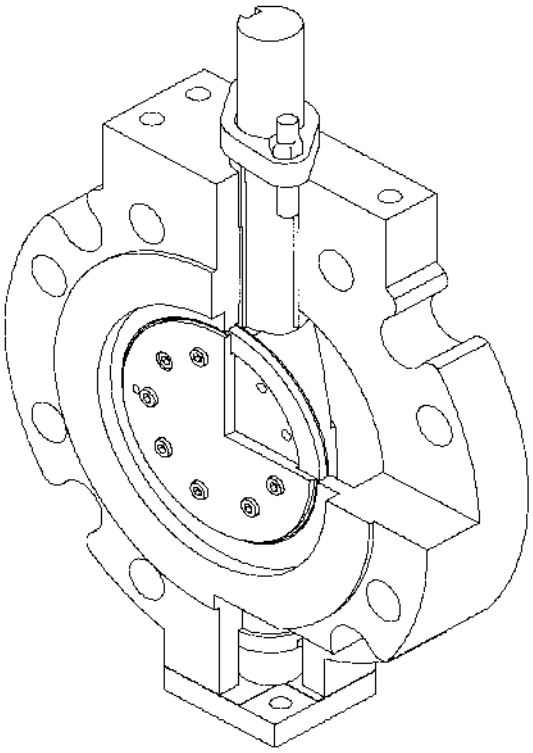
Operating Manual

TRI-CON Butterfly Valves

(with gearbox or actuator)



ZWICK Armaturen GmbH, D-58256 Ennepetal
Manual no. Zw-TriCon-2020 / Rev. 12.3

Table of contents

0 Introduction

This manual is intended to assist operators when installing, operating and performing maintenance on TRI-CON butterfly valves.

 **Caution**	**Non-adherence to the following warnings can lead to personal injury, material damage and environmental damage, and result in the loss of any and all warranty claims and claims for damages.** Specifically, non-adherence can lead to the following dangers: - Failure of important functions of the valve or system - Failure of the prescribed methods for maintenance and repairs - Danger to persons due to mechanical, electrical or chemical influences - Danger to the environment due to leakage of hazardous substances

The manufacturer is on hand to answer any inquiries. For contact details, see section 9.

1 Proper use

Following installation in a piping system (via flanges or welding) and after connection of the actuator/end switch (when available) to the control system, TRI-CON butterfly valves are solely intended to block media, let media pass through, or control the flow of media within the permitted pressure and temperature limits. The normal control range is between 25° and 75°, but can be extended depending on the application and design. Deviations from this control range must be agreed with the manufacturer.

These butterfly valves are not recommended for media with more than a low level of solid materials, particularly abrasive materials.

The permissible pressure and temperature range (depending on the body and seat material) can be found on the valve type plate under **PS** and **TS** (see section 2.4, “Marking”).

The valve may only be put into operation once the following documents have been read and understood:

- Enclosed Declaration of Conformity in line with European directives
- TRI-CON operating manual provided with the butterfly valve

Section 2.2 (“Safety instructions for the operator”) must be followed when operating the valve.

For returning the valve to the manufacturer, please note section 7.1 (“Troubleshooting”).

 **Caution**	If a valve is used in continuous operation for controlling media at differential pressures exceeding approx. 0.15 bar (liquid media at approx. 20 °C), the limits of use must be agreed upon with the manufacturer. Cavitation must be avoided in all cases.

1.1 Valves for oxygen applications

During the incoming goods inspection, a check must be made as to whether the delivered valves have the corresponding certificates for oxygen cleaning and whether the valves have oxygen-compliant packaging (see oxygen labeling). The packaging must be inspected for damages. If damages are found, these valves must not be used in oxygen applications as the valves may be contaminated, which can lead to an oxygen fire. If the packaging is undamaged, the valves must be removed from the packaging in a suitable room.

The room must be oxygen-pure and grease-free, and it must also be ensured that the room does not have a greasy atmosphere. The staff tasked with removing the valves from the packaging and installing them in the pipeline must wear suitable protective clothing (grease-free and oil-free gloves, grease-free and lubricant-free clothing, etc.). Once removed from the packaging, the valves must be checked again for possible contamination. At the minimum, a visual inspection must be made under UV light. The inspected, flawless

valves must be taken immediately to the place of installation while ensuring that the valves do not come into contact with oil or grease during this journey, or are otherwise contaminated. When installing the valves, the general safety regulations and instructions in this operating and maintenance manual must be adhered to. During this process, also ensure that – in particular – the pipelines, the flange opposite the valve and the seals are suitable for oxygen applications and are also not contaminated (particularly oil and grease contamination).

 **Danger of death**	Failure to observe this regulation can lead to danger to life and limb (e.g. oxygen fires).

2 Safety instructions

2.1 General safety instructions

The safety instructions in this operating manual, the applicable national regulations on accident prevention, and any in-house working, operating and safety regulations must be observed. Local safety guidelines which the operator is responsible for complying with (including by additional installation staff) must also be observed.

The same safety regulations apply to the valves as for the piping system in which they are installed, and for the control system to which the actuator is connected. This manual only includes safety instructions that must be **additionally** observed for valves.

For drive assemblies and/or end switches, additional safety instructions are included in the documentation supplied by the assembly manufacturer.

2.2 Safety instructions for the operator

It is not the responsibility of the manufacturer ZWICK Armaturen GmbH (and thus also during valve operation) to ensure the following:

- ⇒ That the valve is only used properly as described in section 1 and in the supplied documentation (see above).
- ⇒ That a gearbox or actuator attached to the valve afterwards is adjusted correctly to the valve and in both end positions of the valve. In the closed position, the end stop must occur in the valve seat. A stroke limitation in the actuator in the closed position must either be reset or disabled.
- ⇒ That the pipeline system is laid correctly and is checked regularly for correct functionality. The thickness of the valve body is calculated so that the normal additional forces and torques seen in correctly laid pipelines are taken into consideration.
- ⇒ That impermissible high stresses on the pipeline are avoided in all cases.
- ⇒ That the valve is connected correctly and without stress to these systems, particularly those valves that are welded to the pipeline.
- ⇒ That the actuator/end switches are connected to the on-site control system according to the supplied documentation.
- ⇒ That the normal flow speeds in this piping system are not exceeded in continuous operation, and that abnormal operating conditions such as vibrations, water hammer, erosion (e.g. due to saturated steam), cavitation and more than a low level of solid materials in the medium – particularly abrasive materials – are clarified with the manufacturer ZWICK Armaturen GmbH.
- ⇒ That valves or valve parts used at operating conditions >50 °C or <-20 °C are protected against contact together with the pipeline connections.

⇒ That torsion-related displacement on the mounting bridge due to assemblies or actuation on the actuator is avoided.

⇒ That the valve is installed, operated, serviced and repaired by trained personnel. Within the context of this manual, trained personnel refers to persons who, because of their training, specialist knowledge and professional experience, are capable of correctly assessing and properly executing the work they are assigned and of recognizing and rectifying possible hazards.

⇒ That any leaking, hazardous substances are discharged in such a way that is not dangerous to people or the environment.

For further information please contact the manufacturer!

Danger of death	Valves with a permissible pressure/temperature rating that is insufficient for the operating conditions may not be used. This rating can be found in the ZWICK brochure "TRI-CON butterfly valves" – see section 9 ("Information"). For materials, pressures or temperatures that are not specified in the aforementioned brochure, approval of the permissible pressures above room temperature must be granted by the manufacturer. **Failure to observe this regulation can lead to danger to life and limb and cause damage to the piping system.**
Danger	It must be ensured that the selected materials for valve parts that come into contact with media are suitable for the media used. The manufacturer accepts no liability for damages as a result of corrosion caused by aggressive media. **Failure to observe this regulation can lead to danger to life and limb and cause damage to the piping system.**

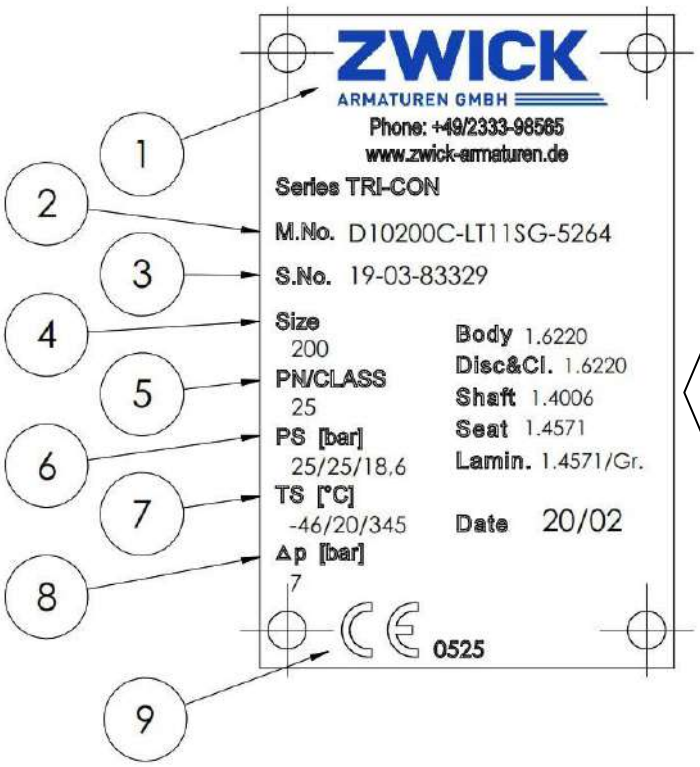
2.3 Special hazards

Danger of death	The valve shaft is sealed by a packing bush. The **pipeline must be completely depressurized** before the nuts on the packing bush are loosened or removed so that no media escapes from the bush.
Danger of death	The **pipeline must be completely depressurized** before the lock screw or body cover are loosened or the valve is removed from the pipeline so that the medium does not escape unchecked from the line. Ensure that the **valve is opened 5° to 10°** so that pressure is released on both sides of the valve. The actuator may only be dismantled – when necessary – once the valve has been opened for this purpose and **left in this open position**.
Danger	*On valves used as end valves:* In normal operation – particularly with gaseous, hot and/or hazardous media, a **blank flange or sealing cap must be attached to the free connection**. Be careful when closing a valve of this type: Danger of crushing!
Danger	If a valve installed as an end valve has to be opened in a pressurized line, this must be carried out with due caution so that the **medium that sprays out** does not cause any damage. Be careful when closing a valve of this type: Danger of crushing!
Danger	*If a valve has to be removed from a pipeline:* Disconnect the actuator/end switch according to the manufacturer's documentation. The medium may escape from the line or valve. If harmful or hazardous media are used, the pipeline must be completely emptied before the valve is removed. Exercise caution with **residues that may escape from dead space in the valve or pipeline** or that have remained **in the valve (under pressure)**.

2.4 Marking of the butterfly valves

Each butterfly valve can be identified and traced according to its type plate. The type plate must therefore not be removed or damaged.

An actuator is usually fitted with an additional type plate.



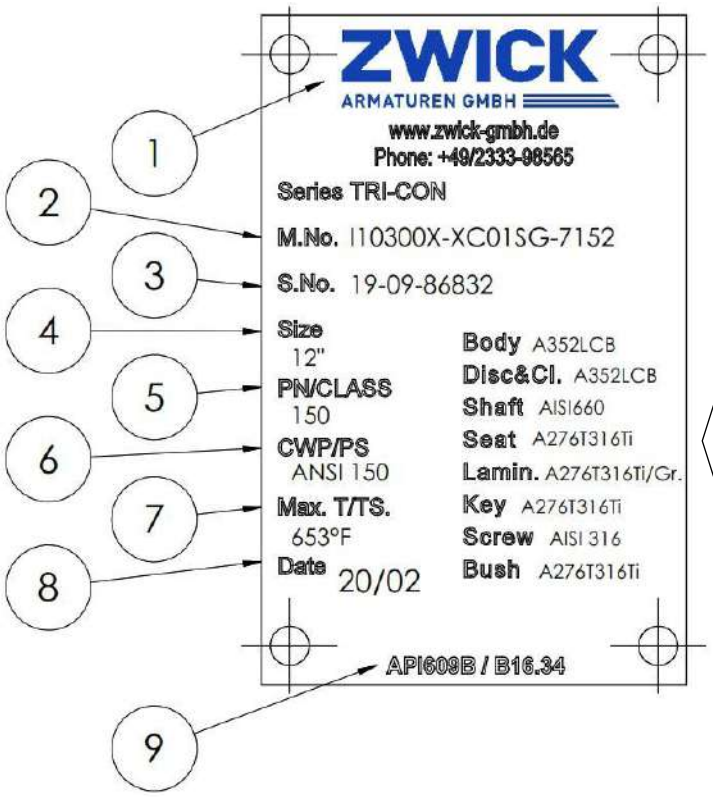
Identification of the specified parts according to material standard

Body material
Material of valve disc and clamp ring
Shaft material
Material of the seat in the body
Material of the (replaceable) laminate seal on the disc
Date (year / month)

PED type plate:

No.	Designation	Comments
1	Manufacturer	**Zwick Armaturen GmbH** For the address, see section 9 (“Information”)
2	M.No.	**Model number**, see Zwick Armaturen GmbH catalog e.g.: D10200C-LT11SG-5264
3	S.No.	Corresponds to: **Year – month – sequential production no.** e.g.: 19-03-83329
4	Size	**Nominal width DN** = value in mm or inches e.g. 200 or 8"
5	PN / CLASS	**Dimension standard for flanged butterfly valves** = value for PN / class e.g. 25
6	PS	**Maximum permissible pressure** At minimum permissible temperature / 20°C / max. permissible temperature Value in bar or PSI
7	TS	**Minimum permissible temperature / ambient temperature ~ 20°C / maximum permissible temperature** Value in °C or °F
8	Δp	**Differential pressure** Value in bar or PSI
9	CE 0525	**Identification according to PED** Number of notified body

If the valves are subject to API 609B or ASME B16.34 directives, they are marked according to ASME:



Identification of the parts in contact with media according to material standard

Body material
Material of valve disc and clamp ring
Shaft material
Material of the seat in the body
Material of the (replaceable) laminate seal on the disc
Key material
Material of the clamping ring screws
Bush material

ASME type plate:

No.	Designation	Comments
1	Manufacturer	**Zwick Armaturen GmbH** For the address, see section 9 (“Information”)
2	M.No.	**Model number**, see Zwick Armaturen GmbH catalog e.g.: I10300X-XC01SG-7152
3	S.No.	Corresponds to: **Year – month – sequential production no.** e.g.: 19-09-86832
4	Size	**Nominal width** = value in inches or mm e.g. 12" or 300
5	PN / CLASS	**Dimension standard for flanged butterfly valves** = value for PN / class e.g. ANSI 150
6	CWP / PS	**Maximum permissible pressure at 20 °C** Value in bar or PSI
7	Max. T / TS	**Maximum permissible temperature** Value in °C or °F
8	Date	**Year / month** Date of manufacture
9	API 609B, B16.34	**Calculation and testing standards**

3 Transportation and storage

Valves must be handled, transported and stored with care:

- ⇒ The valve must be stored in its original packaging and/or with protective caps on the flange connections/welded ends. The valve should be stored and transported on a pallet (or with similar support), including to the installation location.
- ⇒ Before installation, the valve must be stored in a closed room and protected against harmful influences such as dirt or moisture.
- ⇒ In particular, the metal seat in the valve, the actuator and the flange connection surfaces/welded ends must not be damaged by mechanical influences or any other factors.
- ⇒ Valves must be stored in the same way they are delivered. The gearbox or actuator must not be actuated.
- ⇒ Valves must not be suspended on the handwheel, actuator or gearbox. Pay attention to the attachment points (see additional manual for TRI-CON on packaging, shipping, etc.).
- ⇒ Transportation is only permitted with a fixed, closed valve disc (exception: drive type “Safety setting OPEN”).

Danger	*Valves delivered without actuator (special case):* The valve must be transported with extreme care so that an unsecured valve disc cannot open from the closed position due to external influences (e.g. vibration).
Caution	*Valves with drive type “Safety setting OPEN”:* On short valves, the valve disc usually protrudes from both sides of the body. ***Transport with care so that the laminate seal is not damaged.*** **Danger of leaks.**

4 Installation in the pipeline

4.1 General information

When installing valves in a pipeline, the same instructions apply as for connecting pipes and similar piping elements. For valves, the instructions below apply **additionally**.

Also pay attention to section 3 (above) for transportation to the installation location.

Caution	Butterfly valves – especially short ones – must be **transported and installed with the valve disc closed**. Otherwise, the sealing element in the disc may be damaged and the valve is then no longer leak-tight (exception: drive type “Safety setting OPEN”, see above).
Caution	There is a risk of crushing when butterfly valves are not installed. The actuator may only be connected and actuated **when the butterfly valve is installed in the pipeline**. If the valve is used as an end valve in a pipe section, the pipeline must be depressurized and either a cover attached to the outlet or the actuator locked securely against unauthorized actuation in order to eliminate the risk of crushing.
Note	The butterfly valve has been set by the manufacturer in the leak-tight closed position. In the closed position, the end stop of the valve/actuator must occur in the valve seat. A stroke limitation in the gearbox/actuator must either be reset or otherwise disabled. **The setting of the “CLOSED” end stop** must not be changed.

Danger of death	*If – in exceptional cases – a valve has to be installed without gearbox or actuator:* Ensure that **pressure is not applied** to the valve in this case. If a gearbox or actuator is retrofitted afterwards, the torque, direction of rotation, angle of actuation and setting of the end stops “OPEN” and “CLOSED” on the valve must be adjusted according to the operating conditions. **Failure to observe these regulations can lead to danger to life and limb and cause damage to the valve or the piping system.**
Caution	*Valves with electric actuator:* Ensure that the valve is **deactivated by the signal from the torque switch** when in the **“CLOSED”** position. In the **“OPEN”** position, the valve must be **deactivated by the signal from the end switch**. *For additional information, see the documentation of the electric actuator.*
Caution	*Valves in DBB or DIB configuration or with auxiliary connections:* *If two valves are installed as single valves in a DBB or DIB configuration, there must be a pressure relief installed on site to prevent an impermissible overpressure between the single valves. In general, all additional connections (e.g. bleed port, monitoring port, air purge connection, etc.) must be connected on site without leaks!*

4.2 Work steps

⇒ Transport the valve to the installation location in the protective packaging and only unpack it there.

⇒ Check the valve/gearbox/actuator for damages caused during transport. Valves/gearboxes/actuators with visible signs of damage may not be installed.

⇒ Ensure that only valves are installed whose pressure class, connection type and connection dimensions correspond to the operating conditions. Consult the type plate on the valve. The connection data for the actuator must correspond to the data on the control system. Consult the type plate on the actuator.

Danger of death	Valves with a permissible pressure/temperature rating that is insufficient for the operating conditions may not be installed. This rating can be found in the ZWICK brochure “TRI-CON butterfly valves” – see section 9 (“Information”). For materials, pressures or temperatures that are not specified in the aforementioned brochure, approval of the permissible pressures above room temperature must be granted by the manufacturer. **Failure to observe this regulation can lead to danger to life and limb and cause damage to the piping system.** Consult the manufacturer in cases of doubt.

⇒ If the actuator can be actuated by hand, a functional check must be carried out at the start of installation: The valve must open and close correctly. Visible malfunctions must be rectified before commissioning. See also section 7 (“Rectifying malfunctions”). The position indicator on the gearbox/actuator must match the position of the valve disc.
The valve **must be set in the closed position** for installation.

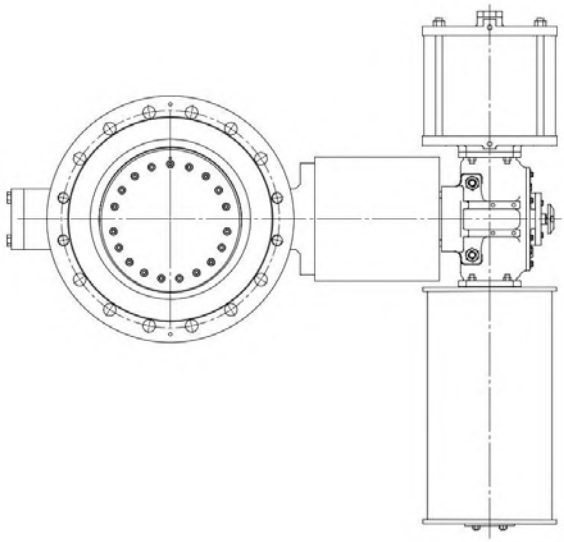
⇒ *Short butterfly valves:*
The counterflange or pipe ends must have a clear gap so that there is enough space for the opened valve disc, and the precision sealing element in the valve disc is not damaged when it swings out.

⇒ To protect this sealing element, the valve and connected pipe must be cleaned carefully from any contamination – particularly solid foreign bodies – before installation.

Danger of death	*Short butterfly valves with pneum./electro-hydr. actuator "Safety setting OPEN":* *For installation:* • *The open valve must be held in place in the "CLOSED" position at full control pressure until it is inserted in the line and fastened securely.* • *The control pressure must then be released slowly.* **Failure to observe this regulation can lead to danger to life and limb and cause damage to the piping system.**

⇒ *TRI-CON butterfly valves are generally installed in the flow direction. They can also be installed against the flow direction if this is agreed with the ordering party. (Leak-tight closing in a non-preferred flow direction requires actuation at a higher torque. Consult the manufacturer for more information.)* The valve must be installed so that the **direction of the arrow** marked on the body matches the direction **in which pressure is applied to the closed disc**. This direction may be against the flow direction when the butterfly valve is open!

⇒ The preferred installation position is with a horizontal valve shaft (see diagram). The gearbox/actuator should not be positioned directly underneath the valve. Leaks from the packing bush can damage the actuator. An installation with vertical valve shaft and actuator under the valve must be discussed with the manufacturer before installation.



Valve with horizontal shaft

Danger	An actuator (electr. /electro-hydraul./pneum.) installed on the side of the valve **must** be supported if its weight or size results in an unforeseen bending load on the valve. The actuator **must** be supported on actuators with an asymmetrical load distribution of >75 kg or on versions with a body extension/shaft extension of >50 kg. In general, a support is recommended. **Contact the manufacture in cases of doubt.**

⇒ When inserting the valve (and flange seals) in an installed pipeline, the distance between the pipeline ends must be sufficient so that all connection surfaces (and seals) remain undamaged.
However, the gap must not be larger than necessary in order to prevent additional stress in the pipeline during installation.

⇒ It is recommended that the valve does not heat up by more than 80 °C/h during commissioning. Consult the manufacturer in cases of doubt.

⇒ Thermal insulation is recommended at operating temperatures above 200 °C (392 °F).

All butterfly valves:

⇒ The manual of the actuator manufacturer applies when connecting the actuator/end switch to the control system.

⇒ A functional check using signals from the control system must be carried out at the end of installation: The valve must close and open with the necessary torque according to the control commands. The signals from the end switches/position indicators (when present) must show the valve position correctly.
Visible malfunctions must be rectified before commissioning. See also section 7 (“Rectifying malfunctions”).

Danger	Incorrectly executed control commands can **pose a risk to the operating personnel and cause damage to the piping system**.

Butterfly valves with flanges only:

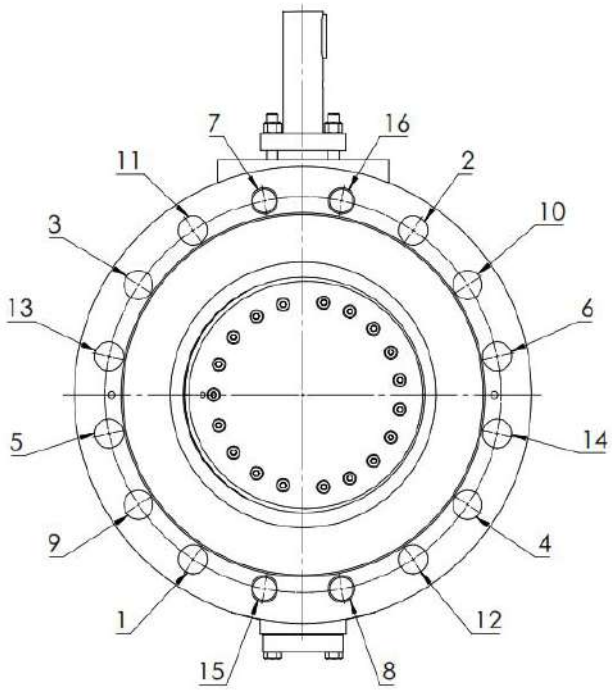
⇒ The counterflange on the pipeline must be flush and in parallel alignment.

Caution	*Butterfly valves with flange ends:* The sealing surfaces on bodies with flange ends on the butterfly valve are designed so that flange seals must be used according to EN 1514 or ASME B16. Counterflanges must have smooth sealing strips, e.g. B1 or B2 according to EN 1092-1 or stock finish according to ASME B 16.5. Other flange shapes must be agreed upon with the manufacturer ZWICK Armaturen GmbH.
Caution	The sealing surfaces on the flange must be free from welding beads, metal shavings and the like, and the inner diameter of the flange must correspond to the inner diameter of the seal and body.
Caution	Short butterfly valves must be inserted with a closed valve disc into the gap between the pipeline ends, otherwise the precision sealing element in the valve disc may be damaged and the valve is then no longer leak-tight.

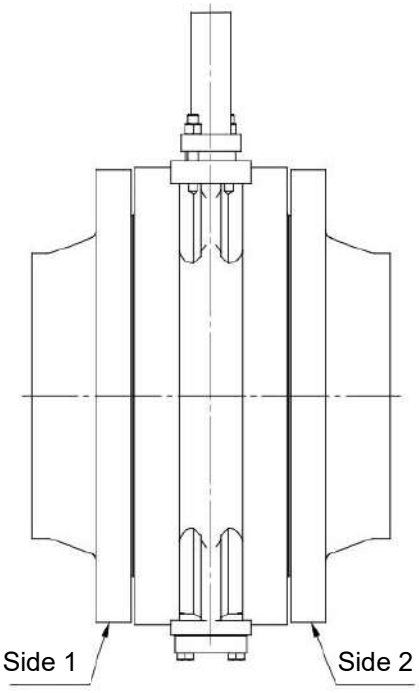
⇒ During installation, flange butterfly valves must be centered on the counterflange using the flange screws before the screws are tightened.

Caution	Short butterfly valves usually require screws of different lengths for connection to the counterflanges. The dimensions of these flange screws can be found in the ZWICK planning document “Zw-TriCon-**2020**”.

Torque must be applied in the sequence specified in the following diagram!



Sequence: **1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16**
Never start in the threaded area of the body! (7, 15, 8, 16)



Where possible, switch between side 1 and 2 when tightening in order to prevent misalignment.

Tightening must always be made crosswise and in multiple increments. Nuts must not be forgotten as a result of the reciprocal tightening, especially in the threaded area of the body. The number of screws can vary depending on the design.

Tightening torques must generally be agreed with the manufacturer. A bolt stress of more than 250 N/mm^2 must be avoided in any case or verified with the manufacturer. Bolt stresses should be between 0.3 and 0.7 of the bolt yield strength.

For further information (e.g. necessary / allowable flange torque) please contact the manufacturer!

Butterfly valves with welded ends only:

- ⇒ The welded ends of the valve must be flush, in parallel alignment and be of the same material as the pipe – see the material specifications on the valve type plate. Opposite welded ends must have matching diameters and weld profiles.
- ⇒ During welding, earthing cables must be clamped to the pipeline and not the valve.
- ⇒ Ensure that welding is carried out in such a way that no significant loads are generated in the pipe section or transmitted to the valve. Ensure that the butterfly valve is not damaged due to heat exposure. Only temperatures of <300 °C are permitted, as measured on the body wall.

⇒ *Butterfly valves >DN 400:*

⚠ **Caution**	When welding the valve in the pipeline, ensure the welding process is controlled so that the introduced thermal energy is limited and warping of the valve body is prevented. For example, welding must be made crosswise in order to prevent tension on the valve body. Failure to observe these regulations can lead to warping of the valve body. A warping of just 1/10 mm in the seat area (around the supports) can result in the valve being rendered unusable.

5 Pressure testing and commissioning

The valves have already undergone a pressure test at the manufacturer. Pay attention to the following when carrying out a pressure test on a pipe section with installed valves:

- ⇒ First flush out newly installed piping systems carefully to remove all foreign bodies.
- ⇒ **Opened valve:** The test pressure must not exceed **1.5 x PS** (according to the type plate).
  (PS = maximum permissible operating pressure at 20 °C).
- ⇒ **Closed valve:** The test pressure must not exceed **1.1 x ΔP** (according to the type plate).

If a leak should occur on the valve, please consult section 7 (“Rectifying malfunctions”).

6 Normal operation and maintenance

Valves that are supplied ex works with a gearbox/actuator are precisely calibrated and should not be adjusted as long as the valve is working correctly.

Normal manual force is sufficient on valves with a handwheel. The use of extensions to increase the actuation torque is not permitted.

Valves with actuators must be actuated using the signals from the control system. Normal manual force is sufficient for emergency manual actuation on the actuator (when available). The use of extensions to increase the actuation torque is not permitted.

Regular maintenance of the valves is not necessary, but there must be no external leakage from a valve – particularly on the packing bush – during inspections on the pipe section. In such cases, please consult section 7 (“Rectifying malfunctions”).

For valves that remain constantly in a certain position, it is recommended to actuate them once or twice per year. It is also recommended to ensure a free inlet and outlet distance of 5 x DN in front of and behind the valve. Consult the manufacturer in cases of doubt.

Danger	*A butterfly valve is usually not self-locking:* The gearbox/actuator must not be removed **as long as pressure is applied to the butterfly valve**.
Note	*A piston actuator is not self-locking:* Piston actuators require a **permanent supply of control pressure** for all positions that are accessed under control pressure.

7 Rectifying malfunctions

Maintenance according to operating hours

TRI-CON valves are generally low-maintenance. Regular inspections and maintenance are required when used in safety-relevant applications. Consult the documentation from the actuator manufacturer for the applicable maintenance intervals for the actuator.

Intervals can differ depending on the loads (e.g. ESD valves).

The following is recommended to prevent unexpected malfunctions:

Operating hours	Maintenance
25,000	Visual inspection (leaks, cracks, etc.), functional check by opening/closing the valve and checking whether an increased torque is required on the valve (changing noises during operation can indicate wear and an increased torque requirement)

50,000	Visual inspection (leaks, cracks, etc.), functional check by opening/closing the valve and checking whether an increased torque is required on the valve (changing noises during operation can indicate wear and an increased torque requirement), replacement of spare parts
66,000	Visual inspection (leaks, cracks, etc.), functional check by opening/closing the valve and checking whether an increased torque is required on the valve (changing noises during operation can indicate wear and an increased torque requirement)
75,000	Visual inspection (leaks, cracks, etc.), functional check by opening/closing the valve and checking whether an increased torque is required on the valve (changing noises during operation can indicate wear and an increased torque requirement)
100,000	Visual inspection (leaks, cracks, etc.), functional check by opening/closing the valve and checking whether an increased torque is required on the valve (changing noises during operation can indicate wear and an increased torque requirement), replacement of spare parts
116,000	Visual inspection (leaks, cracks, etc.), functional check by opening/closing the valve and checking whether an increased torque is required on the valve (changing noises during operation can indicate wear and an increased torque requirement)
125,000	Visual inspection (leaks, cracks, etc.), functional check by opening/closing the valve and checking whether an increased torque is required on the valve (changing noises during operation can indicate wear and an increased torque requirement)
150,000	Visual inspection (leaks, cracks, etc.), functional check by opening/closing the valve and checking whether an increased torque is required on the valve (changing noises during operation can indicate wear and an increased torque requirement), replacement of spare parts
166,000	Visual inspection (leaks, cracks, etc.), functional check by opening/closing the valve and checking whether an increased torque is required on the valve (changing noises during operation can indicate wear and an increased torque requirement)
175,000	Visual inspection (leaks, cracks, etc.), functional check by opening/closing the valve and checking whether an increased torque is required on the valve (changing noises during operation can indicate wear and an increased torque requirement)
200,000	Visual inspection (leaks, cracks, etc.), functional check by opening/closing the valve and checking whether an increased torque is required on the valve (changing noises during operation can indicate wear and an increased torque requirement), replacement of spare parts

Contact the manufacturer for details on the lubricant used.

7.1 Troubleshooting

Section 2 (“Safety instructions”) must be adhered to when rectifying malfunctions.

Note 1:

Conversion or modification of the valve is only permitted following prior consultation with the manufacturer.

Note 2:

*All data on the type plate must be provided when ordering spare parts. Only original spare parts from Zwick Armaturen GmbH may be installed. Otherwise, the liability for consequences **no longer applies**.*

Note 3:

*If, following disassembly, it is determined that the body and/or internal parts are not sufficiently resistant to the medium, the manufacturer **must** be notified under submission of all data on the type plate.*

Note 4:

*If the valve has been contaminated with hazardous substances during operation, it must be decontaminated **properly** before repairs are carried out. If repairs are made by the manufacturer, the manufacturer must be provided with proof of decontamination before repairs are carried out.*

Type of malfunction	**Measure**
If a actuator with spring return has to be removed	 **Danger of injury** Disconnect the actuator from the control pressure connection, then disconnect the actuator from the valve.
Leak on a connection to the pipeline flange or body cover	Pay attention to the instructions contained in the pipeline operating manual. Tighten the flange screws. If this does not rectify the leakage: Repair necessary: Replace the seal. Pay attention to the information in section 2.3 (“Special hazards”) and request the seal for the body cover and required manual from ZWICK Armaturen GmbH.
Valve with handwheel: Leak in the seat seal	Check whether the valve is completely closed. *If the valve is in the closed position:* Check whether the gearbox closes at full torque. *If the gearbox closes at full torque:* Open and close the valve repeatedly while under pressure. *If the valve is then still leaking:* Repair necessary: Replace the laminate seal. Pay attention to the information in section 2.3 (“Special hazards”) and request the spare parts and required manual from ZWICK Armaturen GmbH.

Type of malfunction	Measure
Valve with actuator: Leak in the seat seal	Check whether the valve is completely closed. *If the valve is in the closed position:* Check whether the actuator closes at full torque. *If the actuator closes at full torque:* Open and close the valve repeatedly while under pressure. *If the valve is then still leaking:* Increase the torque on the actuator in “CLOSED” position to max. 1.1 x the nominal torque. *If the valve is then still leaking:* Repair necessary: Replace the laminate seal. Pay attention to the information in section 2.3 (“Special hazards”) and request the spare parts and required manual from ZWICK Armaturen GmbH.
Corrosion on the inside of the valve body	 **Danger of injuries and death** *Significant corrosion (>1.5 mm) leads to weakening of load-bearing parts and can result in the valve body fracturing, with large quantities of operating medium suddenly escaping at very high speeds:* In line with section 2.2, it is the operator’s responsibility to coordinate the body material and operating medium in such a way that this danger is eliminated in advance.
Leak on the packing bush	Ensure that the line on both sides of the valve is completely depressurized beforehand. Tighten both nuts on the bush alternately and in small increments of ¼ turns each clockwise. *If this does not rectify the leakage:* Repair necessary: Request the spare parts and required manual from ZWICK Armaturen GmbH. *If the nuts on the packing bush have to be loosened or removed (counter-clockwise):*  **Danger of death** Pay attention to section 2.3 (“Special hazards”).
Valve with handwheel: Malfunction	Check the functionality of the gearbox. *If the gearbox is working correctly:* Remove the valve (pay attention to the information in section 2.3, “Special hazards”) and inspect it. *If the valve is damaged:* Repair necessary: Request the spare parts and required manual from ZWICK Armaturen GmbH.
Valve with actuator: Malfunction	Check the actuator and control commands. *If the actuator and control system are working correctly:* Remove the valve (pay attention to the information in section 2.3, “Special hazards”) and inspect it. *If the valve is damaged:* Repair necessary: Request the spare parts and required manual from ZWICK Armaturen GmbH.

All safety and protection devices must be put back into operation immediately after the work is completed.

In the event of malfunctions on the actuator, see the documentation of the actuator manufacturer.

7.2 Decommissioning and disposal

Pay attention to the sections “Installation in the pipeline” and “Troubleshooting” when carrying out decommissioning.

⇒ Pipeline is released, depressurized and emptied.
⇒ Close the valve completely, loosen the flange screws and spread the flange apart with the tool.
⇒ Pull out the valve, protect the sealing surfaces and ensure the sealing surfaces on the flange are not damaged.
⇒ In case of welded valves, ensure that damage caused by flying sparks is avoided during removal.

Danger	If valves have come into contact with harmful or hazardous media, they must be decontaminated properly before disposal.

The applicable legal regulations must be adhered to in order to ensure correct, environmentally friendly disposal.

8 Warnings when using the butterfly valve in Ex zones

8.1 Warning for the valve (without electric/hydraulic/pneumatic actuator)

The following list summarizes the results of the ignition risk analysis carried out by valve manufacturer ZWICK Armaturen GmbH according to EN ISO 80079-36:

Source of danger	Measure
Valve (without actuator/accessories)	If the following measures are adhered to by the operator, the valve does not have ignition sources of its own.
Creation of an explosive atmosphere	*This hazard is not the responsibility of the valve manufacturer:* Pay attention to any leaks and rectify them. Cordon off the area extensively.
Sparks when installing the butterfly valve in a pipe section	Assembly / disassembly / service is only permitted in non-explosive atmospheres.
Heating up of the valve body to an impermissible high temperature	*This hazard is not the responsibility of the valve manufacturer:* The operator is responsible for ensuring that the operating medium remains within permissible limits in potentially explosive atmospheres.
Creation of ignition sources due to retrofitted assemblies that have not been approved by the manufacturer	*This hazard is not the responsibility of the valve manufacturer:* The operator is responsible for carrying out a new risk analysis and taking the necessary measures.
Charging of individual valve parts during operation (opening and closing)	*All external parts on the valve are made from metal and have a conductive connection with each other:* Ensure that the TRI-CON valve is earthed correctly and remains so. For mounting parts, proceed according to the manufacturer’s specifications.

Pressure wave or compression during operation (opening and closing)	*It is the responsibility of the operator to ensure that predefined opening and closing times of the valve cannot lead to an ignition source. The operator is responsible to design and use protection systems to prevent pressure waves or compressions that can lead to an ignition.*
Welding in an explosive atmosphere	*Welding is strictly prohibited in explosive atmospheres!*

8.2 Warning for the electric/hydraulic/pneumatic actuator and/or accessories

The actuator or (electric) valve accessories have ignition sources of their own.

The combination of the TRI-CON butterfly valve and actuator or (electric) accessories does not lead to an added risk of ignition in potentially explosive atmospheres, provided the warnings in the table in section 8.1 above are observed.

Source of danger	Measure
Actuator	The documentation provided by the actuator manufacturer (see the declarations by ZWICK Armaturen GmbH enclosed with the delivery) must be observed strictly and in full by the operator, and must be included in the risk analysis of the pipe section.

9 Further information

This manual, the ZWICK brochures mentioned in the manual and additional information – including in different languages – can be obtained from:

Zwick Armaturen GmbH
Egerstraße 1 + 25
D-58526 Ennepetal
Tel: +49 2333 9856 - 5
E-Mail: info@zwick-gmbh.de
www.zwick-armaturen.de
www.zwick-valves.com

10 Declarations according to EU directives

Declaration of conformity according to: **Directive 2014/68/EU**
Declaration in relation to: **Directive 2014/34/EU**
Installation declaration according to: **Directive 2006/42/EC**

The manufacturer	**Zwick Armaturen GmbH, Egerstraße 1, D-58256 Ennepetal**	
hereby declares that the valve:	**TRI-CON butterfly valve** • **with pneumatic/electric/hydraulic actuator** • **with free shaft end for subsequent retrofitting of an actuator**	
in accordance with EU directives		
Directive 2014/68/EU	**Directive 2006/42/EC** **(only on versions with the aforementioned actuator)**	**Directive 2014/34/EU**
1. is a pressure-bearing piece of equipment within the context of directive 2014/68/EU and conforms to the requirements contained within this directive, 2. may only be operated under consideration of the included operating manual no. "Zw-TriCon-2020",	3. is an incomplete machine within the context of Article 2 of this directive, 4. meets the basic safety requirements according to the risk assessment made in accordance with the machinery directive. The technical documents were created according to Appendix VII, Part B. If requested by the responsible authorities, we can provide the special technical documents by mail or in digital form. This can be requested from the assigned person. 5. may only be put into operation if it has been determined that the machine in which the incomplete machine is installed corresponds to the provisions in the machinery directive. 6. may only be operated under consideration of the included operating manual no. "Zw-TriCon-2020".	**(without actuator/accessories)** 7. is not covered by 2014/34/EU, 8. has been subjected to a risk analysis, 9. has no ignition source of its own and can therefore be used in potentially explosive atmospheres, 10. may only be operated under consideration of the included operating manual no. "Zw-TriCon-2020", in particular sections 1.1 and 8. **Note:** Electric/pneumatic/hydraulic actuators must be subjected to a special risk analysis and correspond to directive 2014/34/EU.

The commissioning of this valve is only permitted when the valve has been connected to the pipe on both sides and the risk of injury has therefore been eliminated.

Applied EU directives and standards:

2014/68/EU	**EU pressure equipment directive**
EN 593	**Industrial valves – Metallic butterfly valves**
EN 12516-1	**Industrial valves – Shell design strength (table)**
EN 12516-2	**Industrial valves – Shell design strength (calculation)**
2014/34/EU	**Explosion protection directive**
EN 1127-1	**Explosive atmospheres – Explosion protection**
EN ISO 80079-36	**Non-electrical equipment for use in potentially explosive atmospheres**
EN ISO 80079-37	**Non-electrical equipment for use in potentially explosive atmospheres**
2006/42/EC	**EC machinery directive**

Type description and technical features: **ZWICK catalog "TRI-CON butterfly valves"**

Person responsible for the creation of technical documents: **Dipl.-Ing. Daniel Zwick, Egerstraße 1, D-58256 Ennepetal**

Applied conformity assessment procedure: **Pressure equipment directive 2014/68/EU, category according to Table 1, Module H**

Name of notified body	*ID number of notified body*	*Certificate no.*
LRQA Deutschland GmbH **Curienstraße 1, D-20095 Hamburg**	**0525**	**0525-PED-DE-50040/1-Mod-H-1**

These declarations are invalidated by modifications to valves and/or assemblies that affect the technical data of the valve, the “Proper use” as detailed in section 1 of this manual and/or significantly change the valve or supplied assembly.

Ennepetal, 11/04/2025

Dipl.-Ing. Daniel Zwick, CEO

11 Conformity assessment procedure according to directive 2014/68/EU

Table 1: Category = Fluid Group 1, Diagram 6, Module H

DN	PN							
	6	10	16	25	40	63	100	160
50	I	I	I	II	II			
65	I	I	II	II	II	III	III	III
80	I	I	II	II	II	III	III	III
100	I	I	II	II	III	III	III	III
125	I	II	II	II	III	III	III	III
150	I	II	II	III	III	III	III	III
200	II	II	II	III	III	III	III	III
250	II	II	III	III	III	III	III	III
300	II	II	III	III	III	III	III	III
350	II	III	III	III	III	III	III	
400	II	III	III	III	III	III	III	
450	II	III	III	III	III	III	III	
500	II	III	III	III	III	III	III	
600	III	III	III	III	III	III		
650	III	III	III	III	III	III		
700	III	III	III	III	III	III		
750	III	III	III	III	III			
800	III	III	III	III	III			
850	III	III	III	III	III			
900	III	III	III	III	III			
950	III	III	III	III	III			
1000	III	III	III	III	III			
1050	III	III	III	III	III			
1100	III	III	III	III	III			
1200	III	III	III	III	III			
1300	III	III	III	III	III			
1350	III	III	III	III	III			
1400	III	III	III	III				
1600	III	III	III	III				
1800	III	III	III	III				
1950	III	III	III					
2000	III	III	III					
2200	III	III	III					

DN	ANSI CLASS				
	150	300	600	900	1500
50	I	II			
65	II	II	III	III	III
80	II	III	III	III	III
100	II	III	III	III	III
125	II	III	III	III	III
150	II	III	III	III	III
200	III	III	III	III	III
250	III	III	III	III	III
300	III	III	III	III	III
350	III	III	III	III	
400	III	III	III	III	
450	III	III	III	III	
500	III	III	III	III	
600	III	III	III	III	
650	III	III	III	III	
700	III	III	III	III	
750	III	III	III	III	
800	III	III	III		
850	III	III	III		
900	III	III	III		
950	III	III	III		
1000	III	III	III		
1050	III	III	III		
1100	III	III			
1200	III	III			
1300	III	III			
1350	III	III			
1400	III				
1600	III				
1800	III				
1950	III				
2000	III				
2200	III				

Note: PS is based on the maximum pressure at the pressure level (on class valves, the ceiling pressure according to ASME B16.34).