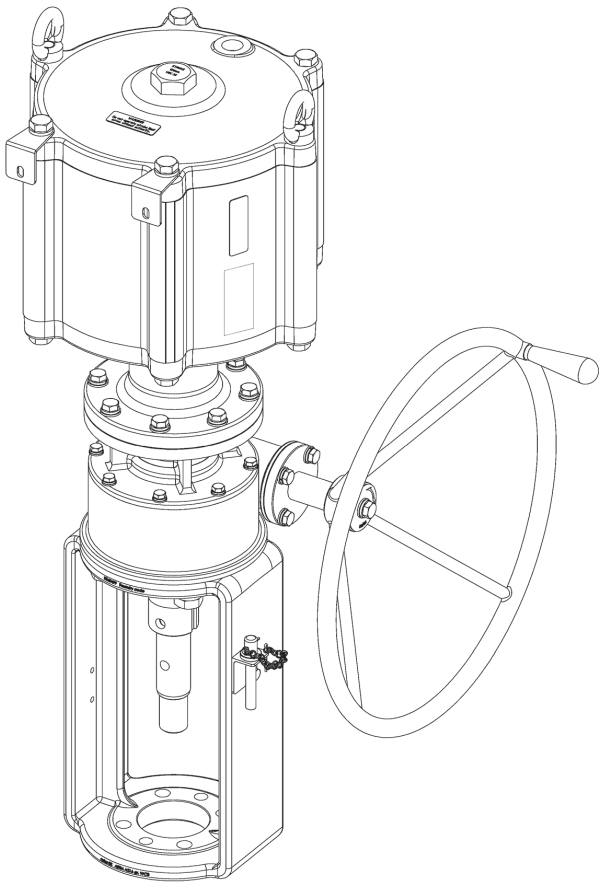
Pneumatic linear cylinder actuator

Series VBC

Installation, maintenance and operating instructions



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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 of Neles™ VB series, linear double-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

VBC models are linear double-acting pneumatic cylinder actuators. Excellent accuracy and long run reliability is achieved through the use of piston and well fitted seal rings in the actuator.

The VBC double 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.

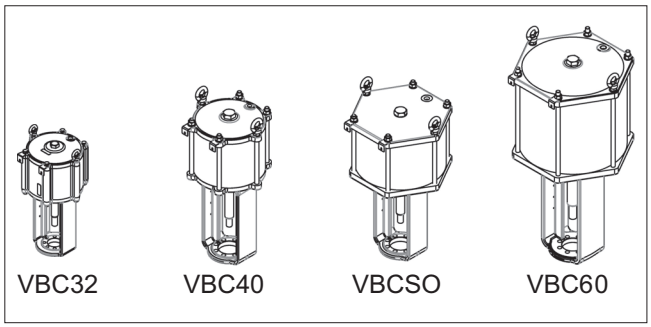


Fig. 1 VBC actuator without the handwheel

1.3 Actuator markings

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

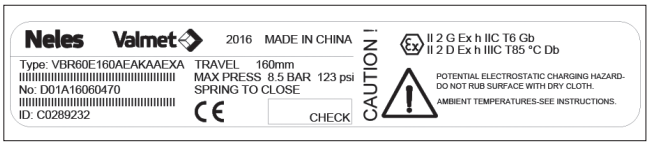


Fig. 2 Example of identification plate

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

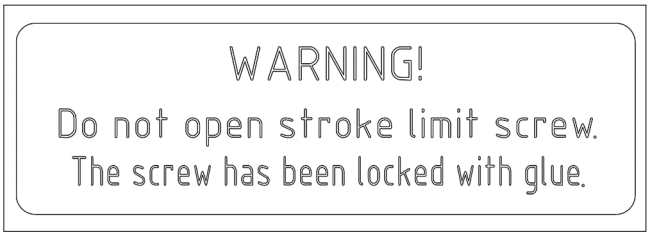


Fig. 3 Warning plate

1.4 Specifications

Table 1 VBC Actuators temperature ranges

Description	Standard VBC	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 VBC Actuators air supply connections

Standard	3/4" NPT for VBC32, VBC40
	1" NPT for VBC50, VBC60
Optional	Please contact Neles

1. Maximum operation pressure (MOP) for VBC: 10 bar / 145 psi
2. ATEX class: II 2 GD
3. Protection class: IP66, NEMA 4X

Table 3 VBC Actuators specifications

Actuator Size	Piston dia. (mm)	Stem dia. (mm)	Effect Area		Volume		Maximum Stroke		Thrust at Pressure		Pressure Thrust		Max. operation pressure	
			cm^2	$inch^2$	dm^2	$inch^2$	mm	inch	bar	psi	N	lbs	bar	psi
32	315	40	767	119	9.2	561.5	120	4.72	4	58	29136	6550	10	145
									6	86	43704	9825		
									8.5	121	61915	13919		
40	400	55	1237	192	22.3	1358.8	180	7.09	4	58	47006	10567		
									6	86	70509	15851		
									8.5	121	99888	22456		
50	500	55	1944	301	35.0	2135.2	180	7.09	4	58	73867	16606		
									6	86	110800	24909		
									8.5	121	156967	35288		
60	600	65	2827	438	79	4830.4	280	11.02	4	58	110779	24904		
									6	86	166169	37356		
									8.5	121	235406	52921		

* Note:
1. Maximum 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 VBC Actuators stroking time

Size	Stroke (mm)	ND Model	Stroke time(Sec.)		ND Model	Stroke time(Sec.)	
			VBC	VBC		VBC	VBC
			Load	Vent		Load	Vent
32	50	NDX	5	5	ND9_06	7	7
	60		6	6		8	8
	70		7	7		9	9
	80		8	8		10	10
	120		10	10		12	12
40	60	NDX	9	9	ND9_06	14	14
	70		10	10		17	17
	80		11	11		20	19
	120		14	14		23	22
50	60	NDX	11	11	ND9_06	27	26
	70		13	12		30	29
	80		14	13		34	33
	120		20	19		38	36
60	140	NDX	15	15	ND9_06	31	30
	160		16	16		35	34
	180		17	17		39	37
	200		18	18		40	38
	280		22	22		44	42

1. Mounted with ND 9200 / NDX smart positioner and Air set only
2. With B72G-2AS-980 Air set (1/4")
3. Air supply pressure: 5.0 barg (72 psi)
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:

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.

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

VBC 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. 4 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.

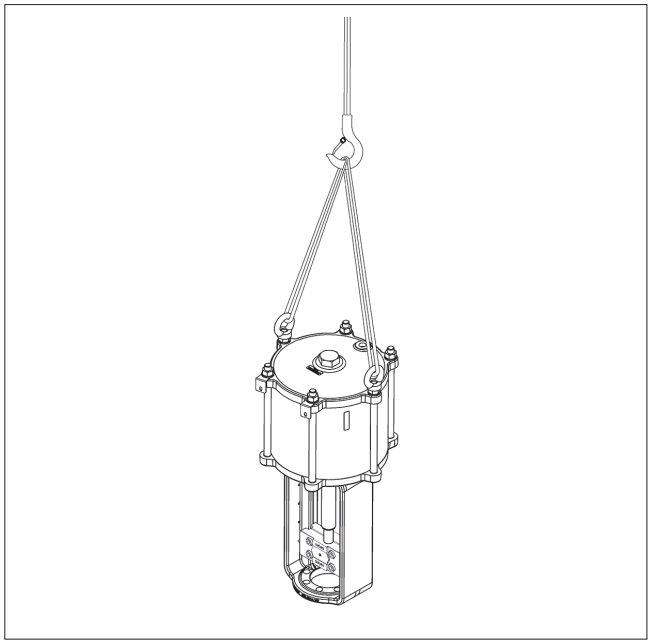


Fig. 4 Lifting the actuator

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 10 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.

CAUTION:
Beware of the cutting movement of the valve!

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.

- 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 (see 4.5 Adjustment for valve stem).
- 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 upright 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.

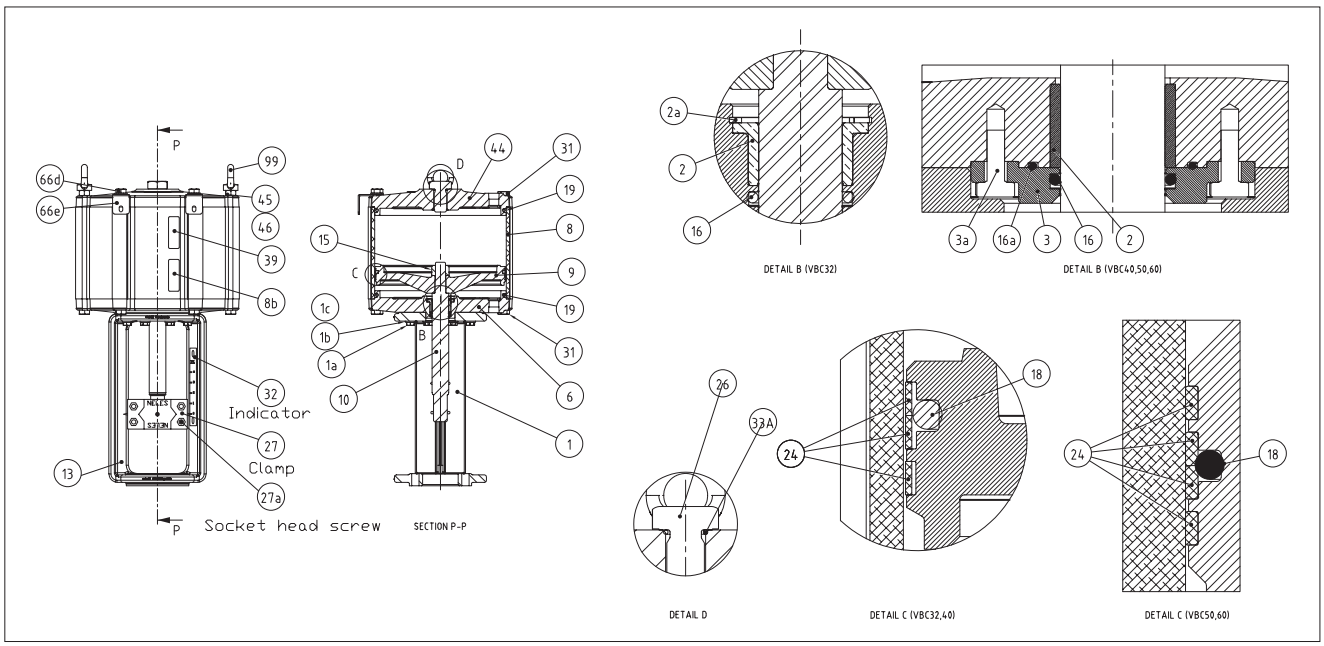


Fig. 5 VBC Actuator Constructions without Handwheel

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
3 (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-AISI 10Mg+ANODIZED	Cat 3
8b	STICKER	PLASTIC	
9	PISTON	EN 1561-GJL-200	Cat 3
10	PISTON ROD	PISTON ROD STEEL +HCr	Cat 3
15	HEXAGON NUT	ASTM A194 gr. 2HM	
16	O-RING	NITRILE, NBR	Cat 1*
16a (VB 50)	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	
27**	CLAMP	ASTM A351 or. CF8	Cat 3
27a**	SOCKET HEAD SCREW	ISO 3506 A2-70	Cat 3
31(VB 32)	HEXAGON SCREW	ISO 3506 A2-70	
31	STUD	IS0 3506 A2-70, EN 10083-1.7218+ZINC	
32	INDICATOR	AISI 304	
33a	O-RING	NITRILE, NBR	Cat 1*
39	IDENTIFICATION PLATE	POLYESTER	
44	CYLINDER END	EN 1563-GJS-400--15	Cat 3
44a	WARNING PLATE	POLYESTER	
45	HEXAGON NUT	ISO 3506 A2-70, SS STEEL or CARBON STEEL+ZINC	
46	WASHER	AISI 304, CARBON STEEL+ZINC	
66d	SPRING WASHER	AISI 304	
66e	BRACKET	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
** 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 the 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. 5, 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 pipe-line while the valve is pressurized!

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

4.2 Replacement of piston seals for VBC

We recommend that all seals 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 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 loosened 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 stud (31) and hexagon nut (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 piston (9) with piston rod (10).
- Remove the piston ring (24) and O-ring (18) from the piston (9).
- Loosen the VB 32 screws (31) or VB 40/50 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 whether each part gets scratched or damaged.

Reassembling

CAUTION:
Checking whether scratched on the piston rod (10) and dirty particles inside of the bearing (2) and the wear ring and O-rings before reassembling.

- Apply VCI-369 to O-ring groove and each pressure surface of the piston (9).
- Use tie ring to assemble the piston ring (24) to prefabricated piston (9) and piston rod (10) set. Refer to Fig. 6.
- Lubricate seal space (inner surface of the bearing (2)) and new O-rings with Unisilikon L250L or equal silicone grease.
- Put the bearing (2) and new O-rings (16) into cylinder base (6).
- Mount the cylinder pipe (8) to cylinder base (6).
- Fasten the VB 32 screw (31) or VB 40/50 stud (31) and hexagon nut (45) on cylinder base (6).
- Put the prefabricated piston set into the cylinder pipe (8) and cylinder base (6).

- 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 stud (31) and hexagon nut (45) on 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.

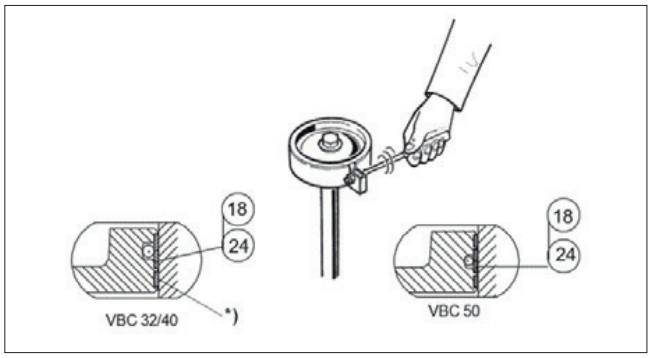


Fig. 6 Tightening piston seals with a tie ring

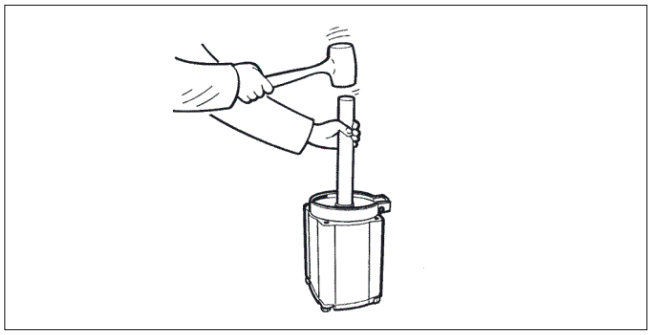


Fig. 7 Placing the piston into cylinder pipe

4.3 Operation of the handwheel

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 Fig. 8 and Fig. 9.

- 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).
- Operation 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.

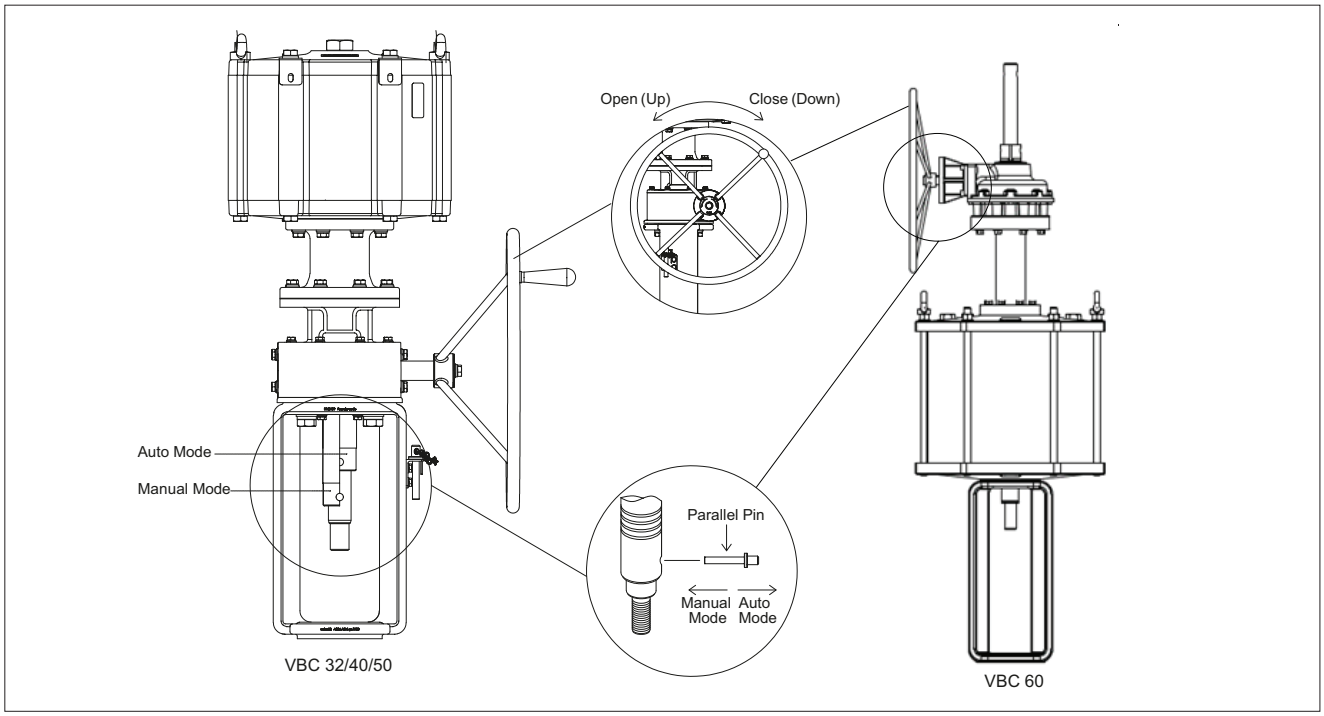


Fig. 8 VBC Actuator Constructions with Handwheel

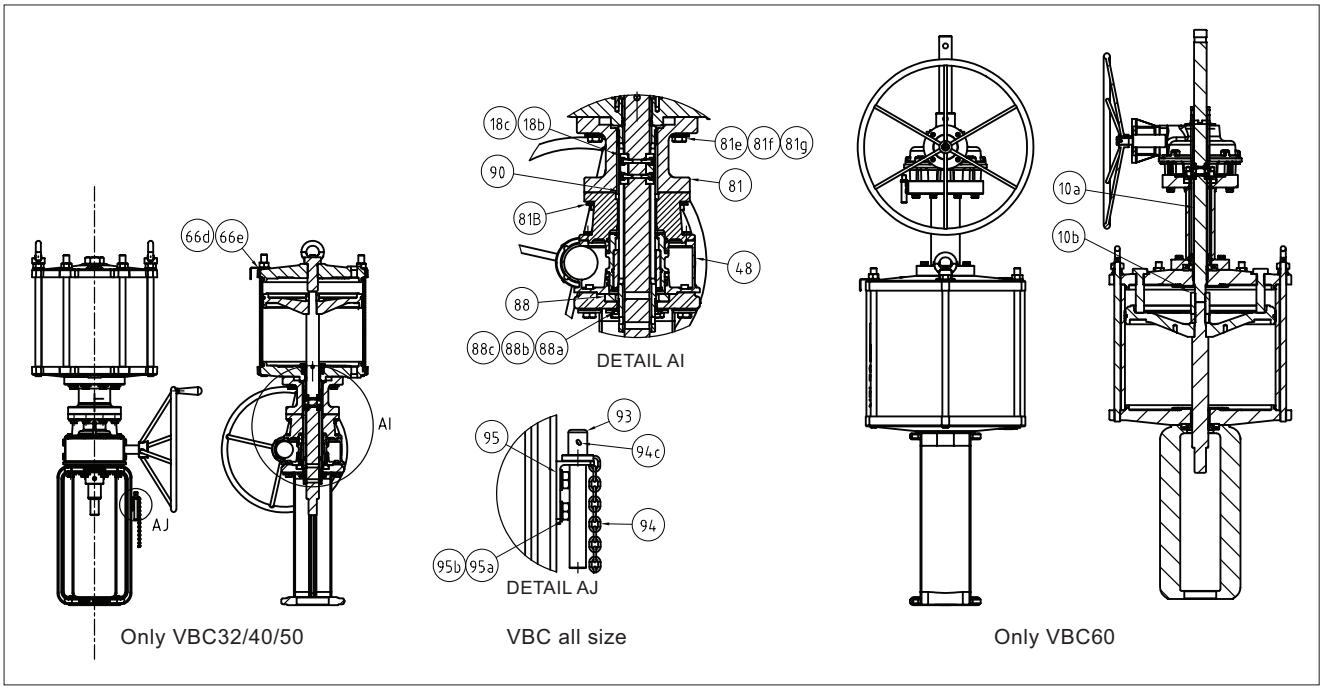


Fig. 9 VBC Actuator Constructions with Handwheel

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		
66d	SPRING WASHER	AISI 304		
66e	BRACKET	AISI 304		
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

4.4 Removal of the handwheel sub assembly

The manual override requires no regular maintenance.

Please refer to Fig. 5 and 9, 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!

4.5 Adjustment for valve stem

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

The actuator stroke is always longer that the valve stem stroke, therefore, the actuator stroke is required to adjust when the stems are coupling together. Please refer to Fig. 5 & 9, if needed.

- Push the valve stem and plug until its end surface slightly touches the seat ring.
- With the handwheel or pneumatically, operate the actuator to the fully open position.
- Measure the maximum distance between top end of the valve stem and the other end of actuator piston rod (10).
- Calculate the 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.

Table 5 VBC 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	M12 x 1.75P	4	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:
Torque value tolerance: ±10 %
Torques are nominal values

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

7. ORDERING SPARE PARTS

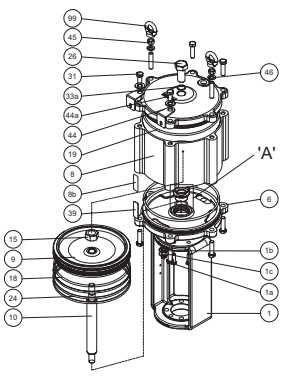
NOTE:
Always use original spare parts to make sure that the valve functions as intended.

When ordering spare parts, always include the following information:

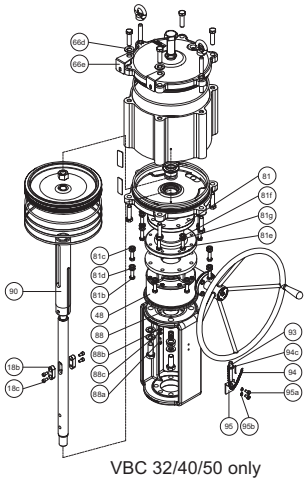
- Type code, sales order number, serial number
- Number of the parts list, part number, name of the part and quantity required

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

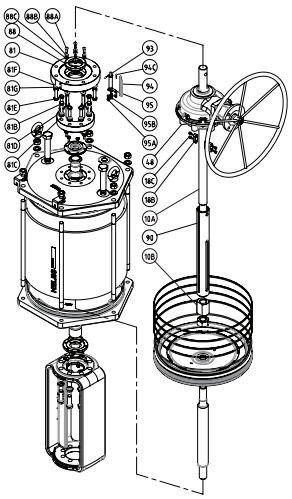
8. EXPLODED VIEWS AND PARTS LISTS



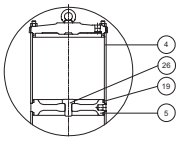
All sizes
without handwheel



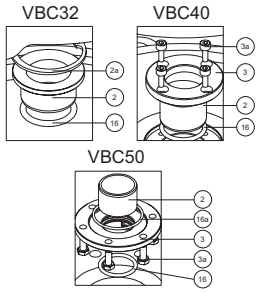
VBC 32/40/50 only
with handwheel



The items highlighted wit red means
this item is the new one in VB60 type.



with volume chamber



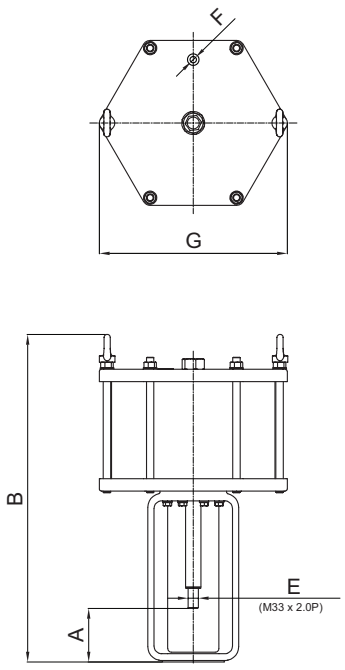
DETAIL 'A'

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)	COVER PLATE	AISI 304	Cat 3
3a (VB 40,50)	HEXAGON SCREW	ISO 3506 A2-70/80	Cat 3
4	VOLUME CHAMBER	EN 1706 G-AISI 10Mg+ANODIZED	Cat 3
5	MIDDLE PLATE	EN 1563-GJS-400-15	Cat 3
6	CYLINDER BASE	EN 1563-GJS-400-15	Cat 3
8	CYLINDER PIPE	EN 1706 G-AISI 10Mg+ANODIZED	Cat 3
8b	STICKER	PLASTIC	
9	PISTON	EN 1561-GJL-200	Cat 3
10	PISTON ROD	PISTON ROD STEEL+HCr	Cat 3
15	HEXAGON NUT	ASTM A194 gr. 2HM	
16	O-RING	NITRILE, NBR	Cat 1*
16a (VB 50)	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	Cat 3
31 (VB 32)	HEXAGON SCREW	ISO 3506 A2-70	
31	STUD	ISO 3506 A2-70, EN 10083-1.7218+ZINC	
33a	O-RING	NITRILE, NBR	Cat 1*

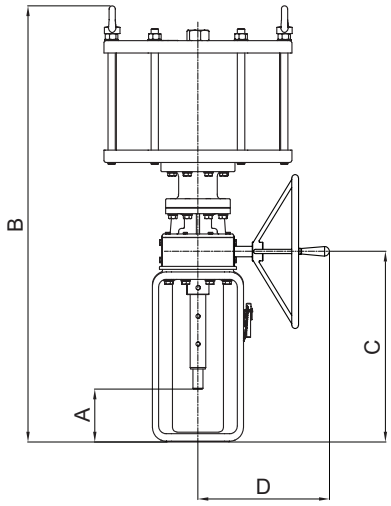
Part No.	Description	Material	Recommended spare part
39	IDENTIFICATION PLATE	POLYESTER	
44	CYLINDER END	EN 1563-GJS-400-15	Cat 3
44a	WARNING PLATE	POLYESTER	
45	HEXAGON NUT	ISO 3506 A2-70, SS STEEL or CARBON STEEL+ZINC	
46	WASHER	AISI 304, CARBON STEEL+ZINC	
48	GEAR BOX	DUCTILE IRON	
66d	SPRING WASHER	AISI 304	
66e	BRACKET	AISI 304	
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	
81f	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

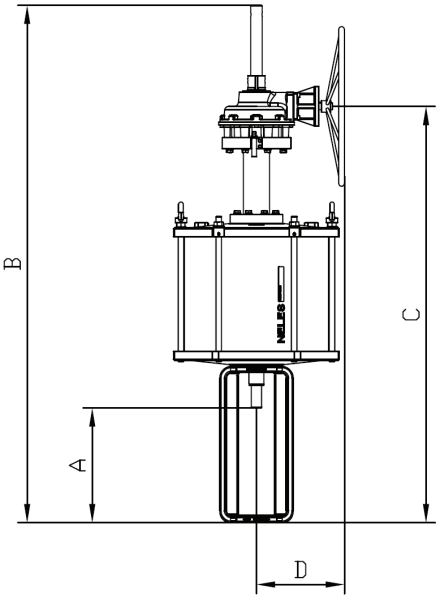
9. DIMENSIONS AND WEIGHTS



VBC, without handwheel



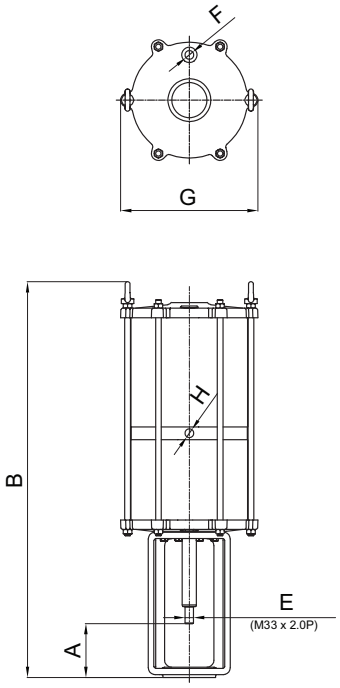
VBC 32/40/50, with optional handwheel



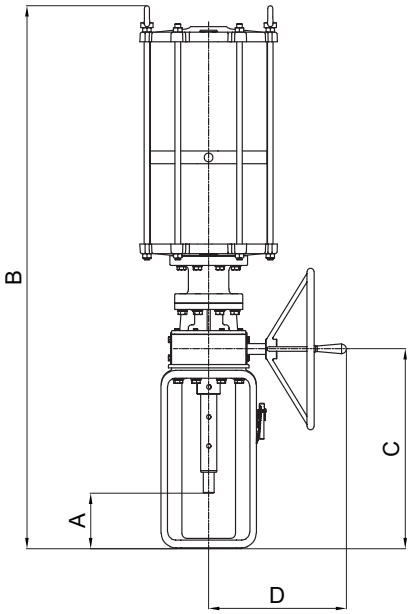
VBC 60, with optional handwheel

Dimension (mm) / Size	Stroke Range	Without handwheel					With handwheel				
		A	B	F	G	Weight (kg)	A	B	C	D	Weight (kg)
VBC32	50,60,70,80,120	153	769	3/4" NPT	392	96	158	1093	471	417	147
VBC40	60,70,80,120,140,160,180	185	1054	3/4" NPT	499	190	185	1403	619	427	263
VBC50	60,70,80,120,140,160,180	184	1066	1" NPT	610	297	179	1415	619	427	371
VBC60	140,160,180,200,280	222	1404	1" NPT	724	507	222	2265	1823	333	660

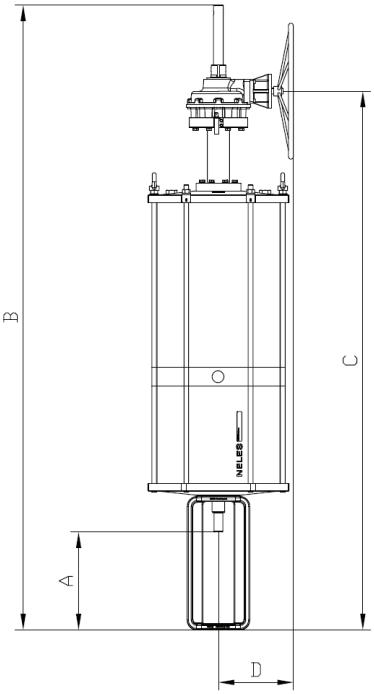
Dimension (mm) / Size	Stroke Range	Without handwheel					With handwheel				
		A	B	F	G	Weight (lbs)	A	B	C	D	Weight (lbs)
VBC32	50,60,70,80,120	6	30.3	3/4" NPT	15.4	212	6.2	43	18.5	16.4	324
VBC40	60,70,80,120,140,160,180	7.3	41.5	3/4" NPT	19.6	419	7.3	55.2	24.4	16.8	580
VBC50	60,70,80,120,140,160,180	7.2	42	1" NPT	24	655	7	55.7	24.4	16.8	818
VBC60	140,160,180,200,280	8.7	55.3	1" NPT	28.5	1117.7	179	1415	619	427	1455



VBC, without handwheel
& with volume chamber



VBC 32/40/50, with optional handwheel
& volume chamber



VBC 60, with optional handwheel
& volume chamber

Dimension (mm) / Size	Stroke Range	Without handwheel						With handwheel				
		A	B	F	G	H	Weight (kg)	A	B	C	D	Weight (kg)
VBC32_V	50,60,70,80,120	153	1116	3/4" NPT	390	3/4" NPT	129	158	1440	471	417	180
VBC40_V	60,70,80,120,140,160,180	185	1550	3/4" NPT	499	3/4" NPT	255	185	1899	619	427	329
VBC50_V	60,70,80,120,140,160,180	184	1570	1" NPT	610	1" NPT	415	179	1919	619	427	490
VBC60_V	140,160,180,200,280	222	1903	1" NPT	724	1" NPT	787	222	3045	2603	333	950

Dimension (mm) / Size	Stroke Range	Without handwheel						With handwheel				
		A	B	F	G	H	Weight (lbs)	A	B	C	D	Weight (lbs)
VBC32_V	50,60,70,80,120	6	43.9	3/4" NPT	15.4	3/4" NPT	284	6.2	56.7	18.5	16.4	397
VBC40_V	60,70,80,120,140,160,180	7.3	61	3/4" NPT	19.7	3/4" NPT	562	7.3	74.8	24.4	16.8	725
VBC50_V	60,70,80,120,140,160,180	7.2	61.8	1" NPT	24	1" NPT	915	7	75.6	24.4	16.8	1080
VBC60_V	140,160,180,200,280	8.7	74.9	1" NPT	28.5	1" NPT	1735	8.7	119.9	102.5	13.1	2094

10. TYPE CODE

Pneumatic Cylinder Actuator, Linear type, Series VBC													
1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10.**	**11.**	**12.**	**13.**	**14.**
VB	C	32	X	070	A	E	A	K	A	X	D	X	A

ACTUATOR CONSTRUCTIONS

1.	ACTUATOR SERIES
VB	Pneumatic Cylinder actuator, Linear type

2.	FUNCTION CODE		
	Direction	Spring to	Air to Stem
C	Double acting (no spring)		

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

4.	SPRING RANGE
X	Not applicable (no spring)

5.	STROKE			
	VB 32	VB 40	VB 50	VB 60
040	IQI	IQI	IQI	IQI
050	STD	IQI	IQI	IQI
060	STD	STD	STD	IQI
070	STD	STD	STD	IQI
080	STD	STD	STD	IQI
120	STD	STD	STD	IQI
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 Neles 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 (applicable 32/40/50 only)
T	Top-Side Handwheel mounted (applicable 60 only)

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
V	Volume Chamber
Y	Special

14.	MODEL CODE
A	Original model

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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