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OPERATION AND MAINTENANCE INSTRUCTIONS

**Crane® FKX 9000
Triple Offset Butterfly Valves**



Crane®FKX 9000 Installation, Operation & Maintenance

1. Introduction

This manual is to support the user with the installation, operation and maintenance of Crane Butterfly Valves of the series Crane®FKX 9000.

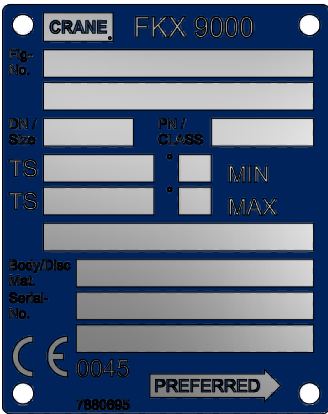
⚠ ATTENTION

If the following attention and warning notes are not adhered to, dangers could arise and the warranty of the manufacturer could become void.

2. Intended use

These valves are exclusively designed to 1) shut off or release pipe sections 2) control the flow on or between flanges after installation in a pipe system 3) shut off, enable or control flow within permissible pressure and temperature limits after the actuator has been connected to the system control. This is to take place after the installation in a pipe system

- between flanges in accordance with EN 1092-1 (blank flange with PN designation) or EN 1759-1 (blank flange with class designation); with flat face. These have to be mechanically processed parallel and level and which have to be flush. The installation between other flanges and /or raised faces listed above is permitted only after technical checking back with Crane / Friedrich Krombach GmbH
- media with maximum operating pressure PS, which is indicated for the maximum permissible temperature TS on the name plate of the butterfly valve



Crane®FKX 9000 name plate

- with permissible values of operating temperature/ pressure
- with manual actuation or after connection of the actuator or gear to the system control.

shut off to release or to control the flow when installed in a pipeline system (between flanges or by welding) media in the allowable pressure and temperature limits pipeline sections, by routing or control the flow.

Any other use of the valve is considered unintended.

⚠ ATTENTION

If a valve is used in continuous operation for controlling purposes, the hydraulic flow parameters are to be selected in such a way that no damage can arise in the valve and in the discharge-sided pipeline due to excess speed. In case of doubt check with the manufacturer!

3. Safety notes

3.1 General safety notes

To valves the same safety regulations apply as to the pipe system in which they are installed. This manual you have at hand only provides such safety notes which are additionally to be observed for valves.

3.2 Safety notes for the operator

It is not the responsibility of the manufacturer, Crane / Friedrich Krombach GmbH, to ensure that

- the valve is only used as intended, as it is described in section 2,

⚠ ATTENTION

No valve must be operated above the permissible pressure/ temperature range (=“rating”) of which is insufficient for the operating condition: this permissible range is described in section 2.

The application limits for pressure and temperature are marked on the valve.

The non-compliance of this instruction involves a risk to life and limb and may cause damage to the pipe system.

It has to be ensured that the selected materials of the medium-contacting valve parts are suitable for the used media. The manufacturer does not assume any liability for damage resulting from corrosion caused by aggressive media.

The non-compliance of this instruction may involve a risk to life and limb and cause damage to the pipe system.

Crane®FKX 9000 Installation, Operation & Maintenance

- a manual gear which was subsequently mounted on the valve is adapted to the valve and correctly adjusted in both end positions of the valve – especially in the closing position,
- an actuating unit which was subsequently mounted on the valve is adapted to the valve and correctly adjusted in both end positions of the valve – especially in the closing position,
- the pipe system and the control system were professionally mounted. The wall thickness of the valve body is dimensioned so that in such professionally routed pipelines an additional load F_z of the standard range ($F_z = \pi/4 \times DN^2 \times PS$) is considered. With butterfly valves for clamping even higher values for F_z can be permitted, (PS = maximum permissible rated pressure at room temperature), CWP-cold working pressure)
- the valve is professionally connected to these systems, especially such valves which are connected to the pipeline by welding,
- in this pipe system the usual flow rates (e.g. 4 m/s for liquids) in continuous operation are not exceeded and abnormal operating conditions such as vibrations, water hammers, temperature shocks, cavitation, wet steam with a high water content and more than insignificant portions of solids in the medium – especially abrasive ones - are co-ordinated with the manufacturer, Crane / Friedrich Krombach GmbH,
- valves which are operated at operating temperatures of $>50^\circ\text{C}$ (122°F) or $<-20^\circ\text{C}$ (-4°F) are protected against contact together with the pipe connections,
- the valve is only operated and maintained by personnel being expert in pressurized pipelines.

3.3 Particular dangers

⚠ ATTENTION

The valve shaft is sealed by a stuffing box. Before the nuts on the stuffing box gland are loosened or unscrewed the pressure in the pipeline has to be completely reduced so that no medium escapes from the stuffing box.

Before loosening the plug (or the cover) on the housing or before removing the valve from the pipeline the pressure in the pipeline has to be completely reduced so that the medium does not uncontrollably escape from the line.

For valves which are used as terminal valve: With normal operation, especially with gaseous, hot and/or hazardous media, a dummy flange or a sealing cover has to be mounted on the free connecting socket or (only for short- term use!) the valve has to be securely locked in "CLOSED" position.

⚠ ATTENTION

If a valve as a has to be opened in a pressurized line as a terminal valve, this must be accomplished with utmost caution so that the squirting-out medium does not cause any damage. Take care when closing such a valve: danger of squashing!

If a valve has to be removed from a pipeline, medium may escape from the line or the valve. In the case of media which are harmful to health or hazardous the pipeline has to be completely empty before the valve is removed.

Take care with residues which continue to flow from dead spaces or which remained in the valve (under pressure).

4. Transport and storage

Valves have to be handled, transported and stored carefully:

- The valve is to be kept in its original packaging and/or with the protection caps on the flange connections/ weld ends. The valves should be kept and transported (also to the installation site) on a pallet (or supported in a similar way).
- If the packaging does not feature any damage, valves should be unpacked just before their installation in the pipeline.
- In the case of storage prior to installation the valve is to be stored in a closed room and to be protected against harmful influences like dirt or moisture.
- Especially the gear and the flange connection faces/ weld ends must not be damaged by mechanical or any other influences.
- Valves are to be stored as delivered. The valve must not be operated.
- Especially the actuator and the flange connection faces/ weld ends must not be damaged by mechanical or any other influences.
- Valves are to be stored as delivered. The actuator must not be activated.

⚠ ATTENTION

If lifting tackles (ropes or similar) are required for transport, these have to be attached in such a way that the actuator is not stressed and that neither the valve nor the gear are damaged.

Valves which are delivered without actuator or gear:
The valve has to be transported carefully: the unsecured valve disc may open from closing position due to external effect.

Valves with actuator type "safety position OPEN":
The valve disc protrudes from the housing on both sides. The protruding edge of the valve disc has to be protected against any damage: if the sealing surface on the disc edge is damaged, the butterfly valve does not have an effective seal!

5. Installation in the pipeline

5.1 General remarks

To the installation of valves in a pipeline the same instructions apply as to the connection of pipes and similar piping elements. The following instructions additionally apply to valves. For the transport to the installation site please also observe section 3

⚠ ATTENTION

The sealing surfaces on bodies with flange ends of the butterfly valve are designed in such a way that flange seals according to EN1514-1 or ANSI B16.21 are to be implemented.

Counterflanges must feature raised face, e.g. shape B1 or B2 in accordance with EN 1092 or raised face in accordance with ASME 16.5 standard. Other raised face shapes are to be agreed on with the manufacturer.

To avoid any damage to valves with weld ends:
When welding the valve into the pipeline the welding process has to be controlled in such a way that the supplied thermal energy is limited and a distortion of the valve body is avoided.

To avoid any leakage on the flange connection:
For a flange connection only suitable gaskets must be used.

⚠ ATTENTION

The actuator or gear is adjusted for the operating data stated in the order: The setting of the end stops "OPEN" and "CLOSED" must not be altered without the consent of the manufacturer.

If – in an exceptional case – a valve has to be mounted without actuator or gear, it has to be ensured that such a valve is not pressurized.

If an actuator or gear unit is retrofitted, torque, direction of rotation, operating angle and the setting of the end stops "OPEN" and "CLOSED" have to be agreed on with the manufacturer. The non-compliance of these instructions might involve danger to the user and cause damage to the pipe system.

Valves with electric actuator:

It has to be made sure that the valve is shut off in "CLOSED" position by the signal of the torque switch. In "OPEN" position the valve has to be shut off with the signal of the limit switch. For further notes please refer to the manual for the electric actuator.

Crane®FKX 9000 Installation, Operation & Maintenance

5.2 Working steps

- Transport valve in the protective packaging to the installation site and unpack it only there.
- Inspect valve, actuator and gear for damage in transport. Damaged valves or actuators must not be installed.
- Make sure that only valves are installed the pressure class, connection type and connection dimensions of which meet the application requirements. See name plate on the valve.
- The connection data for the actuator or gear has to correspond to the data of the control. See name plate on the actuator or gear.
- The name plates or signs on the valve and actuator have still to be identifiable after commissioning.

⚠ ATTENTION

No valve must be operated the permissible pressure/temperature range (=“rating”) of which is insufficient for the operating condition. The non-compliance of this instruction involves a risk to life and limb and may cause damage to the pipe system.

Butterfly valves with a short face-to-face dimension:

- Counter-flanges and/or pipe ends have to feature a clear span allowing for sufficient space for the opened valve disc so that the latter is not damaged when being swivelled out.
- At the beginning of the installation an operational check is to be carried out: the valve must close and open properly. Discernible malfunctions are absolutely to be redressed prior to commissioning. See also section 8 <Troubleshooting>. The position display on the actuator (if available) has to correspond to the position of the valve disc.
- Prior to installation the valve and the downstream pipeline have to be thoroughly cleaned of any contamination, especially of hard foreign substances.
- Crane®FKX 9000 Butterfly Valves can generally be installed irrespective of the flow direction. In order to benefit from the optimum function of the butterfly valve the following is recommended: Install the valve so that an arrow direction marked on the name plate with “PREFERRED” corresponds to the direction in which pressure is applied to a closed valve. This direction may well be opposite to the flow direction with opened butterfly valve!
- The preferred installation position is the one with horizontal valve shaft. If possible, a gear should not be mounted directly below the valve: stuffing box leakage could damage the gear.
- When inserting the valve (and the flange seals) in an

already mounted pipeline the distance between the pipe ends has to be dimensioned in such a way that all connecting surfaces (and seals) remain undamaged. The gap, however, must not be larger than necessary so that no additional stress is generated in the pipeline during installation.

⚠ ATTENTION

Valves with a short face-to-face dimension have to be mounted with closed valve disc in the gap between the pipe ends: otherwise the valve disc could be damaged and the valve is no longer seal tight.

⚠ ATTENTION

Butterfly valves with actuator “safety position OPEN”: For the installation in an existing pipeline the opened valve disc has to be closed with control medium and inserted into the line and screwed on in a completely closed state. Ensure for the duration of the deinstallation process a supply with control medium is available with full control pressure for the closing of the butterfly valve.

If this is not possible, a part of the pipeline has to be removed so that the valve can be installed in opened position. The non-compliance of this instruction involves a major risk of injury.

Only butterfly valves which are mounted between flanges:

- The counterflanges of the pipeline have to be flush, level and parallel.
- Screws which are used in threaded holes of the valve body are to be implemented with a separating agent (e.g. graphite-containing).
- Flanged butterfly valves are to be centered on the counterflange during installation by means of the flange screws before the screws are tightened.

⚠ ATTENTION

Crane FKX 9000 Butterfly Valves partly require screws of a varying length for the connection to the counterflanges.

- As usual the torque for tightening the flange screws has to be adapted to the strength of the screw materials used, the flange seal used and the operating conditions

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Only butterfly valves which are welded:

- The weld ends of the valve have to be flush, level and parallel and of the same material as the pipes – see name plate of the valve. Opposite weld ends have to fit to one another as far as diameter and shape are concerned.
- By professional welding it has to be ensured that neither considerable tensions are generated in the pipe section or transferred to the valve nor that the butterfly valve is damaged by heat effect: only temperatures of <math><300^{\circ}\text{C}</math> (572°F), measured on the body wall next to the bearing socket, are permissible.
- The welding is to be carried out professionally so that the welding seam features all round a temperature which is as constant as possible. Valves >DN400 are to be welded alternately on opposite sides.
- Welding cables must not be connected to the valve but to the pipeline.

ATTENTION

The non-compliance of these instructions may cause distortion of the valve housing. A lasting distortion of 1/10 mm in the seat area (around the bearing sockets) can render the valve useless.

All butterfly valves:

- To the connection of the actuator to the control the manual of the actuator manufacturer applies.
- At the end of the installation an operational check with the signals of the control is to be carried out: the valve has to close and open properly according to the control commands. Discernible malfunctions are absolutely to be redressed prior to commissioning. See also section 8, <Troubleshooting>.

ATTENTION

Wrongly executed control commands could involve a risk to life and limbs and cause damage to the pipe system.

6. Pressure test of the pipe section

With the pressure test of valves the same instructions apply as to the pipeline. In addition, the following applies:

- First thoroughly flush the newly installed line systems in order to flood out all foreign substances.
- The testing pressure of an opened valve must not exceed the value of $1.5 \times \text{PS}$ (at $20^{\circ}\text{C}/68^{\circ}\text{F}$). The component with the lowest PN limits the maximum permissible testing pressure in the line section. (PS = maximum permissible operating pressure, see also name plate).
- A closed valve must only be pressure-tested with $1.1 \times \text{PS}$.

7. Normal operation and maintenance

ATTENTION

In TA-Luft or FE applications the gland nuts must be tightened to the torques specified in 12.6 before 250 switching cycles.

The valves are to be operated with the signals of the control. Valves which were delivered ex works with actuators or gears are exactly adjusted and must not be re-adjusted as long as the valve is in perfect working order.

For the actuation on the hand wheel of the actuator or gear (if available) normal manual forces are sufficient; the use of extensions to increase the actuation torque is not recommended.

Regular maintenance work on the valves is not required; however, when the line section is inspected no leakage must escape to the outside on any valve.

It is recommended to actuate those valves which remain always in one position once or twice a year!

ATTENTION

A butterfly valve is not self-locking: The actuator or gear must not be removed as long as the butterfly valve is pressurized.

ATTENTION

A piston actuator is not self-locking: Piston actuators require a permanent supply with control pressure for all positions which are triggered under control pressure.

Crane® FKX 9000 Troubleshooting

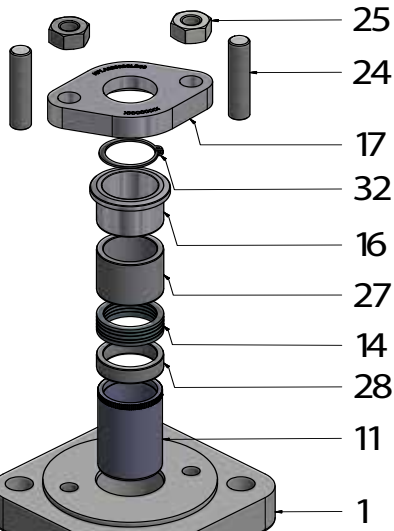
8. Troubleshooting

Fault Type	Remedy	Note
Leakage on the flange connection or plug/ housing cover	<p>Retighten flange screws or plugs.</p> <p>If leakage cannot be redressed in this way: Repair required: replace seal: request spare part and necessary manual from Crane. Observe section 3.3, <Particular dangers>.</p>	
Leakage in the seat seal	<p>Check whether the valve is closed 100%. If this is the case: Check whether the valve is closed with full torque.</p> <p>If the valve, actuator or gear are o.k.: Open/ close valve repeatedly under pressure.</p> <p>If the valve is still leaking: Check whether leakage can be minimized by resetting the "CLOSED" stop in the actuator or gear (valve has to move further into the "CLOSED" position).</p> <p>If the valve is still leaking: Repair required: replace seat seal, request spare parts and necessary manual from Crane. Observe section 3.3, <Particular dangers>.</p>	
Leakage on the stuffing box	<p>Retighten both nuts on the stuffing box gland alternately and in small steps of turn each clockwise.</p> <p>If leakage cannot be redressed in this way: Repair required: request spare parts and necessary manual from Crane 3.3, <Particular dangers>.</p> <p>If the nuts on the stuffing box gland have to be loosened or unscrewed (counter-clock- wise):</p> <p>Attention: In order to protect the operating personnel against any danger it has to be made sure that the line has been completely depressurised.</p>	<p>Note 1: If after the removal it is discovered that the body and/ or the inner parts are not sufficiently resistant to the medium, parts made of a suitable material are to be selected.</p>
Malfunction	<p>Check actuating unit and control commands. If actuator or gear are o.k.:</p> <p>Remove and inspect valve (in observance of the notes from section 3.3, <Particular dangers>).</p> <p>If the valve is damaged: Repair required: request spare parts and necessary manual from Crane.</p>	<p>Note 1: If after the removal it is discovered that the body and/ or the inner parts are not sufficiently resistant to the medium, parts made of a suitable material are to be selected.</p>
If an actuator with spring reset has to be removed	<p>Attention: Before the actuator is removed from the valve, depressure the pipeline and uncouple the actuator from the control pressure supply.</p>	

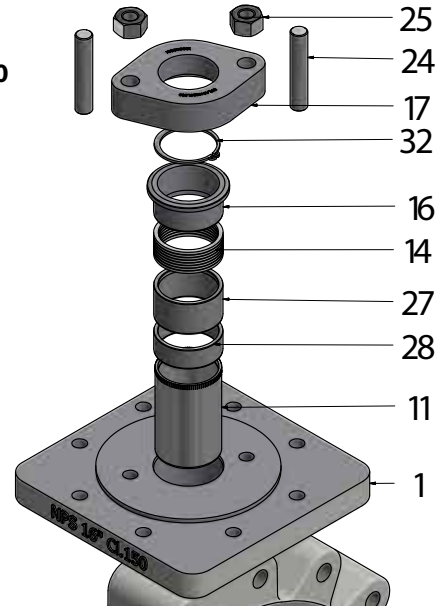
*In case of malfunctions on the actuator or gear see manual of the actuator or gear manufacturer.
Spare parts are to be ordered with all specifications in the name plate. Only original parts must be installed.*

Exploded View Standard Design

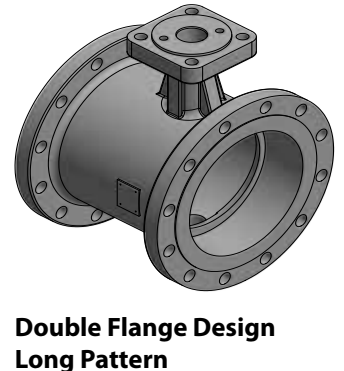
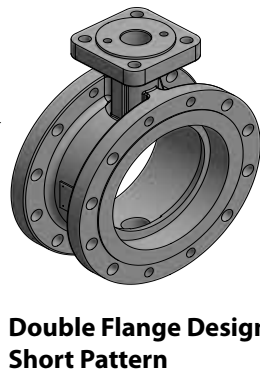
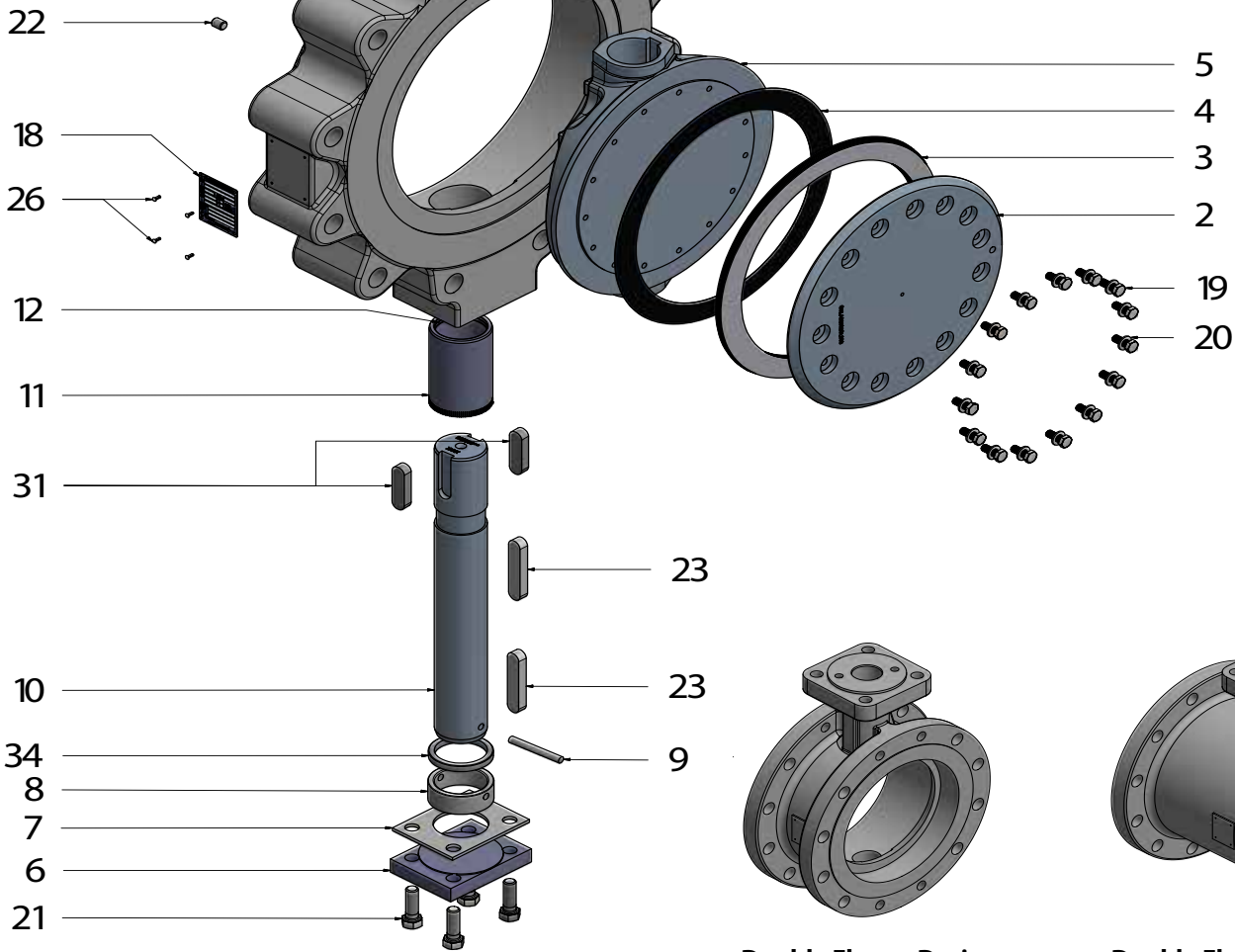
Size
3"-14"
DN 80-350



Size
16"-24"
DN 400-600



Lug Design



Crane® FKX 9000 Materials of Construction

Item*	Description	Spare Part Kit	Carbon Steel		Stainless Steel	
			ASTM	DIN	ASTM	DIN
1	Body		A216 Gr. WCB	1.0619	A351 Gr. CF8M	1.4408
2	Seal retainer ring		A516 Gr. 60	1.0425	A240 T321	1.4541
3	Laminated seal	DSK	A240 UNS S31803 / Graphite	1.4462 / Graphite	A240 UNS S31803 / Graphite	1.4462 / Graphite
4	Seal gasket	DSK	Graphite			
5	Disc		A216 Gr. WCB	1.0619	A351 Gr. CF8M	1.4408
6	Cover		A516 Gr. 60	1.0425	A240 T321	1.4541
7	Cover gasket	BGK	Graphite / Stainless Steel			
8	Shaft retainer		A276 Gr. 304	1.4301	A276 Gr. 304	1.4301
9	Fixing pin		A276 Gr. 431	1.4057	A276 Gr. 431	1.4057
10	Shaft		A276 Gr. 431	1.4057	A276 Gr. 431	1.4057
11	Bearing	SBK	A582 Gr. 303 coated	1.4305 coated	A582 Gr. 303 coated	1.4305 coated
12	Bearing protector inside	SBK	Graphite			
13	Lantern ring		A582 Gr. 303	1.4305	A582 Gr. 303	1.4305
14	Packing	BGK	Graphite			
16	Gland		A582 Gr. 303	1.4305	A582 Gr. 303	1.4305
17	Gland flange		A516 Gr. 60	1.0425	A240 T321	1.4541
18	Name plate		A240 Gr. 304	1.4301	A240 Gr. 304	1.4301
19	Retainer screw	DSK	A193 Gr. B8	A2-70	A193 Gr. B8	A2-70
20	Spring washer	DSK	A2			
21	Cover screw		A193 Gr. B8	A2-70	A193 Gr. B8	A2-70
22	Threaded pin		1.4122			
23	Disc key		A240 Gr. 316Ti	1.4571	A240 Gr. 316Ti	1.4571
24	Gland stud		A193 Gr. B8	A2-70	A193 Gr. B8	A2-70
25	Gland nut		A194 Gr. 8	A2-70	A194 Gr. 8	A2-70
26	Notched nail		A29 Gr. 1012 zinc plated	1.0214 + A2A zinc plated	A29 Gr. 1012 zinc plated	1.0214 + A2A zinc plated
27	Spacer		A582 Gr. 303	1.4305	A582 Gr. 303	1.4305
28	Spacer		A582 Gr. 303	1.4305	A582 Gr. 303	1.4305
30	Plug		A479 Gr. 316Ti	1.4571	A479 Gr. 316Ti	1.4571
31	Drive key (actuation)		A194 Gr.2	1.1191	A194 Gr.2	1.1191
32	Retaining ring		1.4122			
33	Lantern ring		A582 Gr. 303	1.4305	A582 Gr.303	1.4305
34	Thrust ring		A582 Gr. 303 hardened	1.4305 hardened	A582 Gr. 303 hardened	1.4305 hardened
35	O-ring	BGK	FKM			
36	Threaded pin		1.4122			
37	Packing-ring	SBK	Graphite			
38	Support ring		A582 Gr. 303	1.4305	A582 Gr. 303	1.4305

DSK = Disc Sealing Kit

SBK = Shaft Bearing Kit

BGK = Body Gasket Kit

* Master BOM includes all items for standard and optional designs

Exploded View Optional Designs

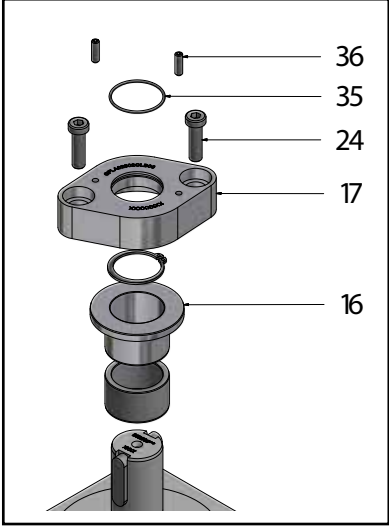
Chemical Gland Flange Design

Item	Description	Spare Part Kit	Carbon Steel		Stainless Steel	
			ASTM	DIN	ASTM	DIN
16	Gland		A582 Gr. 303	1.4305	A582 Gr. 303	1.4305
17	Gland flange		A516 Gr. 60	1.0425	A240 T321	1.4541
24	Gland stud		A193 Gr. B8	A2-70	A193 Gr. B8	A2-70
35	O-ring	BGK	FKM			
36	Threaded pin		1.4122			

DSK = Disc Sealing Kit

SBK = Shaft Bearing Kit

BGK = Body Gasket Kit



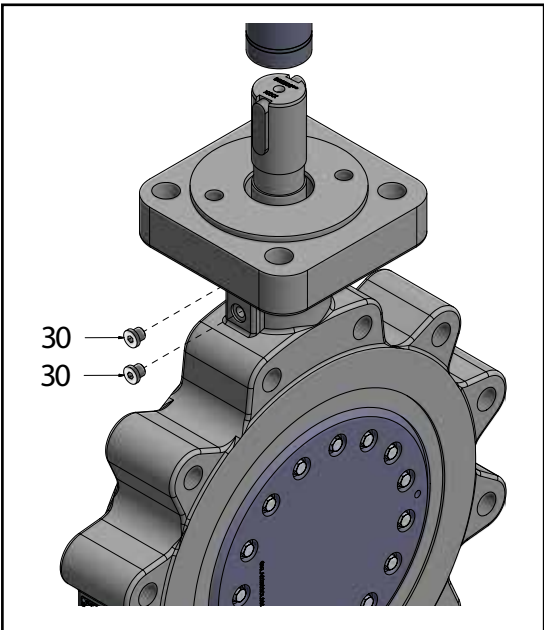
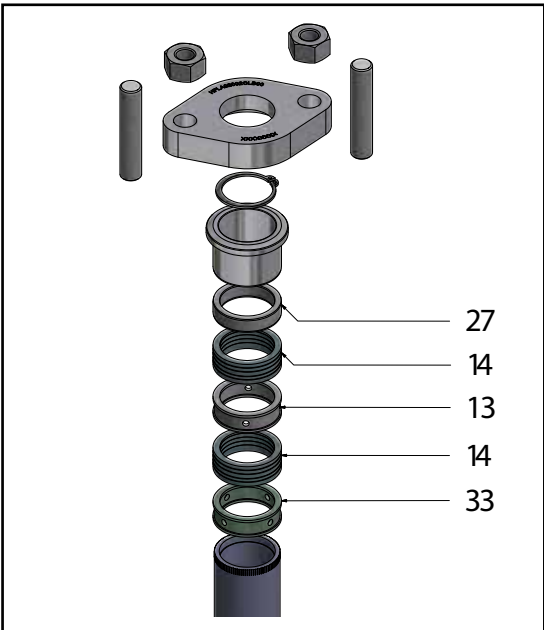
Dual Packing Design

Item	Description	Spare Part Kit	Carbon Steel		Stainless Steel	
			ASTM	DIN	ASTM	DIN
13	Lantern ring		A582 Gr. 303	1.4305	A582 Gr. 303	1.4305
14	Packing	BGK	Graphite			
27	Spacer		A582 Gr. 303	1.4305	A582 Gr. 303	1.4305
30	Plug		A479 Gr. 316Ti	1.4571	A479 Gr. 316Ti	1.4571
33	Lantern ring		A582 Gr. 303	1.4305	A582 Gr.303	1.4305

DSK = Disc Sealing Kit

SBK = Shaft Bearing Kit

BGK = Body Gasket Kit



Exploded View Optional Designs

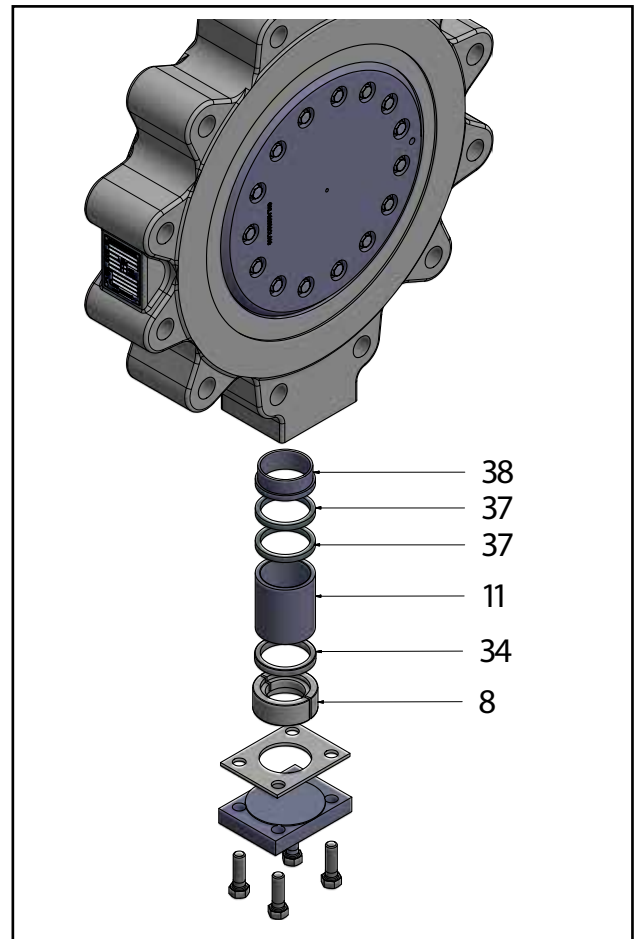
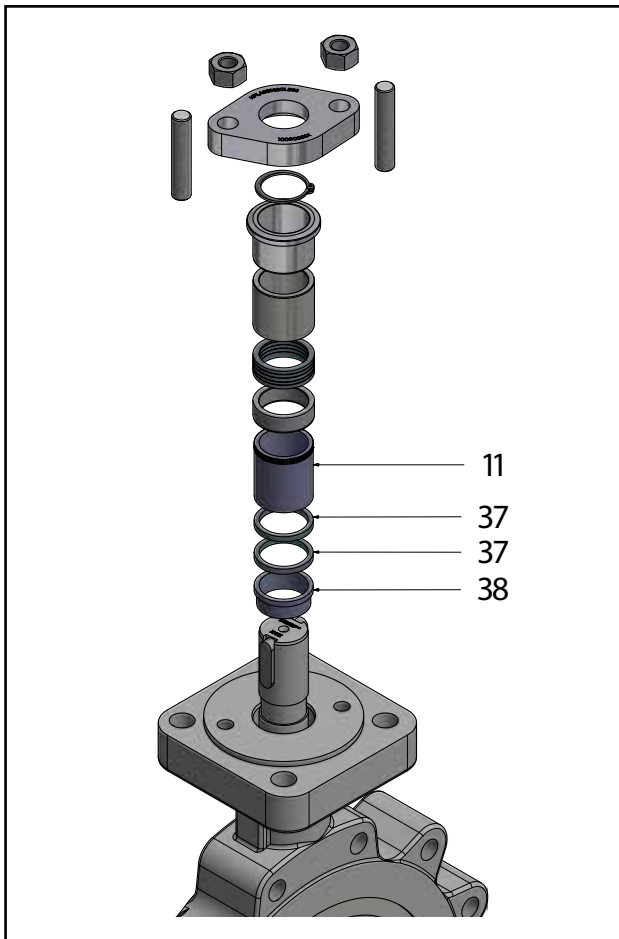
Pressure Tight Bearing Design

Item	Description	Spare Part Kit	Carbon Steel		Stainless Steel	
			ASTM	DIN	ASTM	DIN
8	Ring, devided		A582 Gr. 303 hardened	1.4305 hardened	A582 Gr. 303 hardened	1.4305 hardened
11	Bearing		A582 Gr. 303 coated	1.4305 coated	A582 Gr. 303 coated	1.4305 coated
34	Thrust ring		A582 Gr. 303 hardened	1.4305 hardened	A582 Gr. 303 hardened	1.4305 hardened
37	Packing-ring	SBK	Graphite			
38	Support ring		A582 Gr. 303	1.4305	A582 Gr. 303	1.4305

DSK = Disc Sealing Kit

SBK = Shaft Bearing Kit

BGK = Body Gasket Kit



Replacement of Spare Parts **Disc Sealing Kit**

9. Replacing the Disc Sealing Kit (DSK)

The following table shows the content of the DSK and which options are included. The items are shown in the exploded view.

Disc Sealing Kit (DSK)

Item	Description
3	Laminated Seal
4	Seal Gasket
19	Hex. Head screw
20	Spring Washer

9.1 Disassembly

For the replacement of the recommended spare parts it is necessary to remove the valve from the pipe. The valve has to be turned into the closed position. It is recommended to replace the spare parts in a workshop.

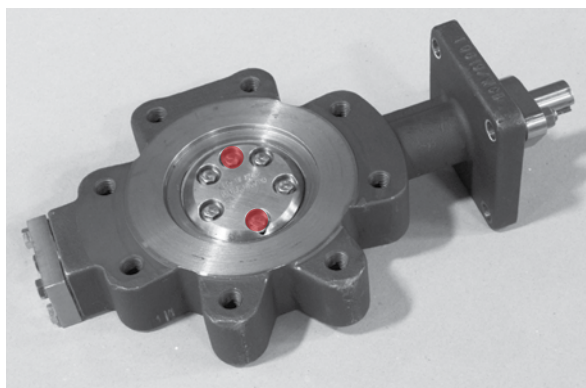
⚠ ATTENTION

If lifting tools (for example ropes) are necessary to carry the valve to the workshop the actuator should be free from heavy load and the valve and actuator must not be damaged.

⚠ ATTENTION

For shut-off flaps with single-acting drives, the drive must be in the safety position for reasons of safety in order to exclude accidental switching during installation. Danger to safety!

1. Place the valve in a horizontal position with the Retainer Screws (19) facing upwards.
2. Loosen all the retainer screws (19). Remove all screws along with the spring washers (20) except two in the centerline direction of the pipe (marked red in the image below)



3. Turn the disc (5) into slightly open position so that the laminated seal has no contact to the seat
Bare shaft valves: Loosen gland nuts (25) (for chemical gland flange design loosen screws (24)) slightly to open the disc. If necessary, open the disc carefully by using a plastic-hammer
Valves with gear: If a gear is mounted use gear handwheel to open the disc slightly without loosening gland nuts (25) (for chemical gland flange design without loosening screws (24)) as before
4. Turn valve 90° to a vertical position and open the disc (5) to a fully open position
5. Carefully, loosen the laminated seal (3), if it is stuck to the seal gasket (4), use a plastic hammer gently
6. Remove remaining screws (19) and spring washers (20)
7. Remove retainer ring (2) through the opposite side of the seat
8. Remove laminated seal (3) and seal gasket (4)
9. Clean the sealing surface on the disc carefully
10. Clean the seat surface on the body carefully. If necessary, polish the seat with abrasive paper 400 in circumferential direction

⚠ ATTENTION

Check the seat surface for any damage or dent marks. Replace body, if dent marks above 1mm are found.

9.2 Assembly of the disc sealing kit

1. For better positioning and centering, we recommend inserting a Ø 5 h8 pin into the bore offset against the shaft by 90° in disc (5),
2. Apply the end seal (4) to the sealing face of the disc (5). The end seal (4) must be aligned so that the mark points towards the diagonal side of the cone seat in the housing.



Replacement of Spare Parts **Disc Sealing Kit**

3. Apply lamella seals (3) with the larger side of the cone onto the end seal (4), so that the pin will position the lamella seal (3).



4. Apply the clamp lid (2) to the lamella seal (3), with the pin running through the bore in the clamping lid (2) and align the disc bores (5) with the screw bores.
5. Turn in the screws (19) with the spring discs (20), but do not tighten them. The screw heads (19) must not be in contact with the spring discs (20).
6. Turn the flap disc (5) into the closing direction until a second pin ($\varnothing 5$ h8) can center the disc (5), lamella seal (3) and clamping ring (2).
7. Slightly close the fitting so that the lamella seal (3) just touches the housing seat.
8. Slightly tighten the screws (19) manually, so that the clamp lid (2) still remains movable; then remove the 2 pins.



9. To float in the lamella (3), the flap is firmly closed (e.g. with an installed manual gear). The clamping lid (2) is clamped automatically in this process by ejecting the lamella seal (3). Additionally, 2 screws (19) are tightened with the torque according to table 12.4 and released again. After releasing the screws (19), align the clamping lid (2) and center it against the housing seat (1).
10. Tighten all screws (19) crosswise with the torques per table in this document (see page 17: Further Information)
11. Tighten gland nuts (25) if loosened during disassembly

12. Make a leakage test
13. Keep the valve closed for min. 24 h
14. Retighten the retainer screws (19) after 6 h or at the time of installation of the valve in the pipeline

ATTENTION

The screws of the seal retainer are to be retightened with a torque wrench prior to the installation of the butterfly valve into the pipeline (see also warning note on the seal retainer). The required torques are to be taken from the table on page 17 or the detailed assembly and maintenance manual.

Replacement of Spare Parts **Body Gasket Kit**

10. Maintenance on Body Gasket Kit (BGK)

The following table shows the content of the BGK and which options are included. The items are shown in the exploded view.

Body Gasket Kit (BGK)

Item	Designation
7	Cover Gasket
14	Packing
35*	O-Ring

*Chemical gland flange design only

10.1 Disassembly

For the replacement of the recommended spare parts it is necessary to remove the valve from the pipe. The valve has to be turned into the closed position. It is recommended to replace the spare parts in a workshop.

⚠ ATTENTION

If lifting tools (for example ropes) are necessary to carry the valve to the workshop the actuator should be free from heavy load and the valve and actuator must not be damaged.

⚠ ATTENTION

For shut-off flaps with single-acting drives, the drive must be in the safety position for reasons of safety in order to exclude accidental switching during installation. Danger to safety!

1. Remove actuator or gear from valve taking care to remove drive key (31) from slot in stem.
2. Keep the valve in horizontal position with screws (19) on the top.
3. Turn the disc (5) into lightly open position that the laminated seal has no more contact to the seat. Loose gland nuts (25) (for chemical gland flange design loose screws (24)) lightly to open the disc. If necessary, open the disc careful by using a plastic-hammer.
4. Turn valve 90° to a vertical position and open the disc (5) to a fully open position. A plastic hammer can be used to open the fitting by turning the disc with slight beats.
5. Remove the packing gland nuts (25), gland studs (24) and gland flange (17). If chemical gland flange design remove gland studs (24) and O-ring (35).
6. Remove retaining ring (32).
7. Remove cover screws (21), cover (6) and cover gasket (7).

8. Remove threaded pin (22) to lose shaft (10) from the disc (5)
9. Remove shaft retainer (8), fixing pin (9) and thrust ring (34) (if available) by pressing the shaft (10) out of the cover side of the body (1)



10. Remove the shaft (10) and upper bearing (11) by pulling them out of the body (1) through the top flange side
11. Remove gland (16) and all other rings like spacers (27) (28) and lantern rings (13) (33) if available from shaft (10) together packing (14)

10.2 Inspection

Inspect the valve components for wear or damage. Be sure to carefully inspect stem (10) for nicks, cracks, breaks or other defects.

Clean all areas thoroughly remove all signs of corrosion and media build-up. Recommended surfaces are

- sealing surfaces for cover gasket (7) at body (1) and cover (6)
- sealing surface of packing (14) at body (1) and shaft (10)
- bearing surface at shaft (10)
- sealing surface for O-ring (35) at shaft (10) for chemical gland flange design only

10.3 Assembly

1. Ensure that disc keys (23) and upper bearing (11) are installed on the shaft (10). The bearings had to be greased on the inner diameter with a paste of molybdenum-sulfite-basis.



Replacement of Spare Parts **Body Gasket Kit**

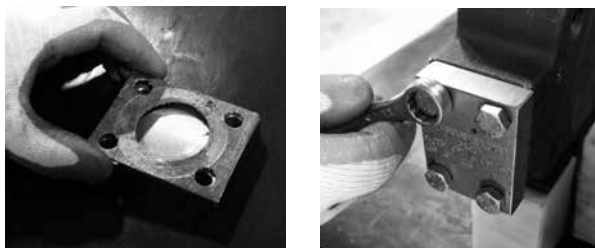
2. Install shaft (10) from top flange side into the body (1) through the disc (5)



3. Reinstall thrust ring (34) (if available), shaft retainer (8) and fixing pin (9)



4. Install cover (6) with cover gasket (7) onto the body (1) and tighten the cover screws (21) with torque purs. to table 12.7.



5. Check free space between disc (5) and bearings (11)



6. Reinstall gland (16), all other rings like spacers (27) (28) and lantern rings (13) (33) if available onto the shaft (10) together with packing ring (14), but each packing ring separately and turned by 180° mounted to the previous ring. According to table 12.6 two packing rings need to be injected and the shaft (10). The completely pressed package must be switched 30 times.



7. Reinstall shaft retainer ring (32)



8. Reinstall gland studs (24), gland flange (17) and gland nuts (25). If chemical gland flange design reinstall gland studs (24) and O-ring (35). Lubricate the pin screws (24) and the support faces of the nuts (25) on the stuffing sleeve flange for tightening to the defined torque.



9. Reinstall the threaded pin (22) and fix the disc (5) on the shaft (10)
10. Reassemble drive keys (31) and actuator or gear

Replacement of Spare Parts Shaft Bearing Kit

11. Maintenance on Shaft Bearing Kit (SBK)

The following table shows the content of the SBK and which options are included. The items are shown in the exploded view.

Shaft Bearing Kit (SBK)

Item	Designation
11	Bearing
12 *	Bearing Protector inside
37 **	Packing Ring

*Standard bearing design only
 **Pressure tight bearing design only

11.1 Disassembly

For the replacement of the recommended spare parts it is necessary to remove the valve from the pipe. The valve has to be turned into the closed position. It is recommended to replace the spare parts in a workshop.

ATTENTION

If lifting tools (for example ropes) are necessary to carry the valve to the workshop the actuator should be free from heavy load and the valve and actuator must not be damaged.

ATTENTION

For shut-off flaps with single-acting drives, the drive must be in the safety position for reasons of safety in order to exclude accidental switching during installation. Danger to safety!

Please follow instructions from Body Gasket Kit disassembly process on page 14 from step 1-10 before you start with step 1:

1. Remove lower bearing (11). If Pressure Tight Bearing Design remove also packing ring (37) and support ring (38)
2. Remove bearing protector (12) from bearings (11)

11.2 Inspection

Inspect the valve components for wear or damage. Be sure to carefully inspect stem (10) for nicks, cracks, breaks or other defects.

Clean all areas thoroughly remove all signs of corrosion and media build-up. Recommended surfaces are

- sealing surfaces for cover gasket (7) at body (1) and cover (6)
- sealing surface of packing (14) at body (1) and shaft (10)

- bearing surface at shaft (10)
- sealing surface for O-ring (35) at shaft (10) for chemical gland flange design only

11.3 Assembly

When reassembling the valves, it is recommended that new seal components be used to minimize the chance of external leakage. Body Gasket Kits are available containing new seals for repairing Crane®FKX 9000 valves.

NOTE: All holes must be free of any media or foreign debris.

1. Install bearing protector (12) into both bearings (11) and assemble upper bearing (11) to the shaft (10). The bearings had to be greased on the inner diameter with a paste of molybdenum-sulfite-basis. If Pressure Tight Bearing Design install also packing ring (37) and support ring (38) to upper bearing (11)



Please follow instructions from Body Gasket Kit assembly process on page 15 from step 1-2 before proceed with step 2:

2. Install lower bearing (11) to the shaft (10). The bearings had to be greased on the inner diameter with a paste of molybdenum-sulfite-basis. If Pressure Tight Bearing Design install also packing ring (37) and support ring (38) to lower bearing (11)



Please follow instructions from Body Gasket Kit assembly process on page 15 from step 3-10 to complete valve assembly.

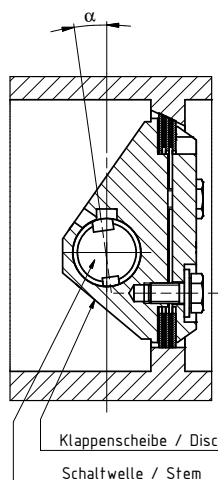
Crane®FKX 9000 Further Informations

12. Further Informations

12.1 Notes opening angle

Crane®FKX 9000 valves shafts are equipped with an integrated offset to prevent leakage of the valve as a result of a possible setting of the laminated seal. To provide a complete opening of the valve while using manually gearboxes and electric actuators the shaft offset must be compensated by adjusting the limit stops of the manual gearbox respectively electric actuator.

When using a non-adjustable pneumatic actuator an opening angle of 90° cannot be realized with the offset of the valves shaft. To reach an opening angle of 90° a pneumatic actuator with adjustable limit stops is required to compensate the valves shaft offset.



12.2 Table of offsets PN10 - 40, ASME Class 150 / 300

DN	NPS	α [°]
80 - 125	3" - 5"	8
150 - 600	6" - 24"	5

12.3 Table of offsets PN63 / 100, ASME Class 600

DN	NPS	α [°]
80 - 200	3" - 8"	10
250 - 400	10" - 18"	8

12.4 Table of torques PN 10 - 16, ASME Class 150

DN	NPS	Screw \varnothing	MA [Nm]
80 - 250	3"-10"	M6	10
300	12"	M8	20
350 - 400	14"-16"	M10	34
450 - 500	18"-20"	M12	45
600	24"	M16	109
700	28"	M12	73
750	30"	M16	134
800	32"	M16	141
900	36"	M16	159
1000	40"	M16	163
1050	42"	M16	187
1200	48"	M16	182

12.5 Table of torques PN 25 - 40, ASME Class 300

DN	NPS	Screw \varnothing	MA [Nm]
80 - 250	3"-10"	M6	10
300	12"	M8	20
350 - 400	14"-16"	M10	34
450 - 500	18"-20"	M12	45
600	24"	M16	109
700	28"	M20	300
750	30"	M20	335
800	32"	M20	352
900	36"	M24	596

12.6 Table of torques PN 63 - 100, ASME Class 600

DN	NPS	Screw \varnothing	MA [Nm]
80 - 100	3"-4"	M5	6
150	6"	M6	10
200	8"	M8	24
250 - 300	10"-12"	M10	45
350 - 400	14"-18"	M12	60

Crane® FKX 9000 Further Informations

12.7 Table gland nut torques Class 150

DN	NPS	Screw ø	MA [Nm]
80	3"	7/16" - 14 UNC	23,5
100	4"	7/16" - 14 UNC	28
150	6"	1/2" - 13 UNC	40
200	8"	5/8" - 11 UNC	79
250	10"	5/8" - 11 UNC	79
300	12"	5/8" - 11 UNC	88
350	14"	5/8" - 11 UNC	105
400	16"	3/4" - 10 UNC	147
450	18"	1" - 8 UNC	349
500	20"	1" - 8 UNC	371
600	24"	1" - 8 UNC	560
700	28"	1" - 8 UNC	448
750	30"	1" - 8 UNC	448
800	32"	1" - 8 UNC	498
900	36"	1" - 8 UNC	548
1000	40"	1 1/8" - 8 UN	821
1050	42"	1 1/8" - 8 UN	821
1200	48"	1 1/4" - 8 UN	1056

12.8 Table gland nut torques Class 300

DN	NPS	Screw ø	MA [Nm]
80	3"	7/16" - 14 UNC	23,5
100	4"	7/16" - 14 UNC	28
150	6"	1/2" - 13 UNC	40
200	8"	5/8" - 11 UNC	79
250	10"	5/8" - 11 UNC	79
300	12"	5/8" - 11 UNC	88
350	14"	5/8" - 11 UNC	105
400	16"	3/4" - 10 UNC	147
450	18"	1" - 8 UNC	349
500	20"	1" - 8 UNC	371
600	24"	1" - 8 UNC	560
700	28"	1 1/8" - 8 UN	821
750	30"	1 1/8" - 8 UN	821
800	32"	1 1/4" - 8 UN	981
900	36"	1 1/4" - 8 UN	1056

12.9 Table cover screws torques Class 150

DN	NPS	Screw ø	MA [Nm]
80 - 100	3" - 4"	5/16" - 18 UNC	15
150 - 250	6" - 10"	3/8" - 16 UNC	29
300	12"	1/2" - 13 UNC	65
350 - 400	14" - 16"	5/8" - 11 UNC	126
450 - 500	18" - 20"	3/4" - 10 UNC	245
600	24"	1" - 8 UNC	343
700	28"	9/16" - 12 UNC	72
750	30"	9/16" - 12 UNC	72
800	32"	5/8" - 11 UNC	95
900	36"	5/8" - 11 UNC	111
1000	40"	3/4" - 10 UNC	163
1050	42"	3/4" - 10 UNC	163
1200	48"	3/4" - 10 UNC	210

12.10 Table cover screws torques Class 300

DN	NPS	Screw ø	MA [Nm]
80 - 100	3" - 4"	5/16" - 18 UNC	15
150 - 250	6" - 10"	3/8" - 16 UNC	29
300	12"	1/2" - 13 UNC	65
350 - 400	14" - 16"	5/8" - 11 UNC	126
450 - 500	18" - 20"	3/4" - 10 UNC	245
600	24"	1" - 8 UNC	343
700	28"	3/4" - 10 UNC	163
750	30"	3/4" - 10 UNC	163
800	32"	3/4" - 10 UNC	186
900	36"	3/4" - 10 UNC	210



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