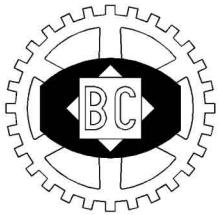


# Installation, operation and maintenance manual



## TAPER PLUG VALVES

### Product group 5.

Immediately before the pressure test,  
the valve must be relubricated.

After the pressure test, the  
valve must be lubricated  
again whilst in the open  
position. If possible  
the valve should  
remain in the  
open position  
until it is put  
into service.



**ISO 9001 CERTIFIED**

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**GB**

The design is based on the well-known construction of the Pressure Balanced Plug Valve, which means that the plug is provided with pressure balance holes to ensure that the plug is always in axial balance. This prevents the plug from taper locking. Furthermore, in order to reduce the valve torque, the surface of the plug is coated with a P.T.F.E. film.

Since the only moving part in the valve is the plug, the basic operation of the BC valve is very simple. When the plug is turned 90°, the valve change from closed to open position – and vice versa.

The plug and the operating stem are two separate parts which are connected by means of the equalizer ring acting as a universal joint. The operating stem is Blow-out proof. This means the only way to remove it is from the bottom after the valve is disassembled. The plug is tapered 1:6 and is individually fitted to the valve body with very close tolerances. It is a Metal to Metal sealing, which means that no soft seal will be damaged of the flowing medium. As a secondary seal, the valve is provided with a lubrication system which allows feeding a special lubricant into the valve while the valve is in operation. Besides sealing, the purpose of the lubricant is to protect the internals of the valve against corrosion and wear as well as reducing the valve torque.

With three independent stem seals the sealing of the BC valve is unique. The complete system consists a stem seal (4), a reinforced P.T.F.E. thrust plate (6) and a fire seal of 100% pure graphite with a stainless steel back-up ring (41). The graphite stem seal is very efficient at extremely high temperatures. This design meets or exceeds the strict requirements and demands of several different standards relative to fire safe design.

The primary seal (4) is placed at the top of the stem. This can be a P.T.F.E. (Teflon) sealing ring with an embedded spring of Hasteloy C or a solid elastomer ring. The sealing ring can be replaced from the outside. The sealing ring is kept in place by the stem bearing (2) and the snap ring (25). In addition to the stem seals mentioned, the wrench operated valve has a weather-proof seal to prevent penetration of water and dirt to the operating stem, and sealing ring.

The bottom cover (9) is bolted on to the valve body with the studs (13a) and the nuts (13). Two flexible diaphragms (15)+(28) are placed in a recess between the valve body and the bottom cover. The diaphragms function as a metal seal between the valve body and the bottom cover and they also prevent the medium from leaking at the plug adjustment arrangement.

The plug adjustment arrangement consist of the pressure screw (11), the retaining ring (14) and the bottom screw / flange cap (12). Adjustment of the plug is done by turning the pressure screw (11) clockwise or counter-clockwise. The pressure screw (11) is locked by means of the retaining ring (14), when the bottom screw / flange cap (12) is tightened.

The diaphragms are flexible and the bending will be negligible after the adjustment.

As mentioned, the valve is provided with a lubrication system which allows injection of a special lubricant into the valve through lubricant screws (24) and check valves (21). The lubricant is injected into a network of grooves by means of a special high pressure lubricant gun. This network system ensures that all seal faces are supplied with a thin coat of lubricant and by so doing becomes an efficient secondary seal.

The BC valves can be supplied as wrench operated or gear operated valves.

Moreover the valves can be supplied with a top-flange and stem for mounting of any kind of actuator.

From the Factory the plug is adjusted to the conical bore of the body, and normally it should never be readjusted. Readjusting is only done when the valve – even after an effective lubrication, - is not tight.

Note that adjustment of the plug is a difficult operation, and should be done by a qualified service mechanic only.

### Adjustment Procedure: (See picture below)

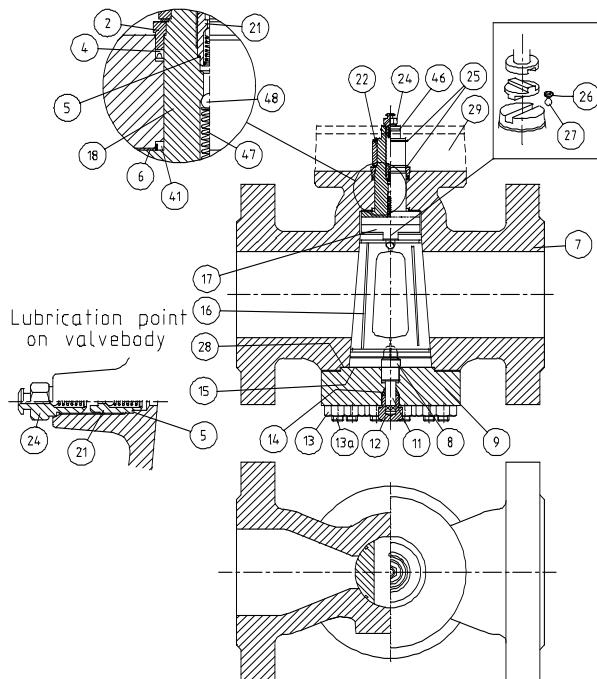
First the bottom screw / flange cap (12), placed on the underside of the bottom cover, is dismounted. Then the adjustment pressure screw (11) is tightened clockwise very slowly, while the plug is turned forwards and backwards if possible.

The adjustment is a matter of “feeling”, there is no exact tighten torque figure. As a guidance it can be observed, that the operating torque of the valve increases, when direct contact between the plug and the body has been obtained. After the adjustment, the bottom screw cap is re-mounted. The adjusting can be done without dismounting the valve from the pipeline.

### Important:

Normally it is advisable not to turn the adjustment pressure screw outwards, (counter-clockwise), because particles from the medium can penetrate into the resulting gap between the plug and body. This can cause damage to the seating surfaces and make proper readjustment of the plug impossible. Only in case that the plug is stuck, (even after a normal relubrication), the following procedure should be carried out: Dismount the bottom screw / flange cap (12). Turn the pressure Screw (11)  $\frac{1}{2}$  turn counter-clockwise. Lubricate the valve using the top mounted lubricant fitting. This will force the plug down out of the body taper and against the bottom adjustment bearing surface. The valve should then become easily operable. Return the pressure screw (11) clockwise while the plug is turned forwards and backwards. Proceed until the proper torque is felt at valve operation. Mount the bottom screw / flange cap (12).

- 2. Stem Bearing
- 4. Sealing Ring
- 5. Gasket
- 6. Thrust Plate
- 7. Body
- 8. Distance Piece
- 9. Bottom Cover
- 11. Pressure Screw
- 12. Bottom Screw Cap
- 13. Nut
- 13a. Stud
- 14. Retaining Ring
- 15. Diaphragm
- 16. Plug
- 17. Equalizer Ring
- 18. Operating Stem
- 21. Check Valve
- 22. Parallel Key
- 24. Lubricant Nipple/Screw
- 25. Snap Ring
- 26. Spring
- 27. Ball
- 28. Diaphragm
- 29. Gear
- 41. Fire Seal
- 46. Sealing Ring
- 47. Spring
- 48. Ball



The valve is grease packed, i.e. the plug rests on a lubricant film in the valve body.

The lubricant has three functions: to protect the internal closing surfaces of the valve from corrosion, to seal the valve, and to contribute to low torque. With an eye for achieving the best possible action, it is therefore important to relubricate the valve.

Lubrication is carried out with a BC-Lubricant Gun (Manually with type BC-1 or Pneumatically with type BC-2, see page 6).

The tube of the lubricant gun has a "push-on-head" for direct connection to the lubricant nipple / lubricant screw of the valve.

The valve must be in fully open position when it is relubricated. Where the medium is compressible (e.g. air or gas) relubrication can also take place in the fully closed position.

Do not lubricate too fast - the lubrication pressure must be allowed to distribute itself.

If possible make a few minor movements of the plug to further the distribution of the lubricant on the sealing surfaces.

On valves with more than one lubricant point, one half of the lubricant is distributed at the valve top while the other half is distributed at the valve bottom.

The interval and quantity of lubricant for relubrication depends on the working conditions, for instance the temperature, the operating frequency, and the need for tightness. (A high working temperature dries up the lubricant).

In cases, where the medium is non aggressive and the temperature is low, the need for relubrication will be small. It is a matter of experience, but as a guideline and starting point, the values in the table below can be used.

Valve size DN	Quantity of lubricant In cm <sup>3</sup>	Number of strokes		Number of units on the indicator Gun type BC-2
		Gun type BC-1	Gun type BC-2	
1"	1,3	1	1	
1 1/2"	1,5	1	2	
2"	1,8	1	2	
2 1/2"	2,0	1	2	
3"	2,4	2	3	
4"	4,0	3	4	
6"	10,0	6	10	0,10
8"	30,0	17	30	0,30
10"	45,0	25	45	0,45
12"	65,0	36	65	0,65
14"	95,0	52	95	0,95
16"	135,0	75	135	1,35
18"	180,0	100	180	1,80
20"	235,0	130	235	2,35
24"	325,0	180	325	3,25



Working temperature	Up to 140°F/60°C	140°F/60°C- 250°F/120°C	250°F/120°C- 400°F/200°C
Interval for relubrication	12 months	6 months	3 months

The lubrication of the gear follows the principle of dry lubrication, meaning that a layer of antisizing paste with a content of molybdenum disulphide is applied to bearings, teeth and worms. Bearings are lubricated through lubricating nipples.

The gear is lubricated at the factory and needs no lubrication within the first year of valve action.

### Relubrication of gear:

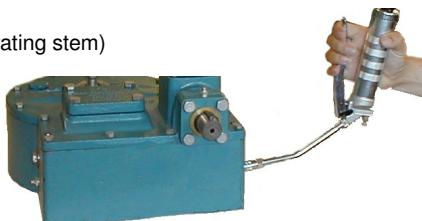
The gear bearings are lubricated through grease nipples. Shown below is the arrangement of the grease nipples on the two BC gear types. The toothed quadrant, wheels and worms are, as a rule, never relubricated. However, in case of operation difficulties where a "screaming" sound occur, lack of lubrication is normally the problem. For gear type C and D, a removal of the gear covers is necessary to make the gear parts accessible. The lubrication paste is then applied to all tooth-rims of both worms and worm wheels in a layer of about 1 mm. (Concentrated powdered molybdenum disulphide cannot be recommended, as the layer thickness here is too thin). Recommended lubricant for bearings, worms and gears: BCH G10.

Gear type C and D are supplied with 2 threaded drain plugs - one on the top an one in the bottom. One of these plugs has a pressure relief valve. Please notice: This plug must always be placed in the correct hole, depending on the type of lubrication and installation position. If the gear is lubricated as described above, the pressure relief plug shall be placed in the lower hole. If the gear is filled with soft grease (described below), it is placed in the upper hole.

Lubricant gun, see page 6.

Gear type C  
(Horizontal operating stem)

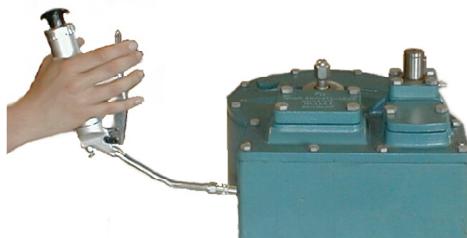
Lubrication of bearings



Lubrication of  
worm and worm gear



Gear type D  
(Vertical operating stem)



If required the worm gears can be supplied with soft grease.  
The gearbox will be filled with sufficient grease approximately 70% of the gearbox-volume.  
Grease type: Castrol Grippa 355

### REMARK: Overpressure protection.

In case of any third party mounting an actuator/gear/stem extension on a valve without our standard gearbox, means shall be provided of preventing pressure build-up in the assemblies.  
(Resulting from a stem seal leakage.)

### Manual Lubricant gun type BC-1 for valve lubrication



Cartridge for  
Lubricant Gun



The lubricant gun type BC-1 is manual operated, which means that the lubricant is pressed into the valve by a high pressure piston pump, when the arm is moved. By turning the handle at the rear end of the gun, the lubricant is pressed forwards against the piston pump. The handle is turned approximately 1/2 turn for each two/three strokes.

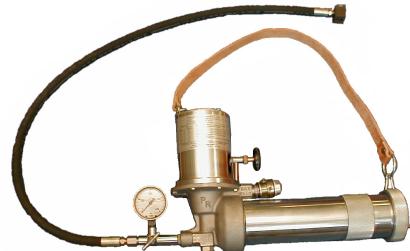
The lubricant is delivered in 300 ccm cartridges.

### Pneumatic Lubricant Gun type BC-2 – 330

Input air pressure: Max. 8 bar (115 Psi).

Output pressure at 8 bar (115 Psi):

330 bar (4785 Psi).



### Pneumatic Lubricant Gun type BC-2 – 1000

Input air pressure: Max. 8 bar (115 Psi).

Output pressure at 8 bar (115 Psi):

1000 bar (14500 Psi).

The lubricant gun type BC-2 is pneumatic, and it requires a pneumatic pressure between 5 to 8 bar to work properly. The speed of the strokes is adjusted by a handle at the gun.

The gun is provided with a manometer, and the output lubricating pressure depends on the working pressure of the valve. For steel valves the lubricating pressure is approximately 275 bar above the working pressure. The accurate lubricating pressure can also be seen from a table, placed on the gun.

The lubrication gun is provided with an oil reservoir, which has to be refilled when it is empty.

**The lubricant is delivered in 1250 ccm cartridges.**



The pneumatic lubricating gun is recommended when a larger number of valves have to be lubricated.

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### Gun type 315-2 for gear lubrication

Grease for gear  
type BCH G10 in a 1 kg can.



**Standard Lubricants** - mainly to be used.

Lubri- cant no. BC	Colour of com- pound	Temperature Range °C      °F		RECOMMENDATIONS
80	Black	- 10 +180	+14 +356	<b>Cold and hot water</b> up to 180°C, conditional up to 200°C. Cold and hot air. 50% lye up to 50°C conditional up to 100°C, 50% acids up to 50°C, inorganic saline solutions up to 100°C, steam conditional up to 200°C. Suitable for town gas, propane, butane and natural gas. Not suitable for gas condensate.
711	Black	- 10 +225	+14 +437	<b>Petroleum products.</b> Butane and propane (max. 100°C). Gasoline, kerosene, asphalt and bitumen, oils and most hydrocarbon solvents. Also suitable for gases (max. 170°C). Cold and hot air. Not suitable for hot water, strong alkalis and aromatic solvents.

**Special Lubricants** - normally to be used only where the standard lubricants cannot be used.

For exceptional working conditions and services not mentioned in the table, please ask for further information.

Lubri- cant no. BC	Colour of com- pound	Temperature Range °C      °F		RECOMMENDATIONS
40	Clear	- 10 +100	+14 +212	Cold and warm water. General Aqueous Solutions. Alcohols.
45	Yellowish-beige clear	- 10 +130	+14 +266	For water at max. 100°C, drinking-water, beer, mineral water, milk, cocoa, cream, ammonia compound, acids and alkali desinfecant, fruit-acid and alcohol.
60	White	- 30 +250	- 22 +482	All diluted and concentrated acids and lyes, fluorine, chlorine, bromine, iodine, phosphorus oxychloride, ozone, hydrogen peroxide, all organic solvents (except hydrogen fluoride), all mineral, vegetable and animal oils and fats. Do not affect elastomers and plastics.
103	Green	- 30 +200	- 22 +392	General purpose synthetic sealant for liquid and gaseous aliphatic hydrocarbon service suitable for gasoline, kerosene, fuel oils, crude distillates, aviation and jet fuel, natural gas. Not suitable for steam, aromatic solvents, strong acids and alkalies.
280	Black	- 10 +200	+14 +392	Cold and hot air up to 200°C. Cold and hot water up to 180°C. Cold and hot gases up to 150°C. Not suitable for strong acids, petroleum products and aromatic and chlorinated solvents.
*330	White	- 30 +250	-22 +482	Hot water and gases. Natural gas, propane, butane, asphalt and bitumen. General chemical aqueous solutions eg. alkalis and dilute acids. It is useful for hot air. Not suitable for light liquid hydrocarbons, aromatic and chlorinated solvents and strong mineral acids.

\* This type of lubricant ought to be avoided, if one of the other types can be used, as this contains silicone oil. The operating torque of the valve will increase considerably.

## Max. pressures and min. temperatures

Table for PS, (max. pressure) in **psi/bar**, at TS = -20°F / -29°C, (min. temp.).

Standard class designated valves.

Pressure / temperature rating in acc. to ASME B16.34.

Material	Rating Class						
	150	300	400	600	900	1500	2500
ASTM A216 Gr.WCB	285/19,6	740/51,1	985/68,1	1480/102,1	2220/153,2	3705/255,3	6170/425,5
ASTM A352 Gr.LCC	290/19,8	750/51,7	1000/68,9	1500/103,4	2250/155,1	3750/258,6	6250/430,9
ASTM A352 Gr.LC2	290/19,8	750/51,7	1000/68,9	1500/103,4	2250/155,1	3750/258,6	6250/430,9
ASTM A216 Gr.WCC	290/19,8	750/51,7	1000/68,9	1500/103,4	2250/155,1	3750/258,6	6250/430,9
ASTM A352 Gr.LCB	265/18,4	695/48,0	930/64,0	1395/96,0	2090/144,1	3480/240,1	5805/400,1
ASTM A351 Gr.CF3M	230/15,9	600/41,4	960/66,2	1200/82,7	1800/124,1	3000/206,8	5000/344,7
ASTM A351 Gr.CF8M	275/19,0	720/49,6	960/66,2	1440/99,3	2160/148,9	3600/248,2	6000/413,7
ASTM A890 Gr.4A*	290/20,0	750/51,7	1000/68,9	1500/103,4	2250/155,1	3750/258,6	6250/430,9
ASTM A890 Gr.5A*	290/20,0	750/51,7	1000/68,9	1500/103,4	2250/155,1	3750/258,6	6250/430,9
ASTM A352 Gr.CA6NM*	290/20,0	750/51,7	1000/68,9	1500/103,4	2250/155,1	3750/258,6	6250/430,9
*Not incl. in ASME B16.34							

Table for PS, (max. pressure) in **psi/bar**, at TS = 20°F / -29°C, (min. temp.).

Standard class designated valves.

Pressure / temperature rating in acc. to ASME B16.1.

Material Cast Iron	Rating Class			
	125		250	
	1/2" - 12"	14" - 36"	1/2" - 12"	14" - 36"
ASTM A 126 Class B	200 / 13,8	150 / 10,3	500 / 34,5	300 / 20,7

Table for PS, (max. pressure) in **psi/bar**, at TS = -20°F / -29°C, (min. temp.) for steel valves, and TS = 14°F / -10°C for cast iron valves.

Standard PN (Pressure Nominal) designated valves.

Pressure / temperature rating in acc. to DIN 2401 Teil 2.

	Rating PN									
	6	10	16	25	40	64	100	160	250	320
Cast Iron (All types)	87/ 6	145/ 10	232/ 16	363/ 25						
Steel (All types)		145/ 10	232/ 16	363/ 25	580/ 40	928/ 64	1450/ 100	2320/ 160	3625/ 250	4640/ 320

Table for PS, (max. pressure) in **psi/bar**, at TS = 482°F / 250°C, (max. temp.).

Standard class designated valves.

Pressure / temperature rating in acc. to ASME B16.34.

Material	Rating Class						
	150	300	400	600	900	1500	2500
ASTM A216 Gr.WCB	170/12,1	605/41,9	805/55,9	1205/83,9	1810/125,8	3015/209,7	5025/349,5
ASTM A352 Gr.LCC	170/12,1	665/46,3	885/61,7	1330/92,7	1995/139,0	3325/231,8	5540/386,2
ASTM A352 Gr.LC2	170/12,1	665/46,3	885/61,7	1330/92,7	1995/139,0	3325/231,8	5540/386,2
ASTM A216 Gr.WCC	170/11,7	665/45,9	885/61,0	1330/91,7	1995/137,6	3325/229,3	5540/382,0
ASTM A352 Gr.LCB	170/11,7	665/45,9	885/61,0	1330/91,7	1995/137,6	3325/229,3	5540/382,0
ASTM A351 Gr.CF3M	150/10,5	395/27,5	635/44,5	785/54,9	1180/82,4	2665/137,3	3280/228,9
ASTM A351 Gr.CF8M	170/12,1	480/33,4	635/44,5	955/66,8	1435/100,1	2390/166,9	3980/278,1
ASTM A890 Gr.4A*	170/12,1	665/40,5	885/53,9	1330/80,9	1995/121,4	3325/202,3	5540/337,2
ASTM A890 Gr.5A*	170/12,1	665/40,5	885/53,9	1330/80,9	1995/121,4	3325/202,3	5540/337,2
ASTM A352 Gr.CA6NM*	170/12,1	665/46,3	885/53,9	1330/80,9	1995/121,4	3325/202,3	5540/337,2
* Not incl. in ASME B16.34							

Table for PS, (max. pressure) in **psi/bar**, at TS = 248°F / 120°C, (max. temp.).

Standard class designated valves.

Pressure / temperature rating in acc. to ASME B16.1.

Material Cast Iron	Rating Class					
	125			250		
	1/2" - 12"	14" - 24"	30" - 36"	1/2" - 12"	14" - 24"	30" - 36"
ASTM A126 Class B	175/12,1	125/8,6	85/5,9	415/28,6	260/17,9	200/13,8

Table for PS, (max. pressure) in **psi/bar**, at TS = 482°F / 250°C, (max. temp.) for steel valves, and TS = 248°F / 120°C for cast iron valves.

Standard PN designated valves.

Pressure / temperature rating in acc. to DIN 2401 Teil 2.

	Rating PN									
	6	10	16	25	40	64	100	160	250	320
Cast Iron (All types)	87/ 6	145/ 10	232/ 16	363/ 25						
Steel (All types)		145/ 10	232/ 16	363/ 25	580/ 40	928/ 64	1450/ 100	2320/ 160	3625/ 250	4640/ 320

The limits for max. / min. temperatures and pressures are with reservation for other limits determined by national legislation and other valve standards.

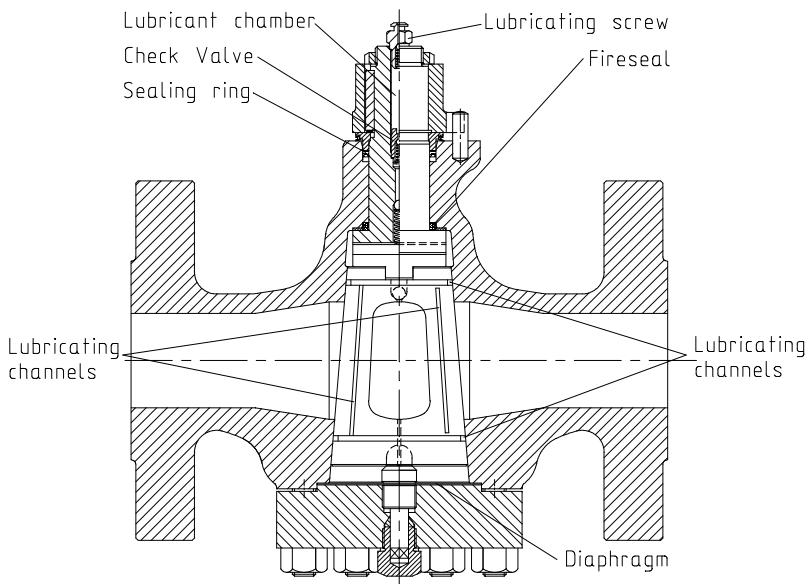
The limits for the max. / min. temperatures does not cover all types of lubricants and sealing rings.

## **Max. pressures and min. temperatures**

The limits for max. / min. temperatures and pressures are with reservation for other limits determined by national legislation and other valve standards.

The limits for the max. / min. temperatures does not cover all types of lubricants and sealing rings.

1. Place the plug in the "Open" position before the installation.
2. The valve can be installed in any position required. (Horizontal, vertical etc.).
3. Before mounting the valve in the pipe system, be sure there are no trapped materials in the passage way of the valve. Remove any trapped materials if found.
4. Avoid exposing the valve to pipe tensions. The pipe arrangement has to be designed in such a way that pipe tensions are minimised.
5. The lubricating points of the valve should be easily accessible.
6. There must be sufficient space for operating and repair of the valve. (Removal of bottom cover etc.).
7. Avoid to damage the lubricant screw. If this occurs it should be replaced.
8. Large and heavy valves are lifted by using the special lifting lugs placed on the valve body. Smaller valves without lifting lugs are lifted with lifting straps wrapped around the valve body.  
**Important:** If the valve is mounted with an actuator, do **not** lift the valve with straps attached to the actuator. The main lift shall always be in the valve body. Straps attached to the actuator shall be for the purpose of position control only. This shall also be observed when the valve is mounted with an extension. If possible do always use soft straps that do not harm the valve coating.
9. Before the pressure testing:  
It is important to relubricate the valve before the pressure testing. The valve is fully lubricated from Brdr. Christensen ApS, but experience shows, that even after a careful lubrication a small amount of air may be left in the lubricating system. During time, if the valve is not serviced, this air might expand to small air pockets. This can cause leaks. Therefore, as a rule, the valve should be relubricated before the pressure testing.



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