/1), first set a low air pressure.

6. Activate the extraction point (e.g. manual spray gun) until material escapes.
7. After successful bleeding, set the desired material pressure with the pressure controller.

5.2 Interrupting operation

See *Chapter 6.2.1 'Cleaning the diaphragm pump' on page 17*.

6 Maintenance

Hose and pipelines

The service life of hose and pipelines is limited even with proper use by environmental influences. For the sake of prevention, all hose and pipelines should be replaced regularly according to their load.

6.1 Maintenance schedule

The following sections describe the maintenance work that is required for optimal and fault-free operation of the device.

Check wearing parts such as seals at regular intervals. The level of wear depends on the abrasiveness of the spray fluid used. Escaping air and spray fluid are signs that parts are worn. In case of questions about maintenance work and intervals, contact the manufacturer; see contact data on the last page.

Interval	Maintenance work	Personnel
After each use	Clean diaphragm pump (↬ *Chapter 6.2.1 'Cleaning the diaphragm pump' on page 17*)	Qualified personnel
When required	Replace valve parts (↬ *Chapter 6.2.2 'Replacing valve parts' on page 18*)	Qualified personnel
	Replace diaphragm (↬ *Chapter 6.2.3 'Replacing the diaphragm' on page 19*)	Qualified personnel

6.2 Maintenance work

6.2.1 Cleaning the diaphragm pump

WARNING!

Danger of injury due to improper cleaning!

- Observe the safety data sheets of the detergent manufacturer.
- Do not use any halogenated detergents.

1. Interrupt the compressed air supply in a suitable location (e.g. shut-off device).
2. Dip the material intake hose into a suitable detergent.
3. Switch on the compressed air supply.
4. Rinse out the diaphragm pump by activating the extraction point until only detergent liquid escapes.
5. Disconnect the compressed air supply.
6. If necessary, activate the extraction point again and depressurise the pump.
7. Leave detergent liquid in the pump.
8. Clean the outside of the device with a cloth dipped in detergent.

6.2.2 Replacing valve parts

1. Clean diaphragm pump (*Chapter 6.2.1 'Cleaning the diaphragm pump' on page 17*).
2. Make sure that the compressed air supply is switched off.
3. If necessary, depressurise the material by activating the extraction point.

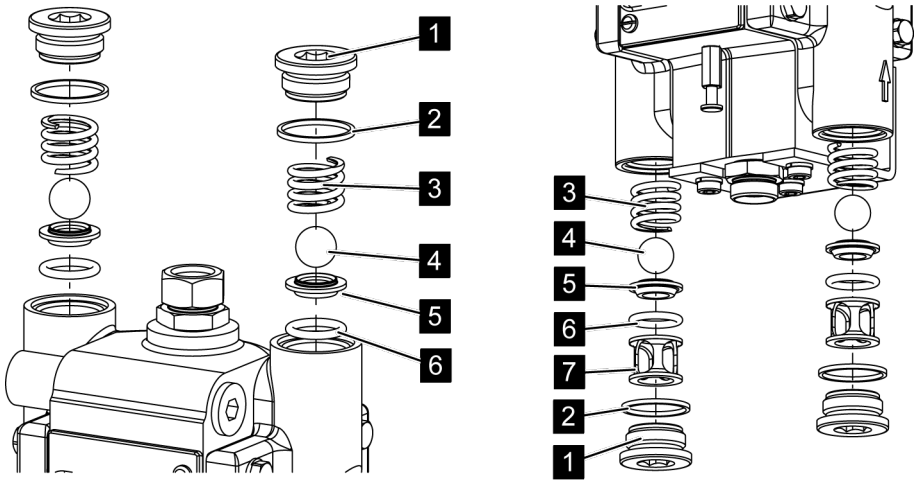


Fig. 8: Valve parts

4. **CAUTION!**

   Risk of injury from spring force!

   The screw plugs are under pressure from springs.

   Carefully unscrew each screw plug (Fig. 8/1).
5. Remove the seal (Fig. 8/2), valve spring (Fig. 8/3), valve ball (Fig. 8/4), valve seat (Fig. 8/5), O-ring (Fig. 8/6) and, if applicable, spacer basket (Fig. 8/7).
6. Check all parts for damage and wear, replace if necessary.
7. Clean the valve housing.
8. Install the the O-ring (Fig. 8/6), valve seat (Fig. 8/5), valve ball (Fig. 8/4), valve spring (Fig. 8/3), seal (Fig. 8/2) and, if applicable, spacer basket (Fig. 8/7) in the order shown.
9. Screw the screw plug (Fig. 8/1) tight to 90 Nm.
10. Clean the diaphragm pump (*Chapter 6.2.1 'Cleaning the diaphragm pump' on page 17*) and perform a test run (*Chapter 5.1 'Commissioning' on page 15*).

6.2.3 Replacing the diaphragm

The following is a description of how to replace diaphragm using the example of the left-hand side of the diaphragm pump.

1. Clean diaphragm pump (*Chapter 6.2.1 'Cleaning the diaphragm pump' on page 17*).

2. Make sure that the compressed air supply is switched off.

3. If necessary, depressurise the material by activating the extraction point.

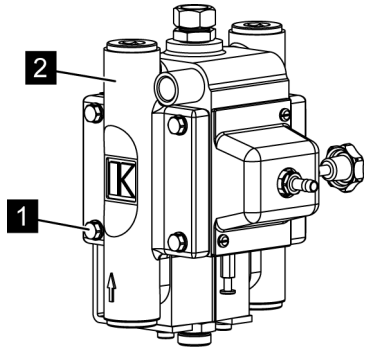


Fig. 9: Unscrew the cover

4. Unfasten all 4 screw (Fig. 9/1) and remove the cover (Fig. 9/2).

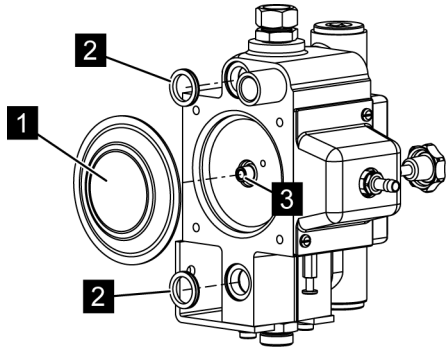


Fig. 10: Unscrewing the diaphragm

5. Unscrew the diaphragm (Fig. 10/1) from the control pin (Fig. 10/3).

6. Clean contact surfaces of the cover.

7. Replace the O-rings (Fig. 10/2).

8. Screw new diaphragm (Fig. 10/1) firmly onto the control pin (Fig. 10/3).

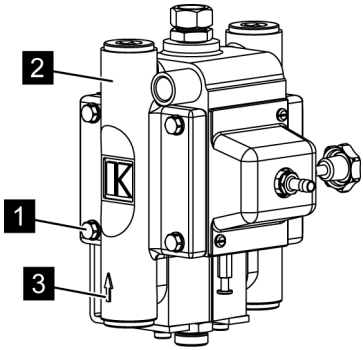


Fig. 11: Screwing the cover in place

9. Put on the cover (Fig. 11/2), with the arrow (Fig. 11/3) pointing upwards.

10. Lightly grease all 4 screws (Fig. 11/1) and screw tight to 20 Nm.

11. Perform test run (↬ *Chapter 5.1 'Commissioning' on page 15*).

7 Faults

7.1 Fault table

If the fault is not included in the following tables or if it cannot be eliminated with the measures described, contact the manufacturer (for contact data, see last page).

Fault	Cause	Remedy
Air bubbles in the material container	Suction line loose/leaky	Check suction line, tighten if necessary
	Seal faulty	Replace seal (↪ *Chapter 6.2.2 'Replacing valve parts' on page 18*)
	Diaphragm faulty	Replace diaphragms (↪ *Chapter 6.2.3 'Replacing the diaphragm' on page 19*)
Diaphragm pump works unevenly	Foreign bodies in the ball valve or worn valve	Check ball valve, replace if necessary
	Air is sucked in	Check suction direction
	Suction line stopped up	Check suction line, clean if necessary
	Valve balls/valve seat soiled/ leaky	Clean/replace valve balls/valve seat (↪ *Chapter 6.2.2 'Replacing valve parts' on page 18*)
Pump does not start up	No compressed air available	Switch on and check compressed air supply
	Control piston not in end position	Move the control piston into the end position (↪ *Chapter 7.2.1 'Moving the control piston into the end position' on page 22*)
	Pressure controller faulty	Replace the pressure controller (↪ *Chapter 7.2.2 'Replacing the pressure controller' on page 23*)
Pump works, but no pressure builds up or does not suck	Intake screen soiled	Clean intake screen
	Suction hose is kinked	Check suction hose
	Valve ball/valve seat soiled	Clean valve balls/valve seat (↪ *Chapter 6.2.2 'Replacing valve parts' on page 18*)
	Valve stopped up	Clean valve, rinse pump

Fault	Cause	Remedy
	Valve ball/valve seat worn	Replace valve balls/valve seat (↬ *Chapter 6.2.2 'Replacing valve parts' on page 18*)
	O-ring faulty	Replace O-ring (↬ *Chapter 6.2.2 'Replacing valve parts' on page 18*)
Pressure fluctuations in operation or changed running noises	Diaphragm worn	Replace diaphragms (↬ *Chapter 6.2.3 'Replacing the diaphragm' on page 19*)

7.2 Work for clearing faults

7.2.1 Moving the control piston into the end position

1. Make sure that the compressed air supply is switched off.
2. Depressurise the material by activating the extraction point.

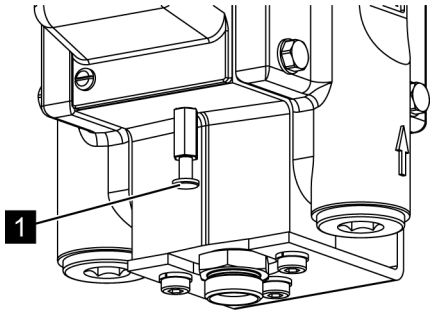


Fig. 12: Auxiliary actuation

3. **NOTICE!**

   If the auxiliary control is actuated in a pressurised state, there is a risk of destroying the valve.

   Press in the auxiliary control (Fig. 12/1).

   ⇨ The control piston is pushed into the end position.

4. Perform test run (↬ *Chapter 5.1 'Commissioning' on page 15*).

7.2.2 Replacing the pressure controller

1. Make sure that the compressed air supply is switched off.
2. Reduce the material pressure by activating the extraction point.
3. Disconnect the compressed air hose from the diaphragm pump.

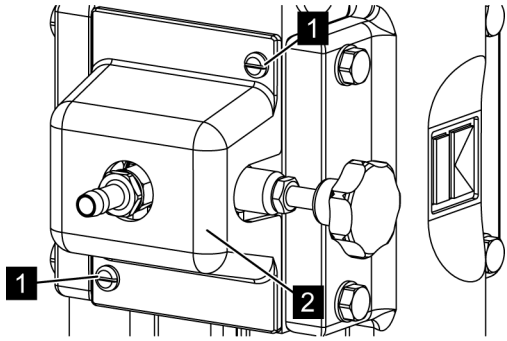


Fig. 13: Cover hood

4. Unscrew the screws (Fig. 13/1) and remove the cover hood (Fig. 13/2).

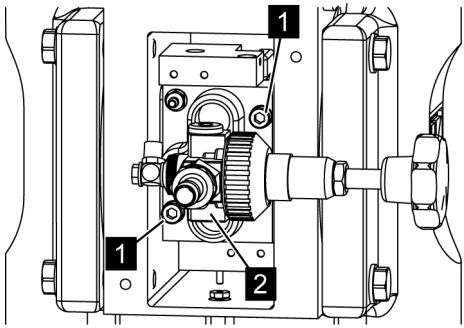


Fig. 14: Pressure controller

5. Unscrew the screws (Fig. 14/1).
6. Remove the complete unit from the pump with the pressure controller (Fig. 14/2).

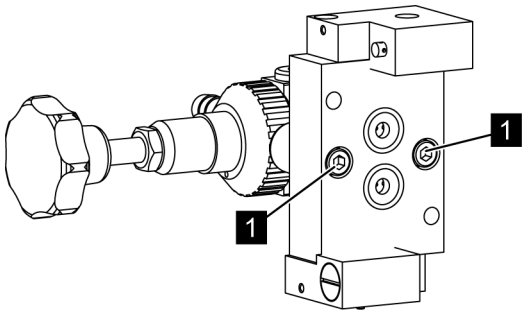


Fig. 15: Pressure controller

7. Unscrew the screws (Fig. 15/1).

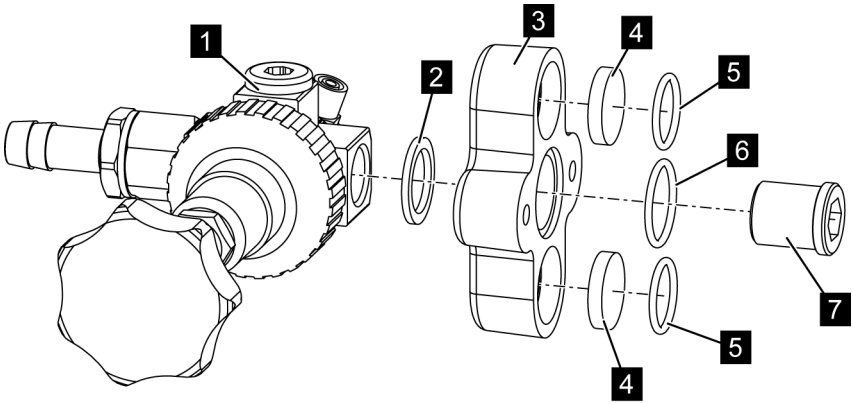


Fig. 16: Pressure controller

8. Unscrew the fastening nipple (Fig. 16/7).

9. Replace the seals (Fig. 16/2, 5 and 6).

10. Remove the sound absorber (Fig. 16/4) from the valve adapter (Fig. 16/3) hand check for wear. Replace it as necessary.

11. Screw the new pressure controller (Fig. 16/1) in place with the fastening nipple (Fig. 16/7) as shown.

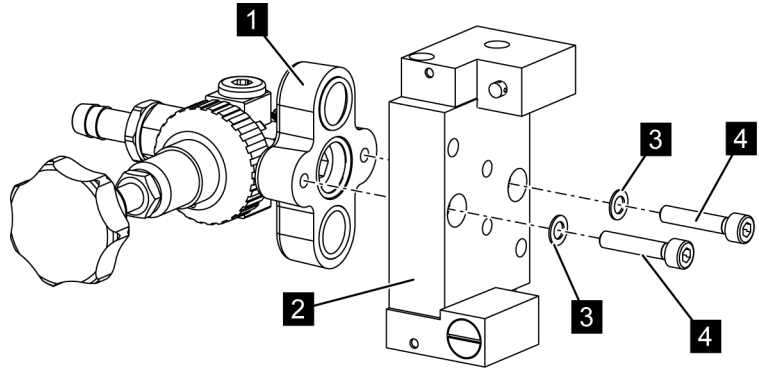


Fig. 17: Housing

12. Screw the housing (Fig. 17/2) to the valve adapter (Fig. 17/1) with the screws (Fig. 17/4) and locking washers (Fig. 17/3).

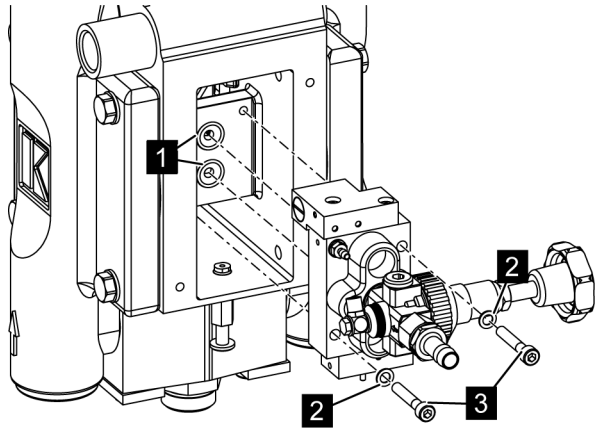


Fig. 18: Pump

13. Replace the seals (Fig. 18/1).

14. Insert the complete unit into the pump and screw it to the pump with the screws (Fig. 18/3) and the locking washers (Fig. 18/2)

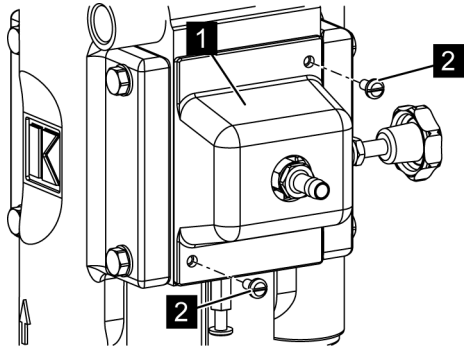


Fig. 19: Cover hood

15. Lightly grease the screws (Fig. 19/2)

16. Put on the cover hood (Fig. 19/1) and fasten it in place with the screws (Fig. 19/2).

8 Spare parts/accessories

8.1 Diaphragm pump spare parts

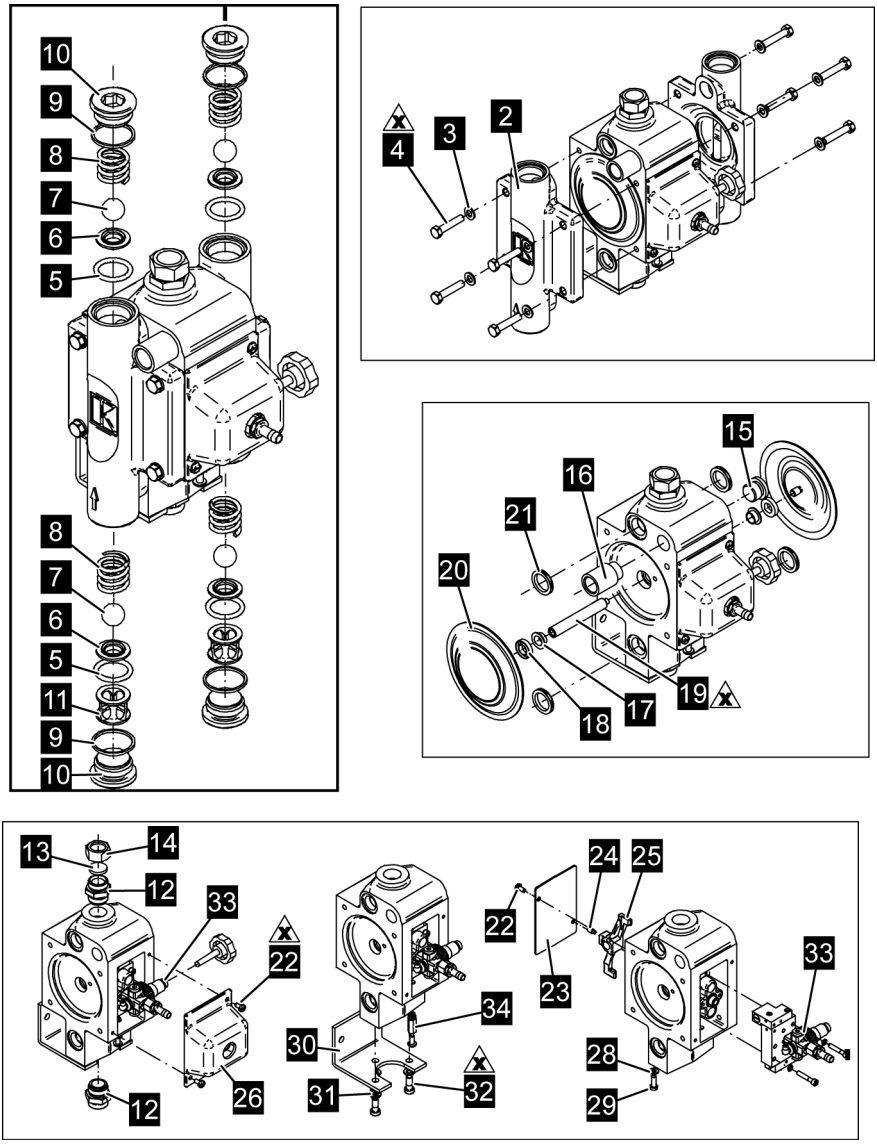


Fig. 20: Diaphragm pump spare parts

Lightly grease parts

Diaphragm pump spare parts list

Item No.	Art. No.	Designation	Item No.	Art. No.	Designation
1	6540-040-2136	Timing case	16	6540-030-2107	Adapter, brass
2	6540-040-2138	Cover		6541-040-0967	Adapter, stainless-steel
3	6540-030-2865	Disk	17	6540-040-0961	Flange sleeve
4	6540-030-0562	Hexagonal head screw	▲ 18	6540-010-0197	Slotted ring
▲ 5	6540-010-0291	O-ring, PTFE	19	6540-040-0959	Control pin
	6542-010-0335	O-ring, NBR	■ 20	6540-010-0455	Diaphragm, PTFE
■ 6	6540-040-0962	Valve seat, stainless-steel		6542-010-0451	Diaphragm, NBR
	6542-080-0369	Valve seat, carbide	▲ 21	6540-010-0199	O-ring
■ 7	6540-030-2753	Valve ball, stainless-steel	22	6540-030-0564	Screw
	6542-030-2752	Valve ball, PUR	23	6540-040-0958	Cover plate
	6543-030-2754	Valve ball, carbide	24	6540-030-0441	Threaded pin
8	6540-020-0081	Valve spring	25	6540-040-0957	Control section
▲ 9	6540-010-0307	Gasket	26	6540-100-0427	Cover hood
10	6540-040-0964	Sealing plug, brass	27	6540-030-2894	Serrated washer
	6541-040-0968	Sealing plug, stainless-steel	28	6540-030-2862	Disk
11	6540-040-0965	Spacer basket	29	6540-030-0274	Cap screw
12	6540-040-0963	Double nipple, brass	30	6540-040-0960	Bracket
	6541-040-0966	Double nipple, stainless-steel	31	6540-030-1982	Spring washer
▲ 13	6540-010-0198	Gasket	32	6540-030-0563	Cap screw
14	6540-040-1246	Union nut	33	6540-130-0281	Control unit, complete
15	6540-030-2138	Sealing plug, brass	34	6540-080-2345	Auxiliary actuator
	6541-030-0561	Sealing plug, stainless-steel	▲	6540-010-0442	Gasket set
			■	6540-080-1455	(*including set of seals, stainless steel valve seats and valve balls, PFTFE*)

8.2 Control unit spare parts

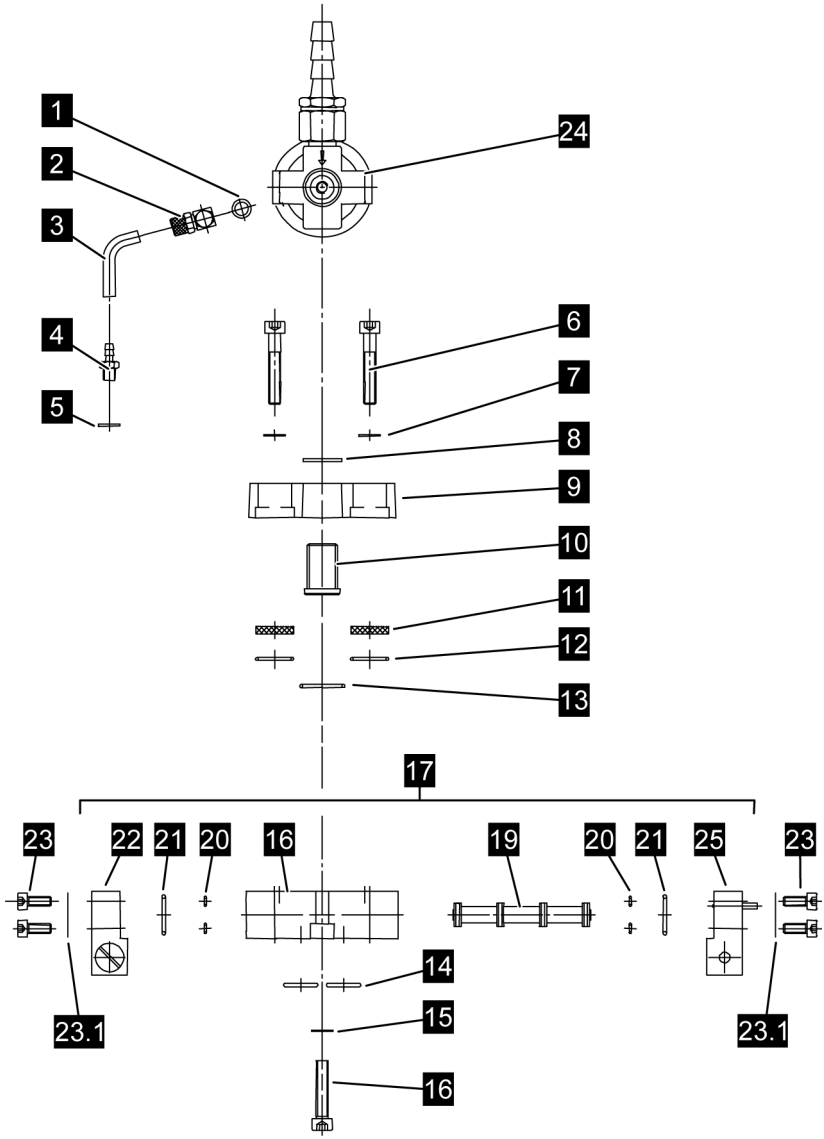


Fig. 21: Control unit spare parts

Control unit spare parts list

Item No.	Article no.	Designation
	6540-130-0281	Control unit assy.
1	6540-010-0203+	Gasket
2	6540-030-2427	Swivel screw fitting
3	6540-110-0101	Air hose
4	6540-030-2207	Hose sleeve
5	6540-010-0203+	Gasket
6	6540-030-0565	Screw
7	6540-030-0707	Locking washer
8	6540-010-0244+	Gasket
9	6540-040-0954	Valve adapter
10	6540-030-1855	Fastening nipple
11	6540-030-1444++	Muffler
12	6540-010-0046+	Gasket
13	6540-010-0150+	Gasket
14	6540-010-0146+	Gasket
15	6540-030-0707	Locking washer
16	6540-030-0147	Screw
17	6540-080-2465	Control valve assy.
18	6540-030-3235	Housing
19	6540-030-3237++	Control piston
20	6540-010-0494+	Gasket
21	6540-010-0056+	Gasket
22	6540-030-3236	Tappet valve assy.
23	6540-030-0212	Screw
23.1	6540-030-1897	Schnorr washer
24	6540-130-0217	Pressure controller assy.
25	6540-080-2464	Tappet valve assy.
	6540-010-0696	Gasket set
	6540-080-1452	Set of wear parts

+ included in the set of seals

++ wear part

8.3 Accessories

There are a wide range of accessories available for the diaphragm pumps. For further information, visit us on the Internet (www.krautzberger.com) or contact your Krautzberger specialist dealer, consultant or our office staff. Here are a few examples:

- Surge tank with removable cleaning cover and pressure gauge for balancing out the pulsation and displaying the set material pressure.
- Several suction devices in various models, with sieve basket.
- Pressure pipe with pressure gauge for displaying the set material pressure.
- Material filter with drain valve.
- Material pressure controller for absolutely constant material pressure, ever in very low pressure ranges.
- Pneumatic pump stroke devices.
- Carriage with pump stand.
- Wall brackets.
- Stand for accommodation of a wall bracket.

- Container lids for diaphragm pump build-up.
- Mount for lid installation.
- Material drain valve.
- ... and further accessories...

9 EU declaration of conformity

EC declaration of conformity according to machine guideline 2006/42/EC, Annex II 1.A

The manufacturer/	Krautzberger GmbH
marketer	Stockbornstr. 13
	65343 Eltville (Germany)

declares, that the following product

Product name:	Diaphragm pump
Type designation:	MP-400
Item no.:	200-0102
Atex marking:	⟨Ex⟩ II 2 G c

corresponds to all relevant provisions of the directive named above as well as the additional applicable guidelines (below) -- including their changes valid at the time of the declaration.

The following EU directives were applied: Atex directive 94/9/EEC

The following harmonised standards were applied:

EN 1127-1:2007	Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology
EN 13463-1:2001	Non-electrical equipment for use in potentially explosive atmospheres - Part 1: Basic method and requirements
EN 809:1998+A1:2009	Pumps and pump units for liquids - Common safety requirements
EN ISO 12100-1:2003/A1:2009	Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology (ISO 12100-1:2003)
EN ISO 12100-2:2003/A1:2009	Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles (ISO 12100-2:2003)
EN ISO 13849-1:2008/AC:2009	Safety of machines - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2006)

The following national and international standards (or parts/clauses from these) and specifications were applied:

Special technical documents were created for the product according to Annex II part 1.A, with justified request, these documents can be transferred to a single-country office via post, e-mail or courier.

Name and address of the person who is authorized to create the technical documents:

Thomas Weidmann
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Eltville, 12.04.2011
Place, date

Managing Director

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