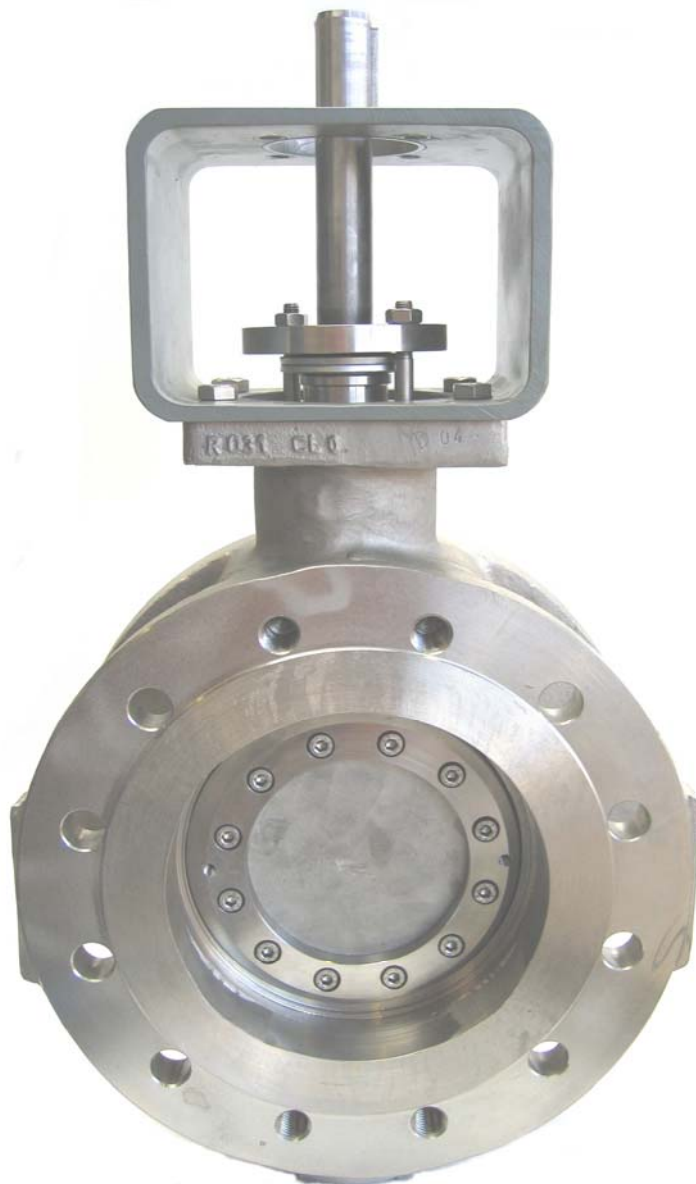


# Operation and maintenance manual

## Butterfly valves TRIEX



### TRIEX – Butterfly valves



FRIEDRICH KROMBACH  
GMBH & CO.KG • Armaturenwerke  
D-57202 Kreuztal • Postfach 1130

Date: 04.04.2005  
Name: C.Wied  
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Operations Manual No.:

**BUW-110/115-E**

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### TRIEX – Butterfly valves



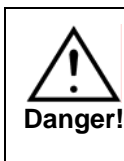
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# 1. Introduction

This manual is intended to support users of TRIEX – butterfly valves in installation, operation and maintenance.



**If the following attention and warning notices are not followed, danger could result**, and the manufacturer's guarantee could become ineffective. Please contact KROMBACH in case of any questions.

## 2. Intended use

TRIEX butterfly valves are exclusively intended, after they are installed in a pipeline system (between flanges or by welding) and after the motor is connected to the control system, to close off, allow through or to regulate the flow of media within the permitted pressure and temperature limits.

- ⇒ Media that are to be allowed through must not contain more than a very small proportion of solid matter.
- ⇒ The use of TRIEX butterfly valves with abrasive media is not recommended.
- ⇒ The maximum permissible pressure in conjunction with the maximum permissible temperature is stated in the type plate of the armature.
- ⇒ TRIEX butterfly valves should not be used for media which have a tendency to build up internal deposits.
- ⇒ Where it is intended that an armature is to regulate in continuous operation, this must be agreed when ordering. The usage thresholds are in any event to be agreed with KROMBACH (cavity-free operation!).
- ⇒ Section 3.2 "Safety instructions for the operator" must be observed in using the armature.

## 3. Safety instructions

### 3.1. General safety instructions

The same safety regulations apply for armatures as for the pipeline system in which they are installed and as for the control system to which the motor is connected. The present manual only provides such safety instructions as are to be followed **additionally** for armatures. For drive modules, additional safety instructions are contained in the manuals of the manufacturer of the module.

### 3.2. Safety instructions for the operator

It is not within the responsibility of the manufacturer KROMBACH, and must therefore be ensured when using the armature, that:

- ⇒ the armature is used only for the purpose for which it is intended, as described in Section 2



Armatures whose pressure / temperature range (= "Rating") is not sufficient for the operating conditions must not be operated: the permitted value can be read from the type plate of the armature. It is mandatory to obtain approval from KROMBACH where the armature is to be used outside these ranges.  
**Failure to observe this requirement can lead to danger to life and limb and cause damage in the pipeline system.**

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**Danger**

It must be ensured that the materials selected for the parts of the armature that come into contact with the medium are suitable for the media used. KROMBACH accepts no liability for damage which results from corrosion caused by aggressive media.

**Failure to observe this requirement can lead to danger to life and limb and cause damage in the pipeline system.**

- ⇒ a drive unit which is subsequently installed on the armature is adjusted to the armature and is correctly aligned in both end positions of the armature. In the closed position, the end stop must occur in the seat of the armature. Any stroke limitation in the drive unit must either be set back or made ineffective.
- ⇒ the pipeline system and the control system are correctly installed and regularly checked. The wall thickness of the housing of the armature must be such that in such correctly installed pipeline systems, an additional load  $F_z$  in the usual order of magnitude ( $F_z = \sqrt{1/4 DN^2 PS}$ ) is taken into account.  
(*PS = maximum permissible design pressure at room temperature*)
- ⇒ the armature and the drive are correctly connected to these systems.
- ⇒ the activation time of the armature/drive unit is adapted to the parameters of the installation.
- ⇒ the usual flow speeds analogously to EN593: 2002, Table 2 are not exceeded in continuous operation in this pipeline system and that normal operating conditions such as vibrations, shocks, erosion (e.g. due to wet steam), cavitation and more than an insignificant proportion of solid material in the medium – particularly abrasive material – is clarified with KROMBACH.
- ⇒ armatures which are operated at temperatures  $>50^\circ\text{C}$  or  $<20^\circ\text{C}$ , together with the pipeline connections, must be protected against physical contact in order to protect the operator from injury.
- ⇒ installation, maintenance and operation are carried out only by properly qualified personnel (see: DIN IEC 3/B/244/CDV).

### 3.3. Special hazards



**Danger to life**

The valve shaft is sealed with a stuffing box. Before the nuts on the stuffing box retainer are loosened or released, **the pressure in the pipeline must be completely normalised**, so that no medium escapes from the stuffing box.



**Danger to life**

Before releasing the bearing cover on the housing or before deinstalling the armature from the pipeline, **the pressure in the pipeline must be completely normalised**, so that the medium does not escape in an uncontrolled fashion from the pipe. It must be ensured that **the armature is open  $5^\circ\text{-}10^\circ$**  so that pressure can be released on both sides of the armature. When it is necessary to deinstall the drive, this may not be carried out until the armature has been opened for this purpose and **is left in the open position**.



**Danger**

*For armatures that are used as end armatures:*  
in normal operation, particularly with gaseous, hot and/or hazardous mediums, a **blind flange or a sealing cap** must be installed **at the free connection piece** or (only for short-term use) the armature must be securely interlocked in the "CLOSED" position.  
Be careful when closing such an armature: pay attention to the danger of becoming crushed between housing and valve disc!



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 <b>Danger</b>	<p>When an armature as the end armature in a pressure-bearing pipe must be opened, this may only be done taking great care that <b>the medium which spurts out</b> does not cause any damage.</p> <p>Be careful when closing such an armature: pay attention to the danger of becoming crushed between housing and valve disc!</p>
 <b>Danger to life</b>	<p><i>When an armature must be deinstalled from a pipeline:</i> medium may escape from the pipe or from the armature. Where the medium is hazardous to health or dangerous, the pipeline must be completely emptied before the armature is deinstalled. Be careful with <b>residues which subsequently flow out of the dead spaces of the armature or out of the pipe</b> or which remain in <b>the armature (under pressure)</b>.</p>

## 4. Labelling of the butterfly valve

Every butterfly valve bears a label containing the following information on the type plate.

For	Labelling	Comment
Manufacturer	KROMBACH GmbH & Co. KG	
Material	E.g. 1.4408	= casing material
Factory No.	E.g. 34082-2005	= consecutive production no. - year of production
DN	DN (and numerical value)	Numerical value in mm, e.g. DN200 or in inches, e.g. 8"
PN /class	Numerical value for PN / class	PN / class = dimension standard for flanged butterfly valves ( <u>not</u> : pressure range!)
PS	Numerical value in bar	= pressure, upper limit of use for "TS"
TS	Numerical value in °C or °F	= temperature, upper limit of use for "PS"
Code		E.g. KKS no.

Armatures which are subject to CE labelling are additionally labelled with


For	Labelling	Comment
Conformity	CE, 0044	CE = manufacturer's declaration 0044 = "notified body" - TÜV

In order that the armature can always be identified, the type label must not become damaged.




## 5. Transport and storage

Armatures must be handled, transported and stored with care:

- ⇒ the armature must be stored in its original packaging and/or stored with the protective caps on the flange connections/butt welding ends. The armature should be stored and transported on a pallet (or similarly supported) (even at the installation site).
- ⇒ when storing before installation, armature and drive must be stored in a sealed dry space.
- ⇒ the metallic seat of the armature, the drive and the flange connection surfaces/butt welding ends in particular must not become damaged either by mechanical or by other influences.

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- ⇒ armatures must be stored in the same way as they were delivered. The drive must not be started.
- ⇒ transportation must be carried out with care and in accordance with the local safety regulations.
- ⇒ for armatures with a larger nominal value, attachment and positioning of the armature must be carried out with suitable hooks and lines the weight must be balanced in order to prevent armatures from falling from the transport.




 <b>Danger</b>	<i>armatures which are supplied without drive:</i> the armature must be transported particularly carefully. The unsecured valve disc can open itself from the closed position under external influence (e.g. concussion).
 <b>Important</b>	<i>Armatures with drive type "Safety setting OPEN"</i> For valves with short face-to-face dimensions, the butterfly valve can project out of the housing on both sides. The packaging at the projecting edge (protective cap or similar) must protect the valve disc/sealing element from damage.
 <b>Danger to life</b>	The means used to lift and transport the armature, such as hooks, lines, etc., must be selected taking into account the weights specified in the delivery note and must be adequately dimensioned. Lifting and transport may only be carried out by qualified personnel.

## 6. Installation into the pipeline


### 6.1. General



The same instructions apply for the installation of armatures into a pipeline as for the connections of pipes and similar elements of the pipeline. For armatures, the following instructions apply **additionally**. Section 5 must also be observed for transportation to the installation site.

- ⇒ See also Section 10.1 – Installation configurations

 <b>Important</b>	Butterfly valves must be <b>transported and installed with the valve disc closed</b> . Otherwise the disc could become damaged and the valve no longer sealed.
 <b>Important</b>	<i>There is a danger of crushing from butterfly valves that have not been installed:</i> the drive must not be connected and activated <b>until the butterfly valve has been installed into the pipeline</b> . When the armature is intended to be the final valve in a section of pipeline, either a cover plate must be mounted on the outlet or the drive must be securely interlocked against unauthorised activation in order to remove the danger of crushing.
 <b>Note</b>	<i>The butterfly valve is configured from works for the sealed closed position:</i> In the closed position, the end stop must occur in the armature/drive unit in the seat of the butterfly valve. Any stroke limitation in the drive must either be set back or made ineffective. <b>This setting of the end stop "CLOSED" may not be changed.</b>

### TRIEX – Butterfly valves


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 <b>Danger to life</b>	<p><i>If – in an exceptional case – an armature must be installed without drive:</i>  It must be ensured that such an <b>armature does not become subjected to pressure</b>. When a drive unit is subsequently added, the torque, direction of rotation, angle of activation and the setting of the endstops “OPEN” and “CLOSED” must be adjusted to the armature and the operating conditions.  <b>Failure to observe these requirements can lead to danger to life and limb and cause damage in the pipeline system.</b></p>
 <b>Important</b>	<p><i>Armatures with electrical drive:</i>  It must be ensured that the valve is switched off <b>by the signal of the torque switch</b> when it is in the “CLOSED” position. In the “OPEN” setting, the valve must be switched off <b>by the signal of the limit switch</b>.  <i>See the manual of the electrical drive for further information.</i></p>

## 6.2. Preparation for installation

⇒ Ensure that no armatures are installed whose pressure class, type of connections and connector dimensions do not correspond to the service conditions. See type plate on the armature. The connection data for the drive must agree with the data of the control system. See type plate on the drive.

⇒

 <b>Danger to life</b>	<p>Armatures whose pressure / temperature range (= “Rating”) is not sufficient for the operating conditions must not be operated: the permitted value can be read from the type plate of the armature. It is mandatory to obtain approval from KROMBACH where the armature is to be used outside these ranges.  <b>Failure to observe this requirement can lead to danger to life and limb and cause damage in the pipeline system.</b></p>
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⇒ Examine armature and drive for transport damage. Do not install damaged armatures or drives.

⇒ *Only for valves with a handwheel:*

a functional inspection must be carried out before beginning installation. The armature must open and close correctly. It is essential to correct recognisable malfunctions before bringing into service.


⇒ *Butterfly valves with short face-to-face dimensions:*

counterflange or tube end must have a clear breadth which leaves sufficient space for the opened valve disc so that the valve disc does not become damaged when it swings out.

⇒ Before installation, the armature and the subsequent pipeline must be carefully cleaned of soiling, particularly of hard foreign bodies.

⇒ It is recommended that the pipeline is flushed before installing the armature.

⇒ Connection ends of the armature and inner sealing surfaces are lubricated with a thin film of grease. Before installation, carefully remove the grease conservation with a suitable solvent and clean the interior of the armature with compressed air.

 <b>Danger to life</b>	<p><i>Butterfly valves with short face-to-face dimensions and drive “Safety setting OPEN”:</i>  For the installation it is necessary</p> <ul style="list-style-type: none"> <li>• first to close the opened valve disc with the control medium</li> <li>• then to hold the armature in the “CLOSED” position with full control pressure until it is pressed into the pipe and is securely fixed</li> <li>• and finally to slowly release the control pressure.</li> </ul> <p><b>Failure to observe this requirement can lead to danger to life and limb and cause damage in the pipeline system.</b></p>
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### TRIEX – Butterfly valves

### 6.3. Installation position and direction of flow

- ⇒ TRIEX butterfly valves can in general be installed independently of the direction of flow. In order to use the OPTIMAL function of the butterfly valve:
- ⇒ it is recommended that the armature is installed such that a **directional arrow** marked on the housing matches the direction **in which the pressure operates on the closed disc**. This direction can be against the direction of flow when the butterfly valve is open.
- ⇒ In the case that it is agreed when ordering (see notes in the attached installation diagrams) **it is mandatory to maintain any pressure direction specified there!**
- ⇒ The preferred installation position is with the valve shaft horizontal. The drive should – if possible – not be positioned directly below the armature: stuffing box leakage could damage the drive.


### 6.4. Steps for installation


- ⇒ When inserting the armature (and the flange sealing) into a previously installed pipeline, the distance between the ends of the pipeline must be measured such that all connection surfaces (and sealings) remain undamaged. However, the gap must not be larger than necessary, in order not to generate any additional stresses in the pipeline.

 <b>Danger</b>	<p>A drive which is subsequently installed must be braced when it produces an unplanned deflecting stress on the assembly section between armature and drive as a result of its weight and/or its installation position.</p>
--	--


#### **Only butterfly valves with flanges:**

- ⇒ The counterflange of the pipeline must be straight and coplanar.
- ⇒

 <b>Important</b>	<p><i>Butterfly valves with flange ends:</i>            The sealing surfaces on housings with flange ends of the butterfly valve are formed such that the flange sealings can be used in accordance with EN1514-1 or ANSI B16.21. The counterflange must have smooth sealing strips, e.g. Form C or D or E in accordance with the standard EN 1092 or Stock Finish in accordance with ANSI B16.5. Other flange forms must be agreed with KROMBACH.</p>
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 <b>Important</b>	<p>Butterfly valves with short face-to-face dimensions must be inserted into the gap between the pipeline ends with the valve disc closed, otherwise the valve disc could become damaged and the armature no longer sealed.</p>
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- ⇒ Flange butterfly valves must be centred when installing by means of the flange screws on the counterflange before the screws are tightened.

 <b>Important</b>	<p>Butterfly valves with short face-to-face dimensions in some cases require different length screws for the connection to the counterflanges. For measures for determining the flange screw lengths, see the attached installation diagrams.</p>
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#### **Only butterfly valves with butt weld ends:**


- ⇒ The butt weld ends of the armature must be straight and coplanar and must be of the same kind as the pipe materials - see Material specification in the type plate of the armature. Opposite butt weld ends must match each other in diameter and joint form.

### TRIEX – Butterfly valves

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- ⇒ Welded cables may not be attached to the armature: they must be attached to the pipeline.
- ⇒ It must be ensured through correct welding that no significant stresses are created in the pipeline section or are transferred to the armature, and that the butterfly valve does not become damaged by the effects of heat. Only temperatures of <math><300^{\circ}\text{C}</math> measured at the housing wall are permissible.
- ⇒ *Butterfly valves >DN300:*

	<p>When welding the valve into the pipeline, the welding procedure must be controlled in such a way that the heat energy applied is limited and that the valve housing does not become distorted. For example, the welding should be carried out "crosswise" in order to avoid tension on the armature housing.</p> <p>Failure to observe these requirements can cause distortion of the valve housing. Distortion remaining in the seat area (the whole area near the position supports) can make the armature unusable.</p>
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**All butterfly valves:**

- ⇒ With operating temperatures above  $200^{\circ}\text{C}$ , the valve casing must be insulated such that the temperature difference between the housing and the valve disc is not more than  $100^{\circ}\text{C}$ .
- ⇒ The instructions of the drive manufacturer apply for the connection of the drive to the control system.
- ⇒ To complete the installation, a functional inspection must be carried out with the signals of the control system: the armature must close and open correctly in accordance with the control commands. The signals of the position sensor (when present) must correctly display the position of the armature.  
It is essential to correct recognisable malfunctions before bringing into service. See also Section 9 "Troubleshooting guide".

⇒

	<p>Control commands that are incorrectly carried out could <b>cause danger to the operations personnel and damage to the pipeline system.</b></p>
---	---

## 7. Pressure testing and commissioning

The pressure testing of armatures has already been carried out by the manufacturer. For the pressure testing of a pipeline section with installed armatures, care should be taken:

- ⇒ if the pipeline has not already been flushed before installation of the butterfly valve, this must be carefully carried out before bringing into service. the valve disc should be open for this purpose.
- ⇒ **armature open:** the test pressure may not exceed **the value 1.5 x PS** (according to the type plate). (*PS = maximum permissible design pressure at 20°C*)
- ⇒ **armature closed:** the test pressure may not exceed **the value 1.1 x PS** (according to the type plate).

If an armature leakage occurs, Section 9 "Troubleshooting guide" should be observed.


## 8. Normal operation and maintenance

The armatures are to be activated with the signals of the control system. Armatures which are delivered from works with a drive are aligned exactly and should not be adjusted so long as the armature functions correctly.



For emergency manual operation on the drive (where available) normal manual force is sufficient. The use of extensions to increase the torque is not permissible.

Regular maintenance work on armatures is not necessary, but there should be no external leakage on an armature when the pipeline section is inspected. In such cases, Section 9 "Troubleshooting guide" should be observed.

### TRIEX – Butterfly valves


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It is recommended that armatures which remain in a single position for long periods are activated at least twice a year.

 <b>Danger</b>	<i>A butterfly valve is not normally self-locking:</i> the drive must not be deinstalled <b>so long as the butterfly valve is subjected to pressure.</b>
 <b>Note</b>	<i>A piston drive is not self-locking:</i> piston drives require <b>permanent supply with control pressure</b> for all positions which are reached under control pressure.

## 9. Troubleshooting guide

It is essential to observe the Safety Instructions in Section 3 when rectifying faults.

Nature of fault	Action
When a drive with spring return has to be deinstalled	<div style="text-align: center;">   <b><u>Danger of injury!</u></b> </div> Before the drive is deinstalled from the armature, the drive must be disconnected from the supply of control pressure.
Leakage on the bearing cover	Tighten screws. <i>If this does not rectify the leakage:</i> repair may be necessary - replace gasket. Observe the instructions in Section 3.3 "Special hazards". For repair instructions, see Section 11.2.
Leakage in the seat sealing	Check whether the armature is 100% closed. <i>If the armature is in the closed position:</i> check whether the drive closes with full force. If the armature closes with full force: open and close the armature several times under pressure. <i>If the armature then still leaks:</i> increase the torque of the drive in the "CLOSED" position up to a maximum of 1.1 x nominal torque. <i>If the armature then still leaks:</i> repair may be necessary; replace the lamellar sealing. Observe the instructions in Section 3.3 "Special hazards". For repair instructions, see Section 11.4.


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Leakage at the shaft sealing	<p>Tighten the two screws on the stuffing box retainer alternately and in small steps each of ¼ of a revolution clockwise.</p> <p><i>If this does not rectify the leakage:</i> repair may be necessary; replace the shaft sealing. For repair instructions, see Section 11.3.</p> <p><i>If the nuts on the stuffing box retainer must be loosened or unscrewed (counterclockwise):</i></p> <div style="text-align: center;">  <p><b>Danger to life!</b></p> </div> <p>To prevent the operating personnel becoming endangered, ensure that the pipeline on both sides of the armature is made completely free of pressure in advance. Observe Section 3.3 "Special hazards".</p>
Functional fault	<p>Check drive unit and control commands.</p> <p><i>If the drive and control system are in order:</i> deinstall the armature (observe the instructions in Section 3.3 "Special hazards") and inspect it.</p> <p><i>If the armature is damaged:</i> repair may be necessary; obtain replacement parts and any help that may be necessary from KROMBACH.</p>
Corrosion	<p>If it is established after deinstallation that the housing and/or the interior parts are not sufficiently resistant to the medium, select parts of a suitable material.</p>

In the case of faults in the drive, see the instructions of the drive manufacturer.

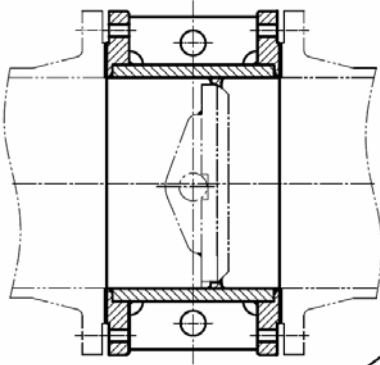
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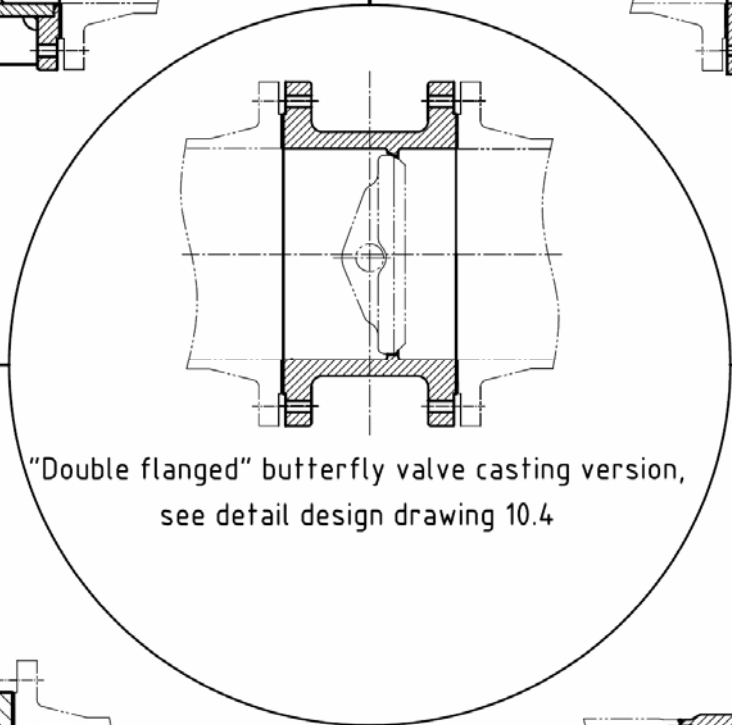
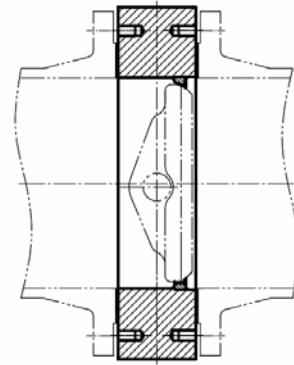
# 10. Drawings

## 10.1. Installation configurations

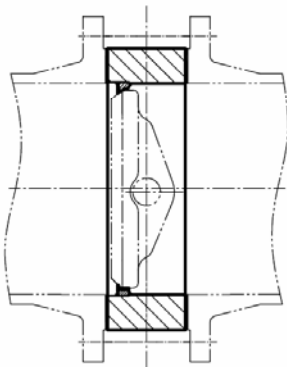
"Double flanged" butterfly valve welded,  
see detail design drawing 10.3



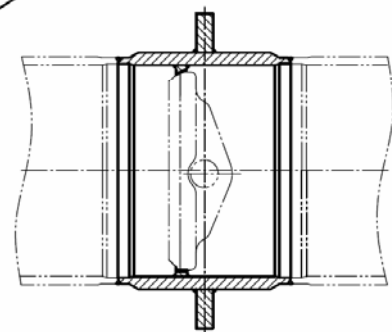
"Lug - type" butterfly valve,  
see detail design drawing 10.6



"Double flanged" butterfly valve casting version,  
see detail design drawing 10.4



"Wafer - type " butterfly valve,  
see detail design drawing 10.5



"Weld-ends" type butterfly valve,  
see detail design drawing 10.7

### TRIEX – Butterfly valves



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## 10.2. List of parts

Item	Description
1	Body
1.1	Body-seat
2	Disc
3	Fitting key
4	Locating pin
5	Retainer flange
6	Filliste head screw
7	Lock washer
8 *	Spiral-wound gasket
9 *	Seal ring
9.1 *	Option: solid seal ring
10	Shaft
11	Trust bearing washer
12	Filliste head screw
13	Locking plate
14	Bottom flange

Item	Description
15	Hex. head screw
16 *	Gasket
17	Body bearing
18	Packing bushing
19	Gland flange
20	Stud bolt with nut
21	Belleville spring
22 *	Scraper
23 *	Packing
24	Spacer
25	Bracket
26	Hex. head screw
27	Hex. head screw
28	Fitting key
29	Option: lantern ring
30	Option: plug

\* recommended spare parts

### TRIEX – Butterfly valves

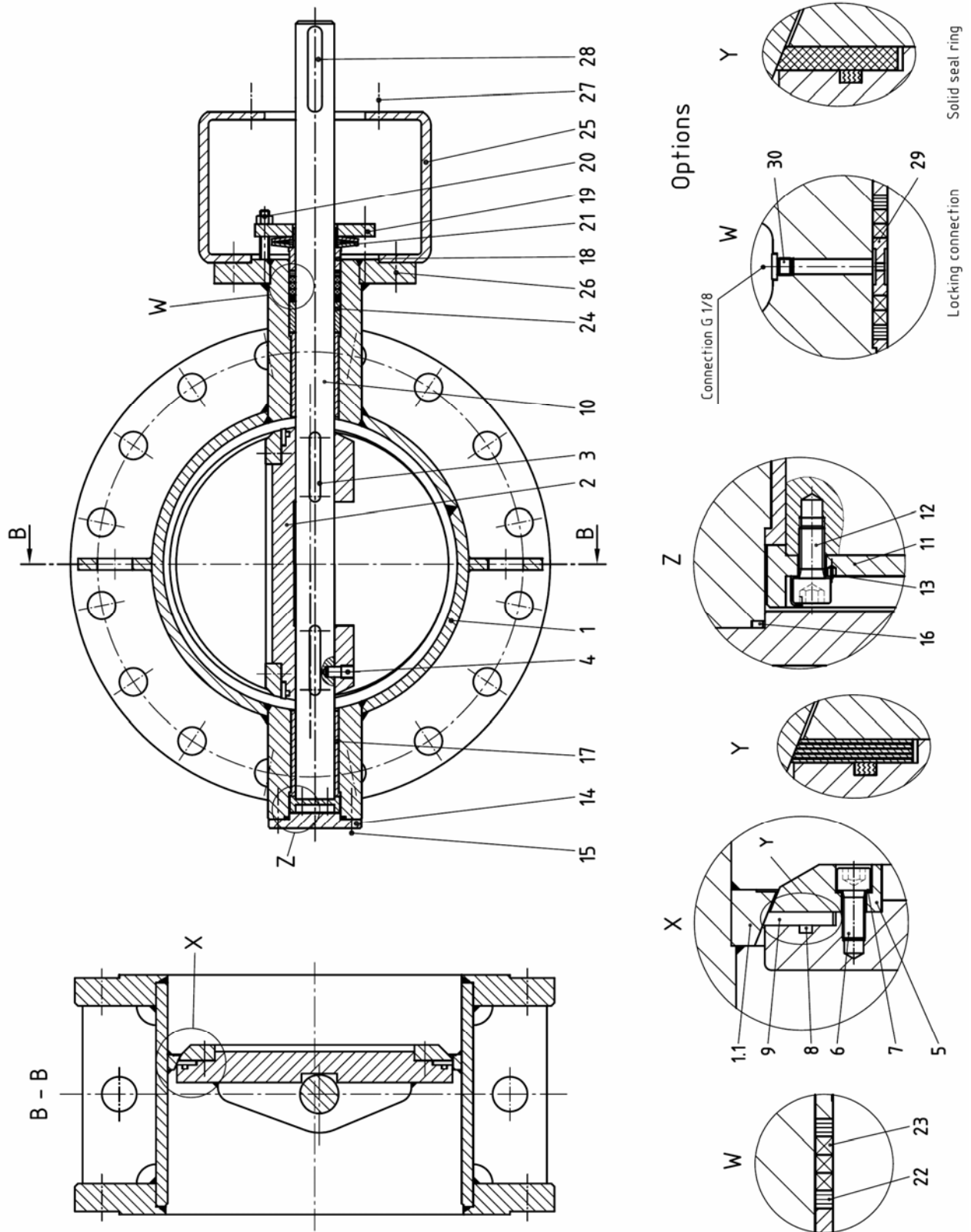


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### 10.3. Detail drawing >Double flanged valve< WELDED



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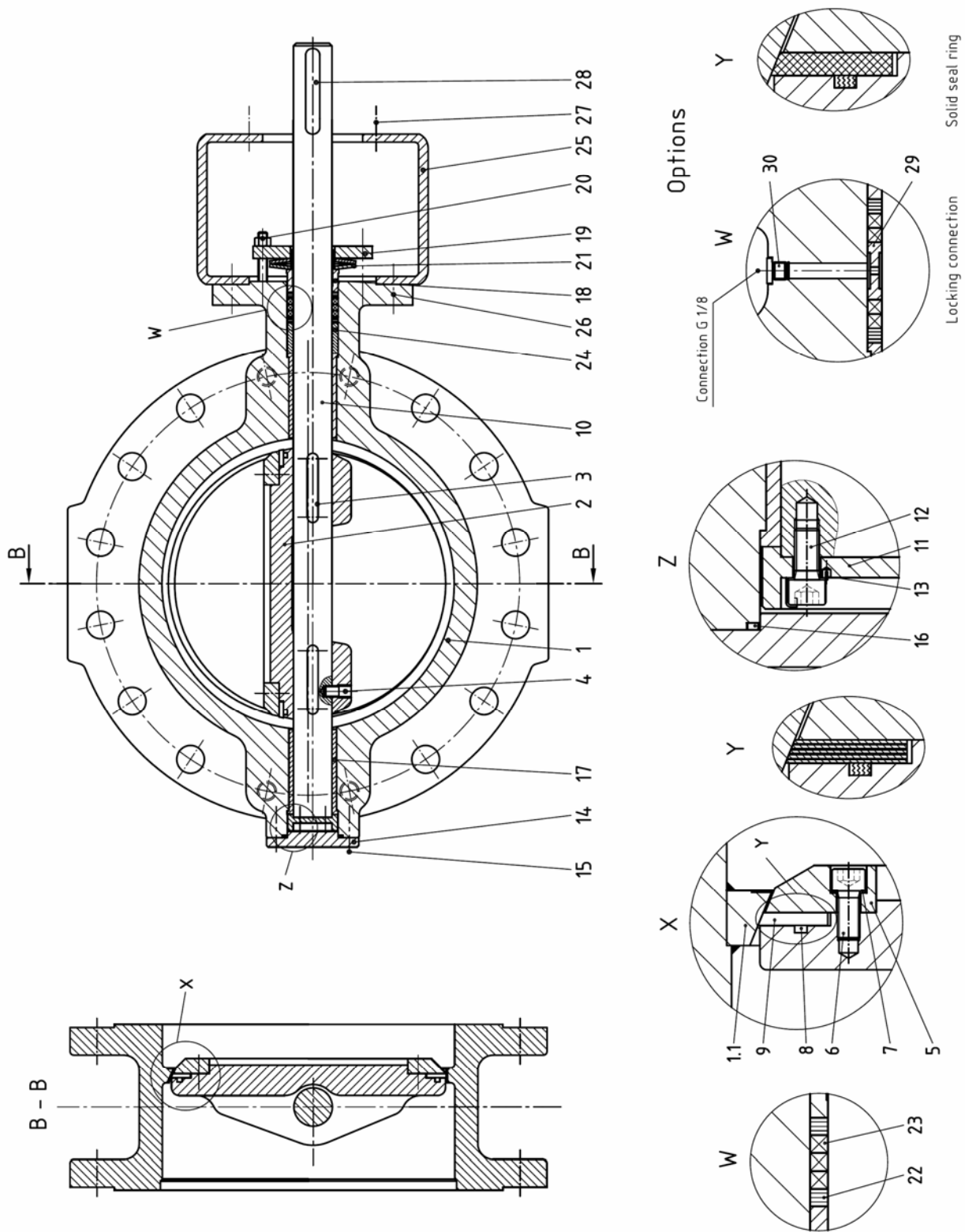
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### 10.4. Detail drawing >Double flanged valve< CASTING VERSION



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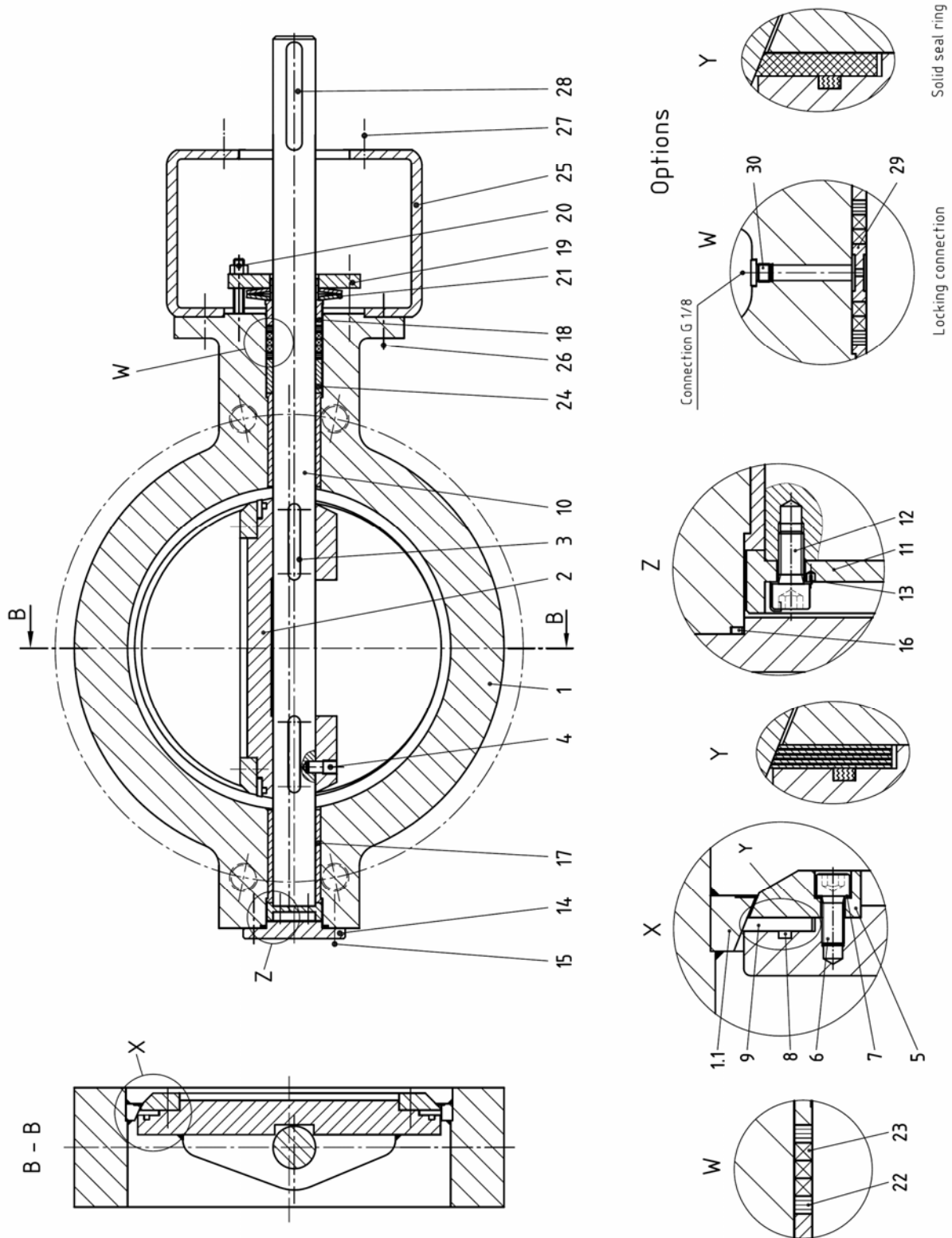
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10.5. Detail drawing >Clamp-in valve< WAFER - TYPE



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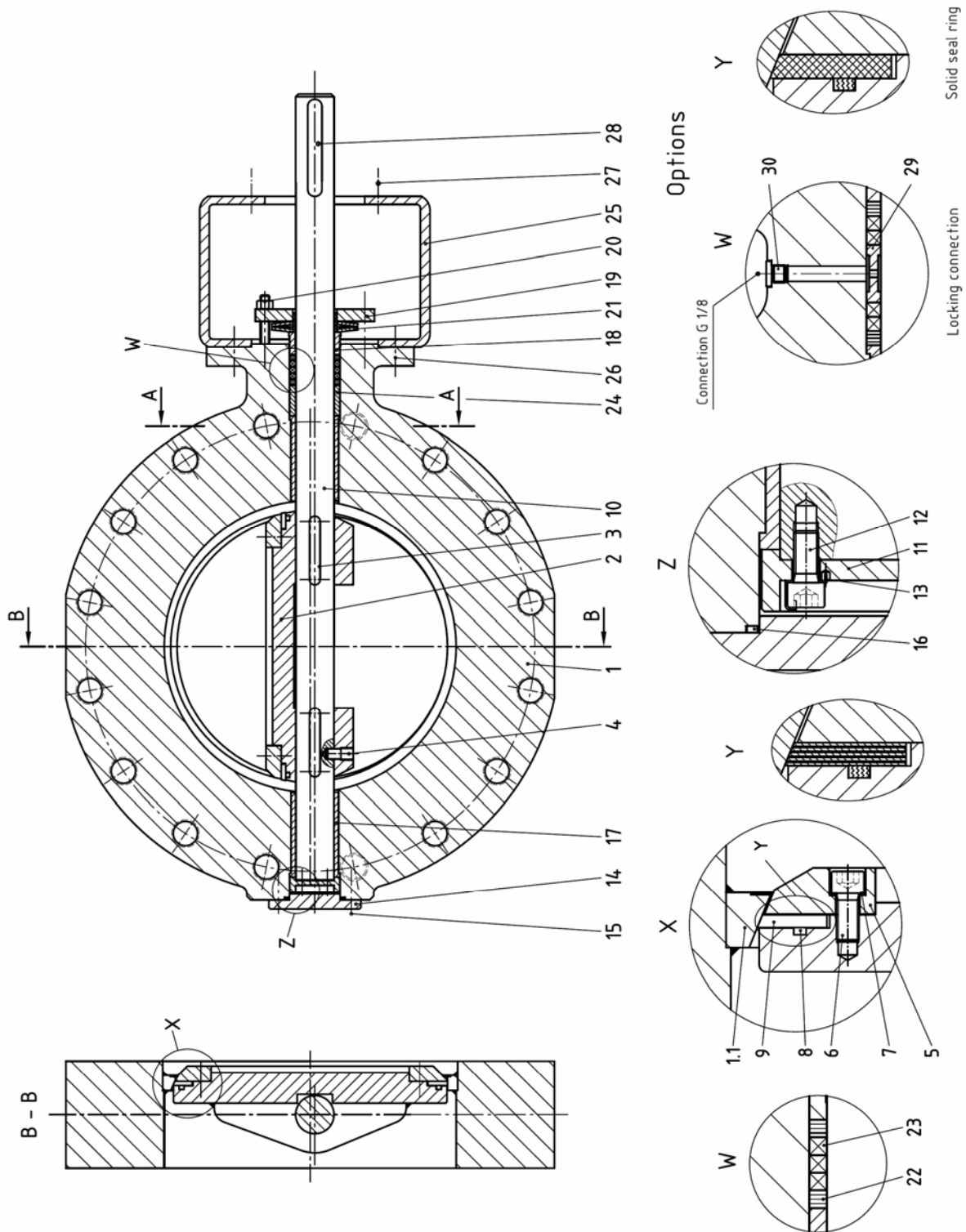
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10.6. Detail drawing >Clamp-in valve< LUG - TYPE



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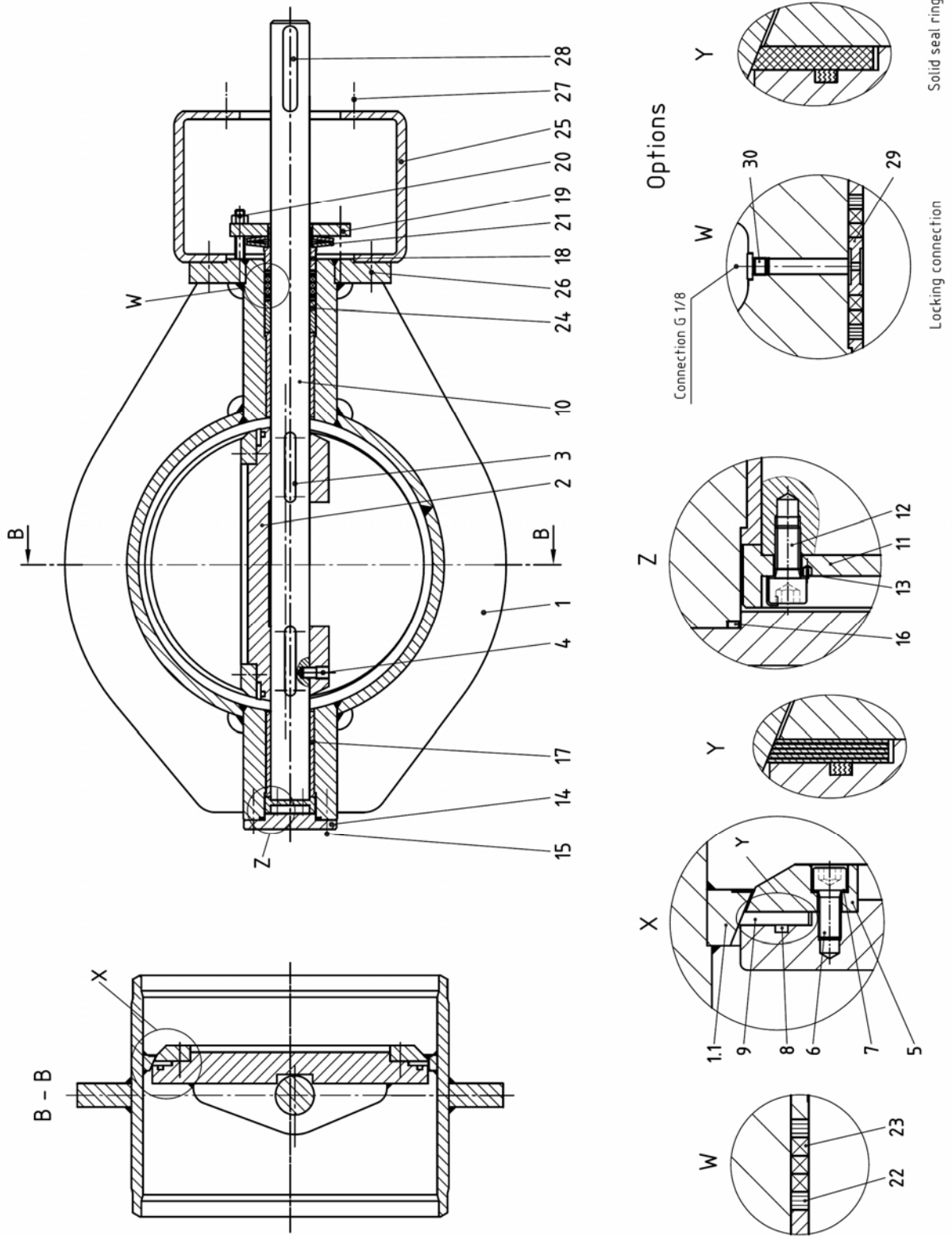
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# 10.7. Detail drawing >Weld-in valve< WELDED



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# 11. Repair instructions

## 11.1. General


- ⇒ For selection of the correct detail drawing see Section 10.1.
- ⇒ For parts list, see Section 10.2.
- ⇒ All information from the type plate must be given when ordering replacement parts. Only original KROMBACH parts may be installed.

## 11.2. Replacing the bearing cover gasket (No. 16)

 <b>Danger to life</b>	Before starting work release all pressure from the pipeline system, and empty it completely! See also Section 3.3 "Special hazards"!
--	---

- 11.2.1. Unscrew the screws (15), deinstall the bearing cover (14) and remove the gasket (16).
- 11.2.2. Check and clean the radial groove for the gasket in the housing and the sealing surfaces on the bearing cover.
- 11.2.3. Lubricate the new gasket (16) with a thin film of mineral oil and place it in the bearing cover (14). Insert the bearing cover with gasket into the housing and turn several times.
- 11.2.4. Clean the screws (15) and cover them with a thin film of Molykote Plus or equivalent lubricant. Insert screws and screw tight. Take account of the tightening torques as in Section 11.5 Table 1.

## 11.3. Replacing the shaft sealing (Nos. 22, 23)

 <b>Danger to life</b>	Before starting work release all pressure from the pipeline system, and empty it completely! See also Section 3.3 "Special hazards"!
--	---

- 11.3.1. Deinstall gear or motor with the associated keys (27). Before deinstallation, mark the position of the gear/drive on the head flange of the armature for correct subsequent reinstallation.
- 11.3.2. Remove packing nuts (20), lift off stuffing box retainer (19) and plate springs (21). Record their arrangement for correct subsequent reinstallation.
- 11.3.3. Remove stuffing box pipe (18). Remove packing rings (22, 23). If the armature is equipped with the "lock connection" connection, the lantern ring (28) must also be deinstalled. Record the exact arrangement in the stuffing box space when deinstalling!
- 11.3.4. Clean the packing space and the upper shaft extensions (10) cautiously and carefully.
- 11.3.5. Cover each new packing ring (22, 23) outside with a thin film of mineral oil. Insert the same number of new packing rings and, if a lock connection lantern ring (28) is present install in the same sequence as before deinstallation. For divided packing rings, the new rings must be inserted with the division offset by 180° in each case.
- 11.3.6. Install stuffing box pipe (18), plate springs (21) and stuffing box retainer (19) in the same arrangement as before deinstallation (see 11.3.2, 11.3.3). Cover the threads of the stay bolts for the packing nuts with a thin film of Molykote Plus or similar lubricant, and tighten the packing nuts (20) by hand.
- 11.3.7. Install the keys (27) on the upper shaft extensions.

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11.3.8. Mount the gear or drive.



Do not use force to mount the gear or drive on the armature shaft! The assembly should take place smoothly.

11.3.9. First tighten the packing nuts (20) with 1.5 times the tightening torque analogously to Section 11.5 Table 2. Wait c. 15 mins. and then loosen the packing nuts (20) again.

11.3.10. Open and close the disc repeatedly. Tighten the packing nuts (20) again, but this time with the tightening torque as given in Section 11.5 Table 2.

11.3.11. Pressurise the pipeline.

11.3.12. If the packing still leaks, tighten the packing nuts slowly and evenly until the leakage is stopped. (See also Section 9 "Leakage at the shaft sealing")



Do not tighten the packing nuts (20) excessively. Otherwise the activation torque will be increased to an impermissible level.

## 11.4. Replacing the lamellar sealing (Nos. 8, 9)

11.4.1. Deinstall the butterfly valve from the pipeline with the disc closed. Clean the armature in accordance with the equipment instructions or in another suitable way.

11.4.2. Open the valve disc (2) a few degrees, loosen the retaining ring screws (6) and open the disc completely.

11.4.3. Mark the disc (2) and retaining ring (5) for correct reinstallation (according to diagram 1!)



For valves with low nominal width, it can be simpler to remove the drive and to turn the disc out over the opening position in order to have more freedom of movement for the remaining work.

11.4.4. Carefully remove the retaining ring screws (6) with the safety ring disc (7), then take off the retaining ring (5).

11.4.5. Remove the lamellar sealing ring (9) and the spiral gasket (8).

11.4.6. Check the seat in the housing, and if necessary clean it with solvent and fine emery cloth (No. 600 or finer).

11.4.7. Check and clean the sealing ring surface and groove for the spiral gasket. These areas must be absolutely free of all constituents before reassembly.

11.4.8. Lubricate the disc area (2) in which the lamellar sealing (9) and the spiral gasket (8) are arranged with a thin film of mineral oil.



Always apply only a thin film of oil to the specified points. Excessive application hinders assembly and can lead to damage to the armature.

11.4.9. Insert the new spiral gasket (8) into the corresponding groove in the disc. Do not use any force and do not damage the gasket.

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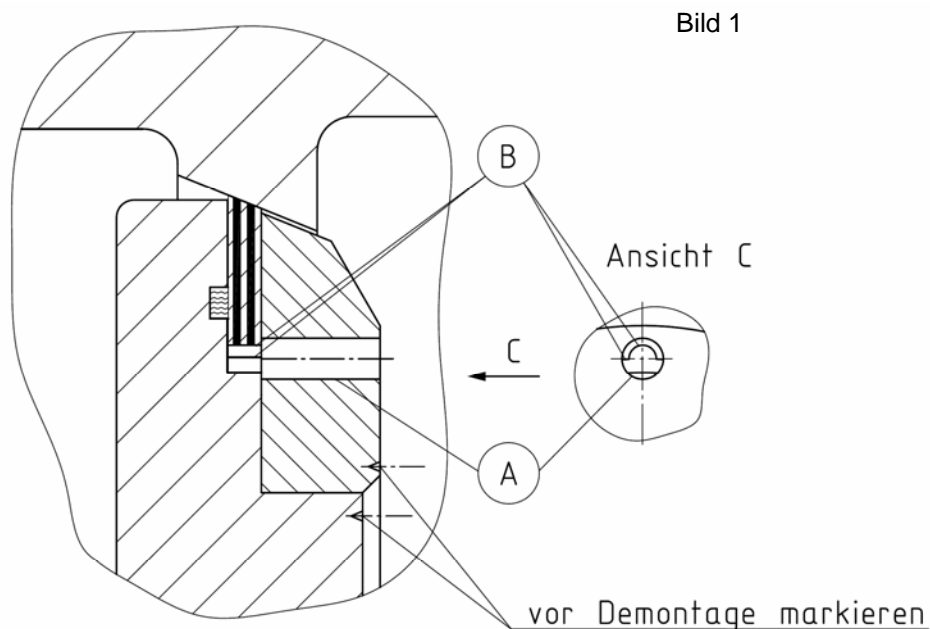
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- 11.4.10. Insert the lamellar sealing (9) into the valve disc in such a way that the marking of the disc (see section 11.4.3) is precisely opposite the marking B of the lamellar sealing.
- 11.4.11. Install the retaining ring (5) taking note of the markings (see section 11.4.3).
- 11.4.12. Check the alignment of the lamellar sealing:  
it must be ensured that the marking (B) of the lamellar sealing is visible through the inspection port (A) in the retaining ring, see diagram 1.
- 11.4.13. Clean the retaining ring screws (6) thoroughly and lubricate the thread with Molykote Plus or equivalent. Insert the retaining ring screws (6) with the associated safety discs (7) and tighten by hand. It must then be ensured that the lamellar sealing can be freely moved without turning it.
- 11.4.14. Lubricate the seat in the housing and the conical outer edge of the lamellar sealing (9) with a thin film of mineral oil.
- 11.4.15. Turn the valve disc in and then out twice in the seat.
- 11.4.16. Turn the valve disc to the closed position without exerting force. Then tighten two opposing retaining ring screws (6) in order to prevent the sealing ring from moving from the specified position.
- 11.4.17. Open the valve disc c. 10-15° and tighten the retaining screws (6) crosswise. Take account of the tightening torques as in Section 11.5 Table 3.

 <b>Important</b>	<p>After complete installation, check whether the markings (A) and (B) agree and are perfectly aligned. If the alignment is not correct, loosen the retaining ring screws and realign the lamellar sealing, and repeat from 11.4.2.</p>
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## 11.5. Screw torques table

Table 1			
Torque stuffing box packing			
DN (mm)	$\Delta P$ max. 10 bar	$\Delta P$ max. 25 bar	$\Delta P$ max. 50 bar
DN (mm)	Ma (Nm)	Ma (Nm)	Ma (Nm)
80	-	15	15
100	-	15	15
125	-	15	15
150	-	20	15
200	-	20	15
250	-	20	15
300	-	20	20
350	-	25	40
400	-	25	40
450	-	25	45
500	-	60	45
600	-	70	50
700	50	70	50
800	60	75	75
900	60	60	80
1000	60	60	80
1200	60	60	80
Above the grade line number of screws = 2.			
Below the grade line number of screws = 4.			

Table 2	
Torque Screws No. 06 retaining ring No. 15 bearing cover	
Thread	Ma (Nm)
8	14
10	26
12	45
14	66
16	108
18	151
20	210
22	274
24	348

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