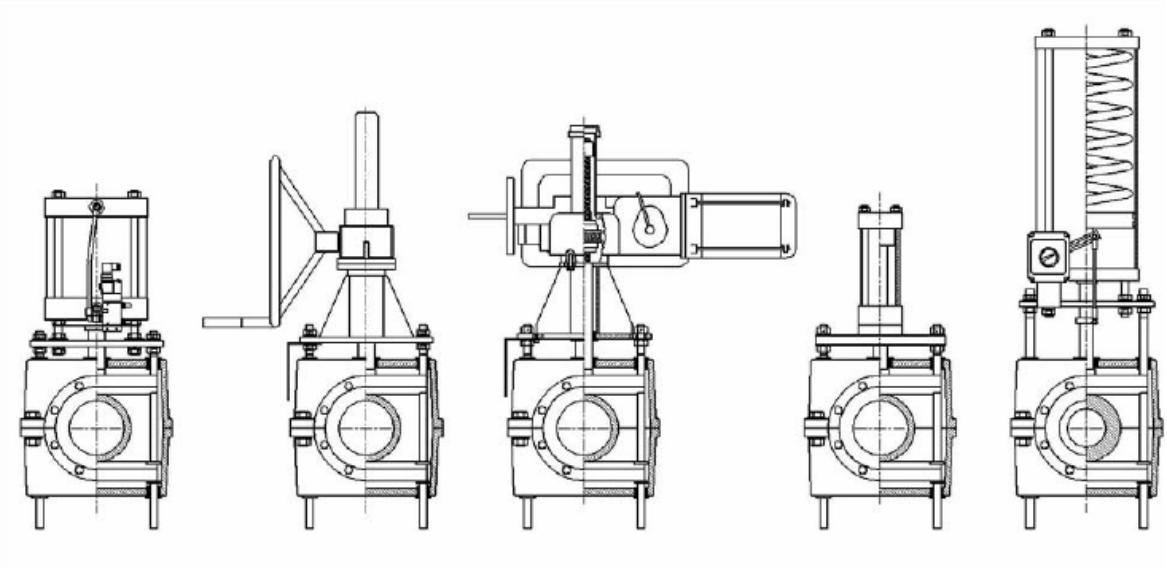
INSTALLATION, OPERATION AND MAINTENANCE MANUAL

TYPE (BE) ENCLOSED VALVE BODY
Series 2001

SMART VALVE ™ Wear Monitoring System



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BE- 8/02 Rev. 6-01-2011

Calibration Instructions for 1-5inch (25-125mm) RF Valve® with Manual Actuator

The RF Valve® is factory calibrated to close evenly on the elastomer tube inside. After calibration, a set screw is inserted into each of the A-nuts and a coating of blue rubber is applied to the pull bar threads above the A-nut (Fig. 1).

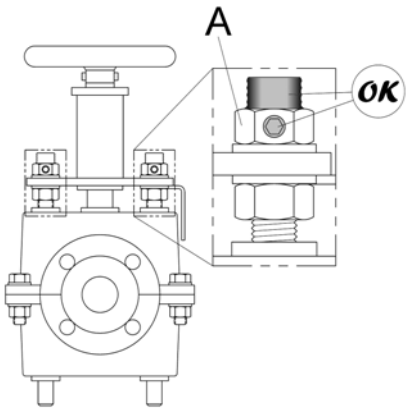


Figure 1: Factory calibration is set with a set screw and a coating of rubber on the pull bar.

Tampering with the A-nut will disturb the factory calibration which can have adverse effects on the elastomer tube and/or the function of the RF 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. 1.
- after removing the elastomer tube, deep cuts are found on the exterior of the elastomer tube where the pinch bars come into contact
- if wear inside the elastomer tube appears uneven

If recalibration seems warranted, its best to consult RF Technologies for confirmation. Contact information is at the bottom of the page.

STEP 1: Have a feeler gauge handy. In addition the RF Valve® must be taken out of the pipeline

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

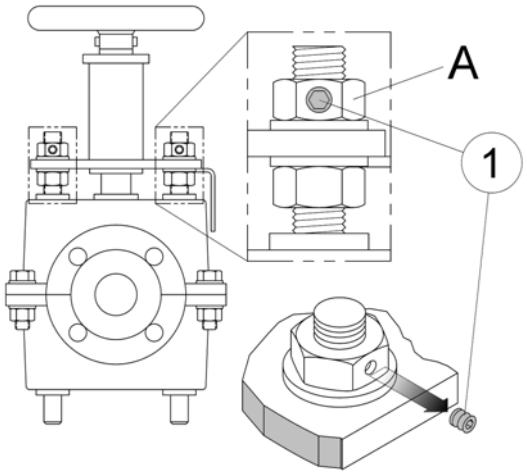


Figure 2: Remove set screw from A-nut.

STEP 3: Now loosen each A-nut until they come to a distance X from the ends of their respective pull bar ② (Fig. 3). The distance X is determined from the information in Table 1.

Table 1: IMPERIAL UNITS

VALVE SIZE (*in*)	DISTANCE X (*in*)
1 to 1-1/4	0.20
1.5 to 3	0.30
4 to 5	0.40

Table 1: METRIC UNITS

VALVE SIZE (*mm*)	DISTANCE X (*mm*)
25 to 32	5
40 to 80	8
100 to 125	10

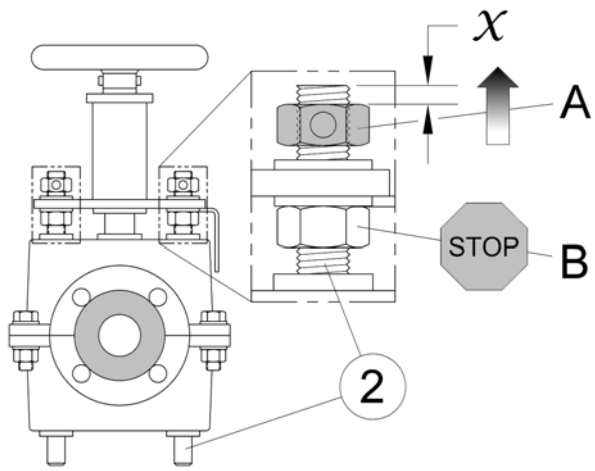


Figure 3: Move A-nut to distance X

STEP 4: Begin to actuate the RF Valve® closed and observe the gap inside. Stop closing the RF Valve® when the gap is roughly 0.13" (3mm) in size (Fig 4).

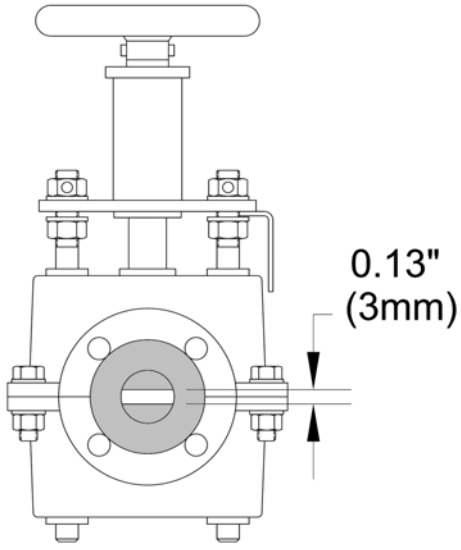


Figure 4: Actuate RF Valve closed until 0.13" (3mm) opening inside

STEP 5: The next objective is to make sure the closure of the RF Valve® remains even about the centerline. Continue to actuate the RF Valve closed and observe the opening inside. One or two gaps may be present (Fig. 5) when the RF Valve is nearly closed.

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.

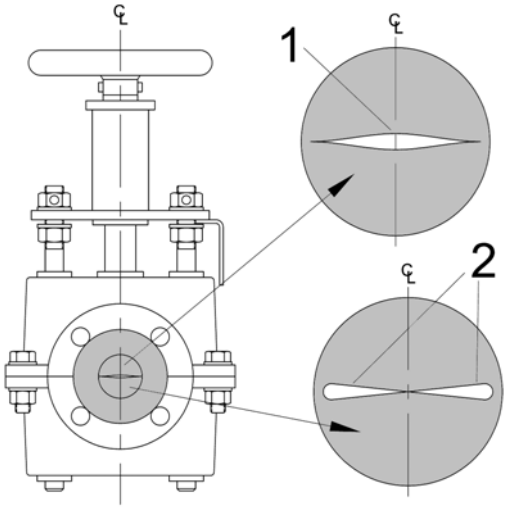


Figure 5: Observe the gap inside the RF Valve when nearly closed.

STEP 6: *FINE ADJUSTMENT FOR ONE GAP*

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

If the gap appears to be off-center (Figs. 6a & 6b), adjustments will have to be done to the A-nuts.

The are two simple rules:

- to make the gap smaller on one side, the A-nut should go DOWN (Fig. 6a)
- to make the gap bigger on one side, the A-nut should go UP (Fig. 6b)

It may take a few iterations to get it right.

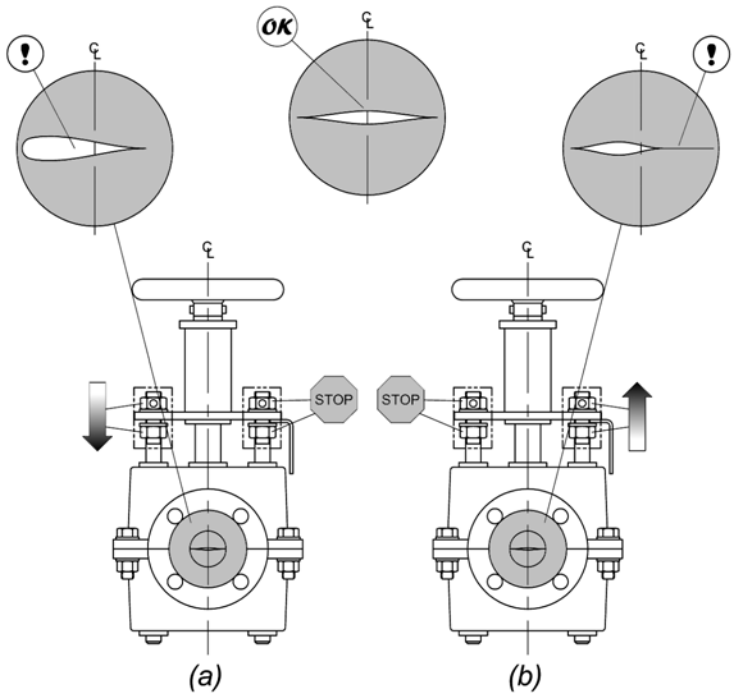


Figure 6: Fine Adjustment for One Gap

STEP 7: *FINE ADJUSTMENT FOR TWO GAPS*

If the RF Valve® appears to have two gaps, be sure the gaps are equal in size and appear evenly across the interior.

If the gaps appear to be uneven (Figs. 7a & 7b), adjustments will have to be done the A-nuts.

The are two simple rules:

- to make the gap smaller on one side, the A-nut should go DOWN (Fig. 7a)
- to make the gap bigger on one side, the A-nut should go UP (Fig. 7b)

It may take a few iterations to get it right.

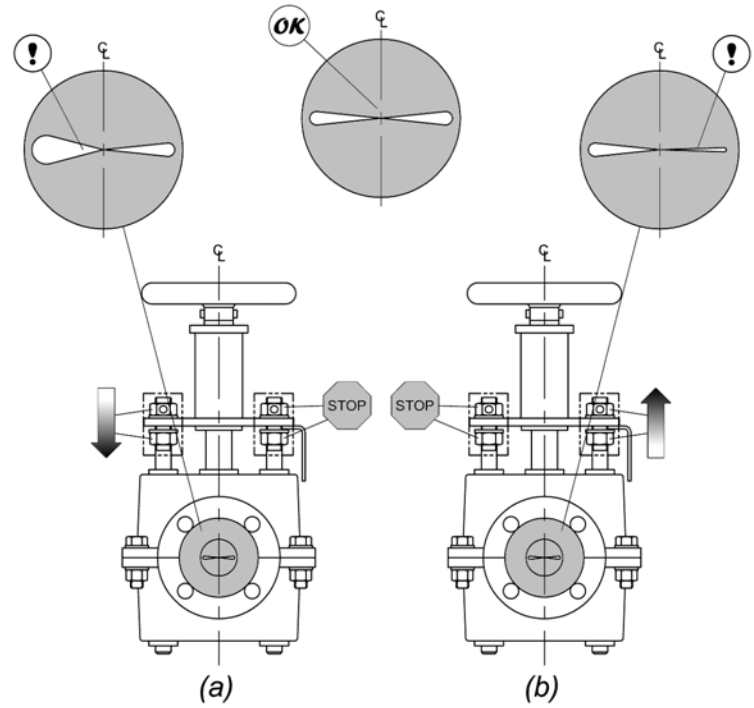


Figure 7: Fine Adjustment for Two Gaps

STEP 8: Actuate the RF 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 RF Valve® closed
- spin both B-nuts down at least one turn (box 1 in Fig. 8).
- actuate the RF Valve® open (box 2 in Fig. 8).
- 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 8). IT IS VERY IMPORTANT THAT THE A-NUT DOES NOT MOVE/TURN RELATIVE TO THE PULL BAR!

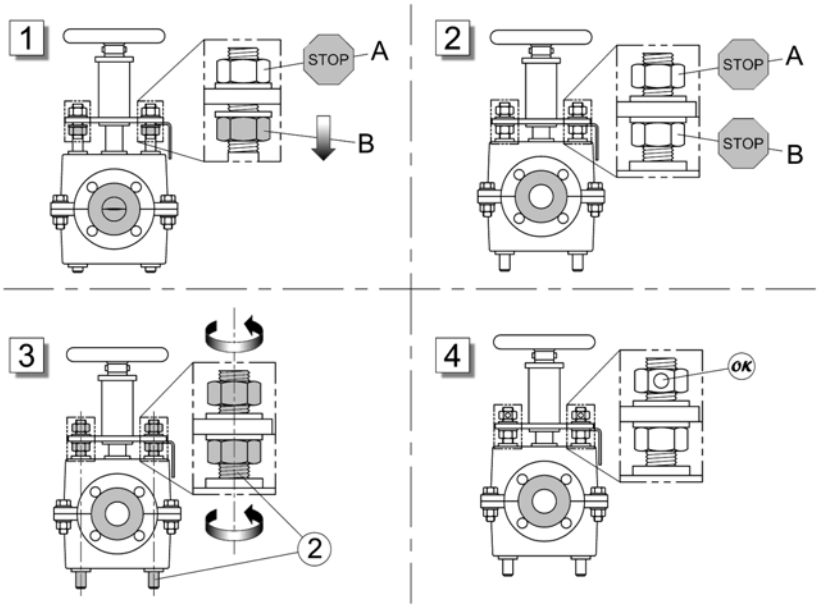


Figure 8: Getting access to the set screw.

- actuate the RF Valve® closed and insert the set screw and tighten.

STEP 9: 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. Apply blue rubber coating (Fig. 1) to exposed thread above A-nut indicating RF Valve is now correctly calibrated. DO NOT CHANGE!

STEP 10: Actuate the RF Valve® open and follow the instructions in section **3.0 INSTALLATION** to put the RF Valve® back in service.

Calibration Instructions for RF Valve® With Manual Screw Jack Actuator

The following calibration instructions apply to RF Valves® with a manual screw jack actuator (sometimes called a manual gear reduction actuator)

The RF Valve® is factory calibrated to close with enough force to seal against pipeline pressure. After calibration is completed, a set screw is inserted into each of the A-nuts and a coating of blue rubber is applied to the pull bar threads above the A-nut (Fig. 1).

Changing the A-nut setting will disturb the factory calibration which can have adverse effects on the elastomer tube and/or the function of the RF Valve®.

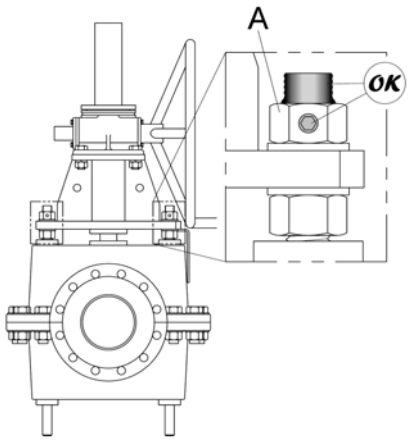


Figure 1: Factory calibration is set with a set screw and a coating of rubber on the pull bar.

Re-calibration becomes necessary when:

- The A-nuts have been disturbed (for example: missing set screw and/or missing blue rubber coating). See Fig. 1.
- After removing the elastomer tube for maintenance, deep cuts are found on the exterior of the elastomer tube where the pinch bars come into contact
- If wear inside the elastomer tube appears uneven

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

PREPARATION

STEP 1: Have a feeler gauge handy. In addition the RF Valve® must be taken out of the pipeline. If possible, it is recommended to put the RF Valve® up on wooden blocks (Fig. 2)

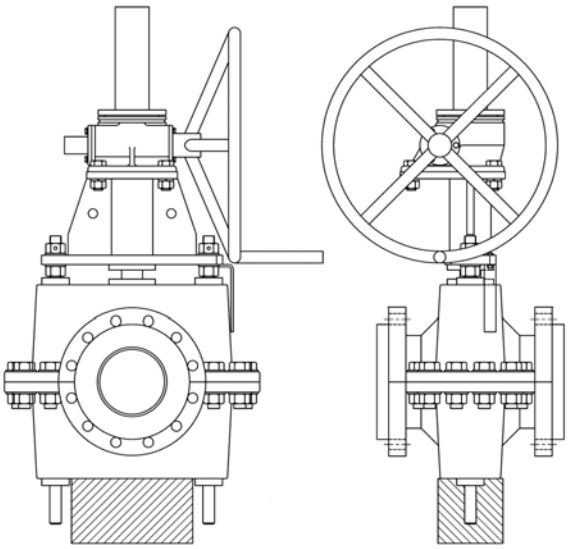


Figure 2: Set RF Valve® Atop Wood Blocks

STEP 2: Remove the set screw ① from each A-nut and cut/scrape away the blue rubber coating above each A-nut (Fig. 3).

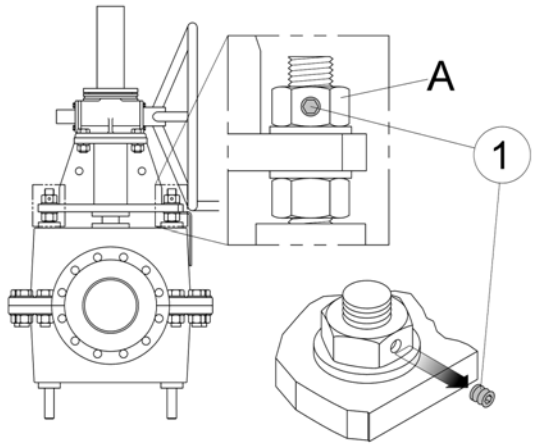


Figure 3: Remove set screw from A-nut.

STEP 3: Now loosen each A-nut until they are flush to the ends of their respective pull bar ② (Fig. 4).

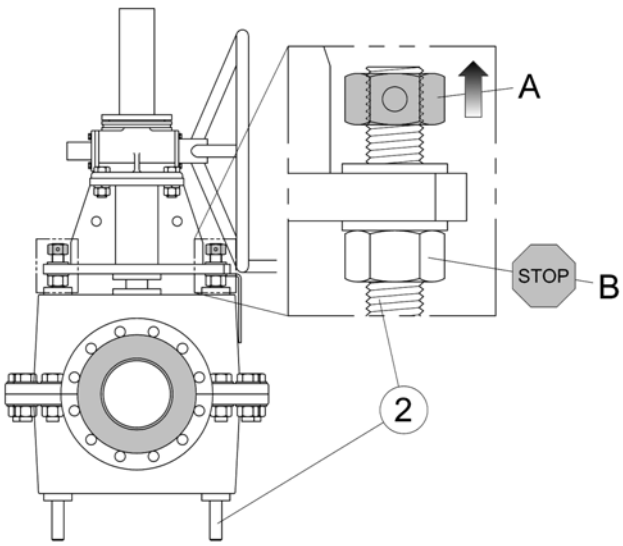


Figure 4: Turn A-nuts up.

PRINCIPLES OF CALIBRATION

STEP 4: Actuate the RF Valve® closed with the handwheel.

After actuation the RF Valve® will not close completely. There will be a gap, X, inside (Fig. 5).

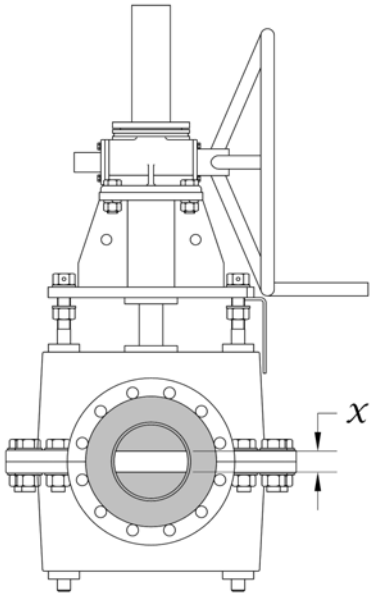


Figure 5: RF Valve® with gap, X.

STEP 5: Measure the size of the gap, X, inside the RF Valve®. Now turn both B-nuts away from the fastening plate ③ a distance X – 3mm.

DO NOT turn the B-nuts away from the fastening plate ③ more than the measurement, X (Fig. 6), or RF Valve® will close too far and further calibration will not be possible.

[EXAMPLE: If gap X is 8mm then the B-nuts should be turned away from the fastening plate ③ approximately 5mm.]

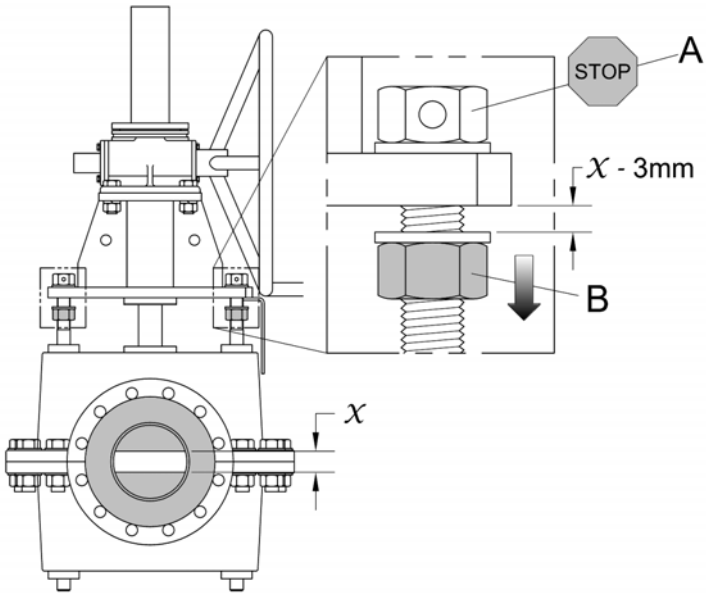


Figure 6: Move the B-nuts away from the fastening plate..

STEP 6: Actuate the RF Valve® completely open until the handwheel stops turning and then turn the A-nuts against the fastening plate ③ (Fig. 7). DO NOT allow the B-nuts to turn/move along the pull bar ② during this step!

STEP 7: Actuate the RF Valve® closed again and measure the size of the new gap, X_1. It should be roughly 3mm in size (Fig. 8).

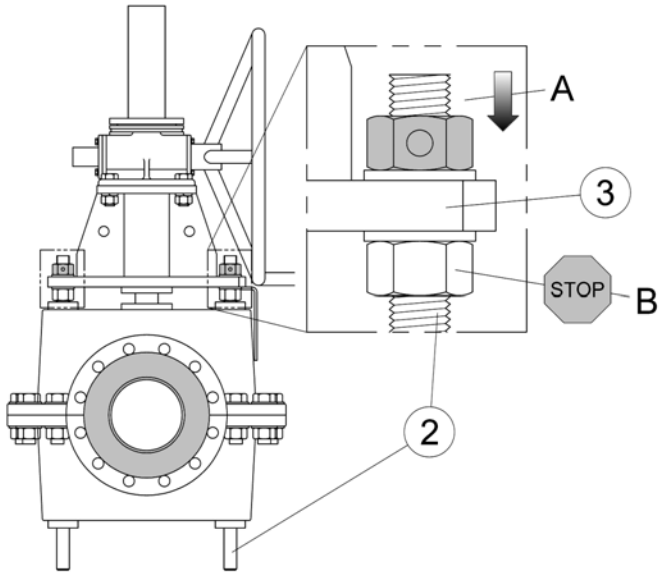


Figure 7: Turn the A-nuts against the fastening plate.

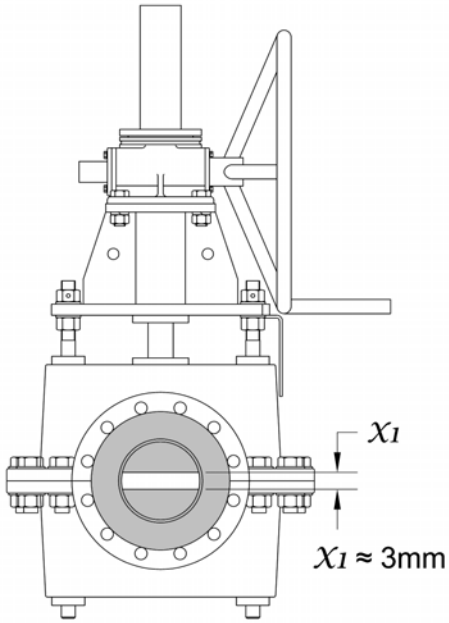


Figure 8: Measure the new gap, X_1.

The previous 7 steps demonstrated how the closure of the RF Valve® is adjusted just by changing the position of the A-nuts along the pull bar. By moving the A-nuts down ward a distance, $\mathcal{D}$, along the pull bar it will cause the gap inside the RF Valve® to become smaller by $\mathcal{D}$ (Fig. 9b). On the other hand, to make the gap inside larger by an amount $\mathcal{U}$, the A-nuts should be repositioned upward a distance $\mathcal{U}$ (Fig. 10a & 10b).

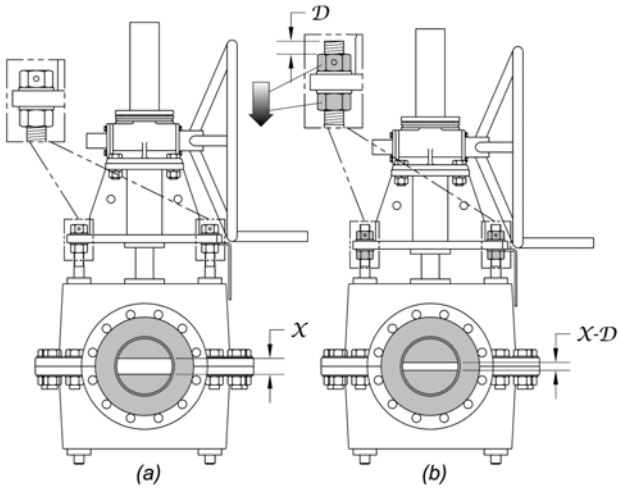


Figure 9: Move A-nuts down to make gap smaller.

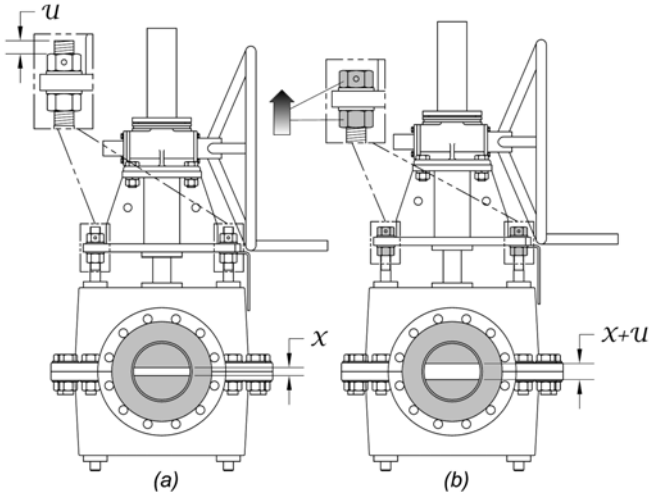


Figure 10: Move A-nuts up to make gap bigger.

CALIBRATION

STEP 8: The next objective is to make the gap inside the RF Valve® 0.5mm AND the gap should be evenly distributed along the centerline of the RF Valve®.

NOTE: One or two gaps may be visible (Fig. 11). In the case of two gaps, both gaps should end up a measurement of 0.5mm. Having a light on opposite side of the RF Valve® will help show the gap clearly.

NOTE: When two gaps are visible, the gaps may be at the extreme edges of the closure preventing them from being observed directly. In this case the feeler gauge must be inserted in each of the corners to measure by "feel" that the 0.5mm gaps are present.

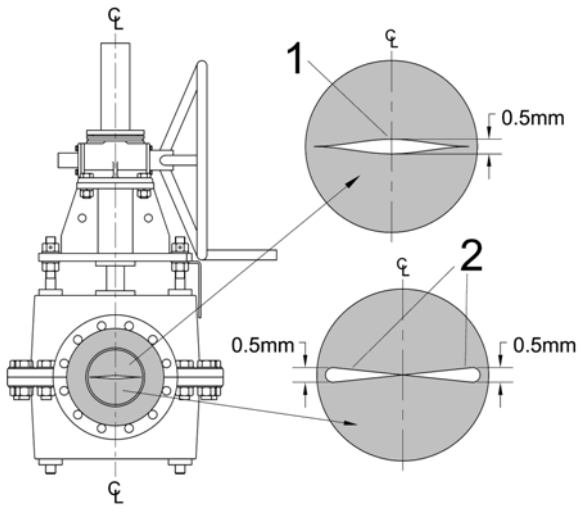


Figure 11: Next objective: the 0.5mm gap(s).

STEP 9: *FINE ADJUSTMENT FOR ONE GAP*

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

If the gap appears to be off-center (Figs. 12a and 12b), adjustments will have to be done to the A-nuts.

The are two simple rules:

- to make the gap smaller on one side, the A-nut should go DOWN (Fig. 12a)
- to make the gap bigger on one side, the A-nut should go UP (Fig. 12b)

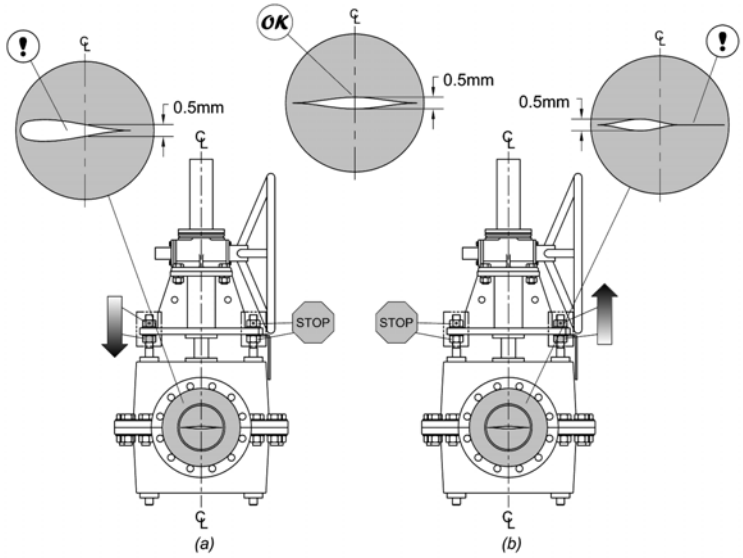


Figure 12: Fine Adjustment for One Gap

STEP 10: *FINE ADJUSTMENT FOR TWO GAPS*

If the RF Valve® appears to have two gaps, be sure the gaps are equally 0.5mm in size and appear evenly across the interior.

If the gaps appear to be uneven (Figs. 13a and 13b), adjustments will have to be done the A-nuts.

The are two simple rules:

- to make the gap smaller on one side, the A-nut should go DOWN (Fig. 13a)
- to make the gap bigger on one side, the A-nut should go UP (Fig. 13b)

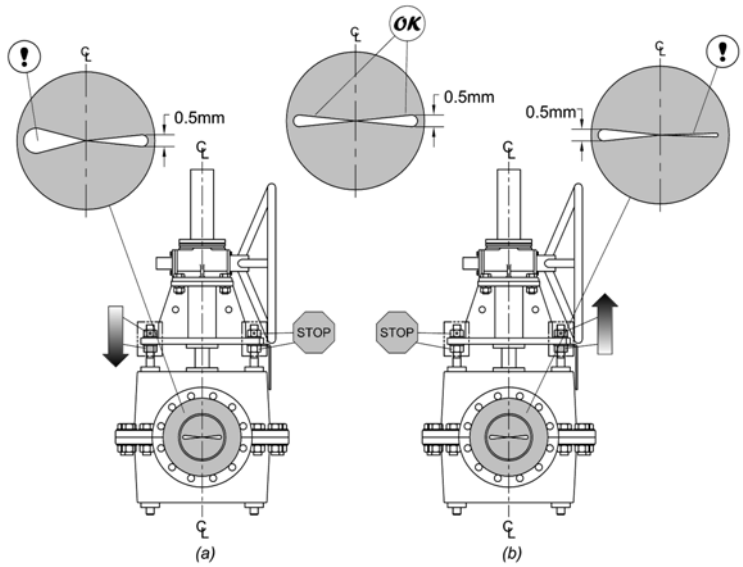


Figure 13: Fine Adjustment for Two Gaps

STEP 11: Once the gap(s) are set with the RF Valve® closed, turn the B-nuts (Fig. 14) away from the fastening plate ③ a number of turns as found in table 1 (next page).

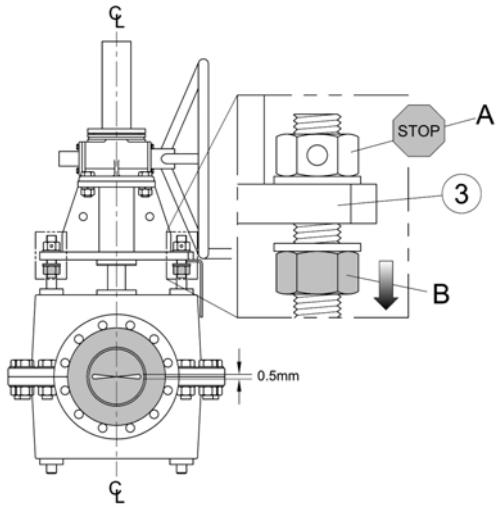


Figure 14: Spin down the B-nuts per Table 1.

The LINE SIZE and the LINE PRESSURE are stamped on a stainless steel name plate on the side of the RF Valve®.

An example of a stamped nameplate is shown in Fig. 15. For this example:

LINE SIZE = ① = 4”

LINE PRESSURE = ② = 150psi

Thus from Table 3 the B-nut should be spun 2 turns.

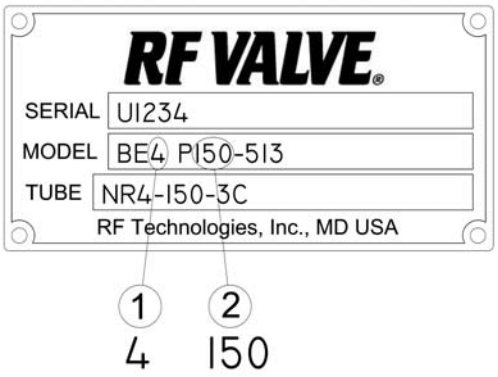


Figure 15: Finding the LINE SIZE and the LINE PRESSURE on the nameplate.

Another example of a nameplate is shown in Fig 16. For this example:

LINE SIZE = ③ = 100mm

LINE PRESSURE = ④ = 10bar

Thus from Table 3 the B-nut should be spun 2 turns.

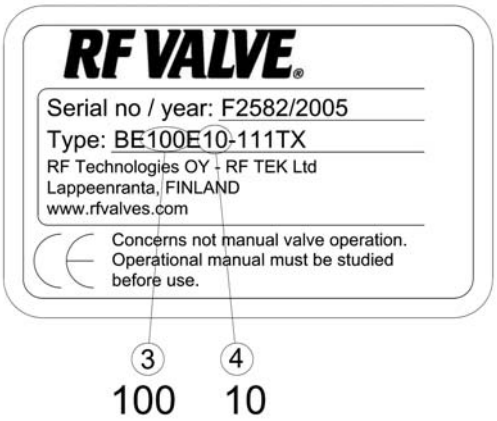


Figure 16: Finding the LINE SIZE and the LINE PRESSURE on the nameplate.

For more information about nameplates, see section **5.0 TECHNICAL MARKINGS.**

TABLE 1: IMPERIAL UNITS

LINE SIZE *(in)*	1...1.25	1.5...3	4...6	8	10....14		16...20
LINE PRESSURE *(psi)*	0…150				0...30	31...150	0...90
number of nut turns	**2.75**	**2**	**1.75**	**1.5**	**1.25**	**1.75**	**1.75**

TABLE 1: METRIC UNITS

LINE SIZE *(mm)*	25...32	40...80	100...150	200	250..350		400...500
LINE PRESSURE *(bar)*	0…10				0...2	3...10	0...6
number of nut turns	**2.75**	**2**	**1.75**	**1.5**	**1.25**	**1.75**	**1.75**

See Fig. 17 below for explanation of fractional nut turn

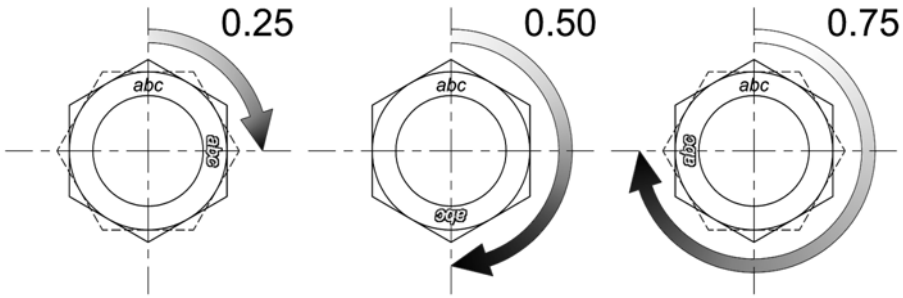


Figure 17: Fractional nut turn terminology.

STEP 12: Actuate the RF Valve® open and tighten both A-nuts against the fastening plate ③ (Fig. 18). DO NOT allow the B-nut to turn along the pull bar ② during this step.

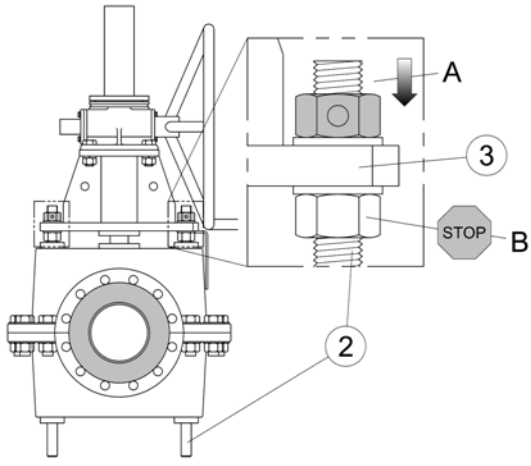


Figure 18: Turn the A-nuts against the fastening plate.

STEP 13: Actuate the RF 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 following the instructions below. Otherwise, proceed to STEP 14.

- start with RF Valve® closed
- spin both B-nuts d own at least one turn (box 1 in Fig. 19).
- actuate the RF Valve® open (box 2 in Fig. 19).
- turn both th e pull bar ② and the A-nut simultaneously as if the y were one part until the hol e in the A-nut is a ccessible (boxes 3 and 4 in Fig 19). IT IS VERY IMPORTANT THAT THE A-NUT DOES NOT MOVE/TURN RELATIVE TO THE P ULL BAR!
- actuate the RF Valve® closed and insert the set screw and tighten.

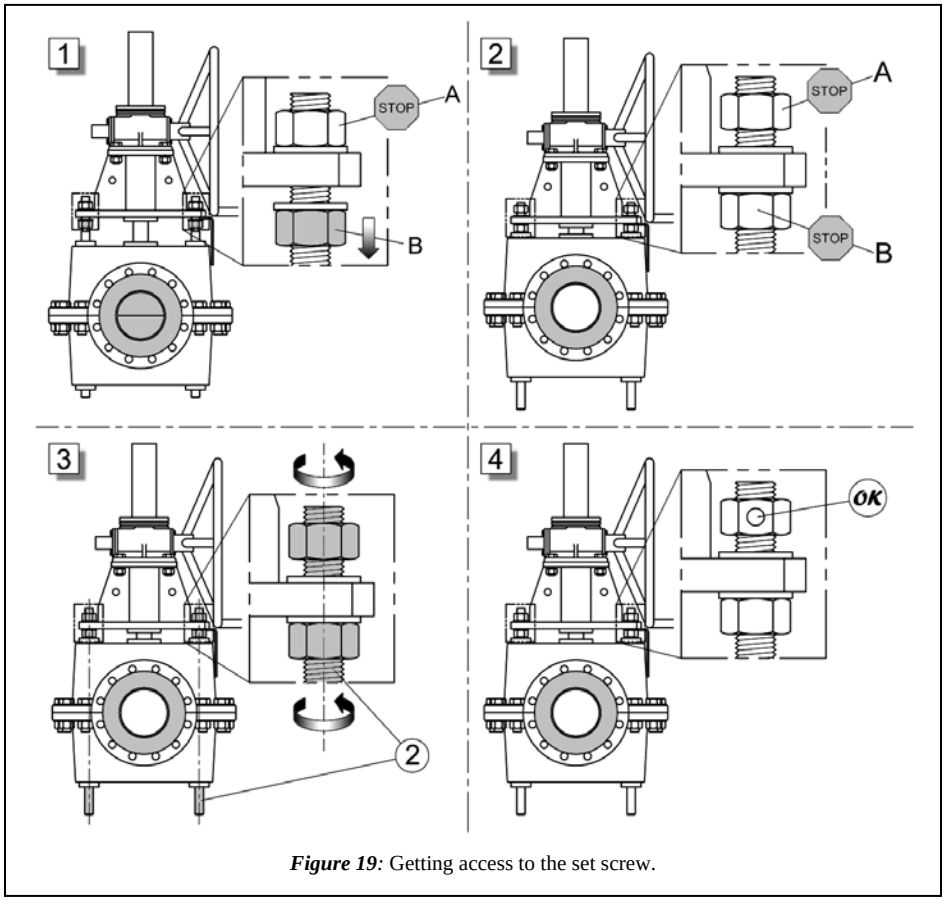


Figure 19: Getting access to the set screw.

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. Apply blue rubber coating (Fig. 1) to exposed thread above A-nut indicating RF Valve® is now correctly calibrated. DO NOT CHANGE!

STEP 15: A ctuate the RF Valve® open with the h andwheel and follow the instructions in section **3.0 INSTALLATION** to put the RF Valve® back in service.

5.0 TECHNICAL MARKINGS: VALVE MODEL AND TUBE MODEL

(Imperial Example) Valve Model: BE4/3 PF90-513T

(Metric Example) Valve Model: BE100/80 PF6-513T

BE	**4/3**	**PF**	**90**	**-**	**5**	**1**	**3**	**T**
BE	**100/80**	**PF**	**6**	**-**	**5**	**1**	**3**	**T**

Body Type	Valve ID (DN)
BE = Body Enclosed	1 - 60 (inches)
BS = Body Sealed	25 - 1500 (mm)
BO = Body Open	Reduced Port (Inlet / Outlet)

Actuator Type	Operating Pressure
A = Air Actuated (aiRFlex)	15 = 15psi
with: Positioner	50 = 50psi
F = ElectroPneumatic	90 = 90psi
D = Pneumatic	150 = 150psi
E = Electro-mechanic Actuator	300 = 300psi
with: F = Electric Positioner	1 = 1bar
H = Hydraulic Actuator	4 = 4bar
with: M = Manual Pump	6 = 6bar
G = Motor Gear	10 = 10bar
M = Manual Handwheel	16 = 16bar
with: G = Gear Reducer	25 = 25bar
L = Lock Out	40 = 40bar
P = Pneumatic Actuator	
with: M = Manual Override Positioner	
F = ElectroPneumatic	
D = Pneumatic	
Air Spring	
RO = Fail Open	
RC = Fail Close	
Mechanical Spring	
KO = Fail Open	
KC = Fail Close	

Flange Drilling	Body Material	Face-to-Face Standard	Accessories
1 = DIN PN10	1 = Cast Iron	1 = DIN 3202 F5	A = Manual Air Valve Switch
2 = DIN PN16	2 = Welded Carbon Steel	2 = DIN 3202 F15	C = MONSYS Box
3 = DIN PN25	3 = Stainless Steel (AISI 316)	3 = ASME B-16 (Short)	G = Gauges
4 = DIN PN40	4 = Aluminum	4 = ASME B-16 (Long)	L = Proximity Limit Switches
5 = ANSI 150#	5 = Ductile Cast Iron	5 = ISO 5752 (Table 6)	N = Mechanical Limit Switches
6 = ANSI 300#	9 = Other	9 = No Standard	Y = Magnetic Limit Switches
7 = ANSI 600#			P = Pressure Switch
8 = JIS 10			Q = Quick Exhaust Valves
9 = AS2129 (Table D/E)			R = Filter/Regulator
0 = Other			S = Solenoid
			T = Opening Tags
			V = Vacuum Pump
			X = Special Requirements

(Imperial Example) Tube Model: PGR4/3-150-3CST

(Metric Example) Tube Model: PGR100/80 10-3CST

PGR	**4/3**	**-**	**150**	**-**	**3**		**CST**	
PGR	**100/80**	**-**	**10**	**-**	**3**		**CST**	

Tube Material	Tube ID (DN)
CR = Chloroprene Rubber (Neoprene®)	1 - 60 (inches)
CSM = Chloro-Sulfonated Polyethylene Rubber (Hypalon®)	25 - 1500 (mm)
EPDM = Ethylene-Propylene Rubber (Nordel®)	
EPDMH = Peroxide Vulcanized EPDM Rubber	Reduced Port (Inlet / Outlet)
FPM = Fluoro-Carbon Rubber (Viton®)	
HNBR = Hydrogenated Nitrile Rubber	
IIR = Chloro-Butyl Rubber	
NBR = Nitrile Rubber (Buna-N®)	
NR = Natural Rubber	
PGR = Pure Gum Rubber	
SBR = Styrene Butadiene Rubber	
with HT = High Temperature Rated	
FB = Foodgrade Black	
FW = Foodgrade White	

Pressure Rating
15 = 15psi
50 = 50psi
90 = 90psi
150 = 150psi
300 = 300psi
600 = 600psi
1 = 1bar
4 = 4bar
6 = 6bar
10 = 10bar
16 = 16bar
25 = 25bar
40 = 40bar

Face-to-Face Standard	Accessories
1 = DIN 3202 F5	A = aiRFlex design
2 = DIN 3202 F15	C = Wear Sensor Wire
3 = ASME B-16 (Short)	T = Opening Tags
4 = ASME B-16 (Long)	S = Single Cone (reduced port)
5 = ISO 5752 (Table 6)	D = Double Cone (reduced port)
9 = No Standard	Z = Straight Interior (filled arches)
	F = Full Flanges
	X = Special Requirements

TROUBLE SHOOTING, VALVE TYPES BE/BO/BSP****

DISTURBANCE	POSSIBLE DEFECT	ACTION
Valve is leaking (in flow direction).	Air pressure in the actuator is too low Or fluid pressure higher than rated.	Check the air supply pressure. Generally min 6 bar. Check fluid pressure. Valve type marking indicates the max rated pressure.
	Pinch bars are not parallel or the distance between the bars is too long.	See maintenance instructions HO 001.4.
	Strange object is stuck between the pinch bars.	Remove the object.
	Sleeve is broken or worn out.	Measure the resistance of the sleeve. Change the sleeve. See maintenance instruction HO 001.4.
	Sealing of the actuator piston is leaking.	Change the sealing.
Flow fluid is leaking through the valve body bushings.	Sleeve is broken or worn out.	Change the sleeve.
Process control indicates that the valve does not open or close.	Proximity switch is not functioning or sensors do not signal.	Check the position of sensors and the distance between sensor plates and sensors. (Generally between 5-6 mm, max 8 mm) Remove possible strange objects and dirt from plates/sensors. Check the air supply pressure.

TROUBLE SHOOTING, TUBE LIFE SHORT - VALVE TYPES BE/BO**P**and H**

CHECK PROCESS CONDITIONS	
- Type of slurry, liquid, powder	
- Temperature min/medium/max ºC	
- Max operating pressure (barg)	
- Max pressure when valve is closed (barg)	
If the pipe/valve is washed	
- Type of washing liquid	
- Temperature max ºC	
- Max pressure (barg)	
- Time needed for washing	
CHECK VALVE OPERATING CONDITIONS	
- Valve type and serial no (machine plate)	
- Time in operation	
- Frequency of closing/opening, cycles/h etc	
- Supply air/hydraulic pressure min/max (barg)	
- Valve closing/opening time	
- distance from the previous pipe bend, T-joint	< 2*DN ☐ > 2*DN ☐
CHECK VALVE CONDITION	
- bolts and nuts tightened	
- pull bar locking nut fixed/sealed	
- air/hydraulic connections tight	
- actuator sealings are not leaking	
- Tmin -20ºC,	
- operation of the auxiliaries	
- position of the actuator	Heavy actuators may need support if not vertical
- describe the type of damage in the tube- take photos of the tube or/and sent to RF	

POSSIBLE DEFECT	ACTION
Air /hydraulic pressure in the actuator is too low (also short periods) Or operating pressure higher than rated.	Valve type marking indicates the max rated pressure. - increase supply air pressure - larger actuator may be needed

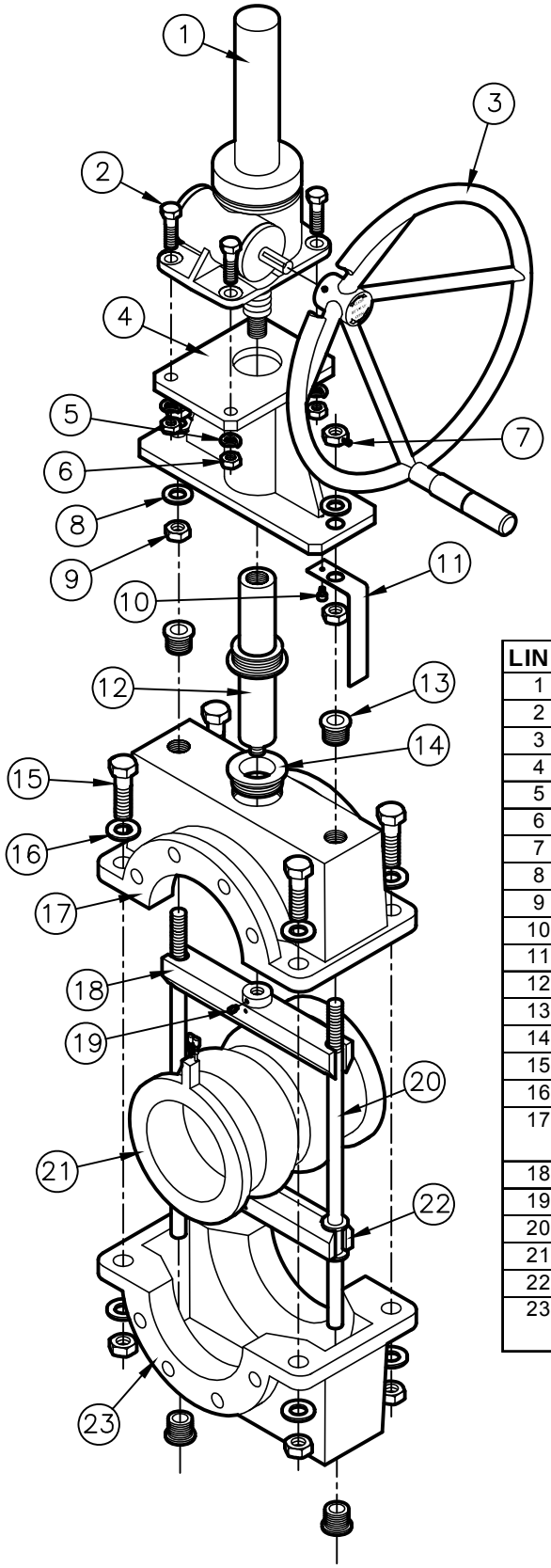
Valve is closing/opening a long time - during these phases wear is maximum	Check if air/ flow is large enough Installing quick exhaust valves on the air cylinder increases closing/opening speed Closing/opening speeds recommended - 1-3 s when DN ≤ 80 - 3-4 s when DN ≤ 200 - 4-7 s when DN ≤ 400
Valve is closing/opening too quickly - water hammer or pressure blow may result	Throttle/decrease air/hydraulic flow to the valve
Valve is close to the next pipe bend/T-joint - flow is directed on one side of the tube causing uneven wear	Remove the valve farther from the bend/T-joint
Process conditions have changed or are different from assumed	New elastomer quality, pressure rating or opening tags maybe needed.
Adjustment of the pinch bars is wrong	See maintenance instructions
Cylinder sealing is leaking	Change the sealing.

APPENDICES

Bill of Materials

Dimensional “as built” drawings

Accessories



RF VALVE®

MATERIALS OF CONSTRUCTION

LINE	DESCRIPTION	MATERIAL
1	GEAR REDUCER	STEEL, CAST IRON, BONZE
2	HEX BOLT	AISI 304
3	HANDWHEEL	STEEL
4	ACTUATOR BODY	WELDED STEEL
5	LOCK WASHER	AISI 304
6	HEX NUT	AISI 304
7	SET SCREW	AISI 304
8	FLAT WASHER	AISI 304
9	HEX NUT	AISI 304
10	SCREW	AISI 304
11	ON/OFF INDICATOR	AISI 304
12	EXTENSION BUSHING	AISI 304
13	PULL BAR BUSHING	POLY ACETAL
14	CENTER BUSHING	POLY ACETAL
15	HEX BOLT	AISI 304
16	FLAT WASHER	AISI 304
17	UPPER VALVE BODY	CAST IRON (6, 8)
		WELDED STEEL (10+)
18	UPPER PINCH BAR	STEEL
19	SET SCREW	AISI 304
20	PULL BAR	AISI 316
21	ELASTOMER TUBE	RUBBER
22	LOWER PINCH BAR	STEEL
23	LOWER VALVE BODY	CAST IRON (6, 8)
		WELDED STEEL (10+)

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HANOVER, MD 21076
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www.rfvalve.com

BEX MGX-XXX MAT'LS OF CONSTRUCTION
MANUALLY ACTUATED (WITH GEAR REDUCTION)

Drawn by: Stachura

7/24/03

SIZE	FSCM NO.	DWG NO.	REV
A		000A259A	

SCALE 1:8 | APPROVED | SHEET

RF VALVE

TECHNICAL SPECIFICATION
TE 189.2

Version 06.03.03/KK

VALVE BODY ASSEMBLY

PARTS 9 and 10, if tube has opening tags
PART 8, short pull bar, types BEXXM, -P and -H
PART 8, long pull bar, types BEXXPD, -PF and -EF

BE valve body	
Part	Description
1	Nut
2	Washer
3	Valve body, upper part
4	Bushing, pull bar
5	Bolt
6	Washer
7	Nut
8	Pull bar
9	Screw
10	Washer
11	Pinch bar, upper
12	Elastomer tube
13	Pinch bar, lower
14	Valve body, lower part
15	Body sealing
16	Bolt
17	Washer
18	Retaining screw