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Operating instructions for shut-off valves 4+E/24B/DVGW, 4+AE/24T/DVGW CE

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1. General information

The following manual provides detailed instructions for the installation, operation and maintenance of typ 4+E/24/DVGW. 4+AE/24T/DVGW (Manufactor Series 900) centric butterfly valves. Failure to follow these instructions may compromise safety and void the manufacturer´s warranty.

Based on many years of experience in the field of shut-off valves, has determined that most operational issues encountered with valves are related to improper installation. For this reason, it is very important to follow the instructions in the ABO Valve installation manual.

1.1. Description

The centric butterfly valves are designed to shut-off and regulate flow in the piping system as required. Installation is carried out between the flanges of the piping system. The appropriate valve type and material selection should be determined based on the datasheets or the manufacturer's recommendations. The butterfly valves fully comply with the CE/97/23 directive.

1.2. Labelling on the butterfly valve

Each Series centric butterfly valve is equipped with an identification label, which lists the attributes used to identify the valve.

2. Safety regulations

Before performing any activities, it is necessary to carefully study and perform activities as listed in the safety regulations. Warranty may be void if adhearance to approved safety regulations is not strictly followed. All work during installation, disassembly, operation and maintenance of the valve must be performed by professionally trained personnel.

Basic safety rules:

- The valve can be operated safely if the pressure and temperature parameters of the media comply with the nominal specifications for the given type of valve.
- The materials of the individual valve components must be suitably selected to withstand the specific media and its operating parameters.
- The valve must not be used for applications for which it was not designed. When changing the media or chemical composition of media, it is necessary to consult with a competent member of the Aichhorn GesmbH team.
- The inner diameter of the flange must be sized to prevent damage to the disc during opening. An internal diameter that is too small may cause the disc to jam and may damage it. An inner diameter that is too large may prevent the outer seal between the sleeve and the pipe flanges from functioning properly. The recommended radial clearance between the disc and the mating bore is provided in Tab. 2.
- The shut-off valves in the **ATEX** version comply with the requirements of standards EN ISO 80079-0:2018, IEC 60079-0:2018. The valves must be conductively connected to the grounded part of the downstream equipment and the measured value of the leakage resistance from the conductive and dissipative

parts of the valve must meet the requirements specified in the standard CLC/ TR 60079-32-1:2018, Article 13… ≤ 1 MΩ.

The maximum temperature does not depend on the product itself, but on its operating conditions, in particular the temperature of the operating media. The maximum surface temperature of the shut-off valve in relation to the ignition temperature of the explosive atmosphere present shall meet the general requirements given in EN 1127-1:2020, Article 6.4.2. To determine the maximum surface temperature of the product T in relation to its operating temperature T_{op}, the following applies: T_{op} ≤ +40 °C: T = 40 °C; +40 °C < T_{op} ≤ +200 °C: T = $T_{op.}$ To determine the maximum surface temperature T of a product in relation to its marked temperature class, the following applies: T6 ...T ≤ +68 °C; T5 ...T ≤ +80 °C; T4 ...T ≤ +108 °C; T3 ...T ≤ +160 °C. The relative humidity of the media must be ≤40% for the FPM-002 in ATEX version. The 900 series butterfly valves themselves are certified as FTZÚ 14 Ex 0004. The certification does not apply to any electrical or pneumatic under pressure. If it is necessary to install a valve without an actuator, it is necessary to ensure that the valve will not be under pressure equipment used to operate the valve. The ambient temperature range Ta for a butterfly valve equipped with a particular type of sealing collar is specified in the manufacturer's documentation supplied with the product.

- If the valve is used as an dead-end valve, it must be securely locked in the closed position (locking lever, etc.).
- If it is necessary to open an dead-end valve in a pressurized pipeline, attention must be paid to the escaping media to prevent potential damage or personal injury
- The oxygen-compatible and silicone-free valve must be kept in its original plastic packaging from the manufacturer until final installation in the piping. Use clean tools (free of grease, dust, etc.) and appropriate clothing during installation to prevent contamination of the valves.
- The valves with actuator must be adjusted before installation in the ductwork, with emphasis on adjusting the end positions.
- Actuated control valves must be designed to prevent cavitation (consult the manufacturer if necessary).
- Thoroughly check the function of the valve with actuator only after installation between the pipe flanges.
- Before removing the valve from the pipeline (or replacing the shaft seal), the pipeline upstream and downstream of the valve must be depressurized (risk of uncontrolled fluid leakage). The valve must be decontaminated.
- During transport and storage of valves without a lever or actuator, ensure that the valve remains closed to prevent damage to the disc.
- The position of the lever indicates the position of the disc. That is, when the lever is perpendicular to the pipeline, the valve is closed; when the lever is parallel to the pipeline, the valve is open.
- The valves are not self-locking; therefore, the lever or actuator must not be removed while the pipeline is under pressure. If it is necessary to install a valve without an actuator, it must be ensured that the valve is not under pressure.
- The valve must be opened and closed smoothly to prevent hydraulic hammer, which could damage the piping and possible danger to persons.
- Recommendation: The valves must be installed in piping with a stabilized flow. The general rules for stabilizing flow behind a pipe element causing turbulence (e.g., pump, other valves, etc.) must be observed. Generally, calculate a minimum of 6xDN upstream and a minimum of 4xDN downstream (Fig. 1), but this depends on the specific conditions specified by the designer.

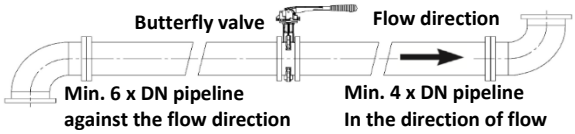


Fig. 1: Valve in pipeline

- If the temperature of the media in the pipeline or the ambient temperature is higher or lower than the actuator manufacturer´s recommended limits, the actuator must be insulated (protected) from these temperatures in accordance with the actuator manufacturer´s instructions.
- For single-acting pneumatic actuators in NO (normally open) design, the sealing edges of the butterfly valve must be protected during transport and storage. During installation, the valve must be closed manually, or air must be connected to the pneumatic actuator and the valve closed.
- Pneumatic (or hydraulic) actuators must be adjusted so that rapid closure (or opening) does not occur. Unless otherwise specified, a closing time of t [sec]=DN/50 is recommended.
- Double-acting pneumatic actuators are not self-locking, so they must always be under air pressure.
- The electric actuator must be adjusted so that the actuator is switched off by the limit switch, not by the torque switch (see the electric actuator manufacturer's instructions).
- For valves DN300 and larger, a horizontal shaft position is recommended. For valves DN32-250, any installation position is permitted (unless otherwise restricted by the actuator manufacturer).
- Operation of the actuator mounted on the valve is permitted only when the butterfly valve is connected to the pipeline on both sides. Operating the valve without meeting this condition poses a risk of injury, for which the

user is solely responsible. An exception applies to valves with a normally open (NO) actuator, where the disc is in the open position by default. In this case, it is essential to partially close the disc before installation using air or the actuator controls.

- Manual operation of the valves should be performed without excessive effort. The use of lever extension or striking tools is not permitted.
- The valve must be lifted using slings passed through the lifting lugs, or threaded lifting eyes screwed into the T-body or valve neck. Never lift the valve by the actuator or through the internal disc opening.

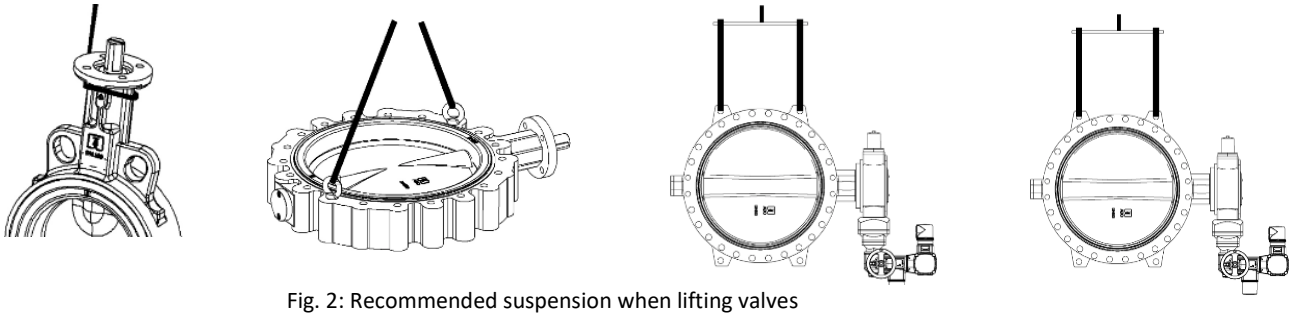


Fig. 2: Recommended suspension when lifting valves

- Never step on the valves or actuators.
- Valves must never be installed directly on rubber expansion joints, as this may increase the torque, making the valve practically inoperable.
- After disassembling the valves from the pipeline, take care to avoid damage to the sealing surfaces.
- In the event of valve malfunction or damage, contact our claims department (reklamace@abovalve.com) or the sales department.

3. Transport and storage

Basic guidelines for the storage of parts containing elastomers are given in ISO 2230.

Proper storage guidelines:

- It is recommended to store valves in closed, dry, dust-free, and temperature-controlled spaces at temperatures between +5 °C and +25 °C, ideally around 15 °C. At temperatures below 10°C, the seat may partially stiffen. Seats should not be exposed to direct sunlight, ozone, contact with solvents, direct contact with heating elements, mechanical damage, vibrations or deformations. We do not recommend storing the valves on the floor. During long-term storage of rubber. its elasticity decreases. Relative humidity should not exceed 50%. Leave the valve in the original packaging from the factory until the beginning of assembly. When storing for more than 5 months, all surfaces that come in contact with the seat must be thoroughly cleaned and lubricated with silicone grease.
- Valves should be stored with the disc slightly open, approximately 15°. Never store fully closed. The edges of the disc must be protected against mechanical damage.
- Valves should not be stacked, if possible, as this may damage the seat. If stacking is necessary, each layer must be separated with an appropriate spacer.
- During long-term storage, it is necessary to rotate the disc regularly to prevent the moving parts of the valve from stiffening. If it gets stiffen, the disc and the seat must be carefully cleaned and then preserved with silicone grease. Then open and close the valve several times. Never rotate the disc when stored at a temperature lower than 0°C.
- Protective coatings and preservatives layers must be checked at six-month intervals and repair if needed. Preserve the seat with silicone grease.

Proper transportation guidelines:

- When handling larger valves with a crane, they must be lifted only by the body or lifting eyes, never by the actuator or lever (Fig. 2).
- Valves supplied without an actuator must be secured and transported in a way that prevents them from opening due to external influences (vibrations) during transport.

4. Installation in the pipeline

Installation of valves into the piping system must be performed by a properly trained and qualified person.

4.1. Prerequisites for installation in pipeline

- The sealing surfaces of the valve are formed by a part of a rubber seat. It is recommended to use type “B” flanges according to EN 1092-1.
- Shut-off valves are mounted between neck or flat flanges according to EN1092-1.

- Prior to installation, it is necessary to check whether the supplied valve corresponds to PN, DN and materials for the given use and whether there was no damage to the valve during transport (damaged valve must not be used!).
- Before installing the valve, thoroughly clean the piping system of mechanical impurities, scale, rust, slag, etc. No sharp edges should be present on the components that could damage the seat. Lubricate rubber parts that do not have enough grease on the seats with silicone grease.
- After storing valves at temperatures below 0 °C, they must be placed for 24 hours in an environment with a temperature of at least 10 °C prior to installation. This allows the valves to warm through completely. Only then may they be installed in the pipeline.
- The pipeline must not be pressurized during valve installation.
- The pipeline flanges must be parallel, and the axes of both pipelines must be coaxial. Misaligned flanges can cause leakage at the valve seat due to uneven pressure on the seat. Flange parallelism tolerances (Tab. 1) are specified according to **EN 558**. **Checking the internal diameter of the pipeline flanges is essential for reliable valve operation!**

Tab. 1: Tolerances of parallelism

DN	Tolerance[mm]
32-150	0,6
200-300	0,8
350-500	1,0
600-800	2,0

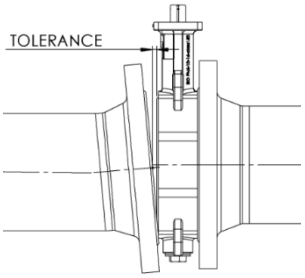
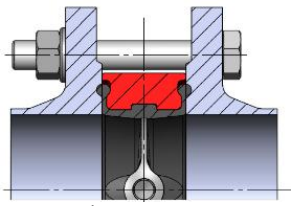
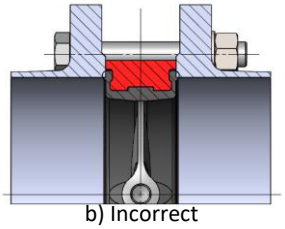


Fig. 3: Parallelism of flanges

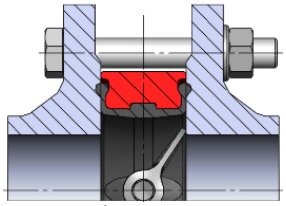
- Check the internal diameter of the mating flanges to ensure proper valve operation (disc rotation). Refer to the information on the disc projection from the valve see in the Tab. **2**. Account must be taken of potential flange misalignment, disc clearance, imperfect centering of the valve, and the shape of the seat!!! **An undersized flange bore** can cause the disc to jam, resulting in severe disc damage and valve malfunction. **An oversized flange bore** may prevent proper sealing between the valve and the pipeline flange.
- In general, it is recommended to install the valve in a vertical position within the piping system. However, there are applications where the valve is installed in a horizontal position (Tab. 3).



a) Correct



b) Incorrect
(excessive internal flange diameter)

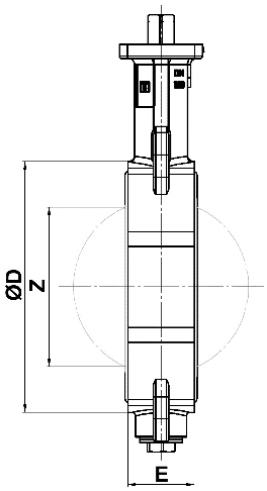


c) Incorrect
(insufficient internal flange diameter)

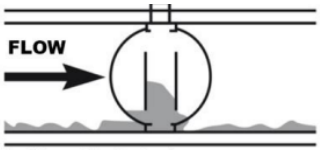
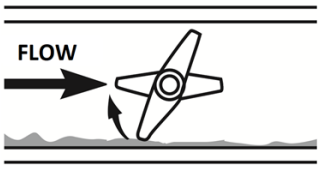
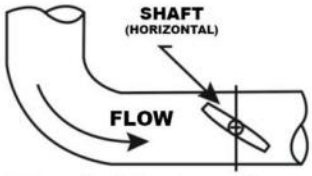
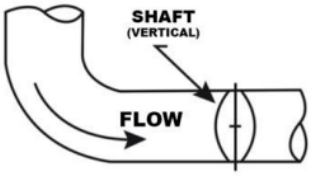
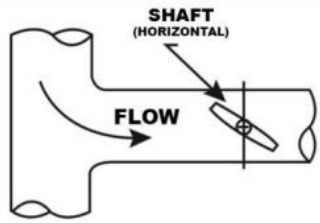
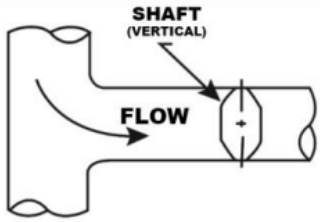
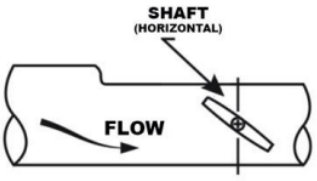
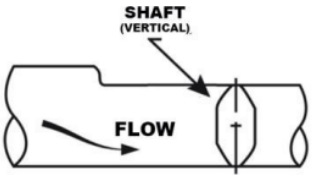
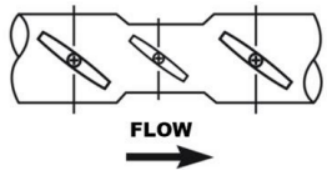
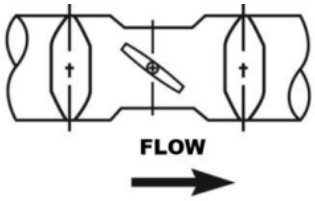
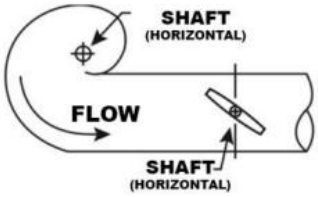
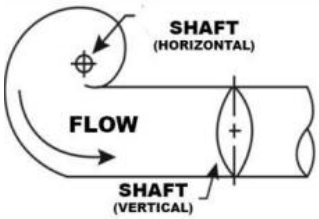
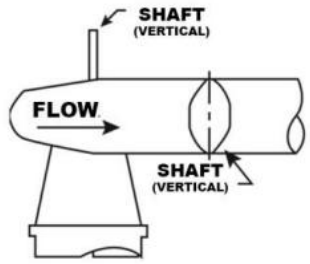
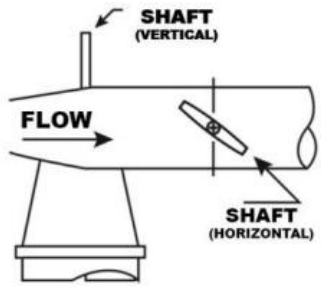
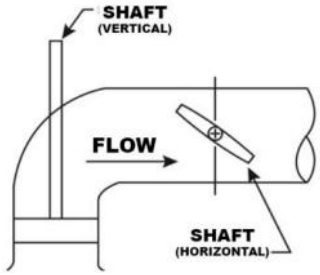
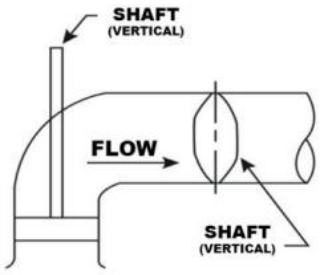
Fig. 4: Mounting between flanges

Tab. 2: Dimension of the disc overlap from the valve and inner diameter of the flange

DN	NPS	Overlap of the disc from the valve Z, mm	Construction length E, mm	Inner diameter of neck flange EN1092-1 type 11 on pipe PN6,10,16, Cl. 150 (GOST PN16), mm	Min. inner diameter of the pipe flange, mm
32	1 1/4 "	22	33 B, T	32.8 -37.2 (31)	31
40	1 1/2 "	22	33 B, T	39.3-43.1 (38)	31
50	2 "	24	43 B, T / 111 F	51.2-54.5 (49)	34
65	2 1/2 "	45	46 B, T / 115 F	70.3 (66) 62.7 Cl. 150	54
80	3 "	65	46 B, T / 117 F	82.5 (78)	72
100	4 "	85	52 B, T / 130 F	100.8-107.1 (96)	90
125	5 "	111	56 B, T / 143 F	125-131.7 (121)	119
150	6 "	137	56 B, T / 143 F	150-159.3 (146)	146
200	8 "	190	60 B, T / 155 F	207.3-206.5 (202)	196
250	10 "	239	68 B, T / 168 F	254-260.4 (254)	249
300	12 "	289	78 B, T / 182 F	309.7 (303)	297
350	14 "	327	78 B, T / 194 F	339.6-352 (351)	335
400	16 "	363	102 B, T	390.4-403 (398)	370
450	18 ″	425	114 B, T / 227 F	441 (442,8)	433
500	20 "	474	127 B, T / 234 F	492 (501)	484
600	24 "	559	154 B, T / 272 F	590-595.8 (602)	566



Tab. 3: Valve orientation

Improper installation	*Proper installation*	*Improper installation*	*Proper installation*
Abrasive cloths		**Knee**	
			
Shaft vertical, sludge accumulates on the disc	**Shaft horizontal, sludge passes under the disc**	**Valve shaft (horizontal)**	**Valve shaft (vertical)**
T- piece		**Pipe reduction**	
			
Valve shaft (horizontal)	**Valve shaft (vertical)**	**Valve shaft (horizontal)**	**Valve shaft (vertical)**
Valve orientation		**Centrifugal pump – o shaft orientation**	
			
Increased noise, erosion and vibration	**Reduced noise, erosion and vibration**	**Horizontal pump shaft and horizontal valve shaft**	**Horizontal pump shaft and vertical valve shaft**
The spun-pump shaft of the pump vertical and horizontal		**Axial pump-vertical pump shaft and vertical valve shaft**	
			
Vertical pump shaft and vertical valve shaft	**Vertical pump shaft and horizontal valve shaft**	**Vertical pump shaft and horizontal valve shaft**	**Vertical pump shaft and vertical valve shaft**

4.2. Working steps during assembly

- Insert the valve with the disc slightly open (approx. 15°) between the flanges (the disc must not extend beyond the face-to-face length of the valve). Lightly tighten and align the valve using two upper and two lower bolts. **Do not use any additional gaskets between the pipe flanges and the valve. For valves with thicker coatings (C4, C5), exercise increased caution during installation and bolt tightening to prevent cracking of the coating.**

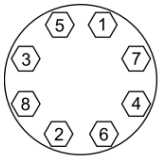


Fig. 5: Cross tightening

- By opening the valve, verify the correct and unobstructed movement of the disc.
- Tack-weld the flanges to the pipeline at several points.
- Remove the valve and weld the flanges to the pipeline around their entire circumference. After the flanges have cooled, reinstall the valve between the pipeline flanges (with sufficient clearance), align it, and lightly tighten the four bolts. Open the valve again to verify correct operation throughout the full range of disc movement.
- Install the remaining bolts (Fig. 5). Always tighten bolts in a cross pattern. Uneven bolt tightening may result in increased torque on the valve.
- Tighten the bolts so that the companion flange only lightly touches the metal of the valve body. In this way, an optimal and sufficient seal is achieved. This condition needs to be checked visually.
- Uneven tightening of the bolts results in increased valve torques.
- Verify the proper operation of the valve.
- Due to pipeline stresses, misalignment, flange non-parallelism, or flange spacing exceeding the valve's face-to-face length, proper tightening of the valve in the flange connection cannot be reliably ensured by torque control alone.



Fig. 6: Installing the valve between the flanges using screws

- For ATEX versions, connect the grounding wire from the valve to the pipeline, which must also be properly grounded.
- Valves with threaded connections allow installation at the end of the pipeline. These valves can be used as end-of-line valves for long-term operation only if the pressure before the valve is reduced according to the following condition: DN50–150: 12 bar / DN200–300: 10 bar / DN350–400: 8 bar / DN450–600: 6 bar. The reason is that the liner is not evenly clamped between both flanges. Operating valves with lugs, through holes, or threads at the end of the pipeline at full pressure is only possible if a counter flange is used.

4.3. Flange bolt tensioning

When installing centric butterfly valves in a piping system, there are several factors that affect the tightening torques. Below is a list of information that affects tightening torques.

Tab. 4: Factors affecting tightening torques

Valve	Type / Size / Material	**Lubrication**	Applications / Type
Flange	Type / Size / Surface finishes	**Torque wrench**	Usage/ Accuracy
Bolt/ Stud	Type / Material / Surface conditions	**General factors**	Temperature / Screw tightening speed / Method of tightening (cross-tightening to evenly distribute the tension on the connections)

- Due to the vast number of conditions that the valve is subject to, it is not possible to provide a precise tightening torque.
- The procedure for installing the valve into the piping system, using the tightening torques from Tab. 5, is described in Chapter 4.2.
- ABO Valve provides this manual only as an installation recommendation. This recommendation is based on full compliance of all supplied materials with their respective specifications. Since many components are not manufactured by ABO Valve, the manufacturer cannot assume any liability for damages caused during installation.
- Tightening must be performed gradually in a cross pattern, with incremental torque application of 15 %, 40 %, and 100 % of the specified M_k in Tab. 5.

- The tightening torque values are based on the use of new, lubricated fasteners. When using non-lubricated fasteners, 20 % may be added to the recommended tightening torque values. Any increase of the torque values from Tab. 5 is permissible only in the case of leakage at the flange joint and only after approval by the manufacturer following verification of all the factors mentioned above.
- When installing valves into the pipeline, washers must be placed under the heads of bolts and nuts to distribute pressure within the joint and to reduce friction during tightening.
- For wafer type (Type B) lugless valves, where bolts or threaded rods are not screwed into the body, the recommended bolt tightening torques may, if necessary, be increased up to the maximum values specified by the manufacturer of the selected fasteners.
- For T (lug)/B (wafer) type valves with blind threaded holes in the body, only threaded rods may be used during valve installation into the pipeline, and they must be tightened to the recommended torque values from Tab. 5. The threaded rod must be fully screwed into the blind thread until it bottoms out.
- For T-type (lug) valves with through-threaded holes, bolts or threaded rods must be screwed into the body to a minimum depth of 0.75×D, where D is the nominal diameter of the bolt/threaded rod. When bolts are used, it must be ensured that the bolts do not contact each other inside the body, as this would prevent proper tightening of the flange joint.
- The tightening torques listed in Tab. 5 apply only to soft-seated ABO series 600 and 900 valves and are not valid for other valve types.

Tab. 5: Recommended bolt tightening torques M_k [Nm]

Screw		M_k [Nm]	Screw		M_k [Nm]
M12		20-30	M30	1 1/8“-7 UNC	170-220
M14	1/2“-13 UNC	30-40	M33	1 1/4“-7 UNC	190-340
M16	5/8“-11 UNC	50-55	M36		220-460
M20	3/4“-10 UNC	60-100	M39	1 1/2“-6 UNC	250-550
M24	7/8“-9 UNC	90-150	M45	1 3/4“ UNC	450-800
M27	1“-8 UNC	160-200	M52		950-1300

4.4. Installation errors

- Insufficient parallelism of the flange – The pressure on the seat will be uneven on both sides. This will cause deformation of the seat and thus leakage between the valve and the flange, or between the seat and the shaft.
- The flanges are too close to each other - The seat may become deformed during installation, leading to rapid damage. If the flanges are far apart, tightening causes high tension in the pipe and valve.
- Deformation of the seat caused by mounting the valve with the disc in the closed position - permanent deformation of the contact surfaces of the seat and the disc may occur. This increases the torque of the valve.
- Use of incorrect flanges - The disc may collide with the inner opening of the flange (if the inner diameter is too small), which will prevent the disc from opening freely and cause damage to it.
- Use of an additional seal between the valve and the pipe flange - The seat will be pushed inwards, which will increase the torque of the valve and make the disc opening improper or impossible.
- Welding near the shut-off valve - The seat is damaged due to high temperature.
- Mounting the valve directly on the rubber expansion joint - The torque increases due to the action of the rubber compensator, and the valve becomes virtually impossible to operate.

4.5. Disassembly of flange or pipe behind shut-off valve type T (LUG – eyebolts)

The same safety rules apply as for installation.

- Close the pressure supply to ensure that no overpressure occurs during flange or pipeline disassembly.
- The disc must be in the closed position.
- Check that the pressure before the valve does not exceed: DN50–150: 12 bar / DN200–300: 10 bar / DN350–400: 8 bar / DN450–600: 6 bar. The figures below (Fig. 7) show LUG-type valves (with threaded holes) mounted between pipeline flanges.
- Gradually loosen the screws in a cross pattern on the side behind the valve, then remove the flange and pipe behind the valve.

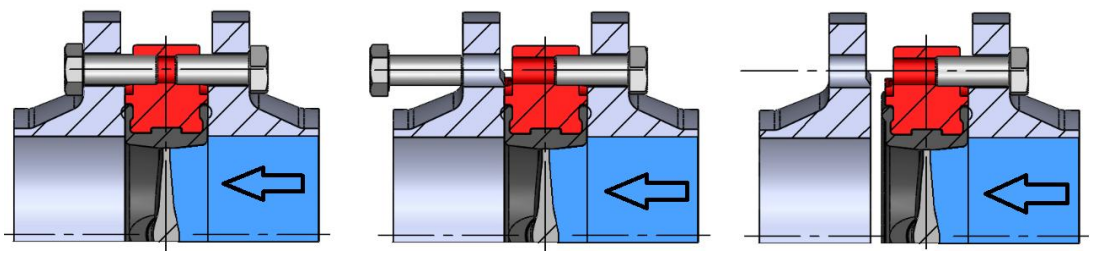


Fig. 7: Removing the flange behind the valve

5. Pipeline pressure test

The valve itself is depressurized by the manufacturer. After installation in the pipeline, it is necessary to pressurize the entire pipeline section with valves. In doing so, the following must be observed:

- The newly installed segment must be thoroughly flushed (cleaned) before mounting valves and all mechanical impurities removed.
- The test pressure with open valves is 1.5 times PS.
- The test pressure with closed valves is 1.1 times PS.

6. Operation and maintenance

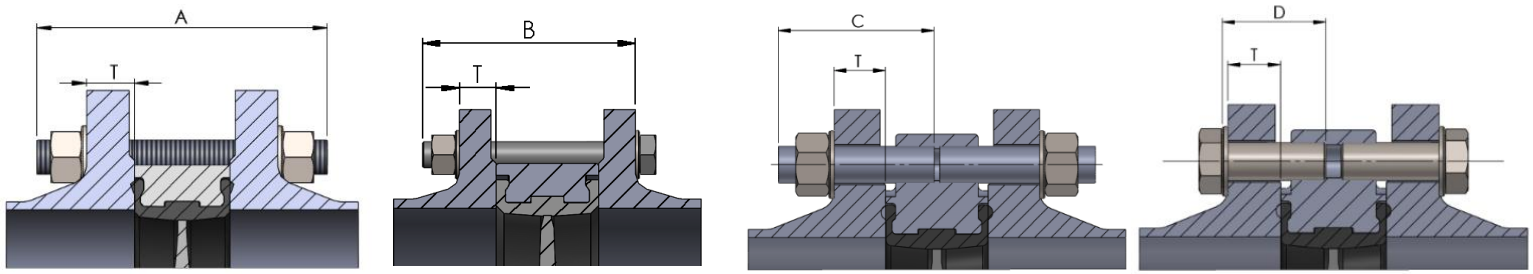
- For manual operation of the valve, normal force is sufficient; it is not necessary to extend the lever length.
- When the lever is parallel to the pipeline, the valve is open. When the lever is perpendicular to the pipeline, the valve is closed.
- Lever or worm gear valves close clockwise and open counterclockwise.
- Valves with electric or pneumatic actuators are operated via control signals and are preset by the manufacturer. Do not modify these settings without the manufacturer's approval.
- Opening and closing must be gradual, not abrupt, to prevent hydraulic shock.
- The valves are maintenance-free; during operation, monitor for leakage between the valve and the pipeline flange is required.
- If there are problems with the tightness of the seat or shaft, the seat or O-rings can be replaced with new ones.
- If the valve remains in the same position for an extended period, it is recommended to operate it (open and close) several times at least four times a year.
- Permissible flow velocities are 4 m/s for liquids and 30 m/s for gases. The flow velocity should be determined based on the valve's application (suction or discharge), installation location, pipe diameter and length, operating pressure, media temperature, pipe material, and other relevant factors.
- In the case of ATEX valve designs, the functionality of the ATEX screw spring must be checked once a year. If it is not functioning properly, the screw must be replaced with a new one.

7. Faults/ Causes of faults/ Troubleshooting

Symptom	Possible cause	Solution
Leakage between valve and pipe flanges	Flange bolts are not tightened	Tighten the bolts
	The valve is not centred	Reinstall the valve into proper position
	Large inner flange diameter	Flange replacement
	Burnt or damaged seat	Seat replacement
	The flanges are not parallel	Total repair necessary
	The flanges are damaged by welding or are not completely straight	Total repair necessary
The valve cannot be closed or opened	Solid particles between the seat and the disc	Remove the valve and clean it, or replace damaged parts
	Hardened or porous seat	Seat replacement
	The media pressure is higher	Check the media pressure
	Actuator is blocked	Actuator control
	The electric actuator is not connected to the mains	Connect the actuator to the mains
The valve in the closed state is leaking	Incorrect close position	Check position adjustment
	Worn disc	Disc replacement
	Worn seat	Seat replacement
Leakage around the shaft	Damaged seat or shaft seals	Seat or seal replacement
	The flanges are not parallel, i.e. uneven deformation of the seat	Total repair necessary
	Improper actuator, actuator not installed properly, i.e. excessive pressure on the shaft	Actuator replacement, correct assembly
Bursting function	Dirt caught in the valve	Open and close the valve several times and flush it
	Insufficient air supply to the actuator	Increase pressure or volume of the supplied air
The valve does not rotate	Actuator failure	Replacement or repairs of the actuator
	The valve is clogged with dirt	Flush or clean the valve
Movement of the seat in the body of the valve	Media speed too high (seat is sucked away from the body)	Attach the seat with special glue or use a valve with vulcanized seat
	Companion flanges have too large inner diameter	Total repair necessary
	The disc remained in the closed position for a long time and the seat dried up	Disc must rotate regularly
The disc cannot be fully opened and closed	Incorrect inner diameter of the flange – compaction of the seat inwardly	Total repair necessary
	Improper mounting of the seat in the body - media leaks between the seat and the body	Proper assembly of the seat
Increased torque and torque on the valve	Dirt on the seat	Clean the seat
	Valve tightened too much between the pipe flanges	Tighten the bolts with lower torque
	Improper installation of the valve in the pipeline	Check the installation of the valve in the pipe
	The actuator is not fastened properly	Tighten the bolts that fasten the actuator
The valve is noisy	Improper mounting position	Change the mounting position
	The valve works outside the designed parameters	Check the project conditions vs the operation conditions

Pipe bolt lengths with neck welded flanges according to EN1092-1.

Bolt lengths apply for use with washers under nuts and under bolt heads.



Size		PN6								PN10							
DN	NPS	Bolt size	Number of bolts, thread. rods A, B	A Threaded rod Nut Washers	B Bolt Nut Washer	Number of bolts, thread. rods C, D	C Threaded rod Nut Washer	D Bolt Washer	T	Bolt size	Number of bolts, thread. rods A, B	A Threaded rod Nut Washers	B Bolt Nut Washer	Number of bolts, thread. rods C, D	C Threaded rod Nut Washer	D Bolt Washer	T
32	11/4	M12	4	100	80	8	50	30	14	M16	4	115	9 5	8	55	35	18
40	11/2	M12	4	100	80	8	50	30	14	M16	4	115	9 5	8	55	35	18
50	2	M12	4	110	90	8	55	35	14	M16	4	125	10 5	8	60	40	18
65	21/2	M12	4	110	100	8	55	35	14	M16	4	130	110	8	60	40	18
80	3	M16	4	120	100	8	60	40	16	M16	8	130	110	16	60	45	20
100	4	M16	4	130	110	8	60	40	16	M16	8	140	120	16	65	45	20
125	5	M16	8	140	120	16	65	45	18	M16	8	150	120	16	70	50	22
150	6	M16	8	140	120	16	65	45	18	M20	8	150	130	16	75	50	22
200	8	M16	8	150	130	16	70	50	20	M20	8	160	140	16	80	55	24
250	10	M16	12	160	140	24	75	55	22	M20	12	170	150	24	85	60	26
300	12	M20	12	170	150	24	80	60	22	M20	12	180	160	24	85	65	26
350	14	M20	12	170	150	24	80	60	22	M20	16	190	190	32	85	65	26
400	16	M20	16	200	180	32	90	65	22	M24	16	220	220	32	100	75	26
450	18	M20	16	210	190	32	100	75	22	M24	20	230	205	40	100	80	28
500	20	M20	20	230	210	40	-	-	24	M24	20	250	250	40	100	70	28
600	24	M24	20	270	250	40	-	-	30	M27	20	280	270 "U"	40	110	80	30
700	28	M24	20	290 "U"	260 "U"				30	M27	20 "U"	300 "U"					35
700	28	M24				8 "U"	80 "U"	50 "U"	30	M27			310 "U"	8 "U"	85 "U"	55 "U"	35
800	32	M27	20 "U"	320 "U"	285 "U"				30	M30	20 "U"	340 "U"					38
800	32	M27				8 "U"	80 "U"	50 "U"	30	M30			320 "U"	8 "U"	95 "U"	60 "U"	38
900	36	M27	24 "U"	340 "U"	305 "U"				34	M30	20 "U"	350 "U"					38
900	36	M27				8 "U"	85 "U"	55 "U"	34	M30			350 "U"	8 "U"	95 "U"	60 "U"	38
1000	40	M27	24 "U"	360 "U"	330 "U"				38	M33	24 "U"	380 "U"					44
1000	40	M27				8 "U"	90 "U"	60 "U"	38	M33			410 "U"	8 "U"	105 "U"	70 "U"	44
1200	48	M30	28 "U"	410 "U"	375 "U"				42	M36	28 "U"	450 "U"					55
1200	48	M30				8 "U"	100 "U"	65 "U"	42	M36			460 "U"	8 "U"	120 "U"	80 "U"	55
1400	56	M33	32 "U"	470 "U"	430 "U"				56	M39	32 "U"	500 "U"					65
1400	56	M33				8 "U"	115 "U"	80 "U"	56	M39			520 "U"	8 "U"	130 "U"	90 "U"	65
1600	64	M33	36 "U"	525 "U"	485 "U"				63	M45	36 "U"	570 "U"					75
1600	64	M33				8 "U"	125 "U"	90 "U"	63	M45				8 "U"	150 "U"	105 "U"	75

Size		PN16								CLASS 150							
DN	NPS	Bolt size	Number of bolts, thread. rods A, B	A Threaded rod Nut Washers	B Bolt Nut Washer	Number of bolts, thread. rods C, D	C Threaded rod Nut Washer	D Bolt Washer	T	Bolt size	Number of bolts, thread. rods A, B	A Threaded rod Nut Washers	B Bolt Nut Washer	Number of bolts, thread. rods C, D	C Threaded rod Nut Washer	D Bolt Washer	T
32	11/4	M16	4	110	90 "B"	8	55	35	18	1/2“-13 UNC	4	100	90	8	45	30	16
40	11/2	M16	4	110	90 "B"	8	55	35	18	1/2“-13 UNC	4	100	90	8	45	35	18
50	2	M16	4	120	100 "B"	8	60	40	18	5/8“-11 UNC	4	130	110	8	60	40	20
65	21/2	M16	4	130	110 "B"	8	60	40	18	5/8“-11 UNC	4	140	115	8	65	45	22
80	3	M16	8	130	110 "B"	16	60	45	20	5/8“-11 UNC	4	140	120	8	65	45	24
100	4	M16	8	140	120 "B"	16	65	45	20	5/8“-11 UNC	8	150	125	16	70	50	24
125	5	M16	8	150	120 "B"	16	70	50	22	3/4“-10 UNC	8	160	130	16	75	50	24
150	6	M20	8	150	130 "B"	16	75	50	22	3/4“-10 UNC	8	160	140	16	75	55	25
200	8	M20	12	160	140 "B"	24	80	55	24	3/4“-10 UNC	8	175	150	16	80	60	28
250	10	M24	12	180	150 "B"	24	90	60	26	7/8“-9 UNC	12	190	165	24	90	65	30
300	12	M24	12	200	170 "B"	24	95	70	28	7/8“- 9 UNC	12	210	180	24	95	70	32
350	14	M24	16	200 "B"	170 "B"	32	100	70	30	1“-8 UNC	12	220	190	24	110	75	35
400	16	M27	16	230 "B"	200 "B"	32	110	85	32	1“-8 UNC	16	240	210	32	120	90	37
450	18	M27	20	240 "B"	220 "B"	40	120	90	34	1 1/8”-7 UNC	16	260	235	32	125	95	40
500	20	M30	20	280 "B"	250 "B"	40	120	90	36	1 1/8“-7 UNC	20	290	255	40	130	95	43
600	24	M33	20	310 "B"	280 "B"	40	140	100	40	1 1/4“-7 UNC	20	330	290	40	140	110	48
700	28	M33	20 "U"	320 "U"	290 "U"				40	1 1/4“-7 UNC	24 U	370 "U"	320 "U"				71
700	28	M33				8 "U"	95 "U"	60 "U"	40	1 1/4“-7 UNC				8 "U"	125 "U"	90 "U"	71
800	32	M36	20 "U"	360 „U	320 "U"				41	1 1/2“-6 UNC	24 U	415 "U"	375 "U"				81
800	32	M36				8 "U"	100 "U"	60 "U"	41	1 1/2“-6 UNC				8 "U"	145 "U"	105 "U"	81
900	36	M36	24 "U"	385 "U"	350 "U"				48	1 1/2“-6 UNC	28 "U"	440 "U"	400 "U"				90
900	36	M36				8 "U"	110 "U"	70 "U"	48	1 1/2“-6 UNC				8 "U"	155 "U"	115 "U"	90
1000	40	M39	24 "U"	430 "U"	380 "U"				59	1 1/2“-6 UNC	32 "U"	455 "U"	415 "U"				90
1000	40	M39				8 "U"	125 "U"	85 "U"	59	1 1/2“-6 UNC				8 "U"	155 "U"	115 "U"	90
1200	48	M45	28 "U"	520 "U"	480 "U"				78	1 1/2“-6 UNC	40 "U"	570 "U"	520 "U"				108
1200	48	M45				8 "U"	155 "U"	110 "U"	78	1 1/2“-6 UNC				8 "U"	180 "U"	140 "U"	108
1400	56	M45	32 "U"	555 "U"	500 "U"				84	1 3/4“- UNC	44 "U"	635 "U"	580 "U"				124
1400	56	M45				8 "U"	165 "U"	120 "U"	84	1 3/4“UNC				8 "U"	205 "U"	160 "U"	124
1600	64	M52	36 "U"	645 "U"	580 "U"				102	1 3/4“UNC	48 "U"						
1600	64	M52				8 "U"	195 "U"	140 "U"	102	1 3/4“UNC				8 "U"			

"U" - applies to U-type valves

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