INSTALLATION AND SERVICE INSTRUCTIONS
MECHANICAL PINCH VALVE TYPE RV

Index

NOTE: IF YOU HAVE AN ATEX VALVE, USE ASLO THE SPECIAL INSTRUCTIONS (RV-EN HO 038.0)

1.0 SAFETY AND STORAGE

1.1 Safety

Keep clear of moving components around the mechanical pinch valve type RV. The actuating mechanism generates substantial forces which can cause bodily harm and damage to tools and equipment in the path of moving parts (Fig. 1).

WARNING: The RV Valve is carefully tailored for specific applications. To ensure the safety of equipment and personnel, **DO NOT** install the mechanical pinch valve in a different application without first consulting AKO Armaturen & Separationstechnik GmbH.

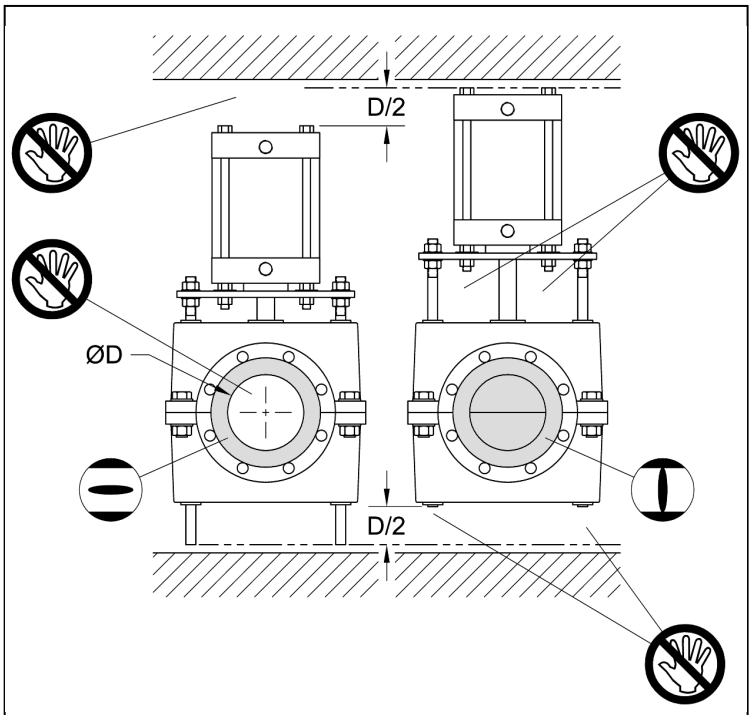

Figure 1: *Beware the pinch points around the RV Valve.*

1.2 Storage Instructions

- RV Valves are to be stored and transported in a dry, clean environment, protected from direct sunlight and condensate water. Temperature for storage is between -13°F to 104°F (-25°C to 40°C).
- RV Valves are to be protected against mechanical damage or force (shock, blow, vibration, etc).
- RV Valves should be transported and stored in the open position.

1.3 Care for Fluid Power Components

Fluid power components (actuators, solenoid valves, air sets, etc) should have protective plugs placed in their ports to keep out dust, foreign objects, and moisture.

1.4 Care for Spare Sleeves

Spare sleeves are to be stored in a dark environment protected against direct sunlight and UV-radiation. Take measures to prevent the sleeve from coming into contact with oils, solvents, and other aggressive chemicals. Temperature for storage is between -13°F to 104°F (-25°C to 40°C).

2.0 INTRODUCING

2.1 Operating Principles

A valve is used to control the flow within a pipe. The RV Valve does this by pinching closed an sleeve in-line with the pipe (Fig. 2). Throttling of the flow can be accomplished by partially pinching the sleeve.

Note how the actuator rises, moving away from the valve body, approximately ½ the nominal diameter of the pipeline as the RV Valve closes. A single actuator drives opposing pinch bars together to pinch the sleeve along the centerline.

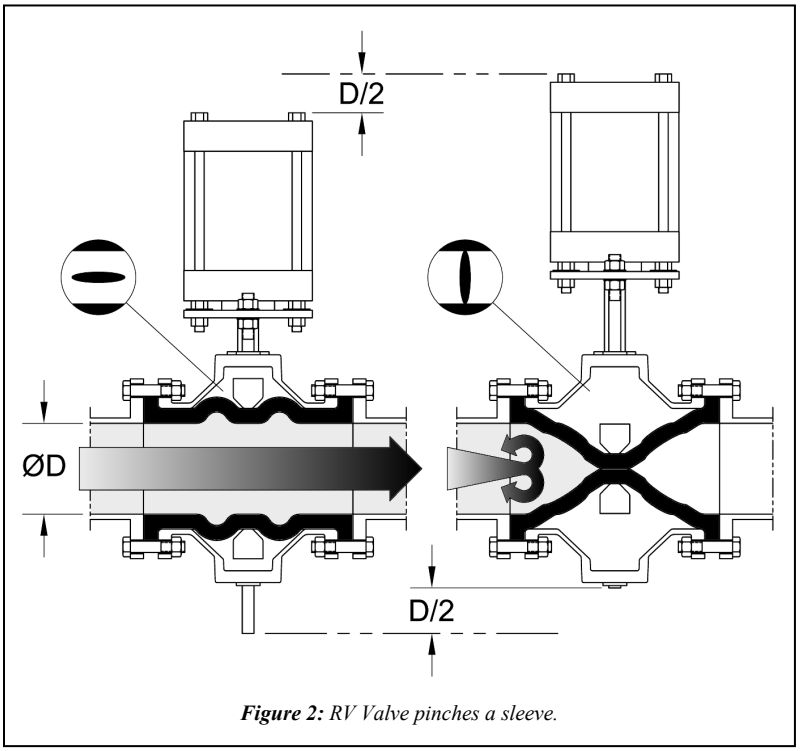

Figure 2: *RV Valve pinches a sleeve.*

2.2 Best Use for an RV Valve

The RV Valve excels in applications in which solids are present in the flow media like waste water, slurries, tailings from mines, paper pulps, etc. The RV Valve seals on solids and resists abrasion that will quickly ruin a metal seated valve (Fig. 3). Other valve designs in the same applications fail due to their inability to close on solids or their seats erode away preventing shut-off due to abrasive slurries.

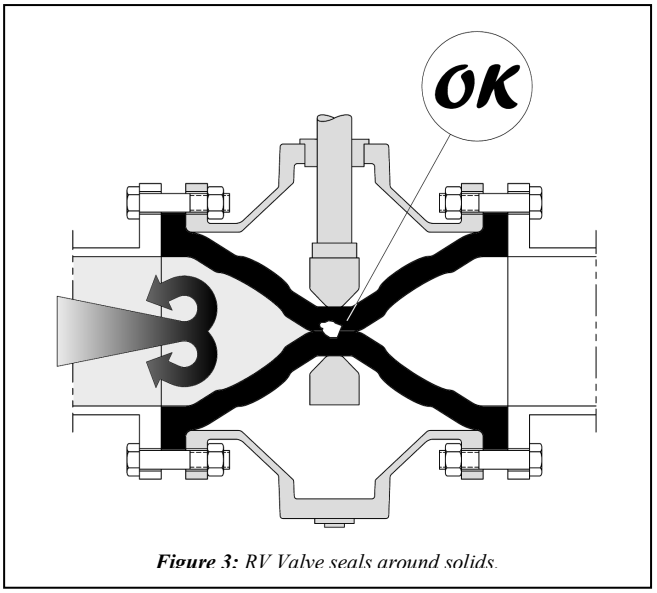

Figure 3: *RV Valve seals around solids.*

2.3 RV Valve's Patented Arch Design

The purposes of the patented arches are:

- To allow the face-to-face length of the RV Valve to meet various piping standards (for example ASME B16 and DIN 3202 F5). This enables direct replacement of any valve with common, standard face-to-face dimensions in the field without having to modify piping (Fig. 4). With its patented arch design, the RV Valve sleeve flexes, or stretches, during closure while conforming to a standard face-to-face dimension. Other pinch valves that have straight sleeves and longer face-to-face dimensions must stretch to close the valve increasing fatigue and wear.

- To provide greater resistance to abrasion in slurry applications since the RV Valve sleeve is flexed, not stretched, during closure. Just as it is easier to cut rubber under tension than when it is relaxed, sleeves that stretch during closure experience increased wear (Fig. 5).

With the unique, patented design of the arched sleeve; the RV Valve has unequalled performance in the industry.

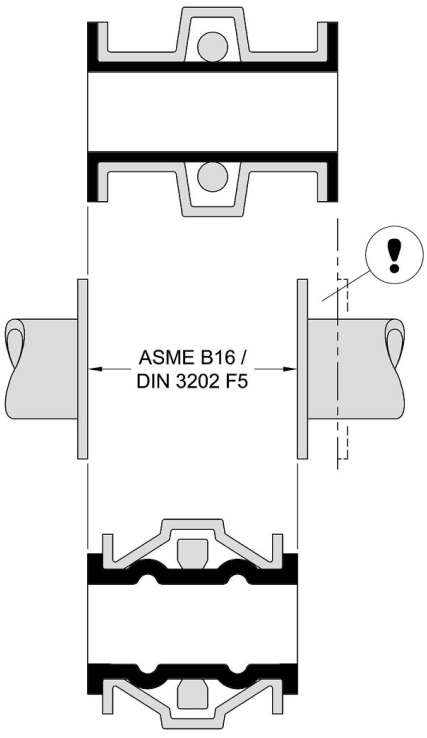

Figure 4: *RV Valve has standard face-to-face.*

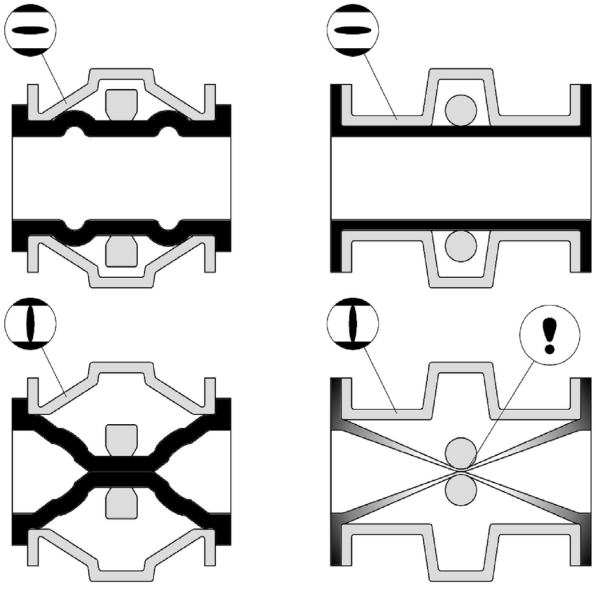

Figure 5: *RV Valve's relaxed sleeve is wear resistant.*

2.4 What Are Those Wire Leads Coming Out of the RV Valve Sleeve?

This paragraph does not apply for ATEX VALVES.

RV Valve sleeves have an optional feature in which a continuous, spiral loop of conductive filament is molded within the wear lining of the sleeve. This spiral loop is called wear monitoring sensor, or MONSYS. The two wire leads, if present, emerging from a rubber tab on the sleeve's flange (Fig. 6) are the ends of the spiral loop.

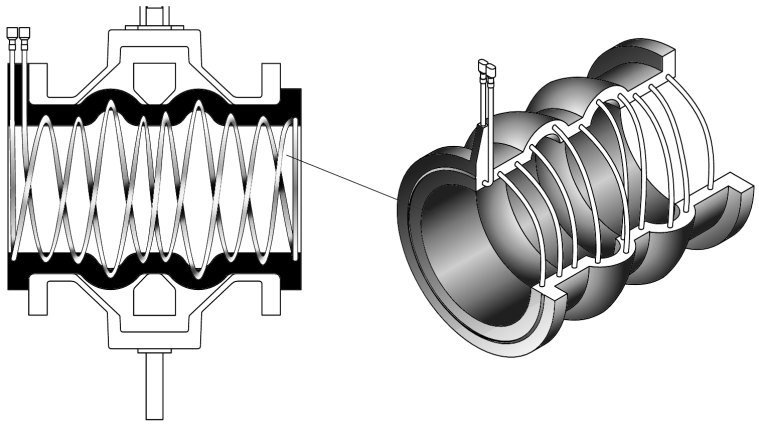

Figure 6: *Wire leads are the ends of the wear sensor*

Just a simple 'go/no-go' check of the resistance of the wire leads using an ohm-meter (Fig. 7) can indicate if the wear lining is intact. Intact sleeves will have a resistance value less than 4MΩ. Once approximately 75% of the wear rubber has been eroded the wear monitoring wire will be exposed and eventually disintegrate causing an open circuit. An ohm meter will indicate infinite resistance (zero conductivity) when this occurs.

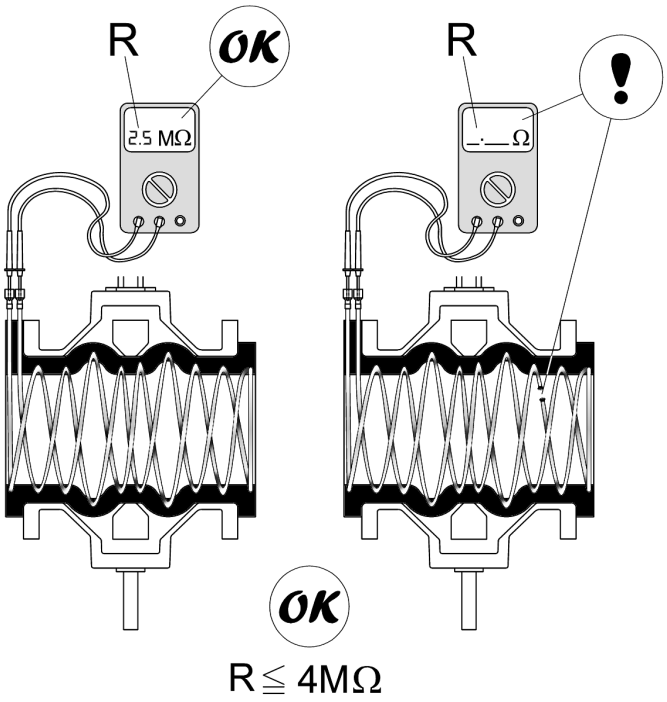

Figure 7: *Use an ohm meter to check the wear sensor*

This test can be conducted in real time while the RV Valve is operational on the pipeline. There's no need to go through the expense of shutting down the process to take the RV Valve out of the pipeline in order to visually inspect the wear lining.

Once the wear monitoring sensor indicates that the wear rubber is sufficiently eroded, preventive maintenance can be scheduled knowing that approximately 25% of the wear rubber remains intact.

3.0 INSTALLATION

3.1 Pipeline and Actuator Orientation Recommendations

Typical installations of the RV Valve should have the actuator oriented above the sleeve and the motion of the actuator should be as close to vertical as possible. Other orientations are permissible within the guidelines illustrated below:

VERTICAL PIPE
(*pipe angled 30° or more above/below horizon*):
actuator can be oriented in any direction as shown in Figure 8.

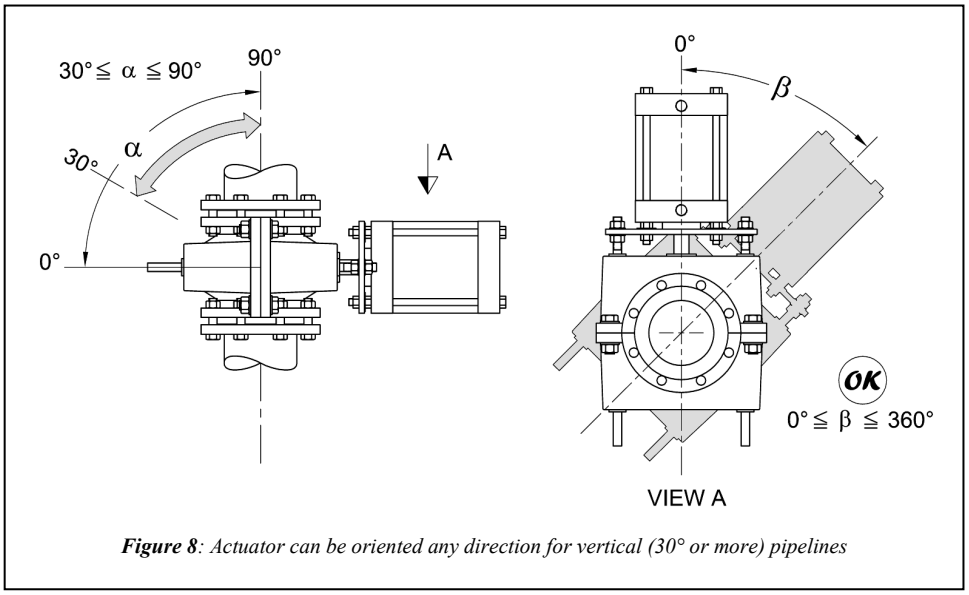

***Figure 8**: Actuator can be oriented any direction for vertical (30° or more) pipelines*

HORIZONTAL PIPE
(pipe angled less than 30° above/below the horizon):
actuator should not be oriented sideways. Refer to Figure 9.

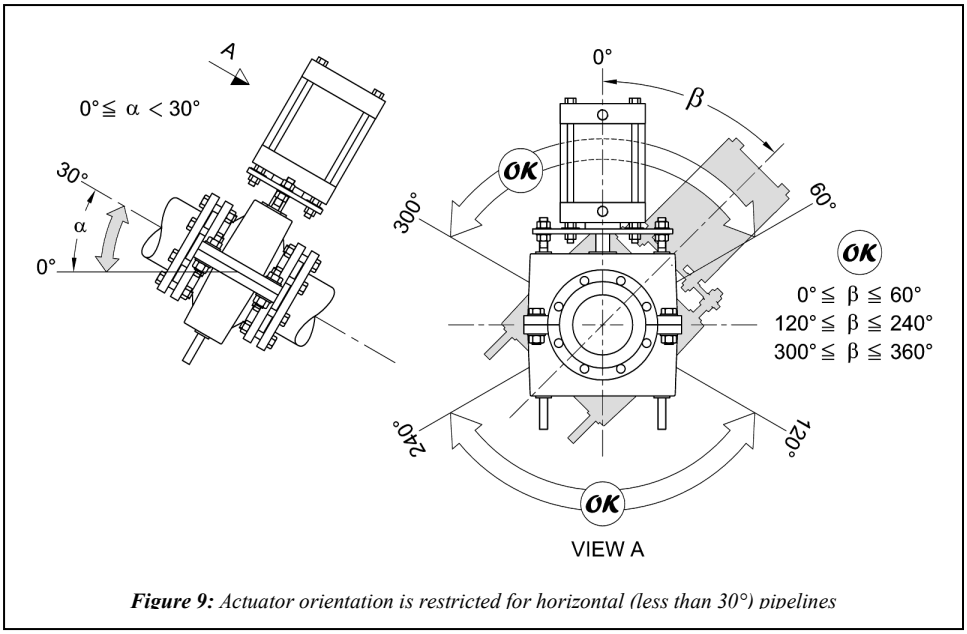

***Figure 9:** Actuator orientation is restricted for horizontal (less than 30°) pipelines*

3.2 *Supporting the Actuator for Vertical Pipelines*

It is recommended to support the actuator when the RV Valve is installed on a vertical pipeline. There are two methods of support: skid plate (Fig. 10) and overhead cable/chain (Fig. 11).

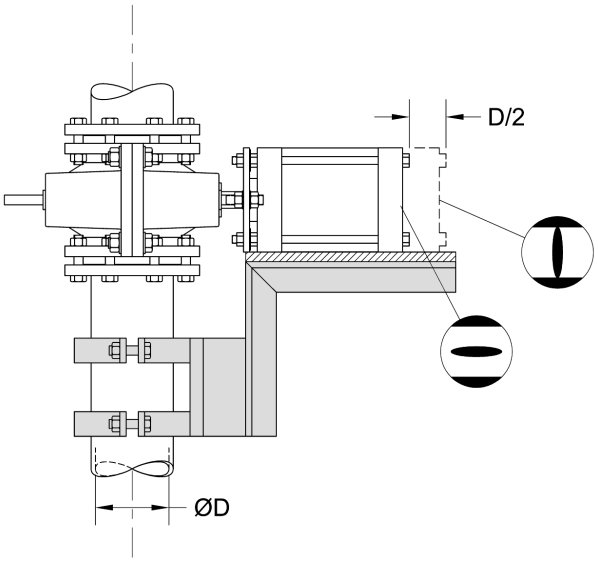

***Figure 10**: Skid plate support*

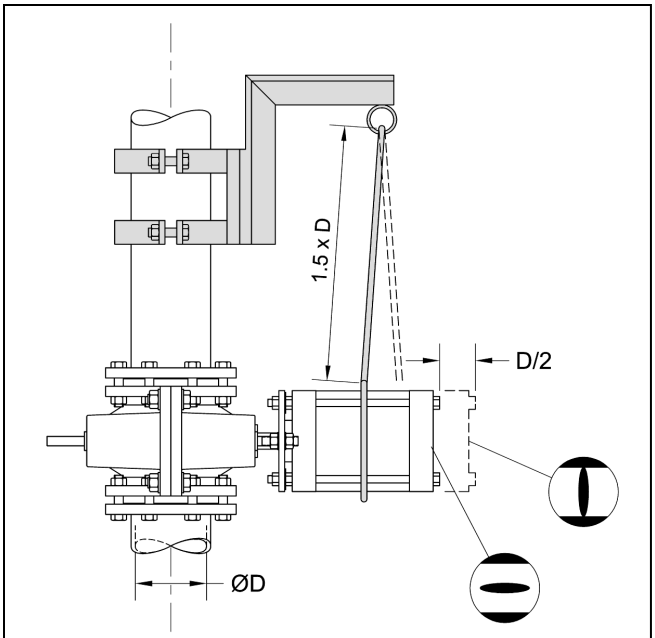

***Figure 11**: Overhead cable/chain support*

3.3 *Clearance for Rising Actuator*

The actuator rises as the RV Valve closes. Be certain there is sufficient clearance above the actuator greater than half the diameter of the pipeline (Fig. 12).

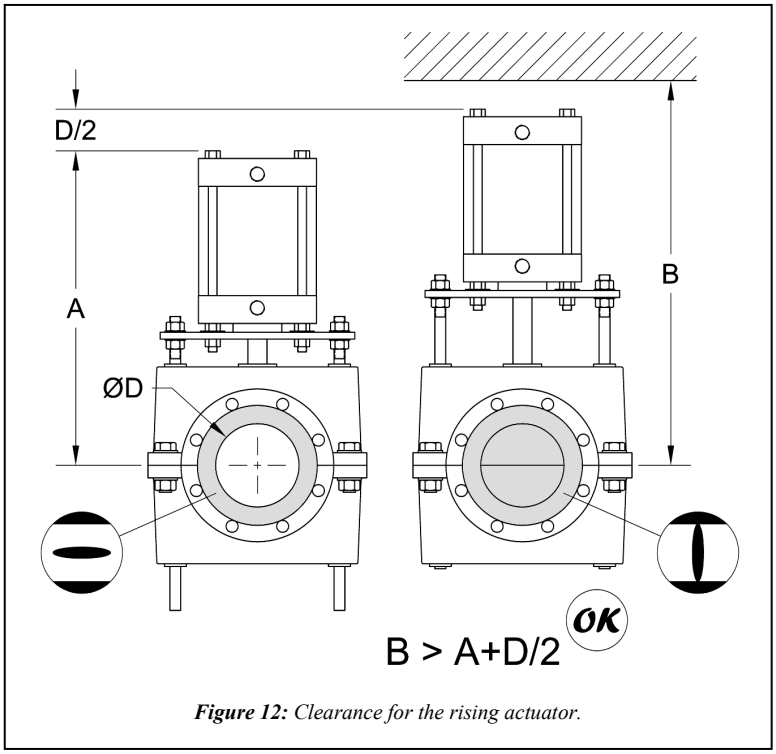

***Figure 12:** Clearance for the rising actuator.*

3.4 Clearance for Maintenance

It is important to install the RV Valve at a location where there is enough clearance to remove the lower body half (dimension C in Fig. 13) to make maintenance easier.

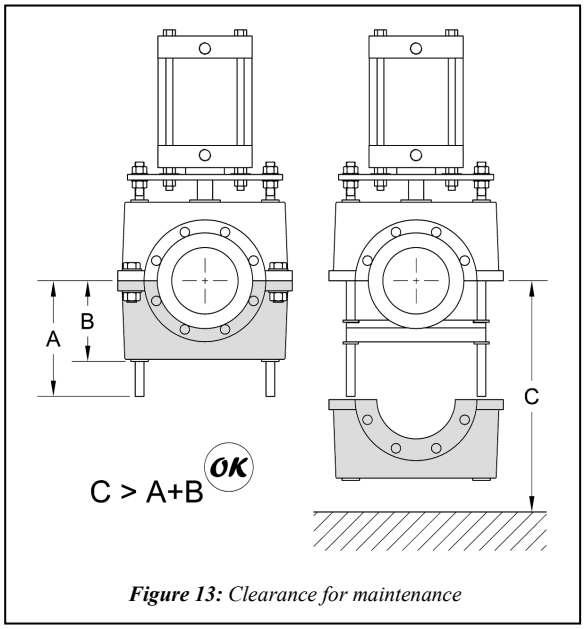

Figure 13: *Clearance for maintenance*

3.5 Pipe Movement

It is best to have some movement along the pipeline axis for at least one of the pipe flanges (Fig. 14).

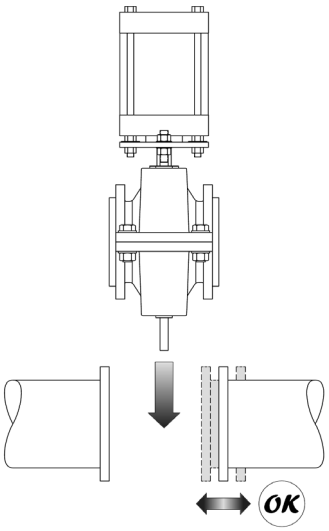

Figure 14: *At least one of the pipe flanges should be able to move along the pipeline axis.*

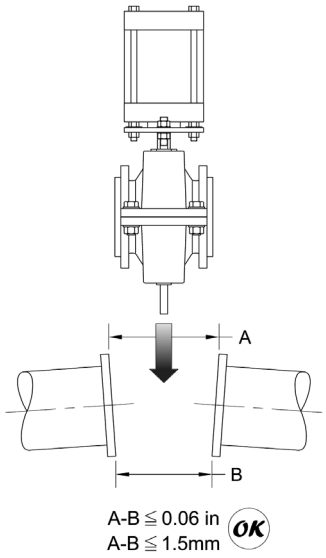

Figure 15: *Check for angular misalignment.*

3.6 Pipe Angular Misalignment

Make sure the pipe flanges are close to parallel (Fig. 15).

3.7 Flow Direction

Full port RV Valves are bi-directional. The RV Valve can be installed in any direction with regard to flow.

Reduced port RV Valves are uni-directional. Flow direction is from the inlet (the large opening ☛A in Fig. 16) to the outlet (the small opening ☛B in Fig. 16).

Look for an arrow on the exterior of the RV Valve® showing the proper direction of flow (Fig. 16).

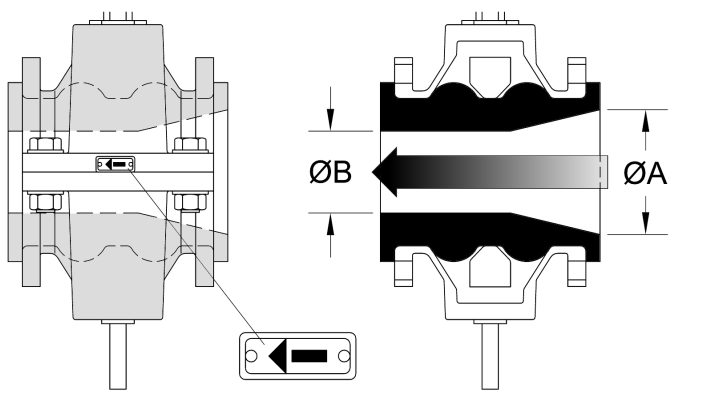

Figure 16: *Flow direction for reduced port sleeves.*

3.8 Flange Bolt Torque Requirements

Proper torque of the flange bolts is required when installing the RV Valve to the pipeline or the sleeve may be damaged.

STEP 1: Use Table 1 to determine the specified torque value for the RV Valve flange bolts.

Tabelle 1: Flange torque

DN		ANSI 150lbs		DIN PN10		DIN PN25		DIN PN40	
		Bolt thread	Torque	Bolt thread	Torque	Bolt thread	Torque	Bolt thread	Torque
mm	Zoll	Metric/ Zoll	Nm/ ft-lbf	Metric/ Zoll	Nm/ ft-lbf	Metric/ Zoll	Nm/ ft-lbf	Metric/ Zoll	Nm/ ft-lbf
25		M12x1,75	20	M12x1,75	12	M12x1,75	12	M12x1,75	12
	1	*1/2-13*	*27*	*1/2-13*	*9*	*1/2-13*	*9*	*1/2-13*	*9*
32		M12x1,75	20	M16x2,0	20	M16x2,0	20	M16x2,0	20
	1,25	*1/2-13*	*27*	*5/8-11*	*15*	*5/8-11*	*15*	*5/8-11*	*15*
40		M12x1,75	20	M16x2,0	20	M16x2,0	20	M16x2,0	20
	1,5	*1/2-13*	*27*	*5/8-11*	*15*	*5/8-11*	*15*	*5/8-11*	*15*
50		M16x2,0	20	M16x2,0	20	M16x2,0	20	M16x2,0	20
	2	*5/8-11*	*27*	*5/8-11*	*15*	*5/8-11*	*15*	*5/8-11*	*15*
65		M16x2,0	20	M16x2,0	25	M16x2,0	28	M16x2,0	30
	2,5	*5/8-11*	*27*	*5/8-11*	*18*	*5/8-11*	*21*	*5/8-11*	*22*
80		M16x2,0	30	M16x2,0	30	M16x2,0	35	M16x2,0	40
	3	*5/8-11*	*41*	*5/8-11*	*22*	*5/8-11*	*26*	*5/8-11*	*30*
100		M16x2,0	25	M16x2,0	30	M20x2,5	35	M20x2,5	40
	4	*5/8-11*	*34*	*5/8-11*	*22*	*3/4-10*	*26*	*3/4-10*	*30*
125		M20x2,5	30	M16x2,0	35	M24x3,0	40	M24x3,0	45
	5	*3/4-10*	*41*	*3/4-10*	*26*	*1-8*	*30*	*1-8*	*33*
150		M20x2,5	40	M20x2,5	45	M24x3,0	50	M24x3,0	60
	6	*3/4-10*	*54*	*3/4-10*	*33*	*1-8*	*37*	*1-8*	*37*
200		M20x2,5	50	M20x2,5	55	M24x3,0	60	M27x3,0	
	8	*3/4-10*	*68*	*3/4-10*	*41*	*1-8*	*44*	*1 1/8-7*	
250		M22x2,5	40	M20x2,5	55	Order related			
	10	*7/8-9*	*54*	*3/4-10*	*41*				
300		M22x2,5	40	M20x2,5	65				
	12	*7/8-9*	*54*	*3/4-10*	*48*				

STEP 2: Start with 50% of the required torque and tighten the bolts in a star pattern (Fig. 17).

STEP 3: Now use 100% of required torque and tighten the flange bolts in a star pattern (Fig. 17).

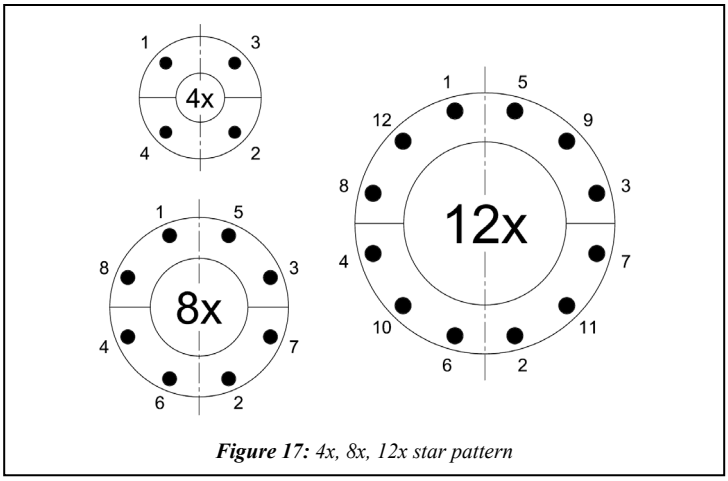

Figure 17: *4x, 8x, 12x star pattern*

STEP 4: It may take more than one sequence until the bolts are at 100% of specified torque. Repeat STEP 3 as necessary until all flange bolts are tightened 100%.

STEP 5: Once line pressure is introduced, check the flanges for leaks. If a leak develops, tighten the flange bolt(s) nearest to the origin of the leak in 10 ft-lbs (13 Nm) increments until the leaking ceases.

3.9 Flexible Lines to the RV Valve

When bringing electrical power and/or pneumatic/hydraulic lines to the RV Valve, or any installed accessories (for example: limit switches, solenoid valves, air-sets), make sure the lines are flexible. The actuator will rise approximately ½ the inner diameter of the RV Valve while closing (Fig. 18).

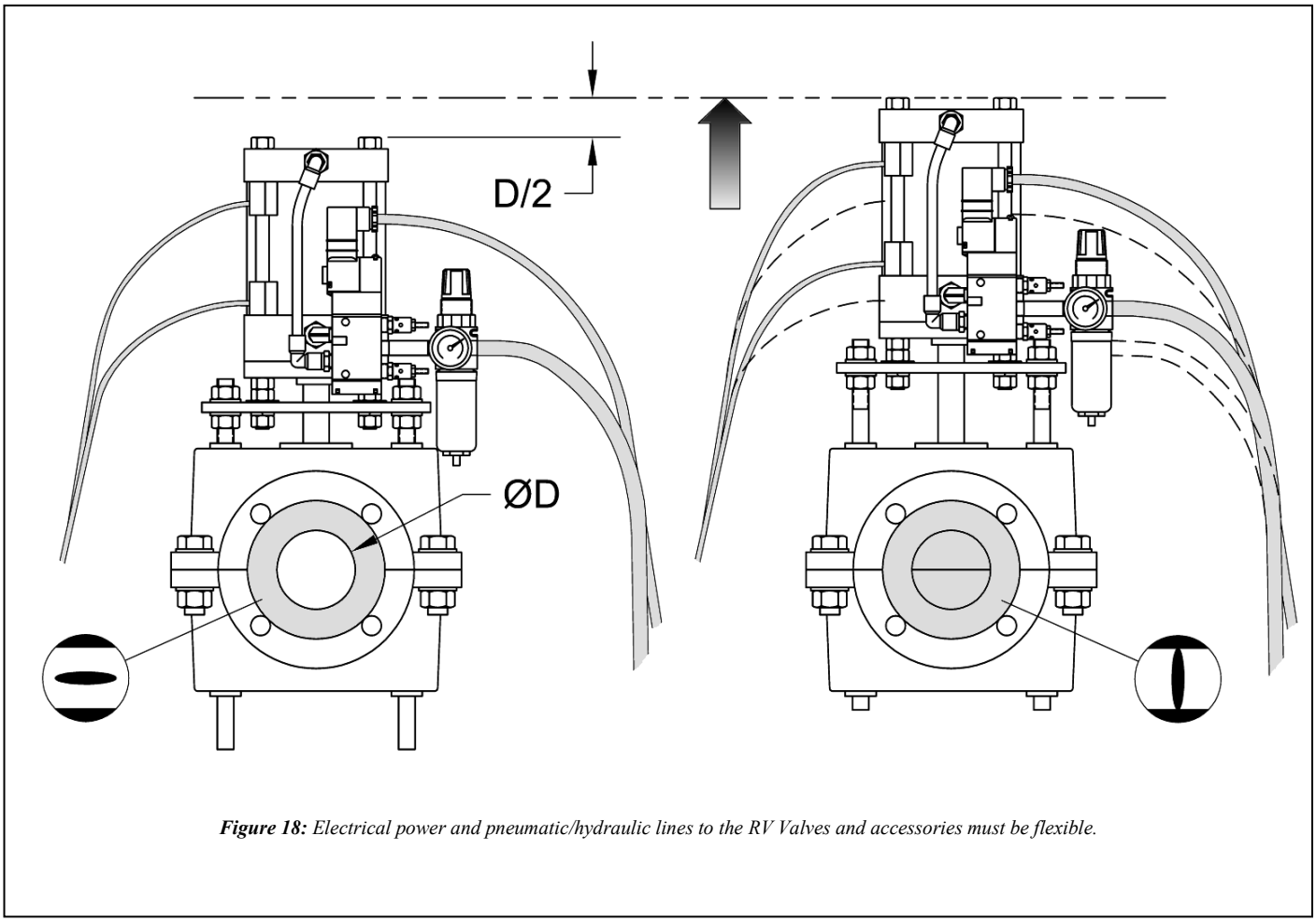

Figure 18: *Electrical power and pneumatic/hydraulic lines to the RV Valves and accessories must be flexible.*

4.0 MAINTENANCE

4.1 Changing the Sleeve – In-Line Tube Change

Follow the steps below to change out the sleeve while the RV Valve is installed in the pipeline.

STEP 1: RV Valve should be isolated from the plant process and actuated to its open position. Take appropriate measures to prevent accidental actuation of the RV Valve until it is ready to be put back in operation. Review section ***1.1 Safety*** about the pinch point hazards around the RV Valve.

STEP 2: Remove flange bolts (B) supporting the lower valve body (Fig. 19). Loosen, but do not remove, the flange bolts (A) supporting the upper valve body (Fig. 19).

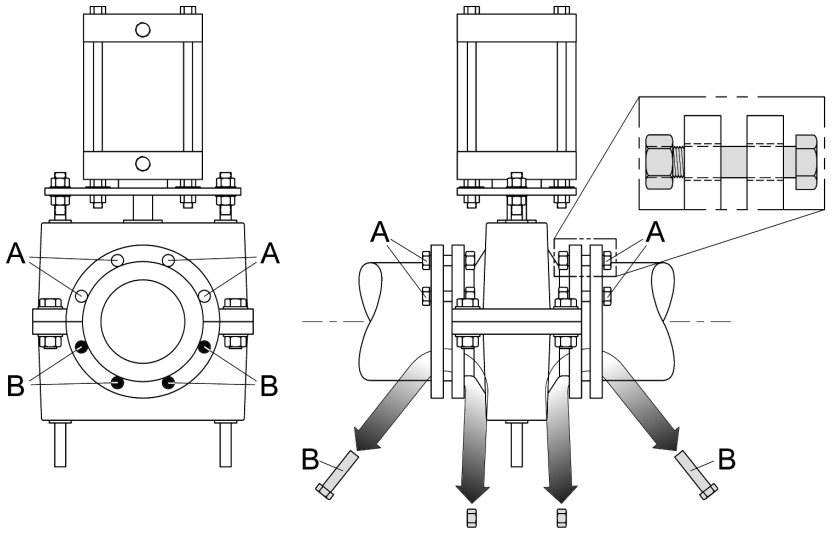

Figure 19: *Remove flange bolts (B) and loosen flange bolts (A).*

STEP 3: Remove the body bolts from the RV Valve to detach the lower valve body. Note that some RV Valves come equipped with guide pieces (see View A in Fig. 20). Do not lose them as they will be needed later for reassembly.

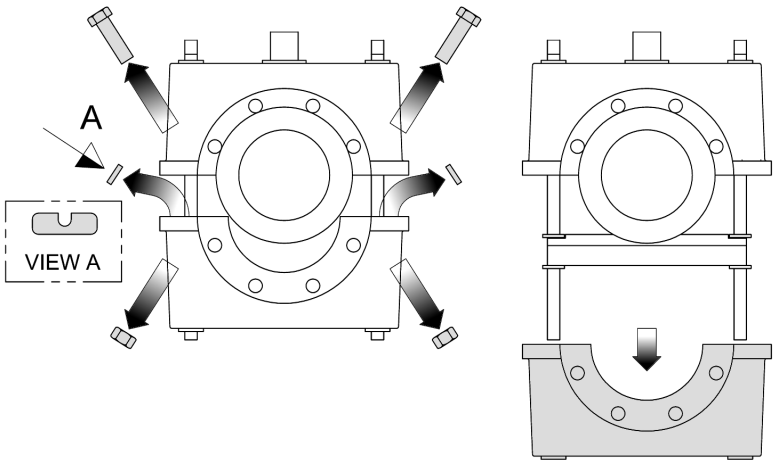

Figure 20: *Remove the body bolts and take away the lower valve body.*

STEP 4: Loosen the B-nut (Fig. 21). Take care that the A-nut does not turn. Spread the pull bars apart to take away the lower pinch bar and remove the sleeve.

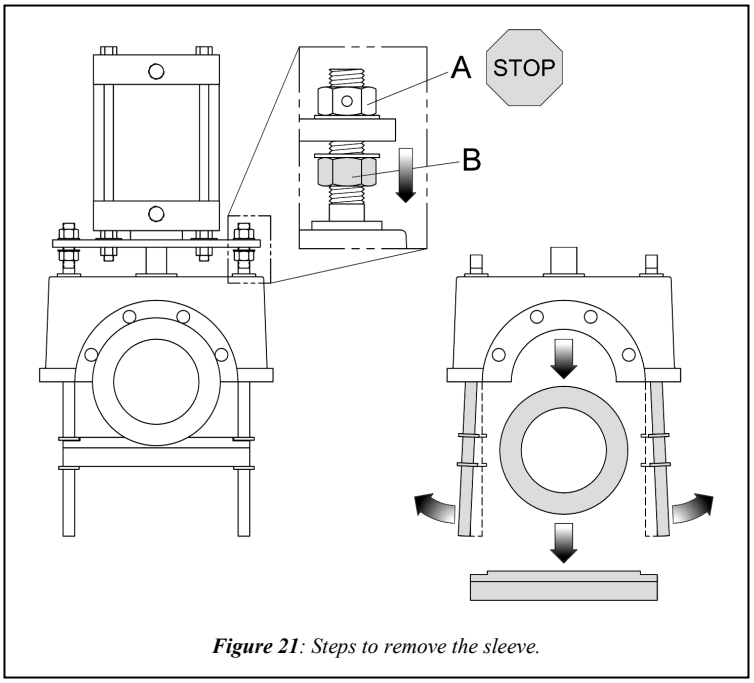

***Figure 21**: Steps to remove the sleeve.*

STEP 5: Install the replacement sleeve. Reverse STEPS 1 to 3 to reassemble the RV Valve. Ensure that the lower pinch bar is installed in the proper orientation (Fig. 22).

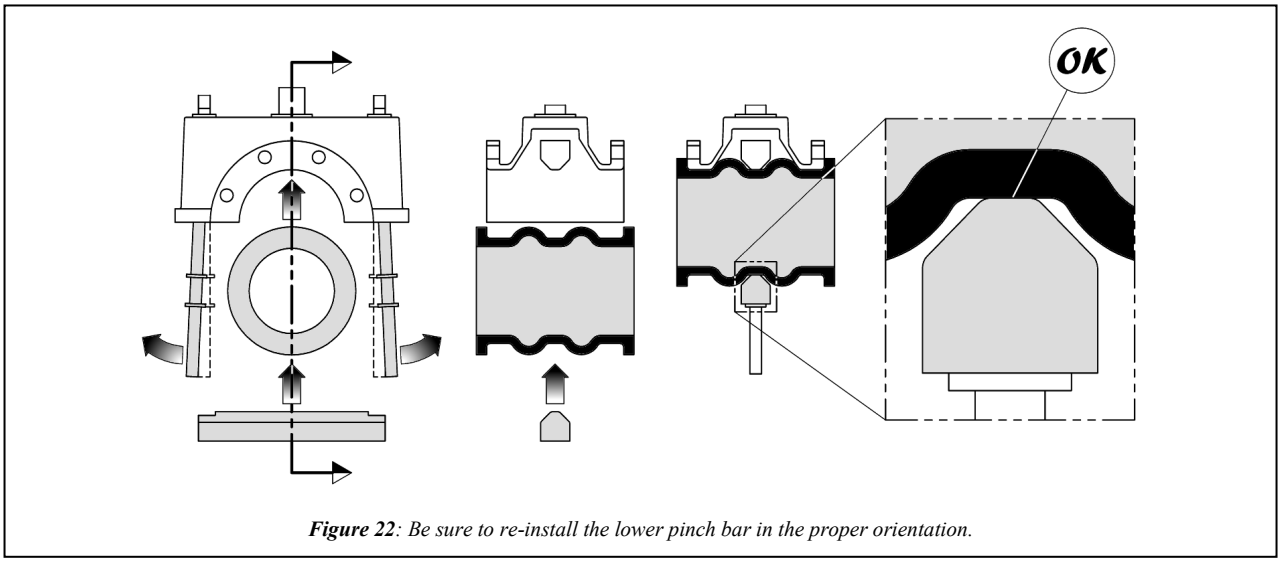

***Figure 22**: Be sure to re-install the lower pinch bar in the proper orientation.*

STEP 6: Once the RV Valve is reassembled, follow the procedures in section ***3.8 Flange Bolt Torque Requirements.***

4.2 Changing the Sleeve – RV Valve Off the Pipeline

STEP 1: Remove the RV Valve from the pipeline. Then place the RV Valve either standing on its actuator or lay it on the ground (Fig. 23). When laying the RV Valve down be sure not to crush any fragile accessories.

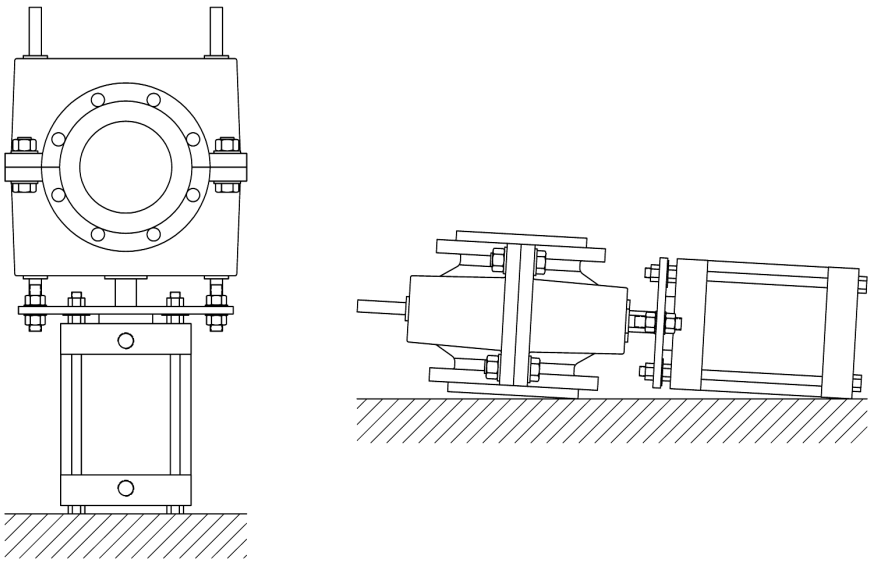

***Figure 23**: Two options to change the sleeve with the RV Valve off the pipeline*

STEP 2: The remaining procedures are the same as STEPS 2 to 5 shown in section ***4.1 Changing an Sleeve – In-Line Tube Change***.

4.3 Calibration

The RV Valve is factory calibrated to close with the amount of crush necessary to seal against the applicable line pressure. After calibration, a set screw is inserted into each of the A-nuts and a coating of rubber is applied to the pull bar threads above the A-nut (Fig. 24).

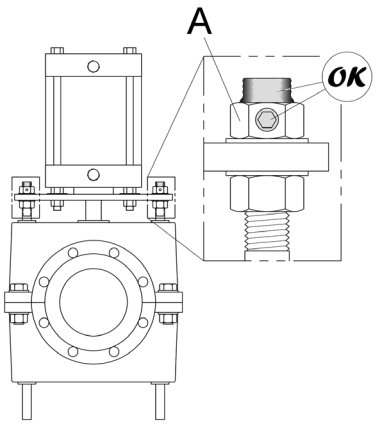

Figure 24: *Factory calibration is set with a set screw and a coating of rubber on the pull bar.*

Tampering with the A-nut will disturb the factory calibration which can have adverse effects on the sleeve and/or the function of the RV Valve.

Re-calibration becomes necessary when:

- it appears the A-nuts have been disturbed (for example: missing set screw and/or missing blue rubber coating). See Fig. 24.
- after removing the sleeve, deep cuts are found on the exterior of the sleeve where the pinch bars come into contact
- if wear inside the sleeve appears uneven
- DN250 and larger tubes are to be recalibrated always when doing tube exchange

If recalibration seems warranted, it's best to consult AKO Armaturen for confirmation. Contact information is at the bottom of the page.

STEP 1: Have a feeler gauge handy.
In addition the RV Valve must:

- be taken out of the pipeline
- have supply pressure available to actuate the RV Valve:
  - minimum 80psi (5.5 bar) for pneumatic actuators
  - minimum 1500psi (100 bar) for hydraulic actuators

STEP 2: Remove the set screw ① from each A-nut and cut/scrape away as much as possible the rubber coating above each A-nut (Fig. 25).

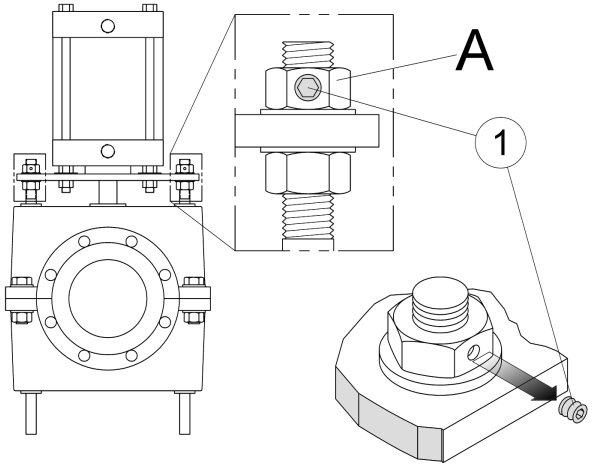

Figure 25: *Remove set screw from A-nut.*

STEP 3: Now loosen each A-nut until they come to the ends of their respective pull bar ② (Fig. 26).

STEP 4: Actuate the RV Valve closed. Be sure to use sufficient supply pressure as indicated in STEP 1. After actuation the RV Valve will not close completely. There will be a gap, X, inside (Fig. 27).

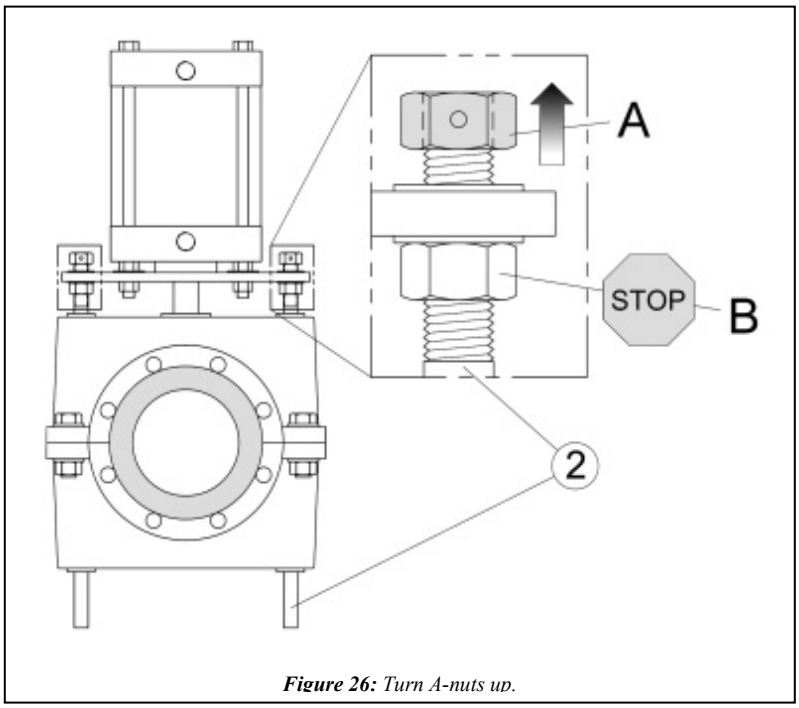

Figure 26: *Turn A-nuts up.*

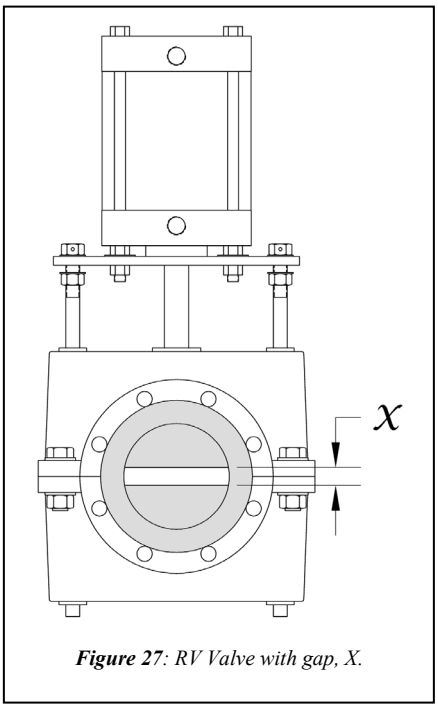

Figure 27*: RV Valve with gap, X.*

STEP 5: Determine the size of the gap, X, inside the RV Valve. Now turn both B-nuts away from the fastening plate ③ a distance X – 0.13” (or X – 3mm).

DO NOT turn the B-nuts away from the fastening plate ③ more than the measurement, X! (Fig. 28).

[EXAMPLE: If gap X is 0.25” (6mm) then the B-nuts should be turned away from the fastening plate ③ approximately 0.12” (3mm)]

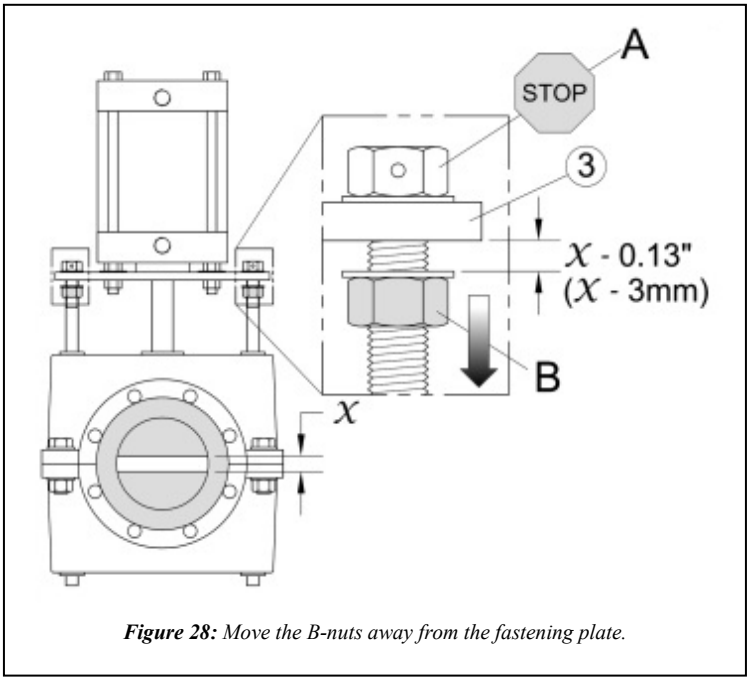

Figure 28: *Move the B-nuts away from the fastening plate.*

STEP 6: Actuate the RV Valve open and then turn the A-nuts against the fastening plate ③ (Fig. 29). DO NOT allow the B-nuts to turn along the pull bar ② during this step!

STEP 7: Actuate the RV Valve closed again and measure the size of the new gap, Y. It should be roughly 0.13" (3mm) in size (Fig. 30).

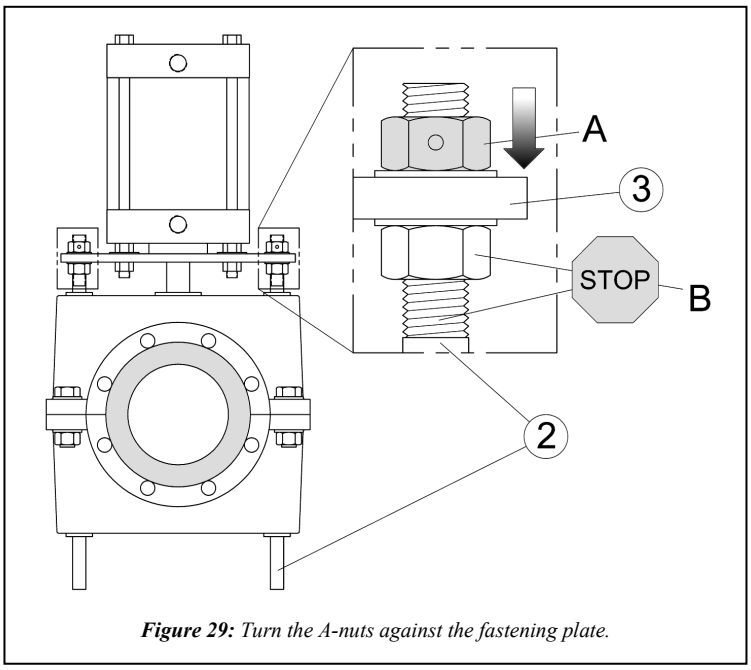

Figure 29: *Turn the A-nuts against the fastening plate.*

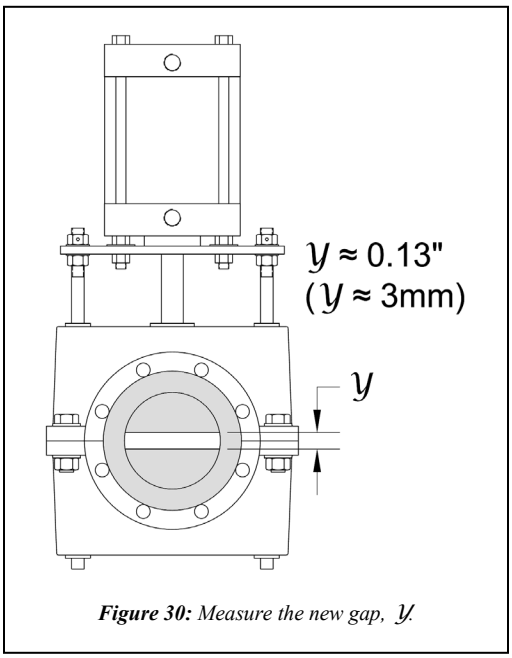

Figure 30: *Measure the new gap, y.*

STEP 8: The next objective is to make the gap inside the RV Valve 0.02" (0.5mm) AND the gap should be evenly distributed about the centerline of the RV Valve.

NOTE: one or two gaps may be present (Fig. 31). In the case of two gaps, both should end up a measurement of 0.02" (0.5mm).

NOTE: for the two gap case, the gaps may be at the extremes of the closure preventing them from being observed directly. In this case the feeler gauge will have to be used blindly.

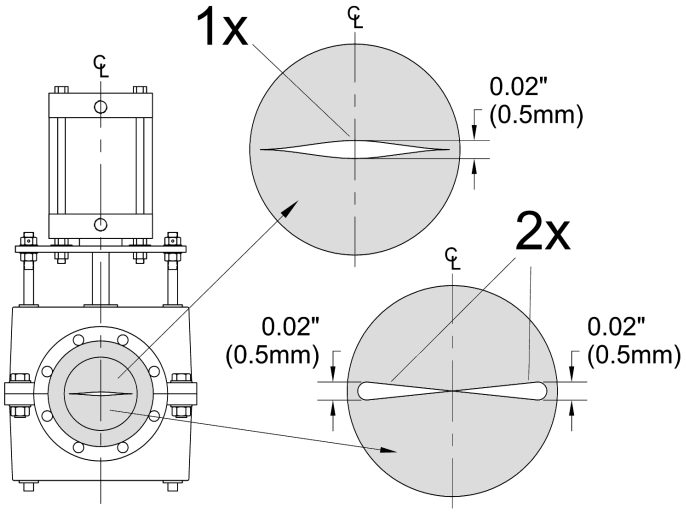

Figure 31: *Next objective: the 0.02" (0.5mm) gap(s).*

STEP 9: *FINE ADJUSTMENT FOR ONE GAP*

If the RV Valve appears to have a single gap, be sure the gap is centered within the RV Valve.

If the gap appears to be off-center (Figs. 32 & 33), adjustments will have to be done to the A-nuts.

There are two simple rules:

- to make the gap smaller, the A-nut should go DOWN (Fig. 32)
- to make the gap bigger, the A-nut should go UP (Fig. 33)

It may take a few iterations to get it right.

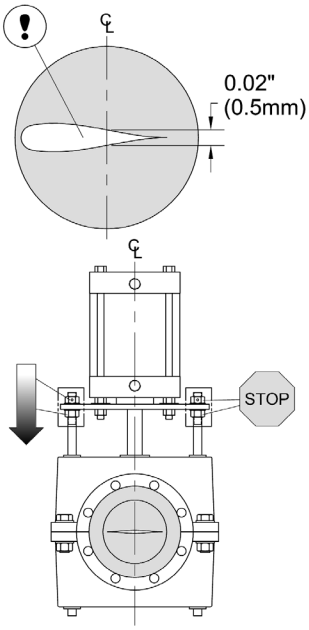

***Figure 32**: Left A-nut should go down to make the gap smaller on the left.*

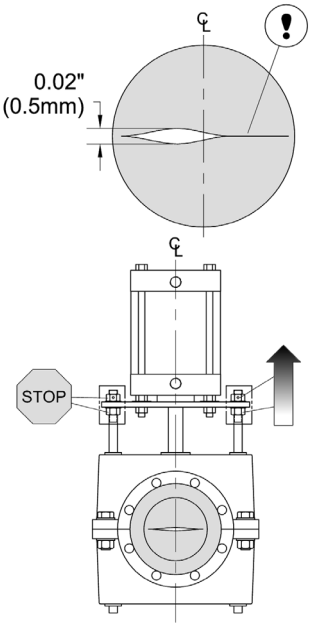

***Figure 33**: Right A-nut should go up to make the gap bigger on the right.*

STEP 10: *FINE ADJUSTMENT FOR TWO GAPS*

If the RV Valve appears to have two gaps, be sure the gaps are equally 0.02" (0.5mm) in size and appear evenly across the interior.

If the gaps appear to be uneven (Figs. 34 & 35), adjustments will have to be done the A-nuts.

There are two simple rules:

- to make the gap smaller, the A-nut should go DOWN (Fig. 34)
- to make the gap bigger, the A-nut should go UP (Fig. 35)

It may take a few iterations to get it right.

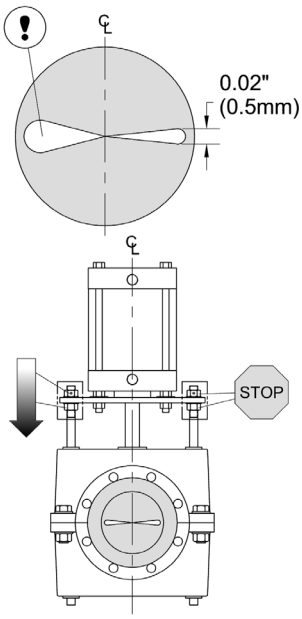

***Figure 34**: Left A-nut should go down to make the gap on the left smaller.*

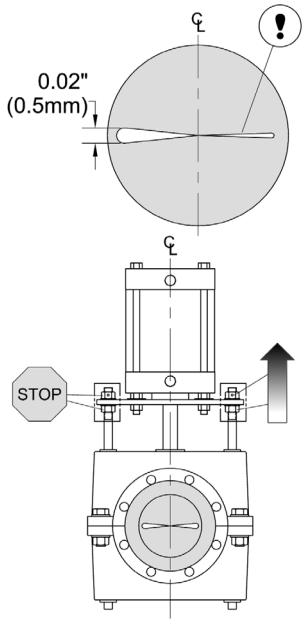

***Figure 35**: Right A-nut should go up to make the gap on the right bigger.*

STEP 11: Once the gap(s) are set with the RV Valve closed, turn the B-nuts (Fig. 36) away from the fastening plate ③ a distance, *T*, as found in table 3.

The VALVE SIZE and the LINE PRESSURE are on the type plate.

For more information about the type designation, see section **5.0 TECHNICAL MARKINGS.**

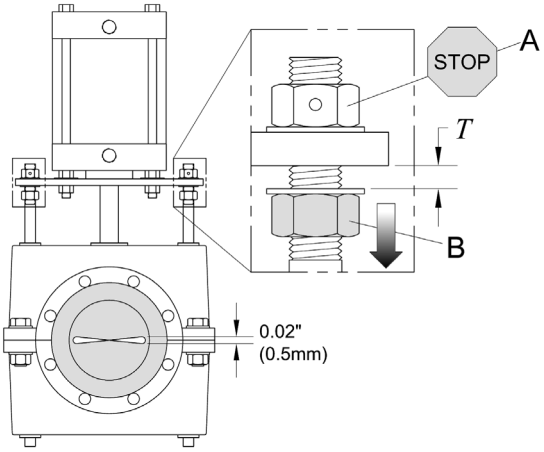

Figure 36: *Turn down the B-nuts a distance, T.*

Tabelle 3: *T*-SETTING DISTANCES

VALVE SIZE (DN)		LINE PRESSURE				
mm	Zoll	0-1 bar (0-15 psi)	2-6 bar (16-90 psi)	7-10 bar (91-150 psi)	11-25 bar (151-363 psi)	26-40 bar (364-580 psi)
25-100		4 mm	4 mm	4 mm	4mm	6mm
	1-4	0,16"	0,16"	0,16"	0,16"	0,24"
125-250		4 mm	4 mm	4 mm	Order related	
	5-10	0,16"	0,16"	0,16"		
300-500		4 mm	6 mm	6 mm		
	12-20	0,16"	0,24"	0,24"		

NOTE! DN250 and larger sleeves must be recalibrated always, when doing sleeve exchange in RV Valve.

STEP 12: Actuate the RV Valve open and tighten both A-nuts against the fastening plate ③ (Fig. 37). DO NOT allow the B-nut to turn along the pull bar ② during this step.

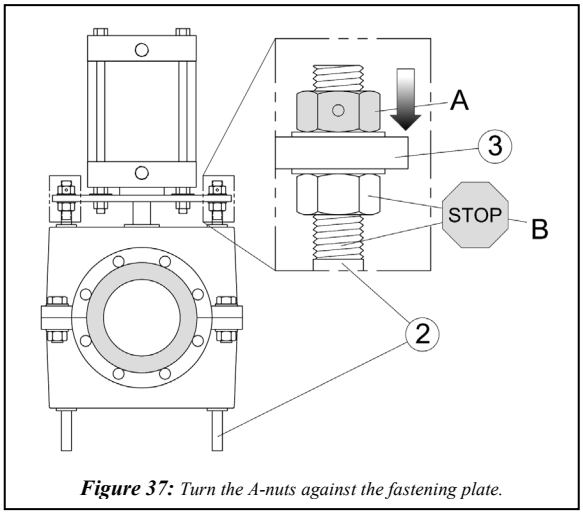

Figure 37: *Turn the A-nuts against the fastening plate.*

STEP 13: Actuate the RV Valve closed and insert a set screw into each of the A-nuts. If the hole in the A-nut is inaccessible, then it can be made accessible by doing the following:

- start with RV Valve closed
- spin both B-nuts down at least one turn (box 1 in Fig. 38).
- actuate the RV Valve open (box 2 in Fig. 38).
- turn both the pull bar ② and the A-nut simultaneously as if they were one part until the hole in the A-nut is accessible (boxes 3 and 4 in Fig 38).
- actuate the RV Valve closed and insert the set screw.

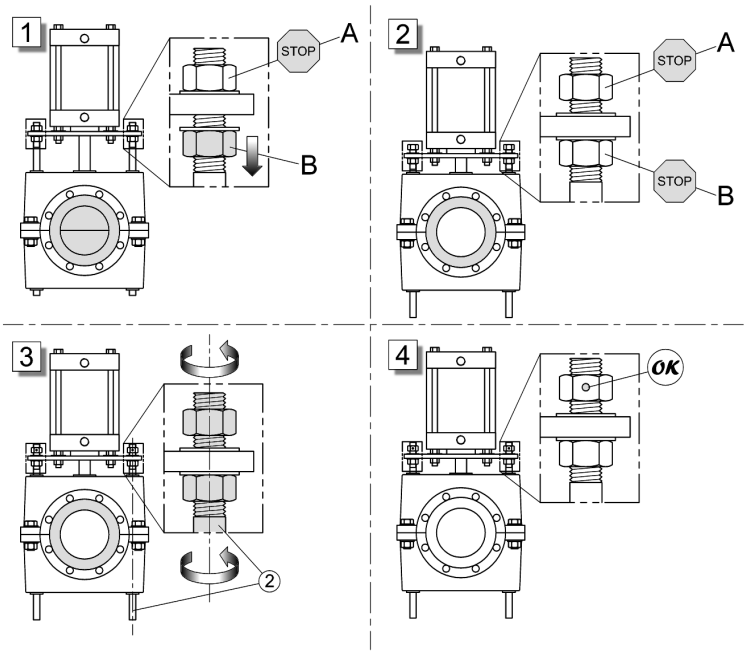

Figure 38*: Getting access to the set screw.*

STEP 14: Tighten the B-nuts against the bottom of the fastening plate. DO NOT allow the A-nut to turn along the pull bar during this step.

STEP 15: Actuate the RV Valve open and follow the instructions in section **3.0 INSTALLATION** to put the RV Valve back in service.

4.4 Drives with threaded rod

Um vorzeitigen Verschleiß der Gewindebuchse zu verhindern, muss die Armaturenspindel regelmäßig mit geeignetem, vom Hersteller freigegebenem, Fett geschmiert werden.

5.0 TECHNICAL MARKINGS: CODIFICATION OF RV-VALVES

Example Code No:

RV	125	3	2	P	1	6	1	B	T	E
1	2	3	4	5	6	7	8	9	10	11

1. Beschreibung: **RV** – Mechanical Pinch Valve, RV Series; **RVA** – Pneumatic Pinch Valve, RVA Series

2. Nennweite: in mm

3. Manschette:
1 – NR (natural rubber)
1LS – NR food black
2 – EPDM (Ethylen-Propylen-Dien)
2LS – EPDM food black
2LW – EPDM food white
2HT – EPDM high temperature
2PU – EPDM polyurethane coated
3 – SBR (styrene butadiene rubber)
4 – FPM (fluorine rubber [viton])
5 – CR (neoprene)
5W – neoprene white
6 – NBR (nitrile)
6/3L – NBR/SBR food quality
6W – Nitrile food white
7 – CSM (hypalone)
8 – IIR (butyle)
9 – PU (polyurethane)
PGR – PGR (natural rubber anti-abrasive)

4. Body material:
1 – cast iron GJL250, was GG25
2 – carbon steel
3 – stainless steel
4 – other, e.g. Alu, GJS400, ...
5 ≙ 1, deleted was GJL250
6 ≙ 4, deleted

5. Actuations:
M – manual actuator
MA – control through round opening
MG – manual actuator with reduction gear
P – pneumatic actuator
PD – + pneumatic positioner
PM – + additional wheel for manual operation
PF – + electro-mechanical positioner
PR – + air spring for unpressurized on / off operation
H – hydraulic actuator
E – electro-mechanical actuator
EK – + electrical positioner
PRM – mechanical spring (optional e.g.: P2RM = with 2 mech. springs)

6. Flange drilling:
1 – DIN PN 10
2 – DIN PN 16
3 – DIN PN 25
4 – DN PN 40
5 – ANSI 150
6 – ANSI 300
7 – ANSI 600
8 – ANSI 900
9 – other, e.g. ON 64

7. Pressure stage:
1 – 1 bar
6 – 6 bar
10 – 10 bar etc.

8. Construction length:
1 – DIN 3202 F5
2 – DIN 3202 F15
3 – ASME B16–short
4 – ASME B16–long
5 – ISO 5752, tab. 6

9. Valve type: **B** – Valve series 2001 – center-closing, flanged ends

10. Accessories:
C – electrical control wire
T – opening tabs
S – solenoid valve
L – limit switch
Z – smooth inner surface
X – acc. specification
D – double cone

11. Body types:
O – open body
S – gas-tight body
E – closed body
E/S – closed body with seals