

1.4 Styles and symbols

This documentation uses the following styles and symbols:

•	list
→	instruction
1. 2.	preset order of instructions
701	part number (according to part list)
1	flexible part number (section)
X	replace spare part

⚠ + DANGER / WARNING / CAUTION;
NOTICE: embedded safety message

given limits or fixed value

1.5 Intended use

The valve is solely intended to control or stop a fluid flow within approved operating limits. The fluid must only flow through the valve in the determined flow direction.

You may only operate the valve with fluids that will not cause any chemical reaction with the valve's materials or lead to abrasive effects.

Under the following conditions, a valve with nominal diameter > DN 25 is not approved as the only shut-off valve at the end of a pressure line:

- The contents of the pressure system must not be released into the atmosphere.
- The contents of the pressure system must not be transferred to a downstream system with lower nominal pressure rating (PN).

1.6 Improper use

In the following cases it is prohibited to operate the valve:

- The valve is not used for the designated purpose.
- The permitted temperature and pressure ranges are exceeded.

- Damages to the valve – e.g. cracks, deformation – were detected but the valve remains in operation.
- Malfunctions were detected but the valve remains in operation.
- The valve has been modified without authorization of the manufacturer.
- The safety instructions of this documentation are not observed.

For damages caused by improper use, the liability of the manufacturer is excluded.

Our guarantee expires in the following cases:

- Undue intervention and altering are done to the valve.
- This documentation or the operating limits as shown in the particular data sheet are not observed.

1.7 Obligations of operator

Product

- Over the entire life cycle of the valve all applicable regulations must be observed. The instructions of this operation manual must be observed and followed.
- Initiate a risk assessment of the overall installation, to detect potential dangers that may occur in combination of the valve with other components.

Persons

- Initiate the instruction of each person who is working with the valve. Applicable regulations about occupational safety and safety engineering must be known and applied.

Documentation

- This documentation must be fully read and understood.
- The instructions given in this operation manual must be put into practice.
- This documentation must be available at any time.

Markings at the operating site

- Ensure adequate warning of the risks linked to the valve. Use in the area of the installed valve the following warning and prohibition signs in compliance with EN ISO 7010 and BGV A8 (VBG125):

	Warning sign to indicate risk of burns at the solenoid
	Warning sign to indicate electrical hazards at the solenoid
	Prohibition sign to prevent people from entering hazardous areas

1.8 Personnel qualification

- Ensure as operator that persons who work on or with the valve are sufficiently qualified for this job.
- Comprehensively train the operating personnel in terms of safety.
- Only allow trained specialists to perform electric connections, commissioning, maintenance and trouble shooting

Demands

Operating personnel must be instructed on operational sequences and procedures.

Operating personnel must know its responsibilities regarding the work to be performed.




Trained specialists must possess profound knowledge in mechanical engineering, electrical engineering, hydraulic and pneumatic.

Trained specialists must be authorized to commission, ground and designate devices, systems and power circuits according to the standards of safety technology.

Trained specialists must possess profound knowledge about design and principle of operation of the valves and the plant.

1.9 Personal protection equipment

- Wear appropriate protection equipment. Observe the personal protection equipment as requested in "residual risks" (see chapter 2).

	Protective eye glasses to protect from escaping fluids or exhausting compressed air
	Protective gloves resistance to cutting to protect from sharp edges or ridges; resistance to acids to protect from hazardous fluids
	Protective footwear to protect from parts or tools falling down

2 General safety instructions

These safety instructions are only related to the single valve. In combination with other plant components there may be other potential dangers, which must be taken into account by carrying out a risk analysis for the system.

- Compare the details on rating plate and data sheet to the operating data. The limits for the particular application (e.g. pressure, temperature) must not be exceeded.
- Only perform assembly and maintenance works when the pipe system is in depressurized state.
- Flood the valve slowly during commissioning. Fast pressurizing will cause the valve to open briefly.
- Strength tests with the valve seat open are permitted maximum up to 1.5 times of the nominal pressure rating (PN) at room temperature. The valve must not be operated during these tests.

⚠ DANGER



Hazardous electrical voltage (>25V AC; >60V DC)

There are risks from electrical voltage during assembly and maintenance.

- The electrical connection of the solenoid must be carried out only by a qualified electrician.
- You may only plug or remove the device socket in de-energized state.
- Disconnect the power supply off the solenoid prior to assembly or disassembly.

⚠ WARNING



Danger from pressurized pipelines

Pressurized pipelines may burst resulting in injuries.

- Depressurize pipe system and block the fluid flow prior to opening or unmounting the valve.

⚠ CAUTION



Risk of burns at the solenoid

Solenoid is heating up during operation. Touching the solenoid leads to risk of burns.




- Let the solenoid to cool down before working on the valve.

Residual risks



Weight of the valve

Phases: transport, storage, assembly, maintenance, disposal
Risk: falling off, tipping over
Personal protection equipment (PPE): protective footwear

	Hazardous fluids Phases: assembly, operation, maintenance, disposal Risk: skin contact, eye contact, breathing vapors PPE: protective gloves, protective eye glasses, breathing protection
	Potentially explosive atmosphere Risk: danger of explosion ⚠ WARNING: use solenoid an device socket with Ex-protection.
	Sharp-edges and threads Phases: transport, assembly, maintenance, disposal Risk: risk of cuts PPE: protective gloves

3 Avoid damage to property

NOTICE

Deposits and dirt lead to malfunctions

If the control bores are clogged or the core is blocked by soil the valve no longer closes or opens.



- Install a strainer (mesh size ≤ 0.25 mm) in front of the valve inlet **P** if necessary.

Damages through accumulation of heat

The solenoid will overheat during continuous duty if the heat can not be radiated. This shortens the service life of the solenoid.

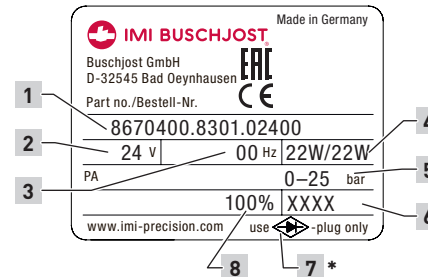
- You must not cover the solenoid with paint.
- You must not encase the solenoid in a tight housing or in a thermal insulation.

Residual risks

	Pressure against valve outlet The valve only firmly closes in flow direction.
	Fluid freezing The valve is not designed to withstand the fluid freezing.

4 Identifying the valve

The rating plate is situated on the solenoid body.



Rating plate (example)

- Order number
- Operating voltage
- Frequency of voltage
- Power consumption inrush/holding
- Operating pressure range
- Date of manufacture (week/year)
- * if this marking is shown on the rating plate: use device socket with rectifier
- Duty cycle

5 Transport and storage

NOTICE

Damage of the valve

Valve may be damaged if foreign particles get into the valve.

- Transport and store the valve dry and only in the delivery packaging.
- Take valve out of the packaging immediately prior to assembly.
- Let the blanking plugs or protective collars into valve connections.

Prolonged storage at -10 °C to +20 °C

Avoid during transport:

Mechanical loads: falling off, tipping over
Damages to the electrical terminal elements

Avoid during storage:

Thermal stress: permanently increased storage temperatures; distance to heat sources < 1m

Chemical load: at the storing site through solvents, chemicals, acids, fuels and similar

Weather conditions: at construction sites strong, watertight containers are necessary

Unfavourable storing conditions may reduce the service life of the sealing materials

6 Function

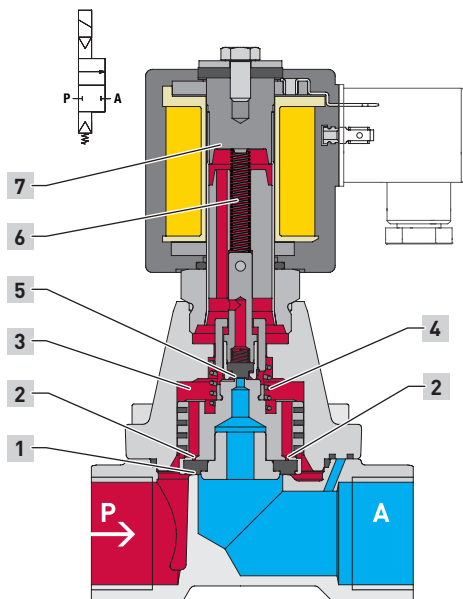
Design

2/2-way seat valve with piston as sealing device.

Operation

The valve is electromagnetic indirectly-controlled with forced lifting.

6.1 NC-valve (normally closed)



Sectional view (NC-valve; closed)

- 1 Main valve seat
- 2 Control bore in the piston (pressure build-up)
- 3 Chamber
- 4 Compression spring above the piston
- 5 Pilot seat (pressure reduction)
- 6 Compression spring inside the core
- 7 Magnet face of the core tube

Normal position: closed

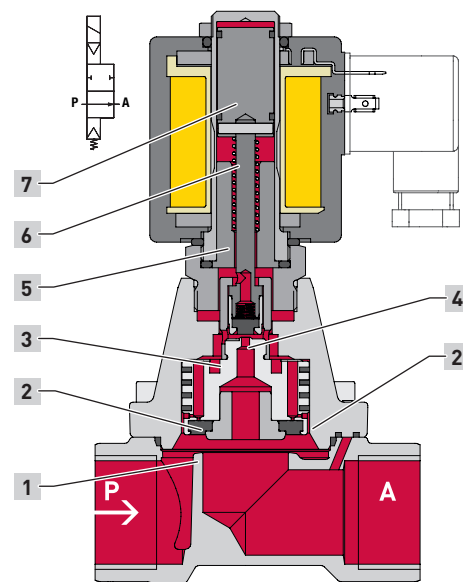
Due to the effect of the compression spring **6** inside the core the pilot seat **5** in the valve piston is closed. A compression spring **4** presses the valve piston sealingly to the main valve seat **1**. The operating fluid flows through the control bore **2** in the piston to the chamber **3** above the piston and increases the closing force.

Switching position: open

The magnetic force lifts the core towards the magnet face of core tube **7** when the solenoid is energized. Since the pilot seat **5** is open the fluid pressure is reducing from chamber **3** towards valve outlet. More fluid is flowing off via the pilot seat **5** to the chamber **3** than the amount flowing in via the control bore **2** in the piston. The differential pressure lifts up the valve piston and opens the main valve seat **1**. Through the mechanical coupling with the core, the valve piston is lifted into open position.

In the absence of differential pressure only the solenoid force moves the diaphragm in the open position.

6.2 NO-valve (normally open)



Sectional view (NO-valve; open)

- 1 Main valve seat
- 2 Control bore in the piston (pressure build-up)
- 3 Chamber
- 4 Pilot seat (pressure reduction)
- 5 Pole piece
- 6 Compression spring inside pole piece
- 7 Core

Normal position: open

When the solenoid is de-energized, the pilot seat **6** is opened by the effect of the compression spring **9**. Through die mechanical coupling with the core, the valve piston is lifted into open position. More fluid is flowing off via the pilot seat **5** to the chamber **3** than the amount flowing in via the control bore **2** in the piston. The resulting differential pressure supports the opening movement. The main valve seat **1** is open.

Switching position: closed

When the solenoid is energized, the core **7** is attracted by the pole piece **5**. The core **7** presses the seal plug sealingly against the force of compression spring **6** on the pilot seat **4**. Through the mechanical coupling with the core, presses the valve piston sealingly to the main valve seat **1**. The outflow of the fluid flow from the chamber **3** is interrupted. The operating fluid flows through the control bore **2** in the piston to the chamber **3** above the valve piston and increases the closing force.

6.3 Solenoid types AC/DC

The valve may be equipped without changing of the mechanical part with an DC voltage solenoid or AC voltage solenoid. In both cases the permissible voltage tolerance amounts to $\pm 10\%$. Special versions may cause deviations.

7 Mounting

NOTICE

Damage of the valve

The valve may be damaged through inappropriate installation.

- Only trained and authorized specialists may install the valve.
- Only use appropriate tools and suitable sealing materials.
- Make sure that the valve is mounted in flow direction.
- Make sure not to distort the valve body, particularly in case of a misaligned pipe-work.

There must be no mechanical loads applied to the solenoid.

- Do not use solenoid as a lever during mounting.

Valve only firmly closes in flow direction. Inflow against the valve's flow direction may lead to the destruction of components.

- Implement adequate measures if back flow is to expect; for example by adding check valves to the pipe system.

The valve subassembly may get damaged by external loads at the operating site.

- Protect valve from objects falling down.
- Secure the valve against direct weather influences and the possible effects.

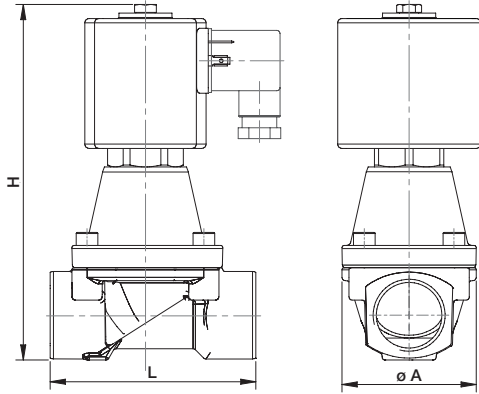
7.1 Dimensions

Notes in dimension tables:

^[1] measured with solenoid 8301 or 8304

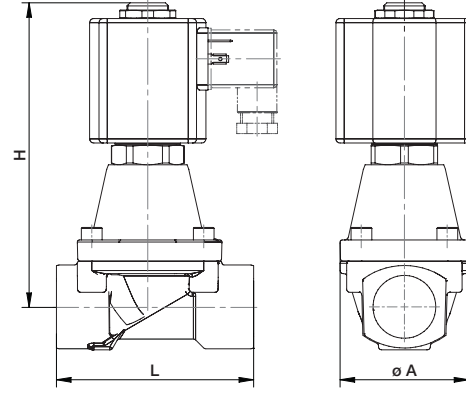
^[2] measured with solenoid 8401 or 8404

^[3] Flange with 8 bores



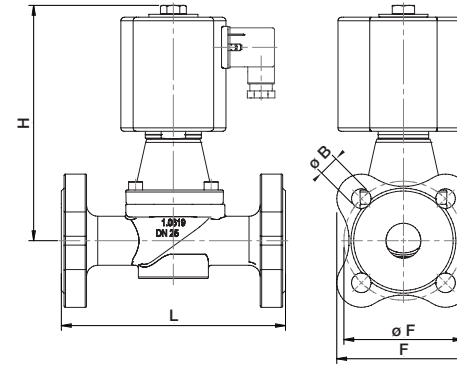
Series 86700, 86710, 86740, 86750 (NC)

Port size		L	H	ØA
G 1/4	1/4 NPT	60	143 ^[1]	44
G 3/8	3/8 NPT	60	143 ^[1]	44
G 1/2	1/2 NPT	67	145 ^[1]	44
G 3/4	3/4 NPT	80	154 ^[1]	50
G 1	1 NPT	95	164 ^[1]	62
G 1 1/4	1 1/4 NPT	132	212 ^[2]	92
G 1 1/2	1 1/2 NPT	132	212 ^[2]	92
G 2	2 NPT	160	226 ^[2]	109



Series 86700, 86710, 86740, 86750 (NO)

Port size		L	H	ØA
G 1/4	1/4 NPT	60	146 ^[1]	44
G 3/8	3/8 NPT	60	146 ^[1]	44
G 1/2	1/2 NPT	67	149 ^[1]	44
G 3/4	3/4 NPT	80	157 ^[1]	50
G 1	1 NPT	95	167 ^[1]	62
G 1 1/4	1 1/4 NPT	132	223 ^[2]	92
G 1 1/2	1 1/2 NPT	132	223 ^[2]	92
G 2	2 NPT	160	237 ^[2]	109



Series 86500, 86540, 86580 (NC)

flange – sealing strip acc. to DIN EN 1092-1B

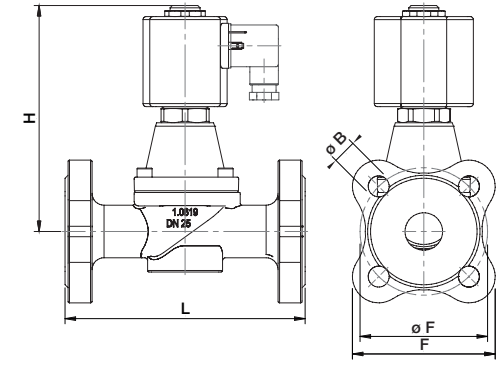
Width	L	H	F	ØF	ØB
DN 15	130	134 ^[1]	77	65	14
DN 20	150	142 ^[1]	86.6	75	14
DN 25	160	147 ^[1]	95.1	85	14
DN 32	180	184 ^[2]	110.7	100	18
DN 40	200	189 ^[2]	117.8	110	18
DN 50	230	196 ^[2]	128.4	125	18

with hole according to ASME B16.5 Class 150, RF

Nom. size	L	H ^[1]	F	ØF	ØB
DN 15	130	134 ^[1]	77	60.3	15.9
DN 20	150	142 ^[1]	86.6	69.9	15.9
DN 25	160	147 ^[1]	95.1	79.4	15.9
DN 32	180	184 ^[2]	110.7	88.9	15.9
DN 40	200	189 ^[2]	117.8	98.4	15.9
DN 50	230	196 ^[2]	128.4	120.7	19

with hole according to ASME B16.5 Class 300, RF

Nom. size	L	H ^[1]	F	ØF	ØB
DN 15	130	134 ^[1]	77	66.5	15.9
DN 20	150	142 ^[1]	86.6	82.6	19
DN 25	160	147 ^[1]	95.1	88.9	19
DN 32	180	184 ^[2]	110.7	98.4	19
DN 40	200	189 ^[2]	117.8	114.3	22.2
DN 50	230	196 ^[2]	155	127	19 ^[3]



Series 86500, 86540, 86580 (NO)

flange – sealing strip acc. to DIN EN 1092-1B

Nom. size	L	H	F	ØF	ØB
DN 15	130	137 ^[1]	77	65	14
DN 20	150	145 ^[1]	86.6	75	14
DN 25	160	151 ^[1]	95.1	85	14
DN 32	180	194 ^[2]	110.7	100	18
DN 40	200	200 ^[2]	117.8	110	18
DN 50	230	207 ^[2]	128.4	125	18

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with hole according to ASME B16.5 Class 300, RF

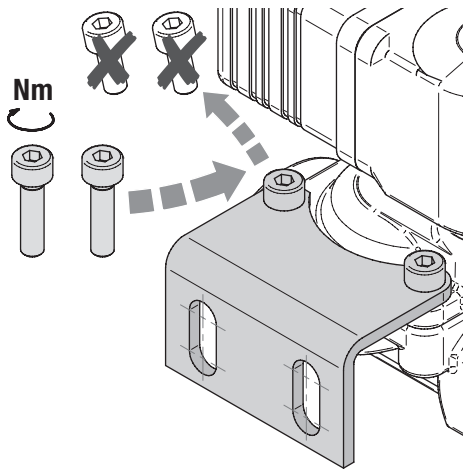
Nom. size	L	H ^[1]	F	ØF	ØB
DN 15	130	137 ^[1]	77	66.5	15.9
DN 20	150	145 ^[1]	86.6	82.6	19
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DN 32	180	194 ^[2]	110.7	98.4	19
DN 40	200	200 ^[2]	117.8	114.3	22.2
DN 50	230	207 ^[2]	155	127	19 ^[3]

7.2 Mounting accessories

Mounting bracket

With an optional mounting bracket, you can connect the valve to an load-bearing structure at the installation site, thus protecting against vibration, for example.

→ Attach the mounting bracket to a long site of valve cover before to assembly. Use the fixing screws delivered with the mounting bracket to achieve the necessary screw-in depth.



Mounting bracket (example)

Available mounting brackets

Order No.	Connections		
1262508	G 1/4	1/4 NPT	
	G 3/8	3/8 NPT	
	G 1/2	1/2 NPT	DN 15
1262510	G 3/4	3/4 NPT	DN 20

info Valves ≤ G 1/2 or 1/2 NPT from series 86700, 86710, 86740 and 86750 with solenoid 8401 or 8404 are supplied with a mounting bracket as standard.

7.3 Conditions of installation

Compliance with operating limits

Ensure to comply with the operating limits prior to mounting the valve. Observe the valve's data sheet.

Planning of the pipe system

The manufacturer recommends to include manual stop valves and drain valves in the plant so that the pipe system may be depressurized and drained prior to working on the valve.

Valve's mounting position

Valve's mounting position may be any.

preferably: Solenoid vertical on top

→ **NOTICE** NO valves (normally open) must be mounted with the solenoid vertical on top.



7.4 Preparation

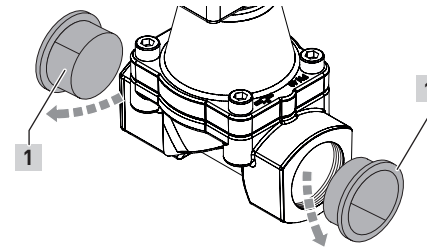
- Check the valve for externally visible damages.
- Let the valve in its protective package prior to mounting.
- Make sure that there is enough free space for disassembly the valve in case of maintenance.
- **⚠ WARNING** Depressurize the pipe system.
- **NOTICE** Clean the pipe system prior to mounting the valve.

7.5 Mounting valve to pipeline

- Mount the valve to the designated pipeline. Comply with existing connections.
- Arrange the valve according to the pipeline's flow direction. An arrow on the valve body marks the flow direction.

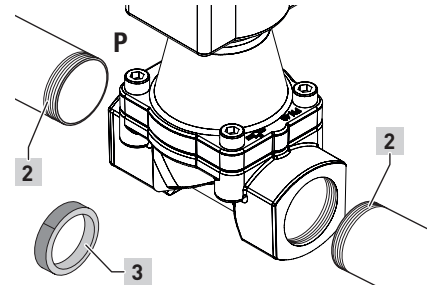
Valve with thread connection

1. Take out the blanking plugs **1** from valve inlet and valve outlet.



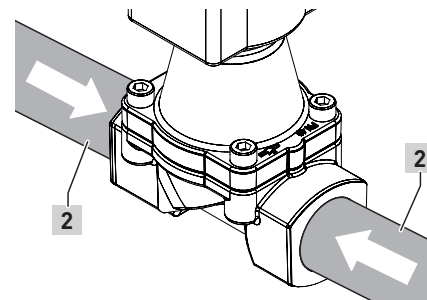
Take out blanking plugs

2. Install a strainer in front of the valve inlet **P** if necessary.
3. Firmly seal pipeline's thread **2** with an appropriate sealing material (e.g. PTFE sealing tape **3**).



Firmly seal pipeline's thread

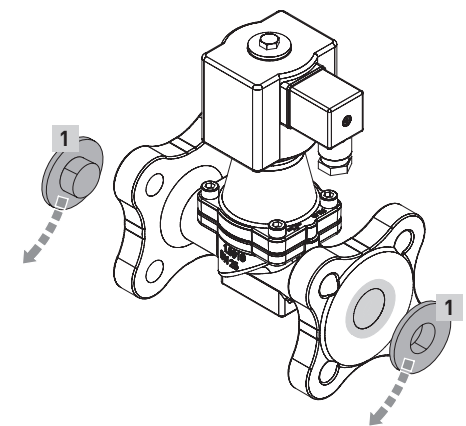
4. Attach pipelines threads **2** to the valve's connection threads.
- NOTICE** Make sure not to distort the valve body.



Attach pipelines to valve

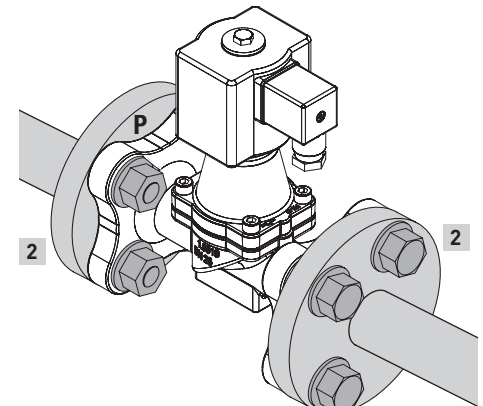
Valve with flange connection

1. Take out the protective collars from valve inlet and valve outlet **1**.



Take out protective collars

2. Install a strainer in front of the valve inlet **P** if necessary.
 3. Connect the flange connections of the valve body with flanges of the pipe line **2**.
- NOTICE** Make sure that the flange seal is correctly positioned.



Connect pipe line flanges to flange connections

8 Connect solenoid electrically

→ Connect solenoid in accordance with the electrical regulations.

Solenoid	830x	840x
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⚠ DANGER



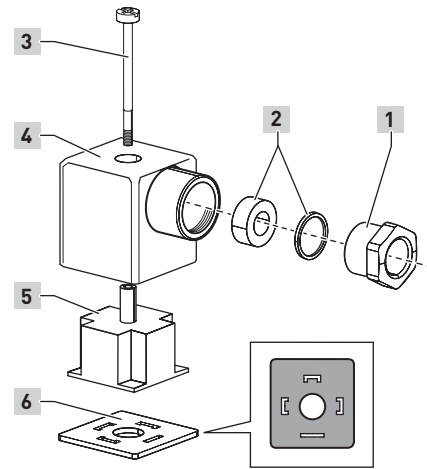
Hazardous electrical voltage (>25V AC; >60V DC)
There are high risks from electrical voltage during assembly works.

- Work on electrical installations may only be carried out by a qualified and authorized electrician (refer to 1.8).
- You must connect the earth wire to the terminal marked with the grounding symbol ⊕.
- You may only plug the device socket in de-energized state.
- Make sure that the insulation of the strands is not pinched.

Connection errors lead to dangers

- After connecting the solenoid carefully close the terminal compartment to restore protection.
- To secure IP 65 protection after connecting: Carefully close the device socket. Check whether the flat seal between solenoid and device socket is properly seated. Check whether cable gland is properly sealed.

- Use a **round** cable with diameters from 5 mm to 10 mm. The wire cross section must not exceed 1.5 mm².

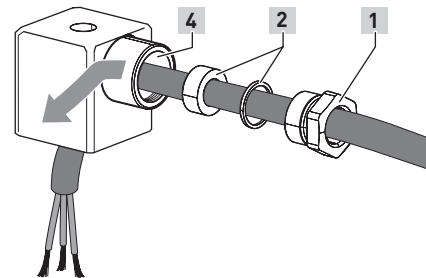


Overview: Device socket

- 1 Pressure screw
- 2 Washers
- 3 Middle screw
- 4 Device socket's housing
- 5 Socket insert
- 6 Flat gasket

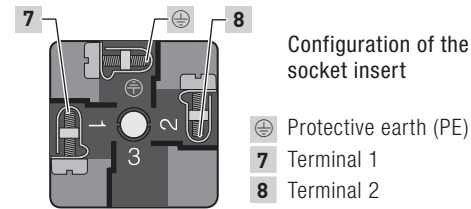
- Make sure that the flat gasket **6** and socket insert **5** are mounted congruently with the connecting lugs of the solenoid.

1. Slide pressure screw **1**, washers **2** and device socket's housing **4** on the cable.



Feed cable through device socket

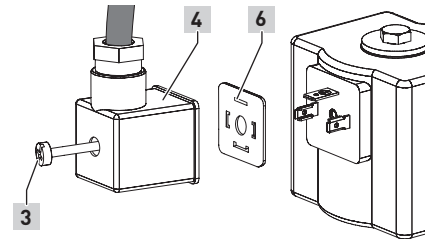
2. Attach the protective conductor at first (insulation: yellow/green) to the terminal marked with the grounding symbol ⊕.



Configuration of the socket insert

- ⊕ Protective earth (PE)
- 7 Terminal 1
- 8 Terminal 2

3. Attach the other wires to the terminals **7** and **8** of the socket insert **5**.
⚠ WARNING Ensure the correct polarity of terminals marked „+“ and „-“.
4. Put the housing of the device socket **4** in the chosen position (9 o'clock, 12 o'clock, 3 o'clock, 6 o'clock) onto socket insert **5**.
5. Tighten pressure screw **1** to cable gland.
NOTICE Cable gland must firmly seal.
6. Pull protective cap from the plug contacts of the solenoid.
7. Attach flat gasket **6** and housing **4** with socket insert to the connection lugs of the solenoid.
⚠ WARNING Make sure that the seal is evenly positioned on the entire surface between solenoid and device socket.



Place mounted device socket (example)

8. Tighten middle screw **3** with 40 Ncm.
NOTICE Avoid visible distortion of the device socket's housing.

Tightening torque 40 Ncm ±10 Ncm

Solenoid	8326	8341	8426	8441
		6220		6240

Solenoid 8326 and 8426

→ Observe operation manual 1262559 supplied with the solenoid.

Solenoid 8341 and 8441

→ Observe operation manual 1258739 supplied with the solenoid.

Solenoid 6220 and 2240

→ Observe operation manual 1377070 supplied with the solenoid.

9 Operating conditions

- Ensure that all operating limits of the valve are considered during the configuration of the overall system.

Operating limits

Operating pressure		0 to 25 bar 0 to 40 bar ^[1]
Fluid temperature ^[2]	with NBR	−20 °C to +90 °C
	with FPM	−10 °C to +110 °C
	with EPDM	−20 °C to +110 °C
	with PTFE	−20 °C to +110 °C
Ambient temperature		−20 °C to +50 °C

^[1] non-standard operating pressure only with solenoid 8400

^[2] depending on material of piston seal

info For special products apply the operating limits specified on the article data sheet and the rating plate.

Permitted media

Series 86700, 86710, 86500 for neutral, gases and liquid fluids
Series 86740, 86750, 86540, 86580 for slightly aggressive, gases and liquid fluids

10 Commissioning

⚠ CAUTION

Danger through escaping fluid

NO-type valves are open in de-energized state.

→ Prior to commissioning of NO-valves, provide safeguards against escaping fluid.

→ Ensure compliance with the operating conditions specified in chapter 9.

10.1 Checking the switching function

→ Check valve's switching function without fluid prior to flooding the valve and exposing valve to the operating pressure. A metallic clicking sound must be heard during the electrical actuation of the valve. This sound is caused by the impact of the core.

10.2 Flooding the valve

1. Check whether all connections to pipe lines are firmly sealed.
2. Slowly increase the pressure to flood the valve. Thus to prevent pressure hammers. **NOTICE** Fast pressurizing will cause the valve to open briefly. **⚠ WARNING** To fast flooding of the valve may lead fluid to escape. **NOTICE** Do not exceed the maximum operating pressure.

11 Operation

NOTICE

Thermal destruction of AC solenoids

Operating AC solenoids in unmounted state will cause them to burn out.

→ Do not operate AC voltage solenoids without being mounted above core tube with core.

Actuate valve periodically

→ **NOTICE** Actuate the valve at least **once a month** to prevent functional parts getting blocked.

12 Maintenance

Maintenance work must only be carried out by qualified personnel (refer to section 1.8). Deposits of the medium, dirt particles, aged or worn out seals may lead to malfunctions.

→ Individually determine as the operator application specific maintenance intervals.

12.1 Cleaning and visual inspection

→ Periodically clean the valve and perform a visual inspection at the same time.

1. **⚠ DANGER** Disconnect the solenoid from power supply.
2. **⚠ CAUTION** Leave the solenoid to cool down prior to working on the valve.
3. Check whether cover screws are properly fixed. Refer to section 12.7.
4. Check whether the device socket is firmly sealed. (refer to chapter 8).
5. Check for damages and leakages.

12.2 Checking for tightness and strength

NOTICE

Risk of damaging the valve

Invalid test conditions may lead to damage of the valve.

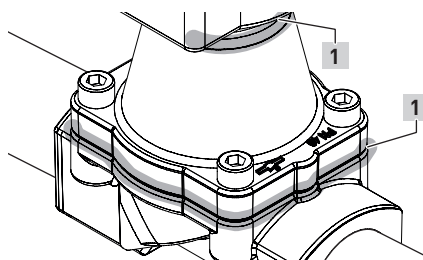
- Do not exceed the maximum operating pressure during the test for internal tightness (valve seat closed).
- The test for strength and external leakage (valve seat opened) according to EN12266 is permitted with maximum 1.5 times of the nominal pressure rating (PN) at room temperature.
- The valve must not be operated during these tests.
- Ensure to increase the pressure slowly.
- After each test, depressurize the valve outlet first.

Checking internal tightness

1. Close the valve (NC valve: solenoid de-energized; NO valve: solenoid energized).
2. Flood the valve.
3. Pressurize up to the maximum operating pressure. There must no fluid escape.

Checking strength and external tightness

1. Open the valve (NC valve: solenoid energized; NO valve: solenoid de-energized).
2. Flood the valve.
3. Pressurize maximum up to 1.5 times of the nominal pressure rating (PN) at room temperature. Apply soap sud to the outer sealing edges 1 and check for the formation of bubbles. There must no bubbles appear.



Check the edges of seals

12.3 Prepare maintenance of internal parts

The valve body may remain in the pipework during maintenance.

1. **⚠ DANGER** Disconnect the solenoid from power supply.
2. **⚠ WARNING** Depressurize the pipe system.
3. **⚠ CAUTION** Risk of burns at the heated solenoid. Let the solenoid to cool down before working at the valve.
4. **⚠ WARNING** Drain the pipeline completely for environmental hazardous and harmful fluids. Handle water polluting fluids in accordance with local regulations.

12.4 Checking valve parts

1. Check disassembled valve parts for damages and wear.
2. Check whether valve seat is intact. The valve seat must not have any damages.
3. If the valve seat is **damaged** you must replace valve body **101**.

12.5 Cleaning valve parts and valve

1. Clean valve piston **103**, in particular the control bores. **NOTICE** Use only neutral, non-aggressive cleaners.
2. Clean all contact surfaces to o-rings and piston.
3. Remove dirt in control bores, chambers and threads.
4. **NC valve:** Clean core **705**.
NO valve: Clean core **702** and pole piece **705**.

12.6 Replacing spare parts

perform after disassembly

⚠ CAUTION

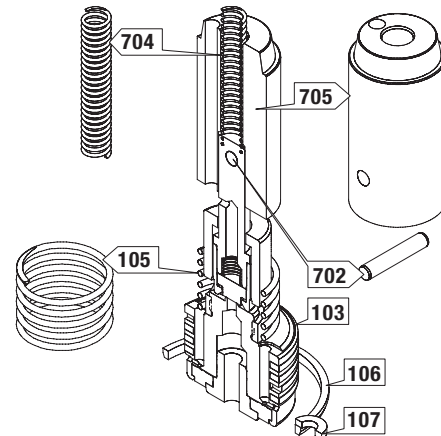
Risk of injury caused through the installation of wrong parts

The installation of wrong components may lead to early wear and early failure of the component. This increases the risk of injury.

- Ensure that only original spare parts are installed.
- Specify the valve number when ordering a spare part kit.

- The manufacturer recommends to replace all spare parts at the same time.
- **NOTICE** Protect all components from dirt.
- The spare parts are marked with **X** in section 12.9 in the respective **component overview** for **A** to **D**.

Internal components – NC valve (ND 25)



Spare parts overview – NC valve

Spare parts related to the core tube assembly

- Replace compression spring **704**. **X**
- Replace core **705**. **X**
- Replace dowel pin **702**. **X**

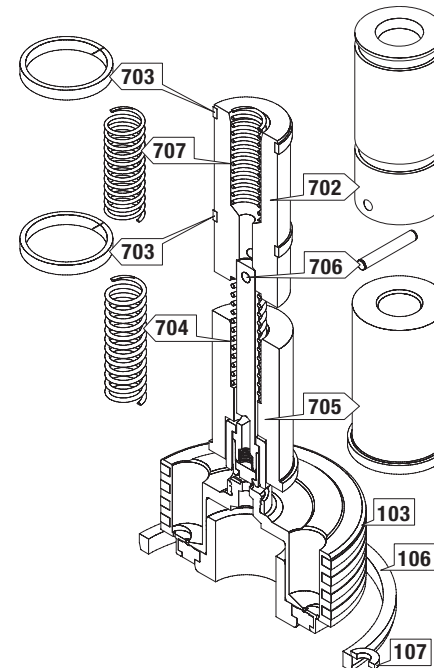
Spare parts related to the valve body

- Replace sealing rings **106** and **107**. **X X**

Spare parts related to the valve piston

- Replace valve piston **103**. **X**
- Replace compression spring **105**. **X**

Internal components – NO valve (ND 32)



Spare parts overview – NO valve

Spare parts related to the core tube assembly

- Replace compression spring **707**. **X**
- Replace core **702**. **X**
- Replace guiding rings **703**. **X**
- Replace dowel pin **706**. **X**
- Replace pol piece **705**. **X**
- Replace compression spring **704**. **X**

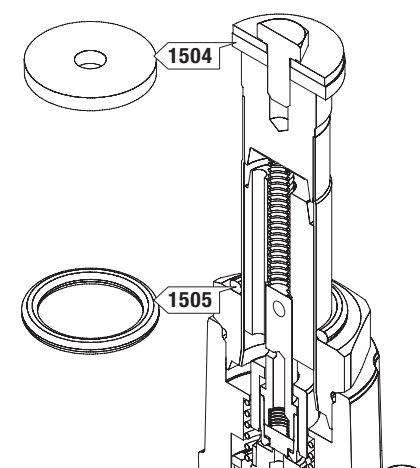
Spare parts related to the valve body

- Replace sealing rings **106**, **107**. **X X**

Spare parts related to the valve piston

- Replace valve piston **103**. **X**

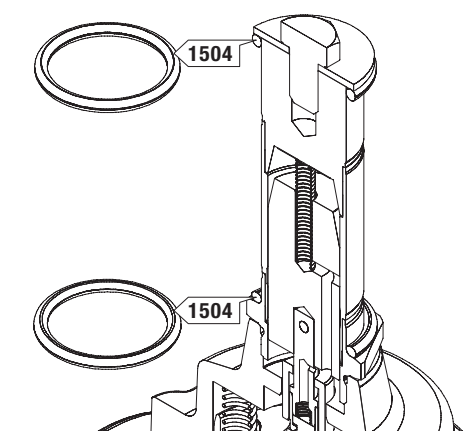
A Core tube 8300 (NC valve)



Spare parts – core tube 8300, NC

- Replace flat gasket **1504**. **X**
- Replace o-ring **1505**. **X**

B Core tube 8400 (NC valve)



Spare parts – core tube 8400 (NC)

- Replace o-rings **1504**. **XX**

C Core tube 8300 (NO valve)

12.7 Tightening torque screws

observe for reassembly

→ Following tightening torque of fixing screws **104** must be observed during reassembly:

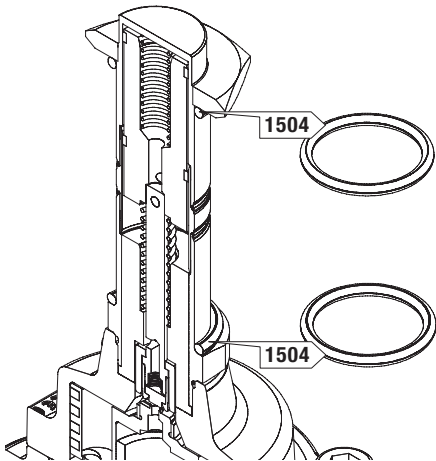
Port size / Nominal size			Thread	Torque
G 1/4	1/4 NPT		M5	3.6 Nm ^[1]
G 3/8	3/8 NPT		M5	3.6 Nm ^[1]
G 1/2	1/2 NPT	DN 15	M5	3.6 Nm ^[1]
G 3/4	3/4 NPT	DN 20	M6	6 Nm ^[1]
G 1	1 NPT	DN 25	M6	6 Nm ^[1]
G 1 1/4	1 1/4 NPT	DN 32	M10	31 Nm ^[1]
G 1 1/2	1 1/2 NPT	DN 40	M10	31 Nm ^[1]
G 2	2 NPT	DN 50	M10	31 Nm ^[1]

¹ Nm ±10%

Spare parts – core tube 8400, NO

→ Replace o-rings **1502**, **1503**. **XX**

D Core tube 8400 (NO valve)



Spare parts – core tube 8400, NO

→ Replace o-rings **1504**. **XX**

12.8 Lubricating valve parts accordingly

perform prior to reassembly

NOTICE

Damage of the valve

The installation of wrong components may lead to early wear and early failure of the component.

→ Use appropriate lubricants.

→ Coat the following spare parts thinly with appropriate lubricant:

- each o-ring
- for valves with solenoid 84xx: inner space of core tube **701**
- the metallic sealing surface between core tube **701** and valve cover **102**
- for series 86540, 86580, 86740 and 86750: thread of fixing screws **104** and thread of core tube **701**

12.9 Valve-specific disassembly/reassembly

A	NC valves*	
solenoid	83xx	6220

→ refer to page 11

B	NC valves*	
solenoid	84xx	6240

→ refer to page 12

C	NO valves**	
solenoid	83xx	6220

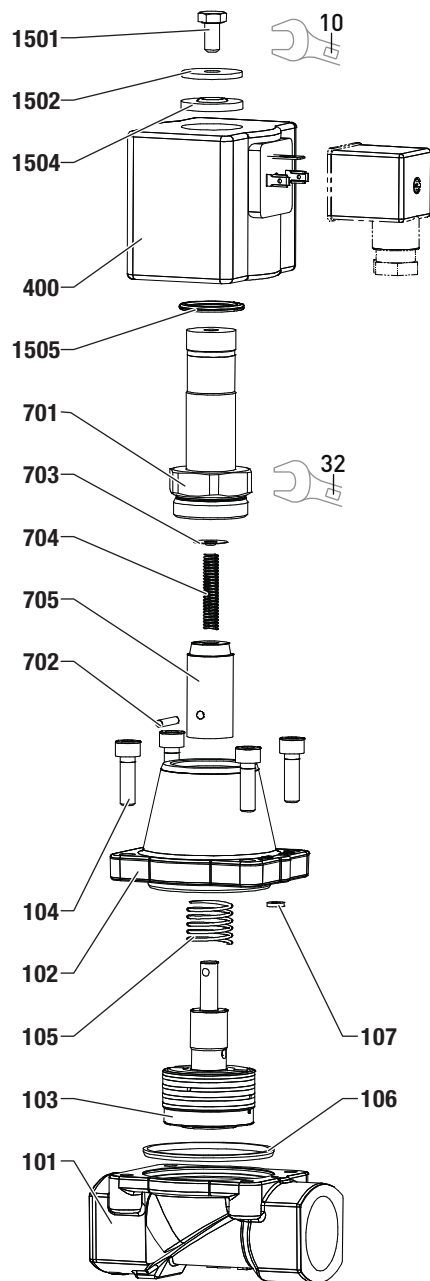
→ refer to page 13

D	NO valves**	
solenoid	84xx	6240

→ refer to page 14

* normally closed

** normally open



NC valve (example: G 1; series 86700)

A	NC valve	
solenoid	83xx	6220

101	Valve body	
102	Valve cover	
103	Piston	X
104	Fixing screws	4 x
105	Compression spring	X
106	Seal ring	X
107	Seal ring	X
400	Solenoid body	
701	Core tube	
702	Straight pin	X
703	Round plate	
704	Compression spring	X
705	Core	X
1501	Special hexagon screw	
1502	Round plate	
1504	Flat gasket	X
1505	O-ring	X

Unmounting solenoid

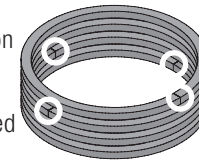
1. Loose the screw **1501** (wrench size 10).
2. Take off the round plate **1502** and the flat gasket **1504**.
3. Take off the solenoid **400** from the core tube **701**. **NOTICE** The o-ring **1505** may get stripped away. Not lose! Without this o-ring, the IP protective class is no longer guaranteed.

Disassembling valve parts

1. Loosen core tube **701** (wrench size 32).
2. Take off core tube **701** from core **705**.
3. Pay attention to loose components: compression spring **704** and round plate **703**.
4. Slide o-ring **1505** from core tube **701**.
5. Press out straight pin **702** with a bolt (\varnothing 3 mm) and take off core **705** from valve spindle of valve piston **103**.
6. Loosen four fixing screws **104** from valve cover **102**.
7. Take off valve cover **102** together with valve piston **103**.
8. Take off seal ring **106** from valve body **101**.
9. Take off seal ring **107** from valve cover **102**.
10. NC-valve \leq DN25: Push valve piston **103** together with compression spring **105** out of piston guide.
NC-valve \geq DN32: Push valve piston **103** with two compression springs **105** out of piston guide.

Reassembling valve parts

1. NC-valve \leq DN25: Put compression spring **105** centered on valve piston **103**.
NC-valve \geq DN32: Put two compression springs **105** in the two holes of valve piston **103**.
2. Push valve piston **103** from beneath into valve cover **102**.
NOTICE The valve piston should move easily into the guide. The guiding rings should be arranged at an offset of 90°.
3. Put guiding ring **106** into the groove inside valve body **101**.
4. Put seal ring **107** into the groove inside valve cover **102**.
5. Put valve cover **102** with preassembled valve piston **103** on valve body **101**.
6. Insert four fixing screws **104**. Tighten fixing screws crosswise. Observe tightening torque – refer to table in 12.7.
7. Put core **705** on the spindle of valve piston **103**.
8. Align spindle and core **705** to the cross bore.



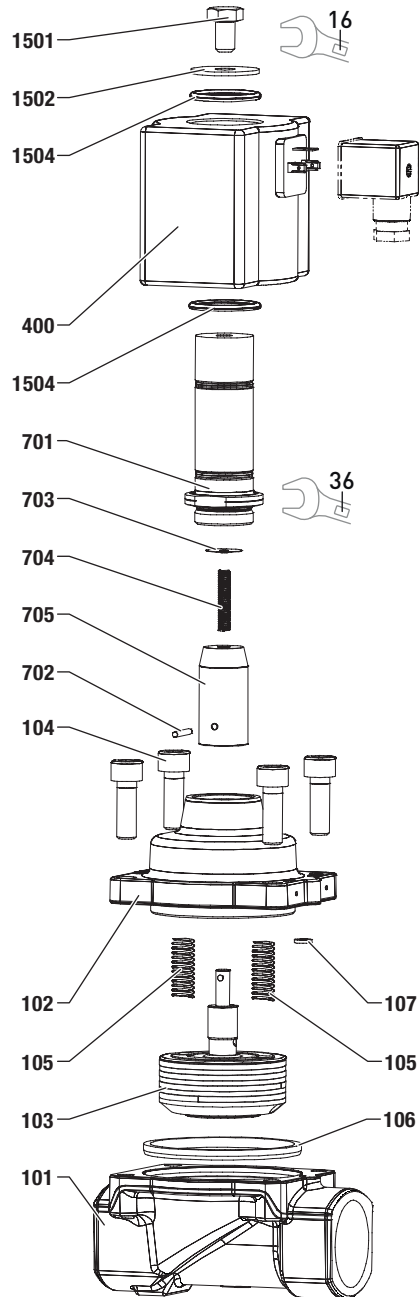
9. Insert straight pin **702** flush to fix core **705** to the piston.
10. Insert compression spring **704** into core **705**.
11. Insert round plate **703**, with the smooth side facing the pole surface, from below into core tube **701**.
Note for overhead mounting: Fix round plate **703** to pole surface with a little lubricating grease.
12. Slide core tube **701** over core **705** on valve cover **102**.
13. Screw core tube **701** (wrench size 32) metalically sealed on valve cover **102**.

Tightening torque 80 Nm \pm 5 Nm

Mounting solenoid

1. Push o-ring **1505** onto core tube **701** until it rests smooth on the base of the tube.
2. Place solenoid **400** on core tube **701**.
3. First put flat gasket **1504** and then round plate **1502** on core tube **701**, in the groove of solenoid **400**.
4. Align the solenoid **400**.
5. Fix solenoid **400** with hexagon screw **1501** (wrench size 10).

Tightening torque 7,5 Nm \pm 10%



NC valve (example: G 1 1/2; series 86700)

B	NC valve	
solenoid	84xx	6240

101	Valve body	
102	Valve cover	
103	Piston	X
104	Fixing screws	4 x
105	Compression spring (2x)	X
106	Seal ring	X
107	Seal ring	X
400	Solenoid body	
701	Core tube	
702	Straight pin	X
703	Round plate	
704	Compression spring	X
705	Core	X
1501	Special hexagon screw	
1502	Round plate	
1504	O-ring	X

Unmounting solenoid

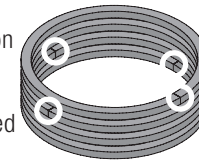
1. Loose screw **1501** (wrench size 16).
2. Take off round plate **1502** and o-ring **1504**.
3. Take off solenoid **400** from core tube **701**.
NOTICE The o-ring **1504** may get stripped away. Not lose! Without this o-ring, the IP protective class is no longer guaranteed.

Disassembling valve parts

1. Loosen core tube **701** (wrench size 36).
2. Take the core tube **701** from core **705**.
3. Pay attention to loose components: compression spring **704** and round plate **703**.
4. Slide o-ring **1504** from core tube **701**.
5. Press out straight pin **702** with a bolt (\varnothing 3 mm) and take off core **705** from valve spindle of valve piston **103**.
6. Loosen four fixing screws **104** from the valve cover **102**.
7. Take off valve cover **102** together with valve piston **103**.
8. Take off seal ring **106** from valve body **101**.
9. Take off seal ring **107** from valve cover **102**.
10. NC-valve \leq DN25: Push valve piston **103** together with compression spring **105** out of piston guide.
NC-valve \geq DN32: Push valve piston **103** together with both compression springs **105** out of piston guide.

Reassembling valve parts

1. NC-valve \leq DN25: Put compression spring **105** centered on valve piston **103**.
NC-valve \geq DN32: Put two compression springs **105** in two holes of valve piston **103**.
2. Push valve piston **103** from beneath into valve cover **102**.
NOTICE The valve piston should move easily into the guide. The guiding rings should be arranged at an offset of 90°.
3. Put the guiding ring **106** into the groove of the valve body **101**.
4. Put the seal ring **107** into the groove of the valve cover **102**.
5. Put the valve cover **102** with the preassembled valve piston **103** on the valve body **101**.
6. Insert four fixing screws **104**. Tighten fixing screws crosswise. Observe tightening torque – refer to table in 12.7.
7. Put the core **705** on the spindle of the valve piston **103**.
8. Align spindle and core **705** to cross bore.
9. Insert straight pin **702** flush to fix core **705** to the piston.



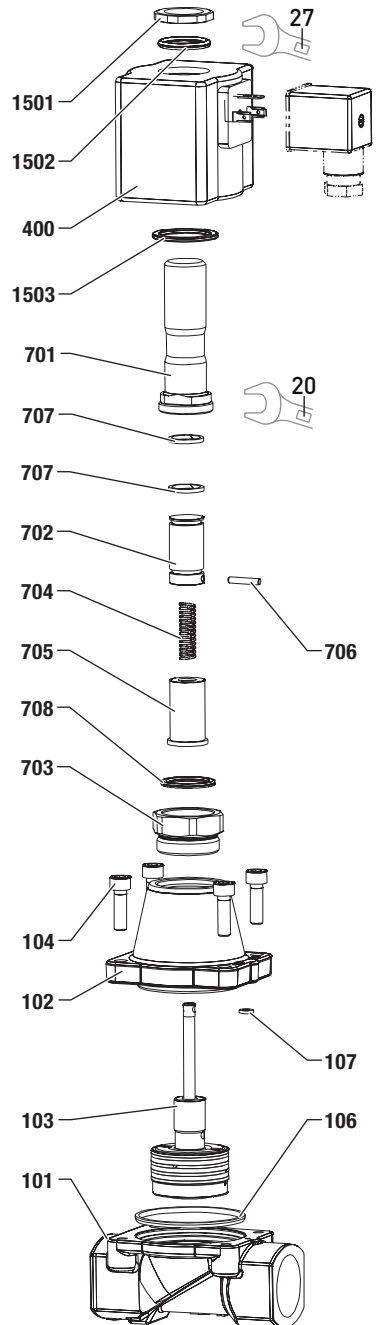
10. Insert compression spring **704** into core **705**.
11. Insert round plate **703**, with the smooth side facing the pole surface, into the core tube **701** from below.
Note for overhead mounting: Fix round plate **703** to pole surface with a little lubricating grease.
12. Slide core tube **701** over core **705** on valve cover **102**.
13. Screw the core tube **701** (wrench size 36) metallically sealed on the valve cover **102**.

Tightening torque 80 Nm \pm 5 Nm

Mounting solenoid

1. Push the o-ring **1504** onto core tube **701** until it rests smooth on the end of the tube.
2. Place solenoid **400** on core tube **701**.
3. First put o-ring **1504** and then round plate **1502** on core tube **701**, in the groove of the solenoid **400**.
4. Align the solenoid **400**.
5. Fix the solenoid **400** with hexagon screw **1501** (wrench size 16).

Tightening torque 20 Nm \pm 10%



NO valve (example: G 1; series 86700)

C	NO valve	
solenoid	83xx	6220

101	Valve body	
102	Valve cover	
103	Piston	X
104	Fixing screws	4 x
106	Seal ring	X
107	Seal ring	X
400	Solenoid body	
701	Core tube	
702	Core	
703	Screw piece	
704	Compression spring	X
705	Pole piece	
706	Straight pin	X
707	Guiding ring (2x)	X
708	O-ring	X
1501	Special hexagon nut	
1502	O-ring	X
1503	O-ring	X

Unmounting solenoid

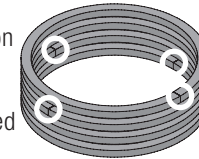
1. Loosen the special hexagon nut **1501** (wrench size 27) and take off o-ring **1502**. Take off solenoid **400** from core tube **701**. **NOTICE** O-ring **1503** may get stripped away. Do not lose! Without this o-ring, the IP protective class is no longer guaranteed.

Disassembling valve parts

1. Loosen core tube **701** (wrench size 20). **NOTICE** You must not disassemble the screw piece **703**.
2. Take off core tube **701** from core **702** and pole piece **705**.
3. Slide o-ring **1503** from core tube **701**.
4. Press out straight pin **706** with a bolt (\varnothing 3 mm) and take off core **702** and compression spring **704** from the spindle of valve piston **103**.
5. Take off guiding rings **707** from core **702**.
6. Also pull pole piece **705** and o-ring **708** from the spindle of valve piston **103**.
7. Loosen four fixing screws **104** from valve cover **102**.
8. Take off valve cover **102** together with valve piston **103**.
9. Take off seal ring **106** from valve body **101**.
10. Take off seal ring **107** from valve cover **102**.
11. Push valve piston **103** out of piston guide.

Reassembling valve parts

1. Push valve piston **103** from beneath into valve cover **102**. **NOTICE** The valve piston should move easily into the guide. The guiding rings should be arranged at an offset of 90°.
2. Put guiding ring **106** into the groove of valve body **101**.
3. Put seal ring **107** into the groove of valve cover **102**.
4. Put valve cover **102** with preassembled valve piston **103** on valve body **101**.
5. Insert four fixing screws **104**. Tighten fixing screws crosswise. Observe tightening torque – refer to table in 12.7.
6. At first put o-ring **708** into screw piece **703** and then pole piece **705** on the spindle of valve piston **103**.
7. Insert compression spring **704** into pole piece **705**, over the spindle of valve piston **103**.
8. Then put core **702** on top of the spindle of valve piston **103**.



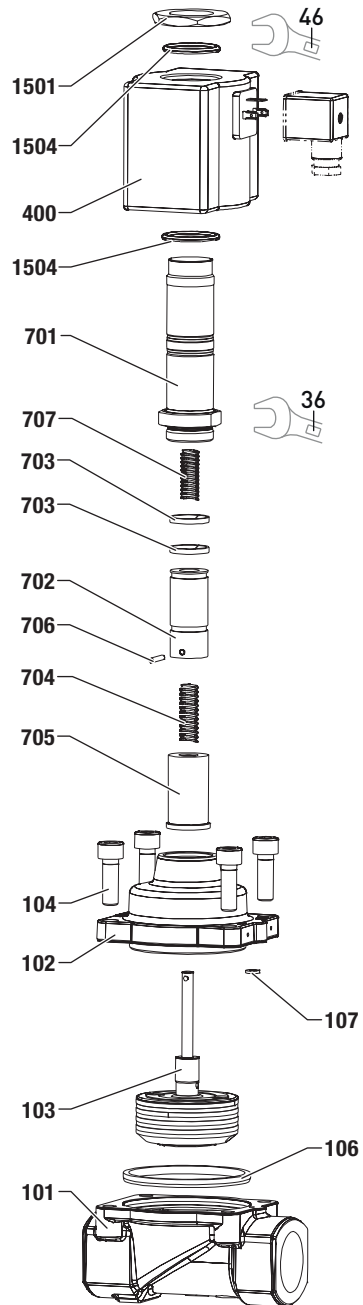
9. Align spindle and core **702** to the cross bore.
10. Insert straight pin **706** flush to fix core **702** to the piston.
11. Now put two guiding ring **707** around core **702**.
12. Carefully slide core tube **701** over the preassembled components onto screw piece **703**. **NOTICE** The two guiding ring **707** on the core must not slip off.
13. Screw core tube **701** (wrench size 20) metalically sealed on screw piece **703**.

Tightening torque 50 Nm \pm 5 Nm

Mounting solenoid

1. Push o-ring **1503** onto core tube **701** until it rests smooth on screw piece **703**.
2. Place solenoid **400** on core tube **701**.
3. Put o-ring **1502** onto core tube **701**, into the groove of solenoid **400**.
4. Align the solenoid **400**.
5. Fix solenoid **400** with hexagon special nut **1501** on core tube **701** (wrench size 27).

Tightening torque 25 Nm \pm 10%



NO valve (example: G 1 1/4; series 86700)

D	NO valve	
solenoid	84xx	6240

101	Valve body	
102	Valve cover	
103	Piston	X
104	Fixing screws	4 x
106	Seal ring	X
107	Seal ring	X
400	Solenoid body	
701	Core tube	
702	Core	
703	Guiding ring (2x)	X
704	Compression spring	X
705	Pole piece	
706	Straight pin	X
707	Compression spring	X
1501	Special hexagon nut	
1504	O-ring (2x)	X

Unmounting solenoid

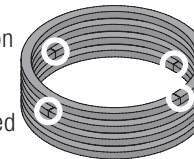
1. Loosen special hexagon nut **1501** (wrench size 46) and take off o-ring **1504**.
2. Take off solenoid **400** from core tube **701**.
NOTICE O-ring **1504** may get stripped away. Do not lose! Without this o-ring, the IP protective class is no longer guaranteed.

Disassembling valve parts

1. Loosen core tube **701** (wrench size 36).
2. Take off core tube **701** from core **702** and pole piece **705**.
3. Pay attention to loose components: compression spring **707**.
4. Slide o-ring **1504** from core tube **701**.
5. Take compression spring **707** out of the bore inside core **702**.
6. Press out straight pin **706** with a bolt (Ø 3 mm) and take off the core **702** and the compression spring **704** from the spindle of the valve piston **103**.
7. Take off guiding rings **703** from core **702**.
8. Also pull pole piece **705** from spindle of valve piston **103**.
9. Loosen four fixing screws **104** from valve cover **102**.
10. Take off valve cover **102** together with valve piston **103**.
11. Take off seal ring **106** from valve body **101**.
12. Take off seal ring **107** from valve cover **102**.
13. Push valve piston **103** out of piston guide.

Reassembling valve parts

1. Push valve piston **103** from beneath into valve cover **102**.
NOTICE The valve piston should move easily into the guide. The guiding rings should be arranged at an offset of 90°.
2. Put guiding ring **106** into the groove inside valve body **101**.
3. Put seal ring **107** into groove inside valve cover **102**.
4. Put valve cover **102** with preassembled valve piston **103** on valve body **101**.
5. Insert four fixing screws **104**. Tighten fixing screws crosswise. Observe tightening torque – refer to table in 12.7.



6. At first put pole piece **705** on the spindle of valve piston **103**.
7. Insert compression spring **704** into pole piece **705**, over the spindle of valve piston **103**.
8. Then put core **702** on the base of the spindle of valve piston **103**.
9. Align spindle and core **702** to the cross bore.
10. Insert straight pin **706** flush to fix the core to the piston.
11. Now put the two guiding ring **703** around the core **702**.
12. Insert compression spring **707** into the hole inside core **702**.
13. Carefully slide core tube **701** over the preassembled components onto valve cover **102**. **NOTICE** The two guiding ring **703** on the core must not slip off.
14. Screw core tube **701** (wrench size 36) metallically sealed on valve cover **102**.

Tightening torque 80 Nm ± 5 Nm

Mounting solenoid

15. Push o-ring **1504** onto core tube **701** until it rests smooth on the base of the core tube.
16. Place solenoid **400** on core tube **701**.
17. Put the second o-ring **1504** onto core tube **701**, in the groove of solenoid **400**.
18. Align the solenoid **400**.
19. Fix solenoid **400** with hexagon special nut **1501** on core tube **701** (wrench size 46).

Tightening torque 30 Nm ±10%

13 Re-commissioning

1. Check valve's switching function without fluid (refer to 10.1).
2. Flood the valve slowly (refer to 10.2).
3. Perform a leak and strength tests (refer to 12.2).

14 Decommissioning

1. ⚠ **DANGER** Disconnect the solenoid from power supply.
2. ⚠ **WARNING** Depressurise the pipe system. Drain the pipework completely. Handle water polluting fluids in accordance with local regulations.
3. ⚠ **CAUTION** Leave the solenoid to cool down.
4. Disconnect the connection cable from the device socket or from the connection area of the solenoid.
5. ⚠ **CAUTION** Wear protective gloves. Loosen pipe connection or the screws from the flange connections.
6. Disassemble the valve.
7. Drain and dry the valve.

15 Replace complete valve

1. Disassemble the valve as described in chapter 14 "Decommissioning".
2. Assembly the new valve as described in chapter 7 "Mounting".
3. Connect the solenoid as described in chapter 8 "Connect solenoid electrically".

16 Trouble shooting

→ Observe safety information and instructions in chapter 12 "Maintenance".

Error table

Not function
Possible cause: solenoid coil defective, Remedy: replace solenoid
possible cause: the control voltage must be $\geq 90\%$ of its nominal value. Remedy: measure the control voltage directly in front of the solenoid. If the operating voltage is lower or a long cable is used, a heavier conductor (crosssection up to 1.5 mm^2) must be chosen to keep the voltage drop small.
Impaired function
Possible cause: valve piston soiled Remedy: clean the control bores in the valve piston
Possible cause: core jammed Remedy: clean core and core tube
Possible cause: valve piston sticks Remedy: clean the piston gilding surface
Possible cause: valve seat leaking Remedy: a) clean valve body b) clean or replace valve piston
Inadmissible operating conditions
Possible cause: operating pressure too high or too low Remedy: check maximum operating pressure and reduce pressure accordingly.

17 Return

1. Disassemble the valve as described in chapter 14 "Decommissioning".
2. Save the "goods return declaration" form – PDF file available online at:
<http://www.buschjost.com/service/other-documents/goods-return-declaration/>
3. Fill in the return form and work through the requirements listed there.
4. ⚠ **CAUTION** Consider the weight of the valve in the choice of packaging.
5. Attach the printed, completed and signed goods return declaration to the package.

18 Disposal

1. Disassemble the valve as described in chapter 14 "Decommissioning".
2. Disassemble the valve parts to enable reusable materials to be recycled.
3. Dispose of the valve parts as appropriate for their materials:

Material	Way of disposal
Valve body, valve cover, piston	Metal recycling
O-Rings, guiding rings	Industrial waste similar category to domestic refuse
Solenoid (copper wire)	Electrical waste recycling

19 Directives and certificates

Note to Pressure Equipment Directive (PED)

This valves of this series, including the connection size DN 25 (G 1), are according to Art. 3 § 3 of the Pressure Equipment Directive 2014/68/EU (PED).

This means interpretation an production are in accordance to engineers practice wellknown in the member countries.

The CE-marking at the valve refers not to the PED. Thus the declaration of conformity is not longer applicable for this directive.

For valves > DN 25 (G 1) Art. 3 § (1) No. 1.4 of the Pressure Equipment Directive 2014/68/

EU (DGRL) applies. The basic requirements of the Enclosure I of the PED must be fulfilled. The CE-marking at the valve includes the PED. A certificate of conformity of this directive will be available on request.

Notes on EEC Directive

The valves shall be provided with an electrical circuit which ensures the limits of the harmonised standards EN 61000-6-3 and EN 61000-6-1 are observed, and hence the requirements of the Electromagnetic Compatibility Guideline (2004/108/EG) satisfied. The CE-marking is related to this EU-requirements.

Inspection certificate series 86580

according to EN 10204 - 3.1

Requirements AD 2000 A4 (W2 / W5 / W10)

12 57 333.0000 Material quality proof for:

- Valve body, valve cover and screws according to EN 10204 - 3.1
- Material quality proof for fluid contacted parts according to EN 10204 - 2.2
- Function- and leak test according to EN 10204 - 3.1
- Leakage rate A according to EN 12266-1



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