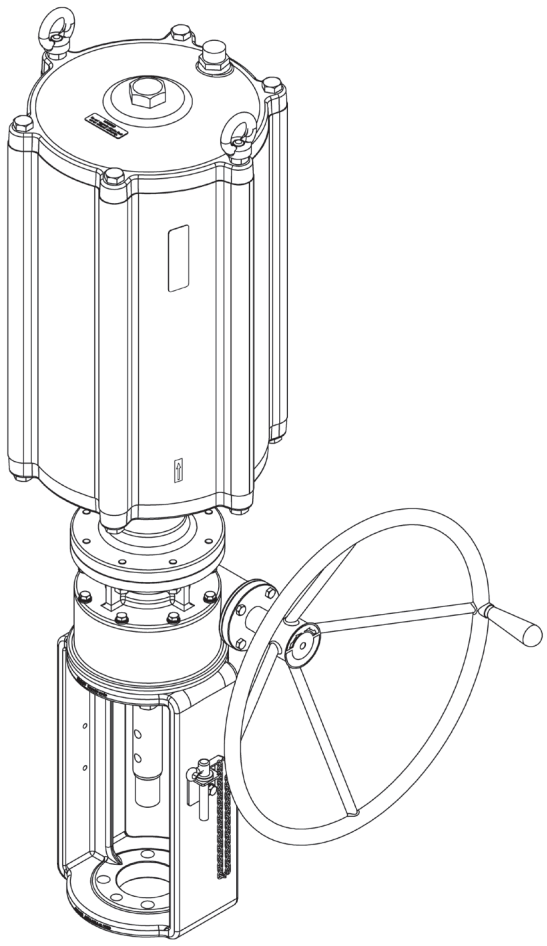
Pneumatic linear cylinder actuator

Series VBD/VBR

Installation, maintenance and operating instructions



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EAC This product meets the requirements set by the Customs Union of the Republic of Belarus, the Republic of Kazakhstan and the Russian Federation.

READ THESE INSTRUCTIONS FIRST!

These instructions provide information about safe handling and operation of the valve.

If you require additional assistance, please contact the manufacturer or manufacturer's representative.

SAVE THESE INSTRUCTIONS!

Addresses and phone numbers are printed on the back cover.

1. GENERAL

1.1 Scope of the manual

This manual provides essential information on Neles VB series, linear single-acting pneumatic cylinder actuators. As information of valve body and trim design is not clearly illustrated here, those who want to see more details of them had better check individual IMO manuals of the valves.

NOTE:
Selection and use of the actuator in specific applications require careful consideration from many aspects. Due to the nature of the product, this manual cannot cover all the individual situations that may occur when the actuator is used. If you are uncertain about use of the actuator or its suitability for your intended purpose, please contact Neles for more information.

1.2 Structure and operation

VB series are spring return piston actuators. Spring to close action is VBR model, spring to open action is VBD model. Excellent accuracy and long run reliability is achieved through the use of piston and well fitted seal rings in the actuator.

The VB single acting cylinder actuators are designed for use in both modulating control and on-off service. They provide heavy duty and reliable operation and are well suited for many different kinds of applications. The high performance internal coating resists wear and corrosion and the replaceable inner parts guarantee a long life cycle. Optional handwheel is available for manual operation. The detailed structure is revealed by the type code shown on the valve identification plate. The type code is explained in Section 10

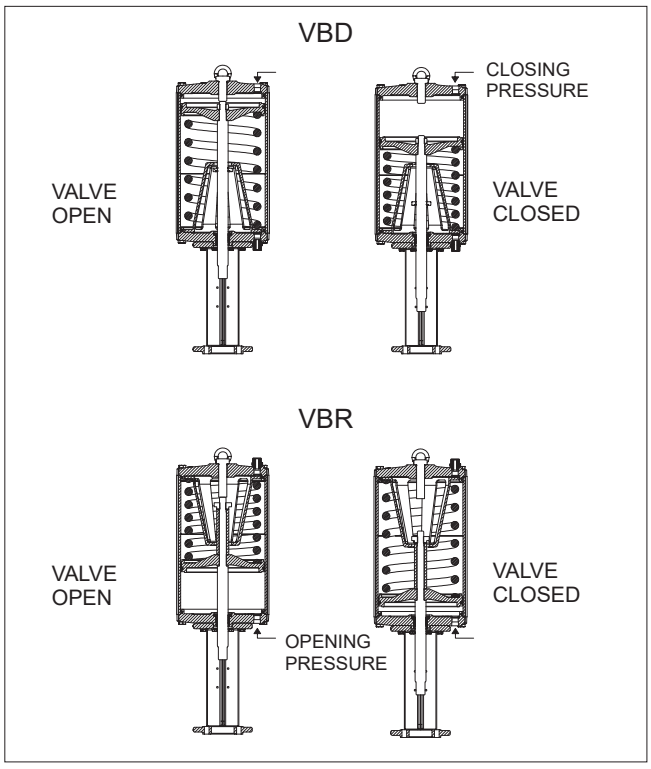


Fig. 1 Operating principle of the actuator

1.3 Actuator marking

The actuator is provided with an identification plate, see Fig. 2. Identification plate markings are:

1. Manufacturing year
2. Type code (model)
3. Serial numbers, BOM codes
4. Travel
5. Max. pressure
6. EAC & CE marking and Check signature

Fig. 2 Identification plate

Also, provided with a warning plate, see Fig. 3

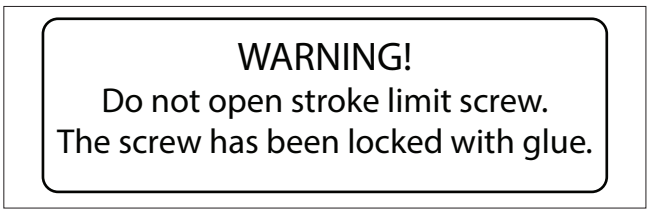


Fig. 3 Warning plate of VBD/R actuator

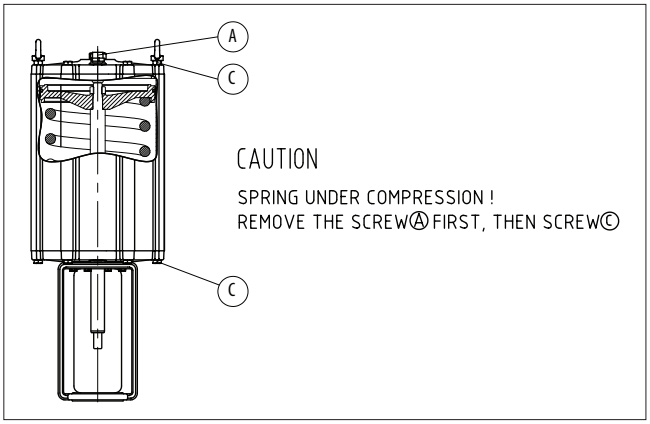


Fig. 4 Warning plate of VBD/R actuator

1.4 Specifications

Table 1 VBD/R Actuators temperature ranges

Description	Standard VB	High. Temp	Low. Temp	Arctic
Temp. range	-20 °C to 70 °C	-20 °C to 120 °C	-40 °C to 70 °C	-55 °C to 70 °C
Type code ref. (sign 8)	A	H	L	S

Note:
1. Temperature: Ambient temperature
2. Type code reference: Please see in page 15 (materials)
3. Other low temperature range: Please contact Neles

Table 2 VBD/R Actuators air supply connections

Standard	3/4" NPT for VB 32, 40
	1" NPT for VB 50, 60
Optional	Please contact Neles

Note:
1. Maximum operation pressure (MOP) for VBD/R: 8.5 bar / 123 psi
2. ATEX class: II 2 GD
3. Protection class: IP66, NEMA 4X

Table 3 VBD/R thrust capabilities

Size	Spring range		Thrust Capabilities							Max operation pressure	
			VBR (Reverse acting)	VBD (Direct acting)							
				Supply air set pressure, bar							
				3.2	4	4.5	5	5.5	6		
	bar	psi	N	N						bar	psi
32	1.3-1.8	19-25	9610	11356	17583	21478	25373	29268	33163	8.5	123
	1.8-2.4	26-35	13033	6178	12414	16309	20204	24099	27994		
	2.3-2.9	33-41	16514	1075	8868	12764	16661	20557	24453		
40	1.3-1.8	19-25	14324	15749	28317	34602	40887	47172	53457		
	1.8-2.4	26-35	19241	7571	20146	26431	32716	39001	45286		
	2.3-2.9	33-41	24968	1736	14310	20598	26885	33172	39457		
50	1.3-1.8	19-25	24670	28557	44264	54079	63894	73709	83524		
	1.8-2.4	26-35	33970	15504	31211	41026	50841	60656	70471		
	2.3-2.9	33-41	43218	2148	21785	31603	41422	51240	61058		
60	1.3-1.8	19-25	-	32934	55550	69685	83820	97954	112089		
	1.8-2.4	26-35	55794	9060	31676	45811	59945	74080	88215		
	2.3-2.9	33-41	-	-	-	-	-	-	-		

*. Note:
1. Max. stroke: Available to extend according to the required specifications.
2. The volume is based on above maximum stroke.
3. The thrust values are not included other considerable factors.

Table 4 VBD/R Actuator stroking time

Size	Stroke (mm)	ND Model	Stroke time (Sec.)		ND Model	Stroke time (Sec.)	
			VBD/R	VBD/R		VBD/R	VBD/R
			Load	Vent		Load	Vent
32	50	NDX	6	8	ND9_06	10	11
	60	NDX	7	8		11	12
	70	NDX	8	9		12	13
	80	NDX	8	10		13	15
	120	NDX	12	13		19	22
40	60	NDX	10	12	ND9_06	18	24
	70	NDX	10	12		26	35
	80	NDX	11	15		31	40
	120	NDX	15	22		35	44
50	60	NDX	12	14	ND9_06	25	36
	70	NDX	13	15		29	38
	80	NDX	14	17		34	42
	120	NDX	22	23		37	44
60	60	NDX	14	16	ND9_06	27	38
	70	NDX	15	17		31	40
	80	NDX	16	19		36	44
	120	NDX	24	25		39	46
	140	-	-	-		40	47
	160	-	-	-		41	48
	180	-	-	-		42	49
	200	-	-	-		43	50
	280	-	-	-		47	54

Note:
1. Mounted with ND 9200 smart positioners and Air set only
2. With B72G-2AS-980 Air set (1/4")
3. Air supply pressure: 5.0 barg(72psi)
4. Stroking time accuracy: ± 10 %

1.5 Recycling and disposal

Most actuator parts can be recycled if sorted according to material. Most parts have material marking. A material list is supplied with the actuator. In addition, separate recycling and disposal instructions are available from the manufacturer. An actuator can also be returned to the manufacturer for recycling and disposal against a fee.

1.6 Safety precautions

CAUTION:
Don't exceed the permitted values!
Exceeding the permitted pressure value marked on the actuator may cause damage and lead to uncontrolled pressure release in the worst case. Damage to the equipment and personal injury may result.

CAUTION:
Don't dismantle a pressurized actuator!
Dismantling a pressurized actuator leads to uncontrolled pressure release. Shut off the supply pressure and release pressure from the diaphragm case before dismantling the actuator.
Otherwise, personal injury and damage to equipment may result.

CAUTION:
Don't dismantle the spring package!
The spring package within the cylinder is preloaded. Never open the lock-welded fastening screw of the piston or dismantle the spring package. The piston, piston rod, spring and spring plate of the VBD/VBR actuator are always delivered as a pre-assembled package.

CAUTION:
Follow the instructions given on the actuator warning plates!

CAUTION:
Take the weight of the actuator or valve combination into account when handling it!
Do not lift the valve combination from the actuator, positioner, limit switch or their piping. Lift the actuator as directed in Section 2, lifting ropes for a valve combination should be fastened around it. The weights are shown in Section 9. Dropping may result in personal injury or damage to the equipment.

CAUTION:
Before opening the cylinder fastening screws, release spring tension directed on actuator warning plate and in these instructions!

ATEX/Ex Safety

CAUTION:
Potential electrostatic charging hazard, do not rub surface with dry cloth

CAUTION:
Ensure the general process and worker protection from static electricity in the facilities.

NOTIFICATION:
The actual surface temperature of actuator is depended on the process and ambient conditions. The protection from high or low temperature must be considered by the end user before put into service.

2. TRANSPORTATION, RECEPTION AND STORAGE

VBD/R series actuators have several rules for transportation and storage. First, product handlers have to make sure that the actuator and its associated parts are not damaged during transportation.

If the actuator needs to get stored before installation, it should be stored in the place where humidity and risk of physical damage are low. Also, protective caps of each air port should not be removed before installation.

The Fig. 5 is a good example of lifting the actuator. The two eye nuts connected with wires will be used for the lifting and moving the actuator. Actuator weights in Section 9 have to be taken in consideration to minimize accidental risks.

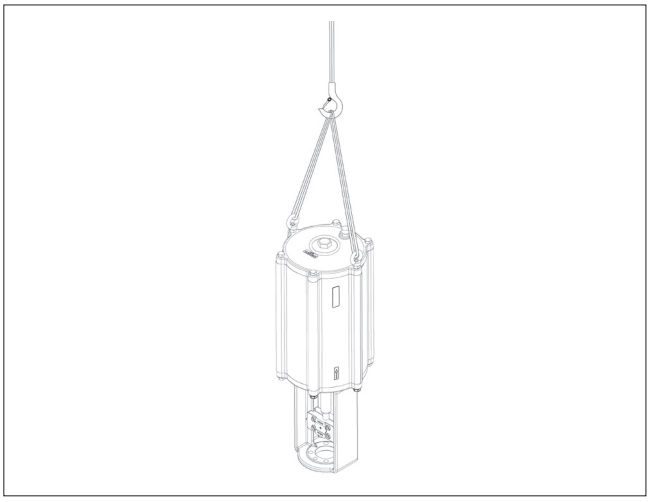


Fig. 5 Lifting the actuator.

3. MOUNTING AND REMOVAL

3.1 Actuator air supply

Dry compressed air or natural gas can be used in actuators in open-close operation, no oil spraying is needed. Clean, dry and oil-free instrument air must be used for piston actuators with a positioner. The air supply connections are presented in the dimensional drawings in Section 9. The maximum supply pressure is 8.5 bar.

3.2 Mounting the actuator on the valve

Installation of actuators has several steps as in the following. Neles recommends assemblers should follow the steps in the way how Neles describes. Before mounting the actuator onto a valve joint area, assemblers must check if the valve is fully constrained with pipelines or certain tools to prevent potential risks. Assemblers ought to keep in mind that all the cautions below should be taken into account for every single move.

Several types of Neles valves can be used with suitable clamps. Refer to the selected valve model manuals for further information on their installation, maintenance and operation.

CAUTION:
Beware of the cutting movement of the valve!

- Mount the new or repaired actuator on top of the valve bonnet, using a suitable lifting device.
- Insert the hexagon screws and tightly fasten the yoke by turning the hexagon screws clockwise using tightening tools.
- Connect air line with actuator.
- Get the piston rod (10) completely reached to the downward end by specified air pressure.
- Adjust piston rod length after clamping the clamp (27) according to rated travel (stroke) as ‘open’ and close position as per pressurizing and depressurizing both the sides of cylinder chambers.
- Tighten the 4 socket head screws (27A) on the clamp (27) and the lower piston rod locknut.
- Connect accessories with actuator.

CAUTION:
Avoid turning the valve plug and stem when plug is on seat ring to prevent the seating line from being damaged.

The installation position can be selected freely, but Neles recommends iupright installation. The actuator is thus best protected against damage from supply air impurities or water.

When necessary, lubricate the actuator piston rod (10) and bearing (2) with Cortec VCI 369 or an equivalent anti-corrosive agent to prevent it from jamming due to rust.

The actuator must not be allowed to come in contact with the pipework, because the vibrations may damage it or cause unsatisfactory operation.

3.3 Removal of the actuator from the valve

CAUTION:
Make sure the valve is not pressurized when removing the actuator.

- Shut off and disconnect the air supply lines and accessories.
- Loosen the plug piston rod locknut and the 4 socket head screws (27A) on the clamp (27).
- Remove the clamp (27).
- Support the actuator with the suitable lifting device.
- Remove the hexagon screws from the valve bonnet.
- Remove the actuator from the valve body assembly.

CAUTION:
Avoid turning the valve plug and stem when plug is on seat ring to prevent the seating line from being damaged.

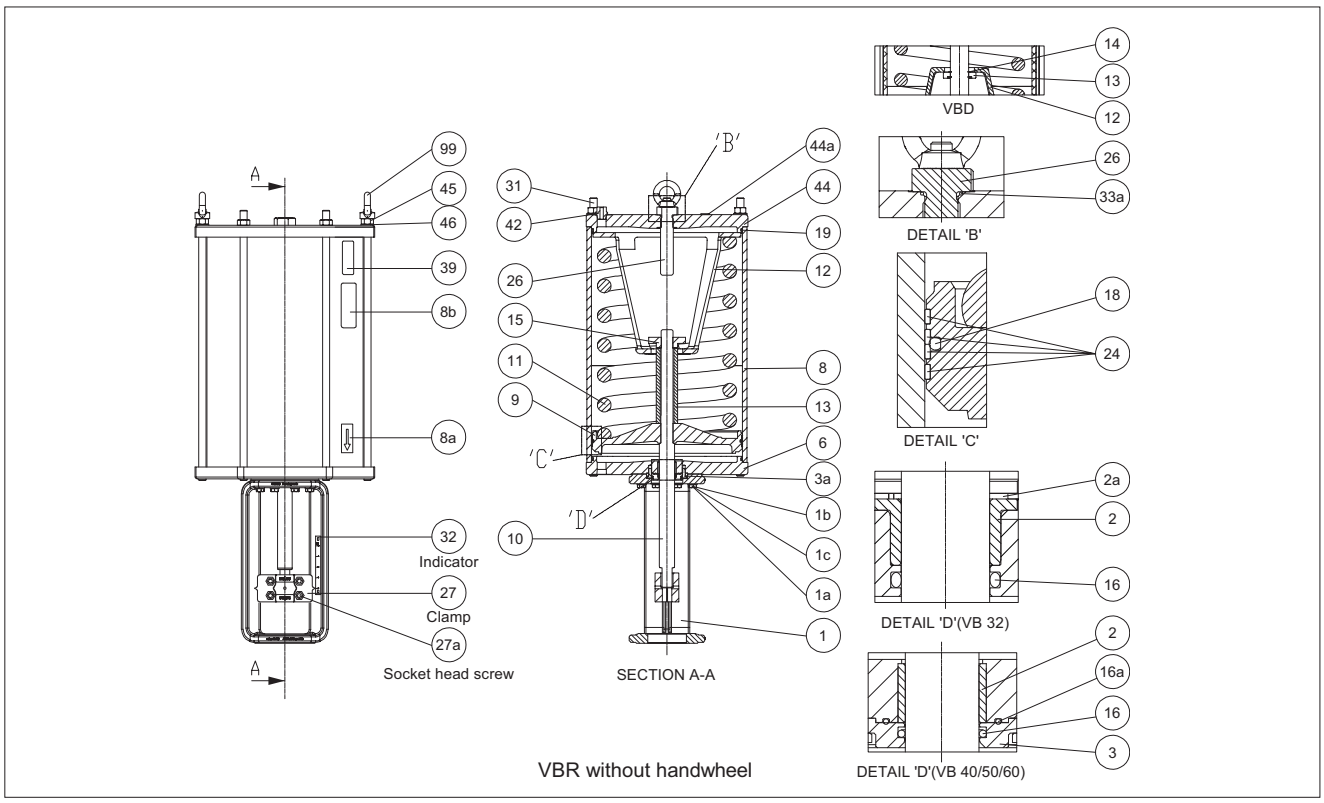


Fig. 6 VBD/R Actuator Constructions without Handwheel

Part No.	Description	Material	Spare part category
1	YOKE	ASTM A216 Gr. WCB	
1a	HEXAGON SCREW	ISO 3506 A2-70	
1b	WASHER	AISI 304	
1c	SPRING WASHER	AISI 304	
2	SLIDE BEARING	BRONZE	Cat 3
2a(VB 32)	RETAINER RING	DIN 17222-C67	Cat 3
3(VB 40/50/60)	COVER PLATE	AISI 304	Cat 3
3a(VB 40/50/60)	HEXAGON SCREW	ISO 3506 A2-70/80	Cat 3
6	CYLINDER BASE	EN 1563-GJS-400-15	Cat 3
8	CYLINDER PIPE	EN 1706 G-ANSI 10Mg+ANODIZED	Cat 3
8a	DIRECTION TAG	POLYESTER	
8b	STICKER	PLASTIC	
9	PISTON	EN 1561-GJL-200	**
10	PISTON ROD	PISTON ROD STEEL+HCr	**
11	COIL SPRING	EN 10089-51CrV4	**
12	SPRING PLATE	EN 1563-GJS-400-15	**
13	RING(VBD), MOUNTING PIPE(VBR)	EN 10025-S355JO	**
14(VBD)	RETAINER RING	DIN 17222-C67	**
15	HEXAGON NUT	ASTM A194 gr. 2HM	**
16	O-RING	NITRILE, NBR	Cat 1*
16a(VB 50/60)	O-RING	NITRILE, NBR	Cat 1*
18	O-RING	NITRILE, NBR	Cat 1*
19	O-RING	NITRILE, NBR	Cat 1*
24	PISTON RING	UHMWPE	Cat 1*
26	LIMIT SCREW	ISO 3506 A2-70/80	Cat 3
27***	CLAMP	ASTM A351 gr. CF8	Cat 3
27a***	SOCKET HEAD SCREW	ISO 3506 A2-70	Cat 3
31(VB 32)	HEXAGON SCREW	ISO 3506 A2-70	
31(VB 40/50/60)	STUD	ISO 3506 A2-70, EN 10083-1.7218+ZINC	
32	INDICATOR	AISI 304	
33a	O-RING	NITRILE, NBR	Cat 1*
39	IDENTIFICATION PLATE	POLYESTER	
42(VBR)	SILENCER	AISI 304	
44	CYLINDER END	EN 1563-GJS-400-15	Cat 3
44a	WARNING PLATE	POLYESTER	
45	HEXAGON NUT	ISO 3506 A2-70, ISO 898/2 8+ZINC+PASS.	
46	WASHER	AISI 304, CARBON STEEL+ZINC+PASS.	
99	LIFTING EYE NUT	JIS G3101-SS400	

Spare part category 1: Recommended soft parts for maintenance
Spare part category 3: Complete overhaul (for complete overhaul, parts of all two categories are needed)
*) Delivered as a set
**) Part of coil spring assembly(11), category 3
***) V-A mounting parts

4. MAINTENANCE

CAUTION:
Observe the safety precautions listed in Section 1.6 before starting work!

CAUTION:
When handling the actuator or the control valve assembly, take its weight into account!

4.1 General

Although Neles actuators are designed to work under severe conditions, proper preventative maintenance can significantly help to prevent unplanned downtime and in real terms reduce the total cost of ownership. Neles recommends inspecting the valves at least every five (5) years.

The inspection and maintenance interval depend on the actual application and process condition. The inspection and maintenance intervals can be specified together with your local Neles experts.

During this periodic inspection the parts detailed in the Spare Part Set should be replaced. Time in storage should be included in the inspection interval.

Maintenance can be performed as presented below. For maintenance assistance, please contact your local Neles office. The numbers in parentheses refer to the parts lists and the exploded views of the actuator in Section 8 and in Fig.6, unless otherwise stated.

NOTE:
When sending goods to the manufacturer for repair, do not disassemble them. Clean the valve carefully and flush the valve internals. For safety reasons, inform the manufacturer of the type of medium used in the valve (include material safety datasheets (MSDS)).

NOTE:
In order to ensure safe and effective operation, always use original spare parts to make sure that the valve and the actuator function as intended.

NOTE:
For safety reasons, replace pressure retaining bolting if the threads are damaged, have been heated, stretched or corroded.

NOTE:
If you send the actuator to the manufacturer for repair, do not dismantle it. For safety reasons, please see the warning plate on the top side of actuator.

CAUTION:
Do not dismantle the actuator or remove it from the pipeline while the valve is pressurized!

CAUTION:
Make sure the valve is not pressurized when removing the actuator.

4.2 Replacement of piston seals for VBD

We recommend that all seals and soft bearings be replaced when the actuator has been dismantled for servicing.

The actuator must be depressurized, and the supply air pipe disconnected.

CAUTION:
Don’t dismantle a pressurized actuator!

CAUTION:
To release spring tension, the stop screw at the end of the cylinder must be removed before the cylinder fastening screws are opened!

CAUTION:
Don’t dismantle the spring package!
The spring package within the cylinder is preloaded. Never open the lock-welded fastening screw of the piston or dismantle the spring package. The piston, piston rod, spring and spring plate of the VBD/VBR actuator are always delivered as a pre-assembled package.

Disassembling

- Check that the actuator has been depressurized, and remove air tubing with instrument parts from the cylinder end (44) and cylinder base (6).

NOTE:
If actuator is equipped with the handwheel, change the operation mode from ‘Manual’ to ‘Auto’ before the actuator is dismantled.

- Remove the clamp (27) after loosening the socket head screws (27A).
- Detach the actuator from valve.
- Loosen the limit screw (26) and remove it from cylinder end (44).
- Loosen the VB 32 screws (31) or VB 40/50/60 stud (31) and hexagon nuts (45) and remove it from cylinder end (44).
- Pull up the cylinder end (44) and remove the O-rings (19) from the O-ring groove.
- Pull up and remove the spring package including the piston (9) and the piston rod (10).
- Loosen the VB 32 screws (31) or VB 40/50/60 stud (31) and hexagon nuts (45) and remove it from cylinder base (6).
- Remove the cylinder (8).
- Remove the hexagon screws (1A) and washers (1B) from the yoke (1) side.
- Remove the retainer ring (2A) and bearing (2) and O-ring (16).
- Remove the cylinder base (6) from the yoke (1).

Cleaning and replacing

- Clean every part.
- Replace all related seal and O-rings by new ones.
- Check each part whether scratched or damaged.

Reassembling

CAUTION:
Check for scratches on the piston rod (10), dirty particles inside of the bearing (2), wear rings and O-rings before reassembling.

- Apply VCI-369 to O-ring groove on the piston (9).
- Use tie ring to assemble the piston ring (24) to the prefabricated spring package. Refer to Fig. 7.
- Lubricate seal space, inner surface of bearing (2) and new O-rings with Unisilikon L250L or equal silicone grease.
- Put the bearing (2) and new O-rings (16) into the cylinder base (6).
- Mount the cylinder pipe (8) to the cylinder base (6).
- Fasten the VB 32 screw (31) or VB 40/50/60 stud (31) and hexagon nut (45) on the cylinder base (6).
- Press the prefabricated spring package into the cylinder pipe (8). Refer to Fig.8.
- Make sure that piston rod (10) is not scratched.
- Mount the cylinder end (44) to the cylinder pipe (8).
- Fasten the VB 32 screw (31) or VB 40/50/60 stud (31) and hexagon nut (45) on the cylinder end (44).
- Input pressed air as per specified air pressure after assembly.
- Check leakage from assembled parts and if operation is smooth.
- Mount the yoke (1) on the cylinder base (6).
- Tighten the hexagon screws (1A) with washers (1B) at the yoke side

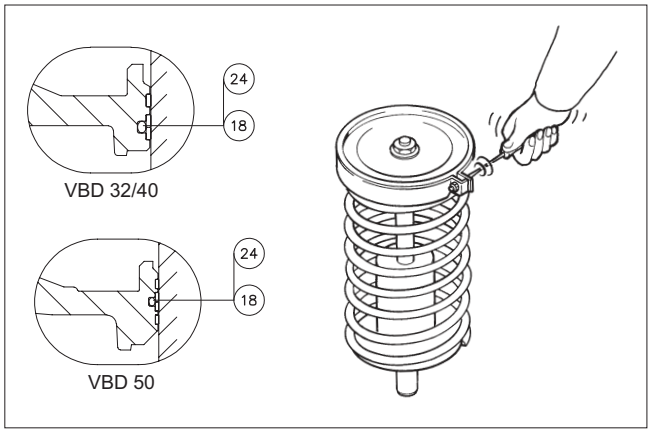


Fig. 7 Tightening piston seals with a tie ring

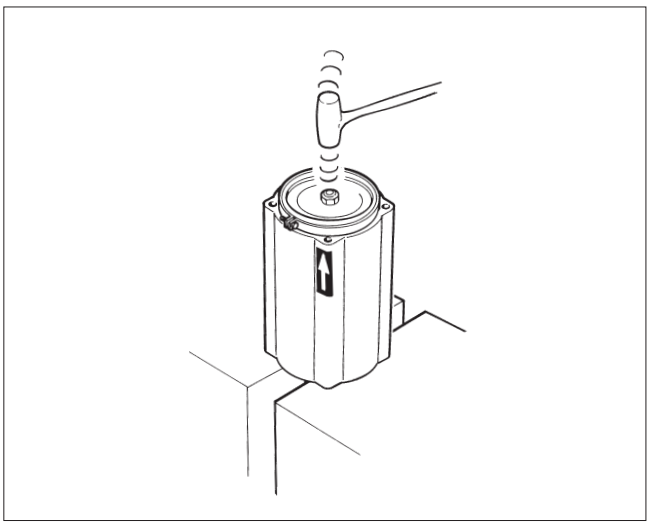


Fig. 8 Placing the piston into cylinder pipe

4.3 Replacement of piston seals for VBR

We recommend that all seals and soft bearings be replaced when the actuator has been dismantled for servicing.

The actuator must be depressurized, and the supply air pipes disconnected.

Disassembling

- Check that the actuator has been depressurized and the piston (9) is at outermost end of cylinder (8).
- Remove air tubing with instrument parts from the cylinder end (44) and cylinder base (6).

NOTE:
If actuator is equipped with the handwheel, change the operation mode from ‘Manual’ to ‘Auto’ before the actuator is dismantled.

- Remove the clamp (27) after loosening the socket head screws (27A).
- Detach the actuator from valve.
- Loosen the VB 32 screws (31) or VB 40/50 stud (31) and hexagon nuts (45) and remove it from cylinder end (44).
- Pull up the cylinder end (44) and remove the O-rings (19) from the O-ring groove.
- Pull up the cylinder pipe (8) and detach it from piston (9) and cylinder base (6).
- Pull up the spring package.
- Remove the wear ring (24) and O-ring (18) from the piston (9).
- Remove the hexagon screws (1A) and washers (1B) from the yoke (1) side.
- Remove the retainer ring (2A) and bearing (2) and O-ring (16).
- Remove the cylinder base (6) from the yoke (1).

Cleaning and replacing

- Clean every part.
- Replace all related seal and O-rings by new ones.
- Check each part whether scratched or damaged.

Reassembling

CAUTION:
Check for scratches on the piston rod (10), dirty particles inside of the bearing (2), wear rings and O-rings before reassembling.

- Apply VCI-369 to O-ring groove on the piston (9).
- Use tie ring to assemble the piston ring (24) to the prefabricated spring package. Refer to Fig. 9.
- Lubricate seal space, inner surface of bearing (2) and new O-rings with Unisilikon L250L or equal silicone grease.
- Put the bearing (2) and new O-rings (16) into the cylinder base (6).
- Mount the cylinder pipe (8) to the cylinder base (6).
- Fasten the VB 32 screw (31) or VB 40/50 stud (31) and hexagon nut (45) on the cylinder base (6).
- Press the prefabricated spring package into the cylinder pipe (8). Refer to Fig.10.
- Make sure that piston rod (10) is not scratched.
- Mount the cylinder end (44) to the cylinder pipe (8).
- Fasten the VB 32 screw (31) or VB 40/50/60 stud (31) and hexagon nut (45) on the cylinder end (44).
- Input pressed air as per specified air pressure after assembly.
- Check leakage from assembled parts and if operation is smooth.
- Mount the yoke (1) on the cylinder base (6).
- Tighten the hexagon screws (1A) with washers (1B) at the yoke side.

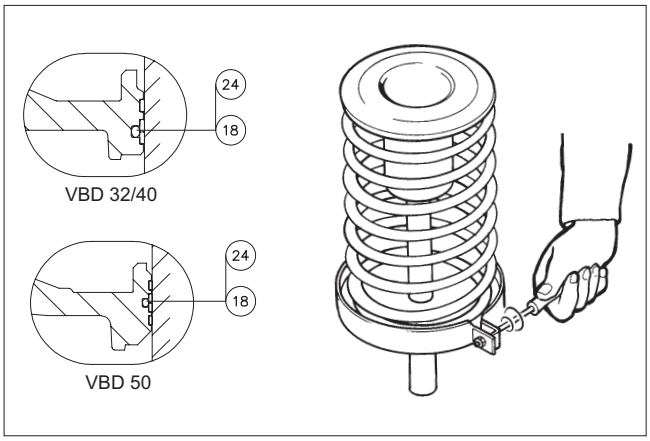


Fig. 9 Tightening piston seals with a tie ring

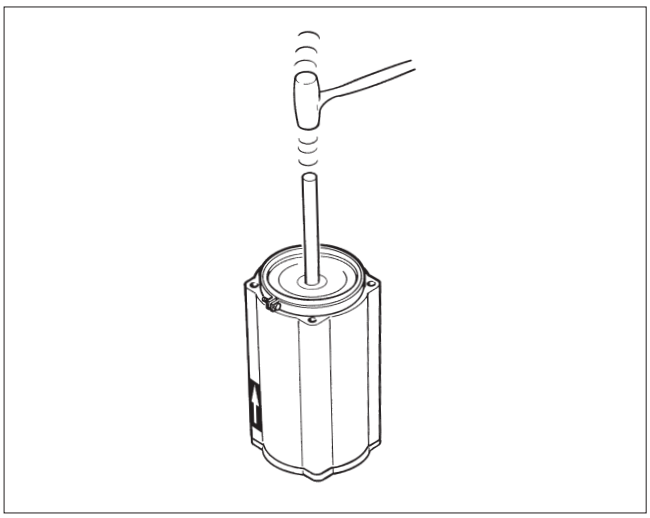


Fig. 10 Placing the piston into cylinder pipe

4.4 Operation of the handwheel

The manual override handwheel can open or close the valve when the valve stem and actuator stem are engaged by a pin. Please refer to the See Fig. 11 and Fig. 12.

- Check the current valve position.
- When using handle, make sure that air supply is cut off.
- Turn the handle to fit with the taper pin hole of the piston rod (10) and the gear pipe (90).
- Fit and insert the taper pin (93) into the pin holes (2 holes in the piston rod).
- Operate handwheel to be open or close position --- Manual mode.
- Return the taper pin (93) to be unlocked with the neutral position --- Auto mode.

NOTE:
VB_32/40/50 handwheel is located on the top of yoke and bottom of cylinder.
VB_60 handwheel is loaded on the top of cylinder.
Refer to Fig. 8.

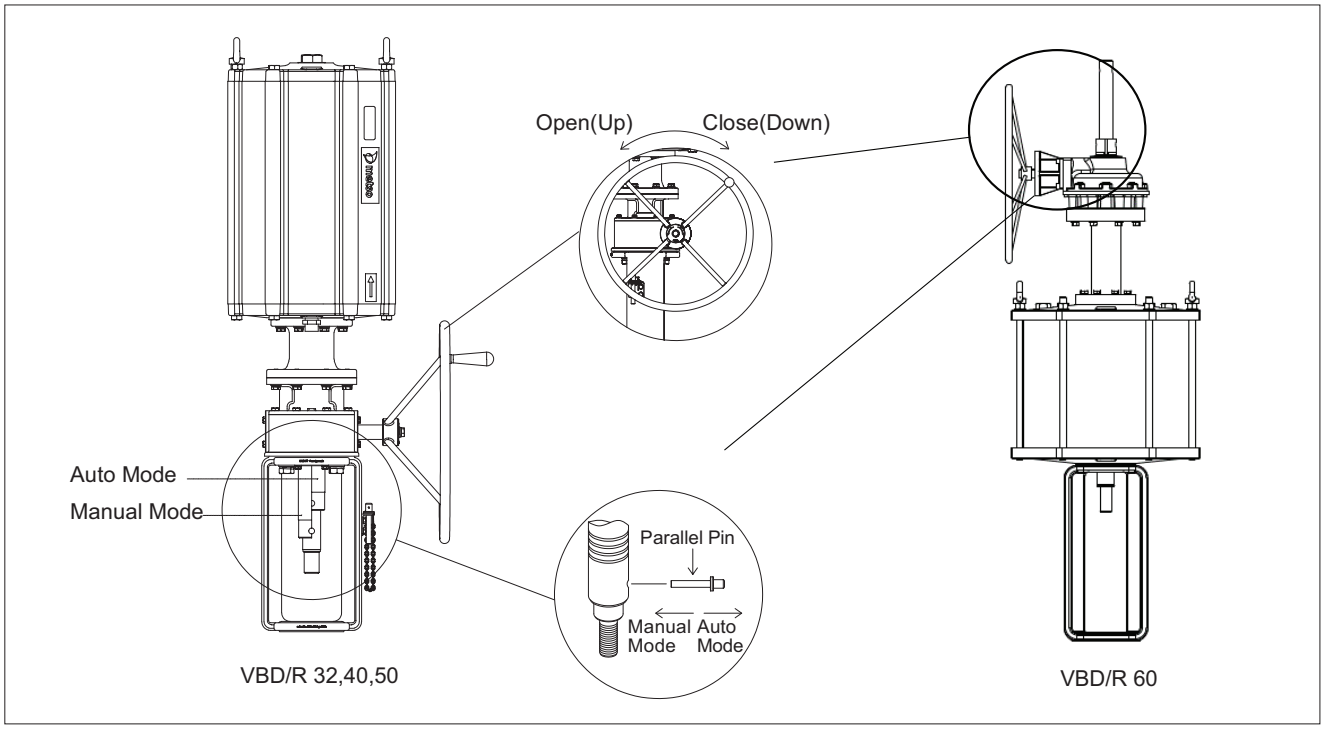


Fig. 11 VBD/R Actuator Constructions with Handwheel

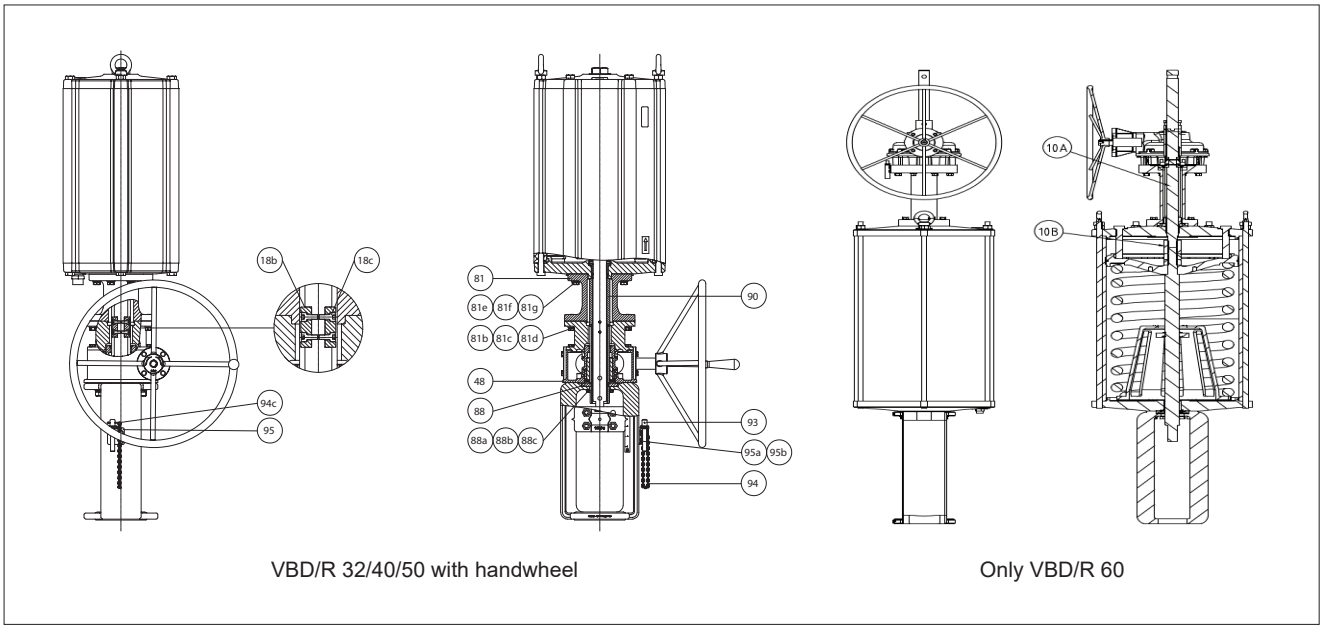


Fig. 12 VBD/R Actuator construction with Handwheel

Part No.	Description	Material	Recommended spare part	Note
18b	KEY	AISI 304+HCr		
18c	SOCKET HEAD SCREW	ISO 3506 A2-70		
48	GEAR BOX	DUCTILE IRON		
81	GEAR BOX COVER	ASTM A105		
81b	HEXAGON SCREW	ISO 3506 A2-70		
81c	WASHER	AISI 304		VB_32/40/50 only
81d	SPRING WASHER	AISI 304		VB_32/40/50 only
81e	HEXAGON SCREW	ISO 3506 A2-70		
81f	WASHER	AISI 304		VB_32/40/50 only
81g	SPRING WASHER	AISI 304		VB_32/40/50 only
88	LIMITER	AISI 304		
88a	HEXAGON SCREW	ISO 3506 A2-70		
88b	WASHER	AISI 304		
88c	SPRING WASHER	AISI 304		
90	GEAR PIPE	AISI 316L		
93	PIN	ASTM A564 gr. 630 H1100		
94	TAPER CHAIN	STAINLESS STEEL		
94c	SPLIT PIN	CARBON STEEL+ZINC		
95	HOLDER	AISI 304		
95a	HEXAGON SCREW	DIN 267 PART 11 A2-70		
95b	WASHER	AISI 304		VB_32/40/50 only
010a	PISTON ROD	PISTON ROD STEEL+HCr		VB_60 only
010b	COUPLING	ASTM A 564 gr. 630 H1025		VB_60 only

Table 5 VBD/R Tightening torques for screws

PN	Description	Screw Size	Q`ty	VB required Torques for each size							
				32		40		50		60	
				N.m	Lbf.ft	N.m	Lbf.ft	N.m	Lbf.ft	N.m	Lbf.ft
1a	Hexagon Screw	M12 x 1.75P	8	40	30						
		M16 x 2.0P	8			80	59	80	59		
		M24 x 3.0P	8							200	147
26	Limiting screw	M30	1 or 2	400	294					400	294
		M42	1			1000	735	1000	735		
27a	Socket Head Screw	M12x 1.75P	8	40	30						
		M16 x 2.0P	4			80	59	80	59	80	59
31	Screw or stud	M16 x 2.0P	12	80	59						
		M24x 3.0P	6			200	147	200	147	200	147
99	Lifting Eye Nut	M16 x 2.0P	2	80	59						
		M24 x 3.0P	2			200	147	200	147	200	147
18c	Socket Head Screw	M8 x 1.25P	4	26	19	26	19	26	19	26	19
81b	Hexagon Screw	M12 x 1.75P	8	40	30						
		M16 x 2.0P	8			80	59	80	59	80	59
81e	Hexagon Screw	M12 x 1.75P	8	40	30						
		M16 x 2.0P	8			80	59	80	59	80	59
88a	Socket Head Screw	M8 x 1.25P	4	26	19						
		M10 x 1.5P	4			28	21	28	21	28	21

Note:
1. Torque value tolerance: ± 10 %
2. Torques are nominal values

4.5 Removal of the handwheel sub assembly

The manual override requires no regular maintenance, please refer to Fig.6 & 12, if needed.

- VB32~50: Confirm handwheel is in auto mode first and remove the clamp (27) with the socket head screws (27a).
  VB60: Confirm handwheel is in auto mode first
- VB32~60: Remove the hexagon screws (81e) and washers (81f) from the top of gear box cover (81).
- VB32~50: Lift the actuator up until the key (18b) gets exposed.
  VB60: Lift the gear box package up until the key (18b) gets exposed.
- VB32~50: Remove the key (18b) and take out the actuator from the gear box package.
- VB60: Remove the key (18b) and take out the gear box package from the actuator.
- VB32~50: Take the gear pipe (90) out first and remove the hexagon screws (1a) and washers (1b) from the yoke (1) side.
  VB60: Take the gear pipe (90) out.
- VB32~50: Remove the socket head screw (88a) from the yoke (1) side.
  VB60: NA
- VB32~50: lift the handwheel sub-assembly from the yoke (1) and remove the limiter (88) from the yoke side.
  VB60: lift the handwheel sub-assembly from the cylinder end side.
- VB32~60: Repairing or replacing parts.

CAUTION:
Keep your fingers, tools or other items out of the housing while operating the actuator with the cover open!

4.6 Adjustment for valve stem

CAUTION:
Avoid turning the valve plug and stem when plug is on seat ring to prevent the plug/seat from being damaged.

The actuator stroke is always longer than the valve stem stroke, therefore, the actuator stroke is required to adjust when the stems are coupling together. Please refer to Fig.6 & 12, if needed.

- Push the valve stem and plug until lightly touching the seat ring.
- With the handwheel or pneumatically, operate the actuator to fully open position.
- Measure the maximum distance between top end of the valve stem and end of the actuator piston rod (10).
- Calculate gap by the following calculation (measured value - rated travel = gap).
- Adjust position of the piston rod (10) to have the gap calculated in the previous procedure between the two ends.
- Fix both the stem thread areas by the clamp (27).
- Align the stroke indicator (32) with the clamp indicator arrow and check actuator stroke for operation.
- Tighten the socket head screws (27A) for finish if the calibrated stroke is well set.
- If the stroke is still out of target range, continue to do the same calibration loop until it gets done.

5. MALFUNCTIONS

Table 6 Possible malfunctions

Symptom	Possible cause	Action
Irregular or slow operation	Low supply pressure	Make sure that supply pressure complies with minimum thrust required by valve. Check that supply air pipes are large enough.
	Positioner fault	Check positioner operation.
	Valve fault	Check that valve functions properly without actuator.
	Incorrect actuator rating	Contact manufacturer to check rating.
	Leak in cylinder pipe or o-rings	Replace o-rings. See sect. 4. maintenance.
	Cylinder damaged by impurities	Note installation position recommended. Replace cylinder if damaged.

6. TOOLS

Removal of the actuator

- Wrench set (mm)
- Hex socket wrench set
- Chisel and hammer (10 pound)
- +, - drivers

Piston seal installation

- Mounting collar (Tool ID)
  7814-7 For VB 32
  7814-8 For VB 40
  7814-9 For VB 50
  7814-10 For VB 60

Removal of the cylinder base

- Lock nut key (Tool ID)
  260196 For VB 40
  260195 For VB 50
  261153 For VB 60

7. ORDERING SPARE PARTS

NOTE:
Always use original spare parts to make sure that the valve functions as intended.

When ordering spare parts, always include the following information:

- Type code, sales order number, serial number
- Number of the parts list, part number, name of the part and quantity required

This information can be found from the identification plate or documents.

8. EXPLODED VIEWS AND PARTS LISTS

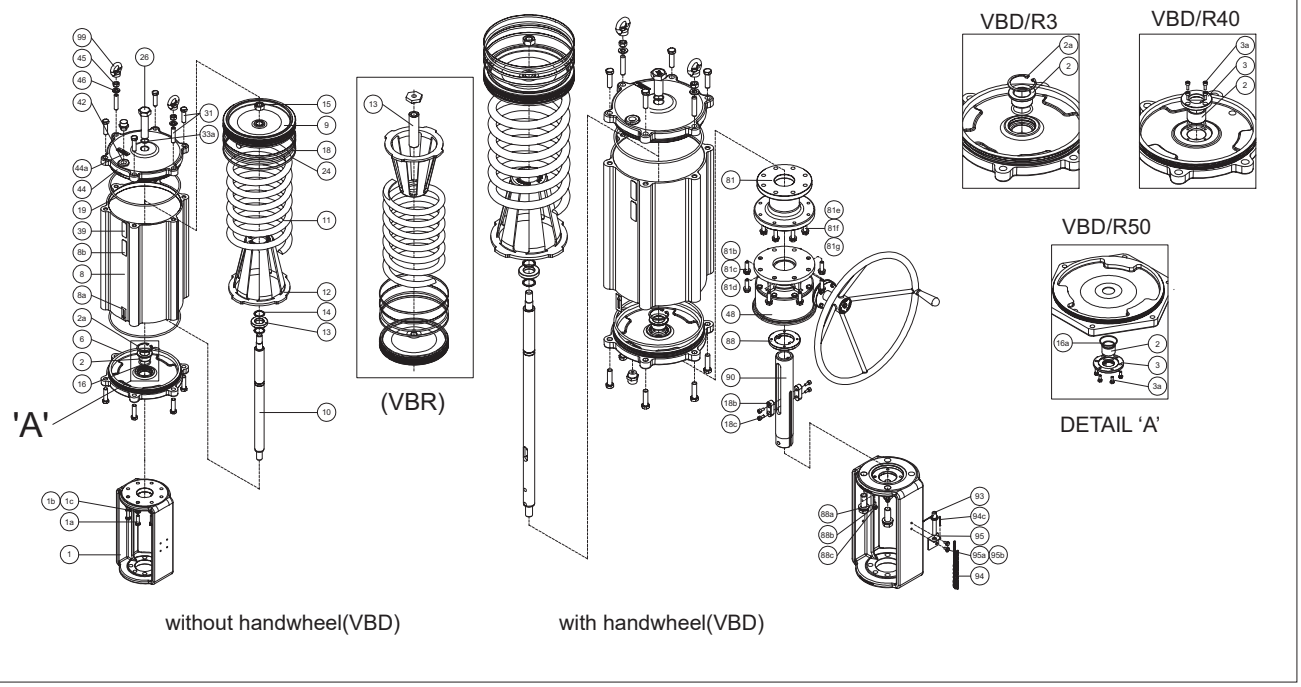


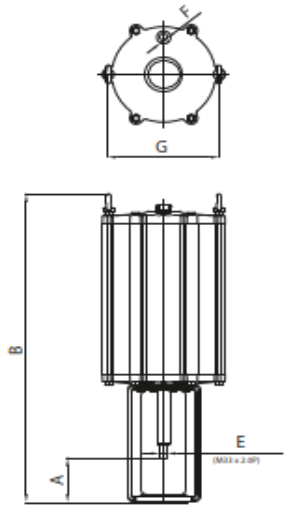
Fig. 13 VBD/R Actuator construction with Handwheel

Part No.	Description	Material	Recommended spare part
1	YOKE	ASTM A216 Gr. WCB	
1a	HEXAGON SCREW	ISO 3506 A2-70	
1b	WASHER	AISI 304	
1c	SPRING WASHER	AISI 304	
2	SLIDE BEARING	BRONZE	Cat 3
2a(VB_32)	RETAINER RING	DIN 17222-C67	Cat 3
3(VB_40, 50, 60)	COVER PLATE	AISI 304	Cat 3
3a(VB_40, 50, 60)	HEXAGON SCREW	ISO 3506 A2-70/80	Cat 3
6	CYLINDER BASE	EN 1563-GJS-400-15	Cat 3
8	CYLINDER PIPE	EN 1706 G-ANSI 10Mg+ANODIZED	Cat 3
8a	DIRECTION TAG	POLYESTER	
8b	STICKER	PLASTIC	
9	PISTON	EN 1561-GJL-200	**
10	PISTON ROD	PISTON ROD STEEL+HCr	**
11	COIL SPRING	EN 10089-51CrV4	**
12	SPRING PLATE	EN 1563-GJS-400-15	**
13	RING(VBD), MOUNTING PIPE(VBR)	EN 10025-S355JO	**
14(VBD)	RETAINER RING	DIN 17222-C67	**
15	HEXAGON NUT	ASTM A194 gr. 2HM	**
16	O-RING	NITRILE, NBR	Cat 1*
16a(VB_50, 60)	O-RING	NITRILE, NBR	Cat 1*
18	O-RING	NITRILE, NBR	Cat 1*
18b	KEY	AISI 304+HCr	
18c	SOCKET HEAD SCREW	ISO 3506 A2-70	
19	O-RING	NITRILE, NBR	Cat 1*
24	PISTON RING	UHMWPE	Cat 1*
26	LIMIT SCREW	ISO 3506 A2-70/80	
31(VB_32)	HEXAGON SCREW	ISO 3506 A2-70	

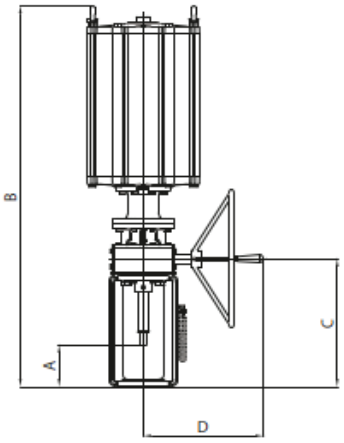
Part No.	Description	Material	Recommended spare part
31	STUD	ISO 3506 A2-70 , EN 10083-1.7218+ZINC	
33a	O-RING	NITRILE, NBR	Cat 1*
39	IDENTIFICATION PLATE	POLYESTER	
42	SILENCER	AISI 304	
44	CYLINDER END	EN 1563-GJS-400-15	Cat 3
44a	WARNING PLATE	POLYESTER	
45	HEXACON NUT	ISO 3506 A2-70, ISO 898/2 8+ZINC+PASS.	
46	WASHER	AISI 304, CARBON STEEL+ZINC+PASS.	
48	GEAR BOX	DUCTILE IRON	
81	GEAR BOX COVER	ASTM A105	
81b	HEXAGON SCREW	ISO 3506 A2-70	
81c	WASHER	AISI 304	
81d	SPRING WASHER	AISI 304	
81e	HEXAGON SCREW	ISO 3506 A2-70	
811	WASHER	AISI 304	
81g	SPRING WASHER	AISI 304	
88	LIMITER	AISI 304	
88a	HEXAGON SCREW	ISO 3506 A2-70	
88b	WASHER	AISI 304	
88c	SPRING WASHER	AISI 304	
90	GEAR PIPE	AISI 316L	
93	PIN	ASTM A564 gr. 630 H1100	
94	TAPER CHAIN	STAINLESS STEEL	
94c	SPLIT PIN	CARBON STEEL+ZINC	
95	HOLDER	AISI 304	
95a	HEXAGON SCREW	DIN 267 PART 11 A2-70	
95b	WASHER	AISI 304	
99	LIFTING EYE NUT	JIS G3101-SS400	

Spare part category 1: Recommended soft parts for maintenance
Spare part category 3: Complete overhaul (for complete overhaul, parts of all two categories are needed)
*) Delivered as a set
**) Part of coil spring assembly (11), category 3

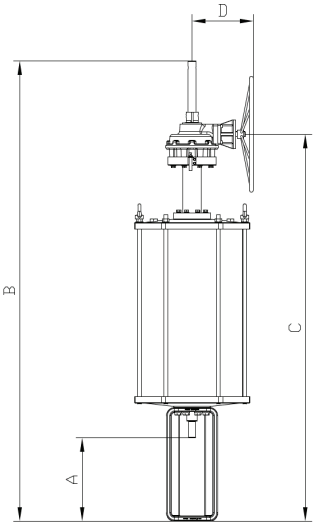
9. DIMENSIONS AND WEIGHTS



All VBD/R
Without handwheel



VBD/R 32/40/50
With optional handwheel



VBD/R 60
With optional handwheel

Dimension (mm) / Size	Stroke Range	Without handwheel					With handwheel				
		A	B	F	G	Weight (kg)	A	B	C	D	Weight (kg)
VBD/R32	50…120	278 / 158	1069	3/4” NPT	392	154	280 / 160	1393	471	417	205
VBD/R40	60…180	365 / 185	1449	3/4” NPT	499	314	358 / 178	1798	619	427	392
VBD/R50	60…180	365 / 185	1531	1” NPT	610	503	358 / 178	1879	619	427	446
VBD/R60	60…280	222	1913	1” NPT	724	826	222	2774	2332	333	986

Dimension (inch) / Size	Stroke Range	Without handwheel					With handwheel				
		A	B	F	G	Weight (lbs)	A	B	C	D	Weight (lbs)
VBD/R32	1.97…4.72	10.9 / 6.2	42,0	3/4" NPT	15.4	340	11 / 6.3	54,8	18.5	16.4	452
VBD/R40	2.36…7.09	14.4 / 7.3	57.0	3/4" NPT	19.6	692	14 / 7	70.8	24.4	16.8	864
VBD/R50	2.36…7.09	14.4 / 7.3	60.3	1" NPT	24.0	1109	14 / 7	74.0	24.4	16.8	1226
VBD/R60	2.36…11.02	8,7	75.3	1" NPT	28.5	1821	8,7	109.2	91.8	13.1	2173

10. EU DECLARATION OF CONFORMITY

EU DECLARATION OF CONFORMITY

Manufacturer:
Valmet Flow Control Korea Co., Ltd.
Chungju, Korea
*Valmet Flow Control (Jiaxing) Co., Ltd.,
Jiaxing, China
*) Manufactures VB-series

EU Authorised Representative: Valmet Flow Control Oy, Vanha Porvoontie 229, 01380 Vantaa, Finland.
Contact details: +358 10 417 5000

Product:	Pneumatic actuator
Type:	VC-, VD-, VB-series
ATEX group and category:	Ex II 2 GD
Protection concept of non-electrical equipment	
VC/VD up to 85°C:	Ex h IIC T6 Gb/ Ex h IIIC T85°C Db
VB 120°C:	Ex h IIC T6…T4 Gb/ Ex h IIIC T85°C…T120°C Db

ATEX 2014/34/EU Annex VIII technical files are archived by Notified Body number 0537.

Manufacturer's certificates:

Standard / Directive	Notified Body and NoBo number	Certificate No.
ISO 9001:2015	LRQA (Certification Body)	00029133 (Approval No.)
ATEX 2014/34/EU Annex IV	DNV Product Assurance AS Norway 2460	Presafe 18 ATEX 91983Q Issue 6

Applicable Directives:

Machinery 2006/42/EC Annex IIB	Actuator
ATEX 2014/34/EU	Non-electrical equipment

As the products within our sole responsibility of design and manufacture may be used as parts or components in machinery and are not alone performing functions as described in Article 6(2) of Machinery Directive 2006/42/EC, we declare that our product(s) to which this Declaration of Conformity relates must not be put into service until the relevant machinery into which it is to be incorporated has been declared in conformity with the provisions of the Machinery Directive.

The product above is manufactured in compliance with the applicable European directives and technical specifications/ standards. The product is in conformity with the customer order.

Non-electrical equipment is according EN 80079-37:2016 and EN 80079-36:2016. The actual surface temperature of non-electrical equipment is depended on the process and ambient conditions (EN 80079-36:2016 § 6.2.5 and 6.2.7). The protection from high or low temperature must be considered by the end user before put into service.

Protection from e.g. static electricity caused by the process or connected equipment must be considered by the user (EN 60079-14 § 6). Follow the caution instruction in identification plate sticker and instruction manual.

The product does not possess any residual risk according to hazard analysis conducted under the applicable directives providing that the procedures stated by the IMO (Installation, Maintenance and Operating) instructions manual are followed and the product is used under conditions mentioned in the technical specifications.

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Vantaa 1.10.2025

Matti Rousku, Quality Director

11. HOW TO ORDER, TYPE CODE

Pneumatic Cylinder Actuator, Linear type, Series VBR / VBD													
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
VB	R	32	E	070	A	E	S	S	A	Y	D	X	A

ACTUATOR CONSTRUCTIONS

1.	ACTUATOR SERIES
VB	Pneumatic Cylinder actuator, Linear type

2.	FUNCTION CODE		
	Direction	Spring to	Air to Stem
R	Reverse acting	Close	Retracted
D	Direct acting	Open	Extended

3.	ACTUATOR SIZE
	Cylinder Inner Diameter
32	Ø315 mm
40	Ø400 mm
50	Ø500 mm
60	Ø600 mm

4.	SPRING RANGE
E	General spring
K	Light spring (spring option for VBD)
V	Strong spring (spring option for VBR)

5.	STROKE			
	VB 32	VB 40	VB 50	VBD/R 60
040	IQI	IQI	IQI	IQI
050	STD	IQI	IQI	IQI
060	STD	STD	STD	STD
070	STD	STD	STD	STD
080	STD	STD	STD	STD
120	STD	STD	STD	STD
140	IQI	STD	STD	STD
160	IQI	STD	STD	STD
180	IQI	STD	STD	STD
200	NA	NA	NA	STD
280	NA	NA	NA	STD
YYY	Contact IQI for special stroke			

MATERIALS

6.	CYLINDER MATERIAL
A	Aluminium
S	Carbon steel + HCr (Offshore)

7.	PISTON MATERIAL
E	EN 1561-GJL-200
S	EN 1561-GJL-400 (Arctic version)

8.	SEAL MATERIAL	
	Material	Temperature range
A	Nitrile rubber	General, -20…+70°C
L	ECO (Epiclohydrin rubber)	Low temp, -40…+70°C
S	Arctic version	Arctic, -55…+70°C
	Optional Seal Application	
H	Viton (Fluorocarbon rubber)	High temp, -20…+120°C

9.	BOLTING MATERIAL
K	SS for VB 32, CS+Zinc plating for VB 40/50
A	CS+Zinc plating for steel cylinder (Offshore)

OTHERS

10.	POSITION LIMITATION
A	General construction

11.	EXTERNAL OVERRIDE OPTION
X	Not Applicable
A	Handwheel, side mounted
Y	Special mounting side or Special H/W construction

12.	AIR SUPPLY CONNECTION	
	Connection Size	Actuator Size
D	3/4" NPT	VB 32/40
E	1" NPT	VB 50/60

13.	OPTIONS
X	Not Applicable
Y	Special

14.	MODEL CODE
A	Original model

12. GENERAL SAFETY WARNINGS AND DISCLAIMERS

General safety warnings

Lifting

1. Always use a lifting plan created by a qualified person to lift this equipment. Lifting guidance is provided in this IMO (Installation, Maintenance and Operation manual) to assist in lifting plan development. Think about the point center of gravity (CG) of the equipment being lifted. Make sure the CG is always under the central lifting point.
2. Valves may be equipped with lifting threads on the body or on the flanges. These are which are intended for use with the lifting plan.
3. Use only correct and approved lifting devices. Ensure that lifting devices and straps are securely attached to the equipment prior to lifting.
4. Check, that lifting devices are not damaged and in good condition with a valid check stamp prior to use.
5. Workers must be trained for lifting and handling valves.
6. Never lift an assembly by the instrumentation (solenoid, positioner, limit switch, etc.) or by the instrumentation piping. Straps and lifting devices should be fitted to prevent damage to instrumentation and instrumentation piping. Failure to follow the lifting guidance provided may result in damage and personal injury from falling objects.

Work activities on the valve

1. Wear your personal safety equipment. Personal safety equipment includes but is not limited to protective shoes, protective clothing, safety glasses, helmet, hearing protection and working gloves.
2. Always follow the local safety instructions in addition to the Valmet instructions. If Valmet instructions conflict with local safety instructions, stop work and contact Valmet for more information.
3. Before beginning service on the equipment, make sure that the actuator is disconnected from any kind of power source (pneumatic, hydraulic, and/or electric), and no stored energy is applied on the actuator (compressed spring, compressed air volumes, etc.). Do not attempt to remove a spring return actuator unless the stop screw is carrying the spring force.
4. Make sure that there is a LOTOTO (Lock Out / Tag Out / Try Out) procedure in place for the system in which the valve is installed and strictly follow it.
5. Always make sure that the pipeline is depressurized and in ambient temperature condition before maintenance work is started.
6. Keep hands and other body parts out of the flow port when the valve is being serviced and the actuator is connected to the valve. There is a high risk of serious injury to hands and/or fingers due to malfunction if the valve suddenly starts to operate.

General disclaimers

Receive, handle and unpacking

1. Respect the safety warnings above!
2. Valves are critical components for pipelines to control high pressure fluids and must therefore be handled with care.
3. Store valves and equipment in a dry and protected area until the equipment is installed.
4. Keep the original packaging on the valve as long as possible to avoid environmental contamination by dust, water, dirt, etc.
5. Remove the valve endcaps just before mounting into the pipeline.
6. FOR YOUR SAFETY IT IS IMPORTANT THE FOLLOWING PRECAUTIONS BE TAKEN PRIOR TO REMOVAL OF THE VALVE FROM THE PIPELINE OR BEFORE ANY DISASSEMBLY:
   - Be sure you know what fluid is in the pipeline. If there is any doubt, confirm with the proper supervisor.
   - Wear any personal protective equipment (PPE) required for working with the fluid involved in addition to any other PPE normally required.
   - Depressurize the pipeline, bring to ambient temperature, and drain the pipeline fluid.
   - Cycle the valve to relieve any residual pressure in the body cavity.
   - After removal but before disassembly, cycle the valve again until no evidence of trapped pressure remains.
7. The identification plate (nameplate, or engraved markings) on the valve gives the information of max. process conditions to the valve.
8. Temperatures and pressures must never exceed values marked on the valve. Exceeding these values may cause uncontrolled release of pressure and process fluid. Damage or personal injury may result.
9. Valmet valves typically are designed to be used in atmospheric conditions. Do not use valves under external pressurized conditions unless specifically designed and explicitly marked for this service.
10. Avoid Pressure shocks or water hammer. Systems with high pressure valves should be equipped with a bypass to reduce the differential pressure before opening the valve to avoid pressure shock.
11. Avoid thermal shock. High temperature, Low temperature and cryogenic valves should be operated in a way that limits the rate of increase or decrease in temperature. The valve should be thermally stabilized before being pressurized.
12. Materials of the valve are carefully selected for the process conditions. Changes to the process media can have a major impact on function and safety of the valve. Always confirm the materials are suitable for the service prior to installation.
13. As the use of the valve is application specific, a number of factors should be taken into account when selecting a valve for a given application. Therefore, some situations in which the valves are used are outside the scope of this manual.
14. It is the end user’s responsibility to confirm compatibility of the valve materials with the intended service, however if you have questions concerning the use, application, or compatibility of the valve for the intended service, contact Valmet for more information.
15. Never use a valve with enriched or pure oxygen if the valve is not explicitly designed and cleaned for oxygen. Selected materials and design have a major impact on the safety to operate the valve with oxygen.
16. Valves intended for use in or with explosive atmospheres must be equipped with a grounding device and marked according ATEX (or equivalent international standards).

Maintenance

17. Respect the safety warnings above!
18. Plan service and maintenance actions, that spare parts, lifting devices and service personnel is available.
19. Maintain the valve within the recommended minimum maintenance intervals or within the recommended maximum operating cycles.
20. Always make sure that the valve and the pipeline is depressurized before starting any kind of maintenance work at a valve.
21. Always check the position of the valve before starting maintenance work. Follow the Lock out /tag out (LOTO) rules at the site before starting any maintenance activity.
    - See IMO for the correct stem position.
    - Consider that the positioner may give the wrong signals.
22. Sealing materials (soft sealing parts) should be changed when the valve is maintained. Always use original equipment manufacturers (OEM) spare parts to ensure proper performance of the repaired valve.
23. All pressure containing parts must be inspected visually for damage or corrosion. Damaged parts must be replaced.
24. Valve pressure bearing parts and all internals must be inspected for corrosion or erosion which may result in reduced wall thickness on pressure bearing parts. Damaged pressure bearing parts must be replaced with original equipment manufacturer's (OEM) replacement parts or repaired to factory specifications by an authorized Valmet service partner in order to maintain the warrantee.
25. Do not use sharp tools, grinding machines, or files to work on functional surfaces such as sealing, seating or bearing surfaces as this can damage these surfaces.
26. Do not weld on pressure bearing parts without an ASME and PED qualified procedure and personnel.
27. Pressure bearing parts of valves in high temperature applications must be carefully examined for the effects of material creep and fatigue.
28. Make sure that the valve is positioned in the correct flow direction into the pipeline.
29. If the valves are marked to be suitable for explosive atmospheres, the correct function of the discharging device must be tested before returning to service.
30. Always work in a clean environment. Avoid getting particles inside the valve due to machining, grinding, or welding nearby.
31. Never store a maintained valve without flow port protection.
32. When pressure testing valve seats, never exceed the maximum operating pressure of the system or the maximum shut-off pressure marked on the valve identification plate.
33. Actuator mounting and unmounting:
    - Before installing the actuator on to the valve, be sure the actuator is properly indicating the valve position. Failure to assemble these to indicate correct valve position may result in damage or personal injury.
    - When installing or removing a linkage kit, best practice is to remove the entire linkage assembly, including couplings which may fall off the valve during lifting or when position changes.
    - Mounting sets have been designed to support the weight of the Valmet actuator and recommended accessories. Use of the linkage to support additional equipment or additional weight such as people, ladders, etc. may result in equipment damage or personal injury.
34. The valve should be installed between flanges using appropriate gaskets and fasteners that are compatible with the application, and in compliance with applicable piping codes and standards. Center the gaskets carefully when fitting the valve between the flanges. Do not attempt to correct pipeline misalignment by means of the flange bolting.
35. Repairs on valves for special service like Oxygen, Chlorine, and Peroxide, have special requirements.
    - Parts must be cleaned appropriate to the service and protected from contamination prior to assembly.
    - Assembly areas and tools must be clean and dry to prevent contamination of the parts during assembly.
    - Test equipment must be clean and dry to prevent contamination during testing. This includes the test equipment internals that may allow particles or other contamination into the test fluid during the test.
    - Lubrication shall be used only if specifically required in the instructions. Where lubrication is required, the lubricant must be approved for the service by the end user.

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