

Neles™ pneumatic cylinder actuators

Series B1C

Installation, maintenance and
operating instructions

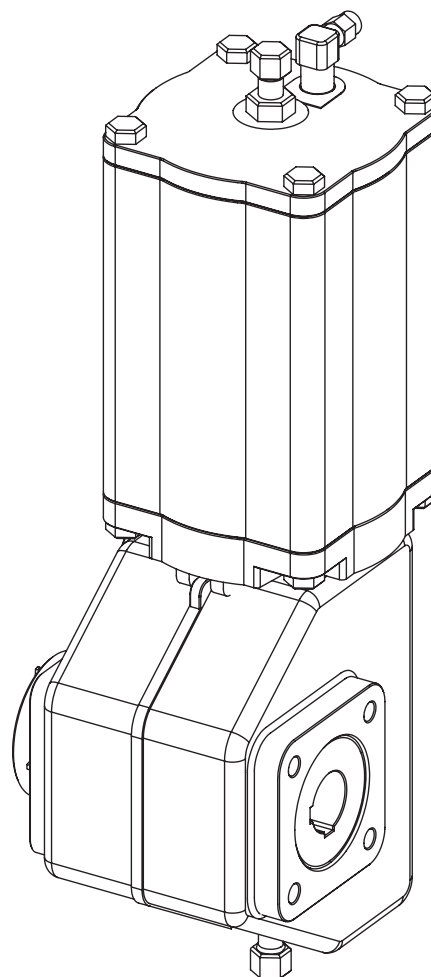


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This product meets the requirements set by the Customs Union of the Republic of Belarus, the Republic of Kazakhstan and the Russian Federation.

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

These instructions provide essential information for the use of Neles B1C series actuators. For more details about valves, positioners and accessories, refer to the separate installation, operating and maintenance instructions of the particular unit.

1.2 Structure and operation

Neles™ B1C series actuators are pneumatic cylinder actuators designed for control and shut-off service.

The linkage bearings have material options. The robust cast-iron housing efficiently protects the mechanism from ambient dust and moisture.

The mounting face dimensions of the B1C actuator comply with the ISO 5211 standard.

The linkage converts the linear motion of the piston into rotation by the actuator shaft. The actuator generates maximum torque when for example a ball or butterfly valve is closed, and the need for torque is greatest. Another peak is achieved at 60-80°, when the need for torque on a butterfly valve caused by the dynamic forces of for example pipe flows reaches a maximum.

Screws are located in the upper end of the cylinder and in the lower end of the housing to regulate the length of the piston stroke and also the rotation angle of the actuator shaft.

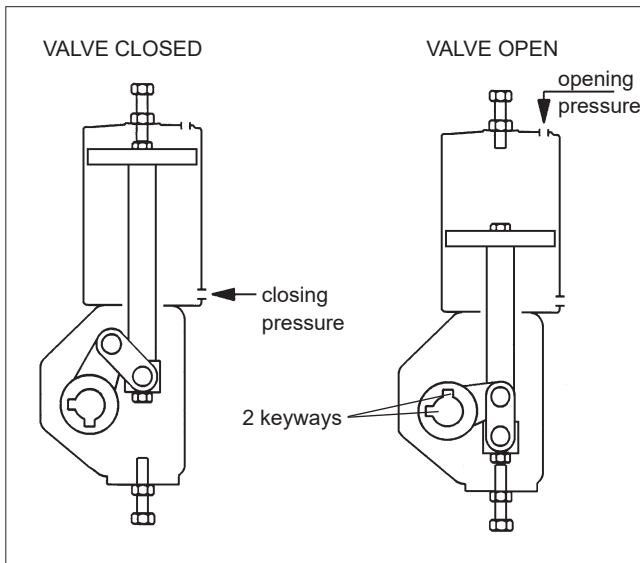


Fig. 1 Operating principle of the actuator

1.3 Actuator markings

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

1. Type
2. Manufacturing site, date, successive no. (bar code)
3. SO number or ID number (bar code)
4. Checked by
5. Max. supply pressure
6. ATEX category and protection level

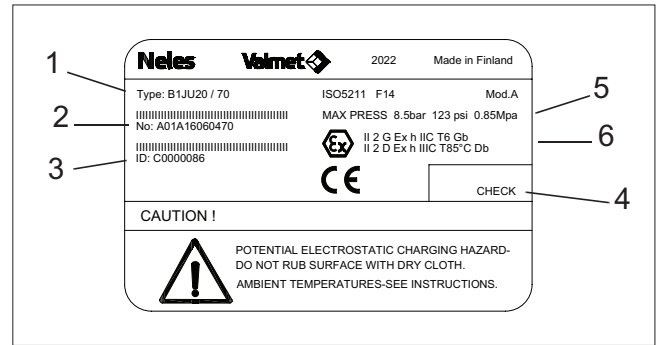


Fig. 2 ID plate

1.4 Specifications

Protection class:	IP66, NEMA 4X
Ambient temperatures:	
Standard design	-20° to 70 °C / -4° to 160 °F
Low temperature design	-40° to 70 °C / -40° to 160 °F
High temperature design	-20° to +120 °C / -4° to 250 °F
Arctic temperature design	-55° to +70 °C / -67° to 158 °F
Maximum supply pressure:	
B1C 6...17, 60, 602	8.5 bar / 120 psi
B1C 20...50, 502	10 bar / 145 psi
B1C 75, 752	5 bar / 70 psi
Stroke volume, dm ³ / in ³	
B1C 6	0.33 / 20
B1C 9	0.60 / 37
B1C 11	1.10 / 67
B1C 13	2.30 / 140
B1C 17	4.30 / 262
B1C 20	5.40 / 329
B1C 25	10.50 / 640
B1C 32	21 / 1280
B1C 40	43 / 2620
B1C 50	84 / 5130
B1C 60	121 / 7380
B1C 75	189 / 11500
B1C 502	195 / 11900
B1C 602	282 / 17200
B1C752	441 / 26900
Nominal torque, Nm / lbf ft (at max. supply pressure):	
B1C 6	135/100
B1C 9	260/190
B1C 11	480/355
B1C 13	1000/740
B1C 17	1900/1400
B1C 20	2700/2000
B1C 25	5300/3910
B1C 32	11000/8115
B1C 40	22000/16225
B1C 50	43000/31715
B1C 60	62000/45730
B1C 75	48000/35400
B1C 502	100000/73755
B1C 602	122000/89980
B1C 752	113000/83350

NB. The torque changes according to supply pressure.

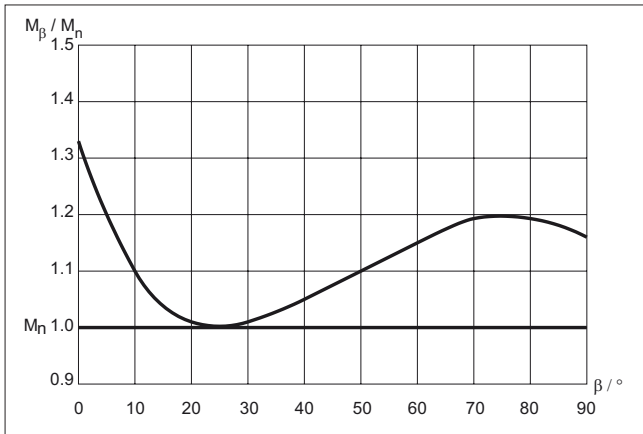


Fig. 3 Output torque as a function of turning angle

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

User Safety

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 cylinder before dismantling the actuator. Otherwise, personal injury and damage to equipment may result.

CAUTION:

Beware of the cutting movement of the valve!

Hands, other parts of the body, tools or other objects must not be pushed into the valve's flow port while it is open. Also prevent foreign objects from entering the pipes. The valves function like a cutter while operating. Shut off and detach the supply of compressed air to the actuator during maintenance. Otherwise, personal injury or damage to the equipment may result.

CAUTION:

Don't use the lever in the torsion arm for manual operation when the actuator is pressurized!

Shut off the supply pressure and release pressure from the cylinder before using the hand lever. Note also the dynamic torque caused by the pipe flow.

Otherwise, personal injury and damage to equipment may result.

CAUTION:

Don't leave the lever in the torsion arm after manual operation!

Leaving the lever in the torsion arm can cause personal injury or damage to the equipment.

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

Check the actuator and the accompanying devices for any damage that may have occurred during transport. Store the actuator carefully before installation, preferably indoors in a dry place. Do not take the actuator to the intended location and do not remove protection plugs from the pipe connections until the actuator is installed.

Lift the actuator as shown in Fig. 4: in a horizontal position from the stop screws, in a vertical position from an eye bolt screwed in the place of a stop screw or from limit stop bolt with lifting tool (table 1). Do not use the eye bolt or lifting tool for lifting dual-cylinder actuators. Larger actuators have lifting hooks. Do not lift the valve-actuator assembly from actuator. Refer to Section 9 for weights.

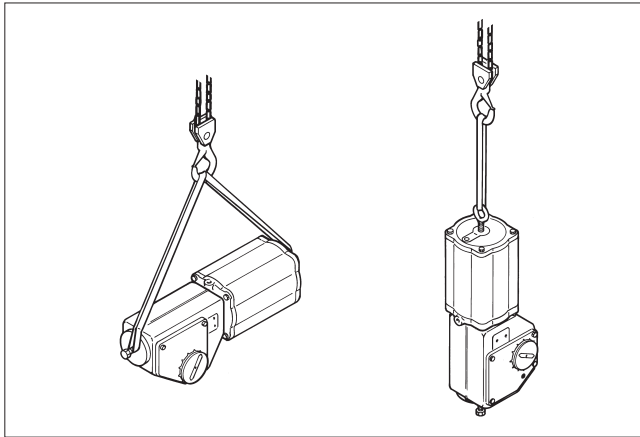


Fig. 4 Lifting the actuator

CAUTION:

Do not lift the valve-actuator assembly from actuator.

Table 1

Lifting tool	
Actuator size, Old model with imperial bolts	Tool ID.
BC 12-16 (BC 11) / BJ 8-10, UNC 5/8	H128479
BC 20 (BC 17) / BJ 12, UNC 3/4	H128480
BC 25 / BJ 16, UNC 1	H128481
BC 32 / BJ 20, UNC 1 1/4	H128482
BC 40 / BJ 25, UNC 1 1/2	H128483
BC 50 / BJ 32, UNC 1 3/3	H128484
Actuator size, Current model with metric bolts	Tool ID.
BC 6-13 / BJ 8-10 / M12 & M16	H096901
BC 17-25 / BJ 12-16 / M20 & M24	H096902
BC 32-50 / BJ 20-40 / M30 & M42	H096903

3. MOUNTING AND DEMOUNTING

3.1 Actuator gas supply

Dry compressed air or sweet natural gas can be used in double-acting cylinder actuators; an oil spray is not needed, nor recommended. Clean, dry and oil-free compressed air must be used in cylinder actuators equipped with a positioner. The air inlets are shown in the dimensional drawing in Section 9. The maximum permitted supply pressure is indicated on the identification plate. See also Section 1.4.

3.2 Mounting the actuator on the valve

CAUTION:

Take the weight of the actuator or valve combination into account when handling it!

CAUTION:

Beware of the cutting movement of the valve!

Install the actuator so that the shaft of the valve or any other device to be actuated goes into the shaft bore of the actuator. If the bore is larger than the shaft diameter, use a keyed shaft adapter sleeve or bushing. There are two keyway slots in the shaft bore of the actuator at an angle of 90°. These allow the installation position of the actuator to be changed in relation to the valve. Neles valves have a bevel at the end of their shafts to facilitate installation.

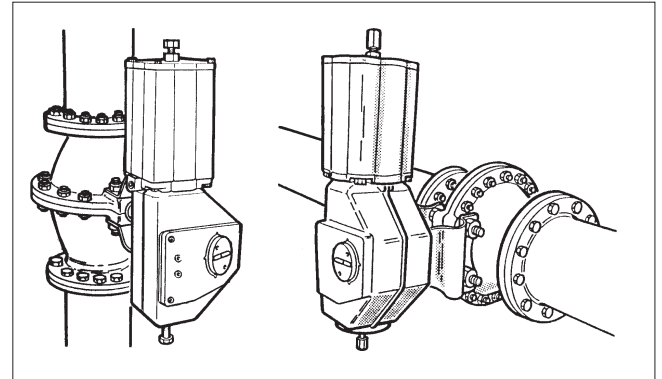


Fig. 5 Ways to install the actuator

The installation position can be chosen freely, although Valmet recommends one in which the cylinder is vertical. This is the best way to protect the actuator from impurities in the supply air or damage caused by water.

When you change the position of the actuator make certain the indicator arrow has been turned to a position corresponding to that of the valve.

When necessary, lubricate the shaft bore and bushing with Cortec VCI 369 or an equivalent anti-corrosive agent to prevent it from jamming due to rust.

The actuator must not touch the pipeline, because pipeline vibration may damage it or interfere with its operation.

In some cases, for instance when the actuator is exceptionally large, the valve has an extended stem or when there is lot of piping vibration, it may be advisable to support the actuator. Contact Valmet for more instructions.

There are two adjustable stop screws in the actuator; these stop the movement of the secondary shaft in the extreme positions. The actuator generates a torque of approximately 1.3 times the nominal torque when the piston is at the upper end of the cylinder, see also Fig. 3. For some valves, e.g. butterfly valve, the closing torque and position is accurate. The stop screw (26) at the cylinder end has to be adjusted according to right instructions, see separate valve specific instructions for more detailed information. An O-ring (33A) is used for sealing the stop screw in the cylinder end. See also the instructions of the valve.

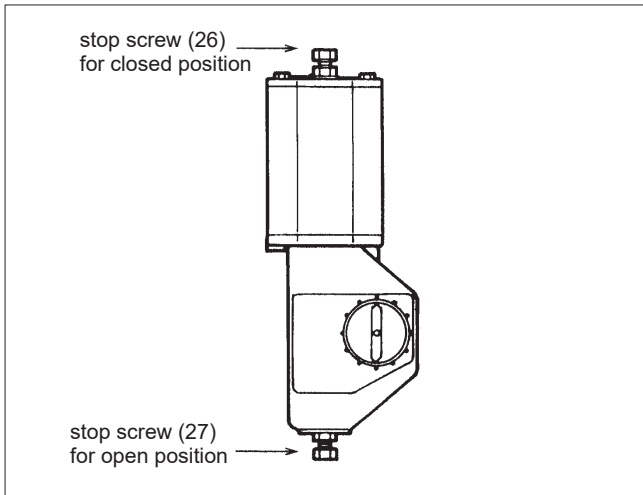


Fig. 6 The stop screws in the open and closed positions

3.3 Demounting the actuator from the valve

CAUTION:
Take the weight of the actuator or valve combination into account when handling it!

CAUTION:
When detaching actuator from valve, sudden release may take place due to friction on valve shaft - actuator bore connection.

CAUTION:
Beware of the cutting movement of the valve!

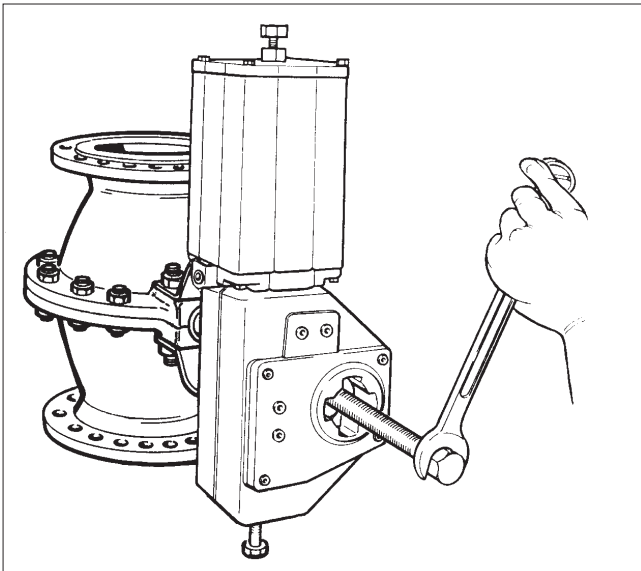


Fig. 7 Removing the actuator with the extractor

The actuator must be depressurized and the supply air pipes disconnected. Unscrew the actuator-side screws of the bracket and pull the actuator off the valve shaft. This is best done using a specific extractor, see Fig. 7 and Section 6. Note the mutual positioning of the valve and the actuator to ensure correct functioning after reassembly.

4. MAINTENANCE

4.1 Maintenance general

CAUTION:
Observe the safety precautions mentioned in Section 1.6 before maintenance!

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. Valmet recommends inspecting the actuators at least every five (5) years.

The inspection and maintenance interval depends on the actual application and process condition. The inspection and maintenance intervals can be specified together with your local Valmet 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. If maintenance assistance is required, please contact your local Valmet office.

The part numbers in the text refer to the exploded view and to the parts list in Section 8, unless otherwise stated.

Under severely corrosive conditions, the linkage system inside the housing should be lubricated at six month intervals. Use Cortec VCI 369 anti-corrosive agent or the equivalent. The housing may also be half filled with semi-fluid water-repellant grease (e.g. Mobilux EP2) while the piston rod is in the lower position.

If you remove the stop screw, adjust the limits after lubrication or grease filling!

NOTE:
Repair and maintain actuator in a safe environment.

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

NOTE:
In order to ensure safe and intended performance, remember to re-assemble all parts (e.g. 3a, 4a) as per original construction.

NOTE:
When sending goods to the manufacturer for repair, do not disassemble them.

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

NOTE:
Before using chemicals, read Material Safety Data Sheet.

4.2 Replacement of piston seals

CAUTION:
Don't dismantle a pressurized actuator!

Replacement of all seals and soft bearings is recommended when the actuator has been disassembled for maintenance.

- Operate the actuator so that the piston goes to the outermost end of the cylinder. Release the pressure from the cylinder.
- Remove the cover of the housing (2).
- Loosen the fastening screw (29) of the bearing unit and the fastening screws of the cylinder (31) from the cylinder base (6). Should the piston turn with the screw (29), remove the end of the cylinder (44) and stop the turning with the piston fastening screw (28). See Figure 8.

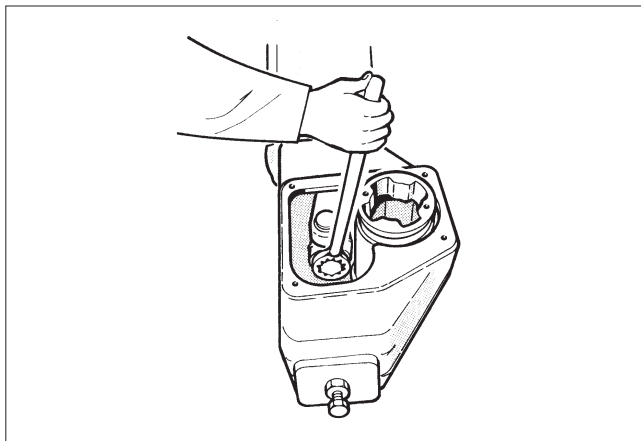


Fig. 8 Opening the fastening screw of the actuator bearing unit

- Remove the cylinder and the piston, including the rod.
- Remove the old seals and the O-ring (24, 18, 19).
- Remove the O-rings (16, 16a) and the bearing (22). Clean the seal space.
- Lubricate the seal space and the new O-rings (16, 16a) with Unisilikon L250L or equal silicone grease. Install the new bearing (22) and O-rings (16, 16a). See Figure 9.

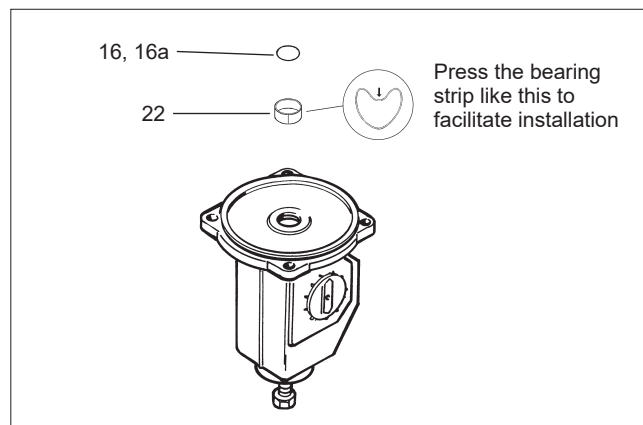


Fig. 9 Mounting the piston rod bearing and seal

- Clean the piston seal groove and lubricate with a thin layer of Cortec VCI 369.
- Place the O-ring (18) under the piston seals.

- Locate the seals (24) around the piston so that the ends of the strips come on opposite sides. Tighten the strips with the tie ring as shown in Figure 10. The strips marked with an asterisk (*) may be cut 1.5-3 mm shorter to facilitate assembly.

NOTE:
The inside surface of the cylinder must be free of any grease!

- Knock or press the piston through the tie ring with a press, Fig. 11.
- Mount the O-ring (19) and the cylinder and piston. Note the location of the air inlet: use the air inlet of the cylinder base as a guide. Tighten the screws (31). See Table 2 for torques.
- Apply locking sealant e.g. Loctite 225 to the threads of the fastening screw (29) of the bearing unit and tighten it. See Table 2 for torque.
- Fasten the housing cover temporarily so that the linkage bearings (3) function, but the linkage is still visible, Fig. 12. Note the grounding rings (3A, 4A).

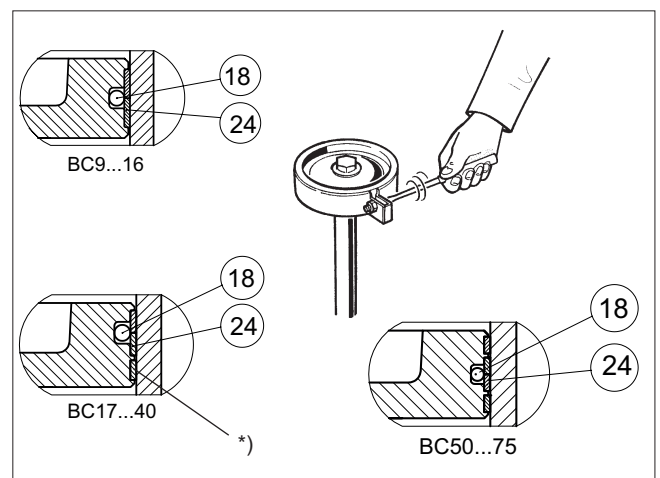


Fig. 10 Tightening piston seals with a tie ring

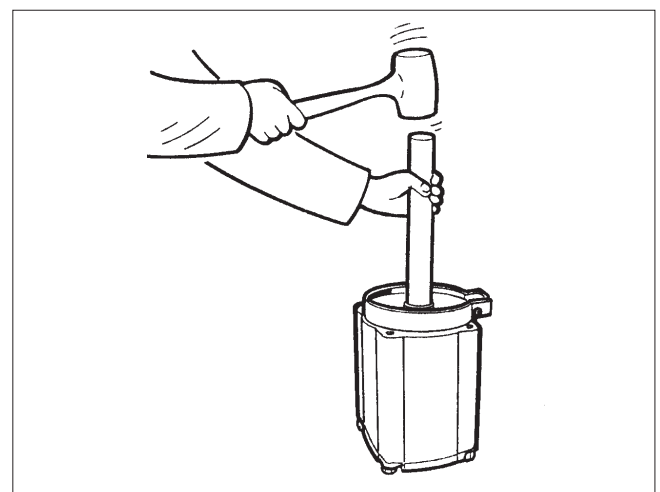


Fig. 11 Placing the piston in the cylinder

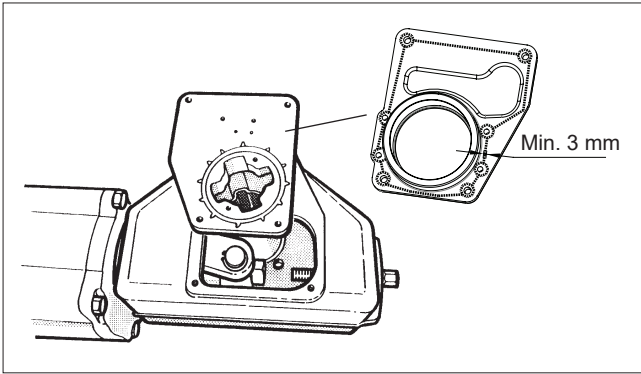


Fig. 12 Mounting the cover on the housing

CAUTION:

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

- Check the assembly of the cylinder to the cylinder base and end. Connect the supply air to the cylinder temporarily via a shut-off valve.
- Operate the actuator and check the function of the cylinder. Also check that the linkage bearings function properly. Remove the air supply and release pressure from the cylinder.
- Lubricate the linkage throughout with Cortec VCI 369 or an equivalent anti-corrosive agent to prevent it from jamming due to rust.
- Lubricate inside surfaces of the housing and cover throughout with Cortec VCI 369 anti-corrosive agent.
- Install new pressure outlet valve (58) on to housing cover.
- Clean housing and cover contact area. Apply proper amount (min. 3 mm diameter continuous path, as shown in Fig. 12) of sealant, e.g. silicone mass, to the interface between housing and cover.
- Mount the actuator to the valve and adjust the limits.

If you wish to remove the cylinder base, you will need a special tool to open the lock nut (35), see Section 6. The nut must be secured with e.g. Loctite 225 or equal liquid glue when remounted.

Table 2 Tightening torques for screws and nuts.

Item	Torque, Nm						
	28	29	30	31	33	34	35
Actuator							
B1C 6	35	35	12	7	30	30	-
B1C 9	90	35	8	12	30	30	150
B1C 11	170	90	8	18	70	30	180
B1C 12	170	170	12	18	70	70	200
B1C 13	300	170	12	40	70	70	200
B1C 16	300	300	12	40	70	70	250
B1C 17	700	300	12	80	130	70	250
B1C 20	700	700	20	80	130	130	400
B1C 25	1100	1100	30	80	220	220	800
B1C 32	2000	2000	70	80	400	400	1500
B1C 40	2000	2000	70	200	1000	1000	2000
B1C 50	3400	3400	150	250	1000	1000	3000
B1C 60	3400	3400	150	250	1000	1000	3000
B1C 75	3400	3400	150	250	1000	1000	3000

4.3 Replacement of linkage bearings and O-rings

CAUTION:

Don't dismantle a pressurized actuator!

- Remove the actuator from the valve
- Guide the actuator so that the piston is at the outermost end of the cylinder. Release the pressure from the cylinder.
- Remove the housing cover (2).
- Loosen the fastening screw (29) of the bearing unit (5), see Figure 8.
- Turn the lever (3) so that the bearing unit is detached from the piston rod (10). Lift the entire lever system out of the housing, Figure 13.

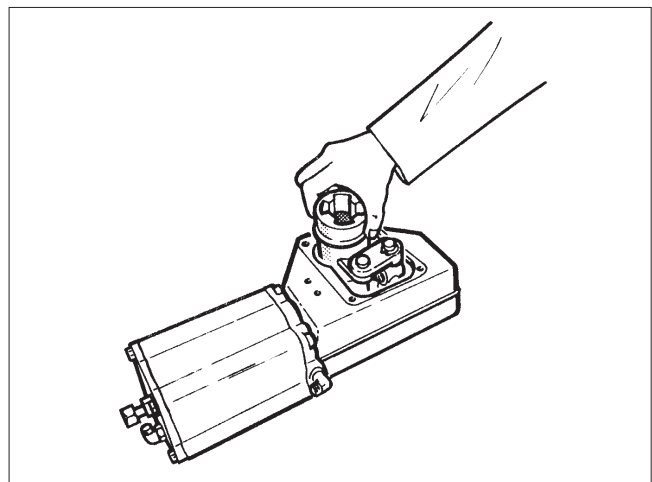


Fig. 13 Removing the linkage from the housing

- Remove the lock rings (36) and the support rings (37).
- Loosen the connection arms (4) and ring (4A), clean them and check the condition of the bearings, see Figure 14.

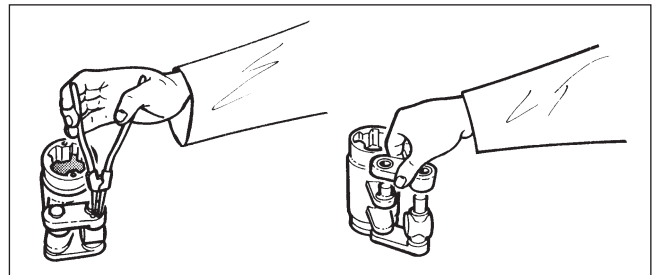


Fig. 14 Dismantling the linkage

The bearings (20, 21) of the connection arm (4) of B1C6-25 actuators are fastened with a press-on fit so that the entire connection arm assembly is replaced instead of the bearings. The bearings in actuators B1C32-75 are removable.

- Remove the lever bearings (23), the O-rings (17) and the grounding ring (3A).
- Clean the parts of the levers and lubricate the bearing and seal surfaces with Cortec VCI 369.
- Install the grounding ring (3A), the lever bearings (23) and the O-rings (17). The grounding rings (3A and 4A) are needed to meet the ATEX requirements.

- Assemble the linkage and install in the housing. See Figure 13 for the correct position. Note the ring (4A).
- Apply locking sealant e.g. Loctite 225 to the threads of the fastening screw (29) of the bearing unit and tighten it. See Table 2 for torque.
- Lubricate the linkage throughout with Cortec VCI 369 anti-corrosive agent.
- Lubricate inside surfaces of the housing and cover throughout with Cortec VCI 369 anti-corrosive agent.
- Install new pressure outlet valve (58) on to housing cover.
- Clean housing and cover contact area. Apply proper amount (min. 3 mm diameter continuous path, as shown in Fig. 12) of sealant, e.g. silicone mass, to the interface between housing and cover.
- Operate the actuator and check that it moves correctly.

Cortec VCI 369 must be applied at six-month intervals in damp conditions where corrosion is likely. Grease filling the housing should also be considered. See Section 4.1.

4.4 Maintenance of a B1CM actuator

CAUTION:

Don't use the lever in the torsion arm for manual operation when the actuator is pressurized!

CAUTION:

Don't leave the lever in the torsion arm after manual operation!

The structure of the B1CM actuator is the same, except for the manual operation lever connected with lever arm (3). See the exploded view, Section 8.

Maintenance as in Sections 4.1 and 4.2.

4.5 Maintenance of B1C502-752 actuators

The structure of the B1C502-752 actuators is in principle the same as a normal B1C actuator. In order to ensure a high operating torque, the equipment is fitted with two cylinders connected to the secondary shaft.

For maintenance see Sections 4.1 and 4.2.

5. MALFUNCTIONS

Table 6 lists malfunctions that might occur after prolonged use.

6. TOOLS

For maintenance of the actuator, you will need a few special tools in addition to the usual ones. The following can be ordered from the manufacturer:

- For actuator removal:
 - Extractor (Table 3)
- For piston seal installation:
 - Tie ring (Table 4)
- For cylinder base removal:
 - Lock nut key (Table 5)

Table 3 Extractor tools

Actuator size	Tool ID.
BC/BJ 6	303821
BC 8-11 / BJ 8-10	8546-1
BC 12-17 / BJ 12-16	8546-2
BC/BJ 20	8546-3
BC/BJ 25	8546-4
BC/BJ 32	8546-5
BC 40 / BJ 322	8546-6
BC 50	8546-7
BC 502	8546-8

Table 4 Mounting Collars

Actuator size	Tool ID.
BC 6-8	7814-1
BC 9-10	7814-2
BC 11-12 / BJ 8	7814-3
BC 13-16 / BJ 10	7814-4
BC 17-20 / BJ 12	7814-5
BC 25 / BJ 16	7814-6
BC 32 / BJ 20	7814-7
BC 40 / BJ 25	7814-8
BC 50, 502 / BJ 32, 322	7814-9
BC 60, 602 cylinder Ø 600	7814-10
BC 75, 752	7814-11

Table 5 Shaft nut tools

Actuator size	Tool ID.
BC/BJ 8	260155
BC 10-11 / BJ 10	260156
BC 12-13 / BJ 12	260157
BC 16-17 / BJ 16	260172
BC/BJ 20	260196
BC/BJ 25	260195
BC 32 / BJ 32, 322	261153
BC 40	261154
BC 50, 502	261155

7. ORDERING SPARE PARTS

NOTE:

Use only original spare parts. This ensures proper functioning of the actuator.

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

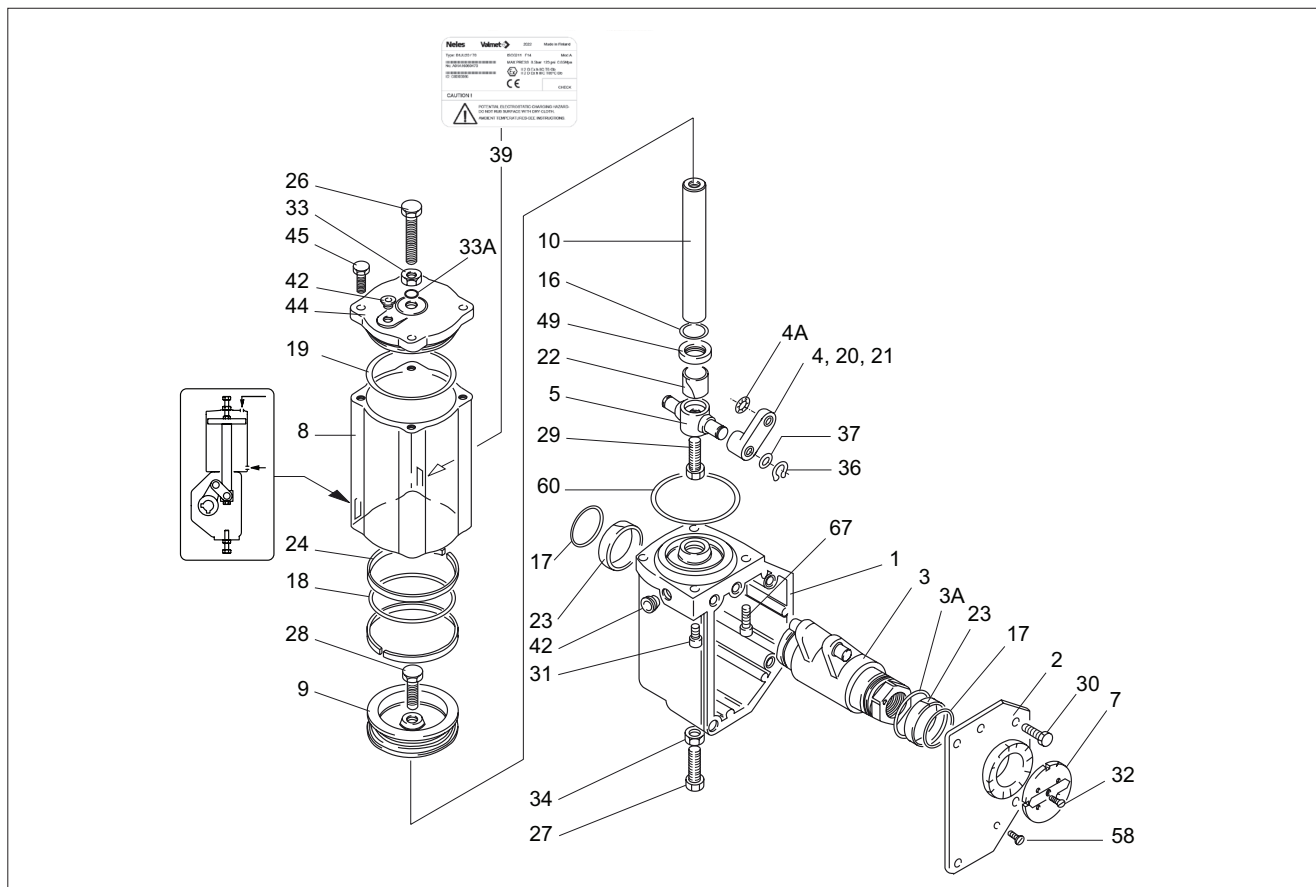
This information can be found from the identification plate or documents.

Table 6 Possible malfunctions

Symptom	Possible cause	Action
Irregular or slow operation	Low supply pressure	Make sure that supply pressure complies with minimum torque required by valve. Check that supply air pipes are large enough.
	Positioner malfunction	Check the operation of the positioner.
	Valve malfunction	Check that valve functions properly without actuator.
	Wrong size actuator	Contact the manufacturer for checking the size.
	Leak in piston or piston rod seal	Replace seals. See Section 4.1.
	Cylinder damaged by impurities	Note installation position recommendation. Cylinder damage always requires replacement.
	Worn-out actuator bearings	Check condition of bearings in accordance with Section 4.2. Replace the bearings if necessary. If the frequency of operation is high, the bearings and piston seals should be replaced at regular intervals, max. of 500 000 operations.
	Linkage rusted in difficult damp conditions	Clean the linkage and replace the bearings. Lubricate the housing regularly and apply grease as in Section 4.1. If water collects in the housing, bore a hole in the lower part of the housing (ø5 mm).
	The fastening screw in the bearing unit is loose	Tighten screw. Lock with Loctite 225 or equal liquid glue.
Play in the joint between actuator and valve	Replace necessary parts.	

8. EXPLODED VIEWS AND PARTS LISTS

8.1 Actuators B1C 6



Item	Qty	Description	Spare part category
1	1	Housing	
2	1	Cover	
3	1	Lever arm	2 **
3A	1	Antistatic ring	2 **
4	2	Connection arm	2 **
4A ***	1	Antistatic ring	2 **
5	1	Bearing unit	2 **
7	1	Pointer cover	
8	1	Cylinder	3
9	1	Piston	
10	1	Piston rod	
16	1	O-ring	1 *
17	2	O-ring	1 *
18	1	O-ring	1 *
19	1	O-ring	1 *
20	2	Bearing	2 **
21	2	Bearing	2 **
22	1	Bearing	1 *
23	2	Bearing	1 *
24	2	Piston seal	1 *
26	1	Stop screw	3 ***
27	1	Stop screw	3 ***
28	1	Screw	

Item	Qty	Description	Spare part category
29	1	Screw	
30	1	Screw	
31	3	Screw	
32	2	Screw	
33	1	Nut	3 ***
33A	1	O-ring	1 *
34	1	Nut	3 ***
36	2	Lock ring	(**)
37	2	Support ring	(**)
39	1	ID plate	
42	2	Plug	
44	1	Cylinder end	
45	4	Screw	
49	1	Bushing	
58	1	Pressure outlet valve	1 *
60	1	O-ring	
62	1	Screw	
67	1	Screw	

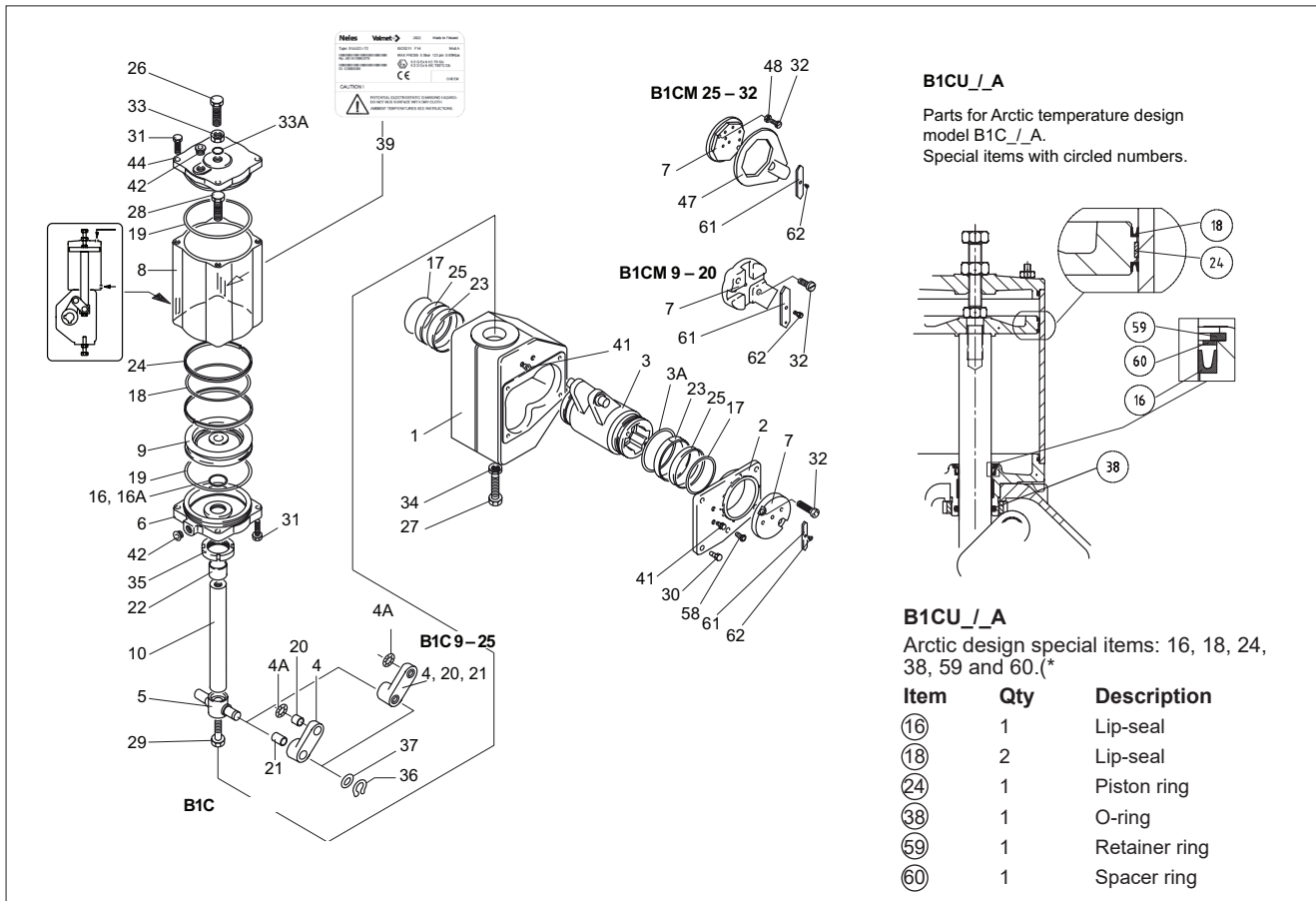
*) Delivered as a set
 **) Leverage assembly, also available as separate part.
 Parts 20 and 21 are not available separately. They are delivered with part 4 as a set only.
 (***) Belongs to leverage assembly, not recommended as separate part
 ****) With long-run option

Spare part set category 1: Recommended soft parts for inspection and maintenance (to be replaced always after disassembling the actuator)

Spare part category 2: Leverage repair

Spare part category 3: Complete overhaul (for complete overhaul parts of all 3 categories are needed)

8.2 Actuators B1C 9-32



Item	Qty	Description	Spare part category
1	1	Housing	
2	1	Cover	
3	1	Lever arm	2 **
3A	1	Antistatic ring	2 **
4	2	Connection arm	2 **
4A ***	1	Antistatic ring	2 **
5	1	Bearing unit	2
6	1	Cylinder base	
7	1	Pointer cover	
8	1	Cylinder	3
9	1	Piston	
10	1	Piston rod	
16	1	O-ring	1 *
16A	1	O-ring	1 *
17	2	O-ring	1 *
18	1	O-ring	1 *
19	2	O-ring	1 *
20	2	Bearing	2 ** (size 32: 1 *)
21	2	Bearing	2 ** (size 32: 1 *)
22	1, 2	Bearing	1 *
23	2	Bearing	1 *
24	2, 3	Piston seal	1 *
25	2	Bushing	3
26	1	Stop screw	3 ***
27	1	Stop screw	3 ***

Item	Qty	Description	Spare part category
28	1	Screw	
29	1	Screw	
30	4	Screw	
31	8, 12	Screw	
32	2	Screw	
33	1	Nut	3 ***
33A	1	O-ring	1 *
34	1	Nut	3 ***
35	1	Lock nut	
36	2	Lock ring	(**)
37	2	Support ring	(**)
39	1	ID plate	
41		Plug	
42		Plug	
44	1	Cylinder end	
47	1	Torsion arm	
48	2	Washer	
58	1	Pressure outlet valve	1 *
61	1	Direction arrow	
62	1	Screw	

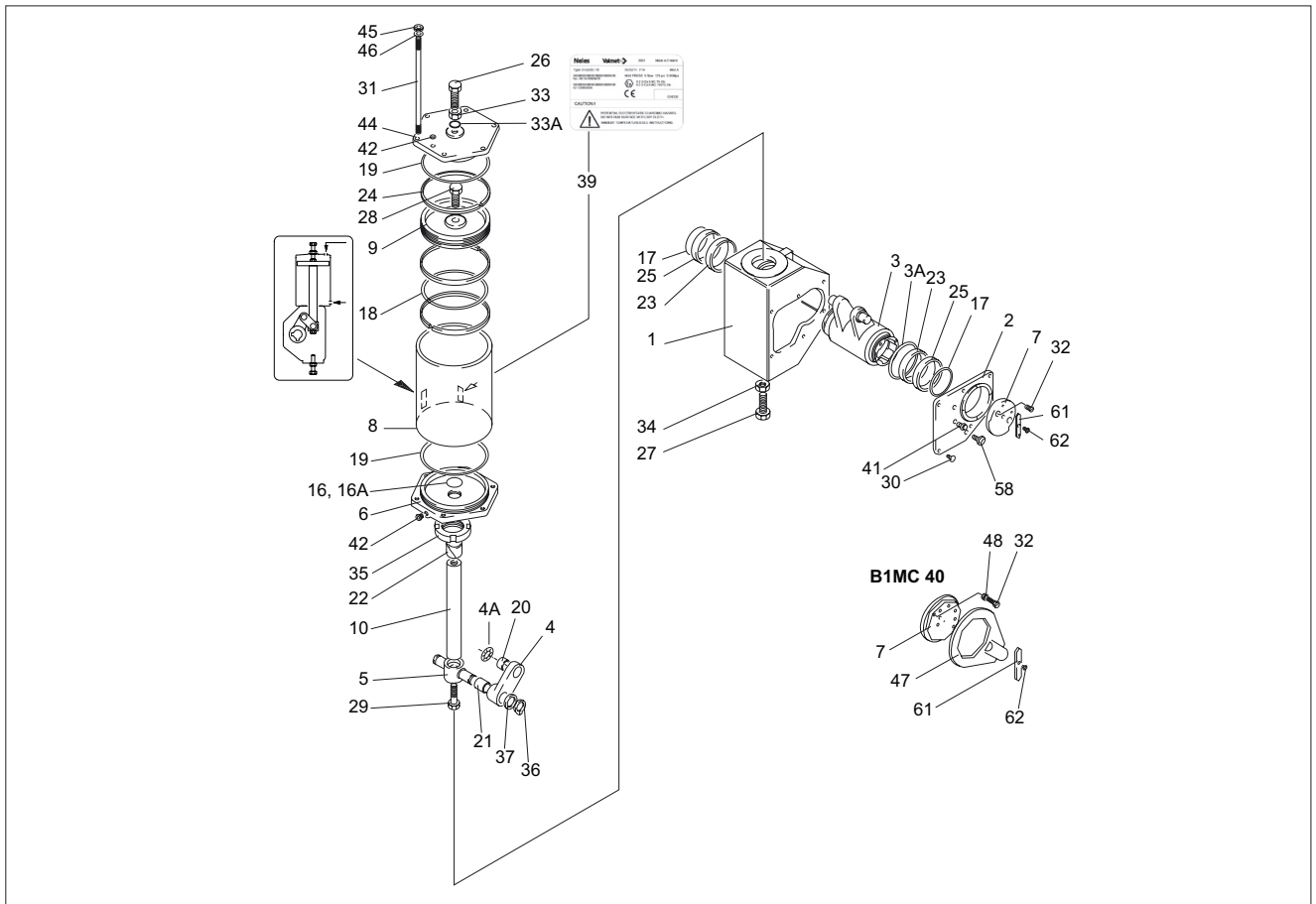
*) Delivered as a set
 **) Leverage assembly, also available as separate part.
 Actuator sizes 9-25: Parts 20 and 21 are not available separately.
 They are delivered with part 4 as a set only.
 (***) Belongs to leverage assembly, not recommended as separate part
 ****) With long-run option

Spare part set category 1: Recommended soft parts for inspection and maintenance (to be replaced always after disassembling the actuator)

Spare part category 2: Leverage repair

Spare part category 3: Complete overhaul (for complete overhaul parts of all 3 categories are needed)

8.3 Actuators B1C 40-75



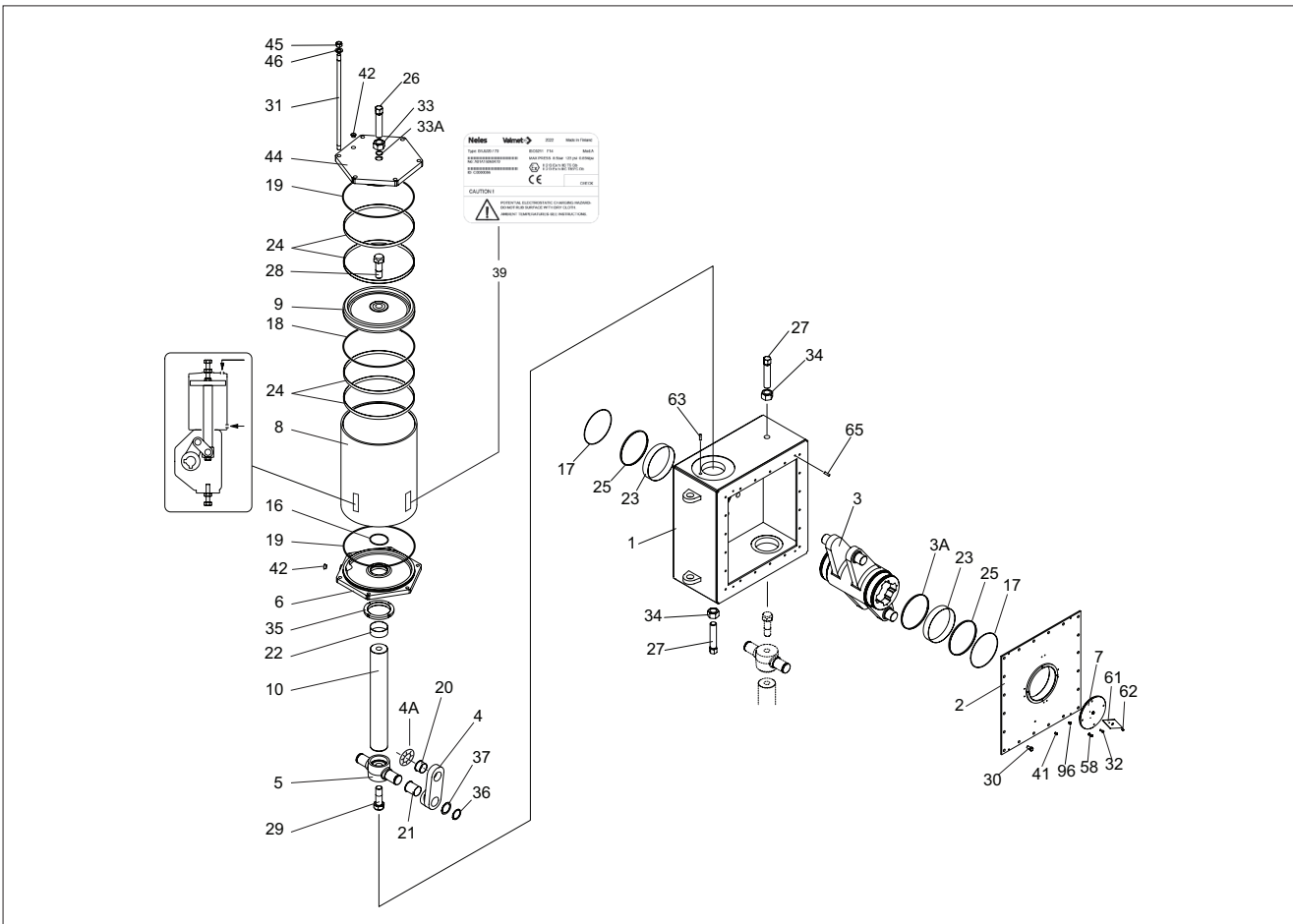
Item	Qty	Description	Spare part category
1	1	Housing	
2	1	Cover	
3	1	Lever arm	2 **
3A	1	Antistatic ring	2 **
4	2	Connection arm	2 **
4A	1	Antistatic ring	2 **
5	1	Bearing unit	2 **
6	1	Cylinder base	
7	1	Pointer cover	
8	1	Cylinder	3
9	1	Piston	
10	1	Piston rod	
16	1	O-ring	1 *
16A	1	O-ring	1 *
17	2	O-ring	1 *
18	1	O-ring	1 *
19	2	O-ring	1 *
20	2	Bearing	1 *
21	2	Bearing	1 *
22	2	Bearing	1 *
23	2	Bearing	1 *
24	3, 4	Piston seal	1 *
25	2	Bushing	3
26	1	Stop screw	3 ***
27	1	Stop screw	3 ***

Item	Qty	Description	Spare part category
28	1	Screw	
29	1	Screw	
30	6	Screw	
31	6	Stud	
32	2	Screw	
33	1	Nut	3 ***
33A	1	O-ring	1 *
34	1	Nut	3 ***
35	1	Lock nut	
36	2	Lock ring	(**)
37	2	Support ring	(**)
39	1	ID plate	
41		Plug	
42		Plug	
44	1	Cylinder end	
45	6	Nut	
46	6	Washer	
47	1	Torsion arm	
48	2	Washer	
58	1	Pressure outlet valve	1 *
61	1	Direction arrow	
62	1	Screw	

*) Delivered as a set
 **) Leverage assembly, also available as separate part
 (***) Belongs to leverage assembly, not recommended as separate part
 ****) With long-run option

Spare part set category 1: Recommended soft parts for inspection and maintenance (to be replaced always after disassembling the actuator)
 Spare part category 2: Leverage repair
 Spare part category 3: Complete overhaul (for complete overhaul parts of all 3 categories are needed)

8.4 Actuators B1C 502-752



Item	Qty	Description	Spare part category
1	1	Housing	
2	1	Cover	
3	1	Lever arm	2 **
3A	1	Antistatic ring	2 **
4	4	Connection arm	2 **
4A	1	Antistatic ring	2 **
5	2	Bearing unit	2 **
6	2	Cylinder base	
7	1	Pointer cover	
8	2	Cylinder	3
9	2	Piston	
10	2	Piston rod	
16	2	O-ring	1 *
17	2	O-ring	1 *
18	2	O-ring	1 *
19	4	O-ring	1 *
20	4	Bearing	1 *
21	4	Bearing	1 *
22	4	Bearing	1 *
23	2	Bearing	1 *
24	8	Piston seal	1 *
25	2	Bushing	3
26	2	Stop screw	3 ***
27	2	Stop screw	3 ***
28	2	Screw	

Item	Qty	Description	Spare part category
29	2	Screw	
30	20	Screw	
31	12	Stud	
32	2	Screw	
33	2	Nut	3 ***
33A	2	O-ring	1 *
34	2	Nut	3 ***
35	2	Lock nut	
36	4	Lock ring	(**)
37	4	Support ring	(**)
39	1	ID plate	
41	4	Plug	
42	4	Plug	
44	2	Cylinder end	
45	12	Nut	
46	12	Washer	
58	1	Pressure outlet valve	1 *
61	1	Direction arrow	
62	2	Screw	
63	2	Pin	
65	4	Pin	
96	4	Screw	

*) Delivered as a set
 **) Leverage assembly, also available as separate part
 (***) Belongs to leverage assembly, not recommended as separate part
 ****) With long-run option

Spare part set category 1: Recommended soft parts for inspection and maintenance (to be replaced always after disassembling the actuator)

Spare part category 2: Leverage repair

Spare part category 3: Complete overhaul (for complete overhaul parts of all 3 categories are needed)

9. DIMENSIONS AND WEIGHTS

9.1 Actuator B1C

Type	Dimensions, mm										NPT	kg
	X	G	F	V	Y	L	K*	K1	R*	R1		
B1C6	90	270	395	36	46	80	138	138	80	80	1/4	4.2
B1C9	110	315	450	43	50	80	130	140	72	81	1/4	9.6
B1C11	135	375	535	51	50	95	144	154	80	89	3/8	16
B1C13	175	445	640	65	65	120	175	190	94	109	3/8	31
B1C17	215	555	785	78	70	137	207	222	111	126	1/2	54
B1C20	215	590	880	97	80	145	240	262	125	147	1/2	73
B1C25	265	725	1075	121	110	180	300	304	162	166	1/2	131
B1C32	395	920	1370	153	146	280	376	379	201	204	3/4	256
B1C40	505	1150	1670	194	185	320	449	449	224	224	3/4	446
B1C50	610	1390	2060	242	195	350	541	543	266	268	1	830
B1C60	725	1390	2060	242	195	350	541	543	266	268	1	1080
B1C75	875	1390	2060	242	195	350	541	543	266	268	1	1190

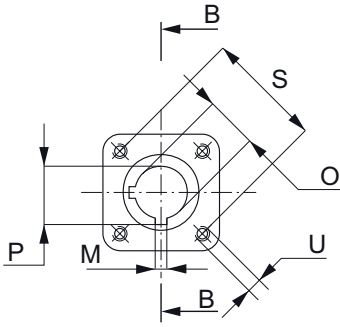
Type	Dimensions, in										NPT	lb
	X	G	F	V	Y	L	K*	K1	R*	R1		
B1C6	3.54	10.60	15.60	1.42	1.81	3.15	5.43	5.43	3.15	3.15	1/4	9
B1C9	4.33	12.40	17.70	1.69	1.97	3.15	5.12	5.51	2.83	3.19	1/4	21
B1C11	5.31	14.80	21.10	2.01	1.97	3.74	5.67	6.06	3.15	3.50	3/8	35
B1C13	6.89	17.50	25.20	2.56	2.56	4.72	6.89	7.48	3.70	4.29	3/8	68
B1C17	8.46	21.90	30.90	3.07	2.76	5.39	8.15	8.74	4.37	4.96	1/2	119
B1C20	8.46	23.20	34.70	3.82	3.15	5.71	9.45	10.31	4.92	5.79	1/2	161
B1C25	10.43	28.50	42.30	4.76	4.33	7.09	11.81	11.97	6.38	6.54	1/2	289
B1C32	15.55	36.20	53.90	6.02	5.75	11.0	14.80	14.92	7.91	8.03	3/4	564
B1C40	19.88	45.30	65.70	7.64	7.28	12.60	17.68	17.68	8.82	8.82	3/4	983
B1C50	24.02	54.70	81.10	9.53	7.68	13.78	21.30	21.38	10.47	10.55	1	1829
B1C60	28.54	54.70	81.10	9.53	7.68	13.78	21.30	21.38	10.47	10.55	1	2380
B1C75	34.45	54.70	81.10	9.53	7.68	13.78	21.30	21.38	10.47	10.55	1	2620

*) Dimensions K and R are for Neles accessories interface.
Dimensions K1 and R1 are for VDI/VDE 3845 interface (type code "U").

Type	Dimensions, mm		Weight kg	Dimensions, in		Weight lb
	X1	X2		X1	X2	
502	540	610	1665	21.3	24.0	3663
602	635	725	2170	25.0	28.5	4780
752	813	875	2300	32.0	34.5	5070

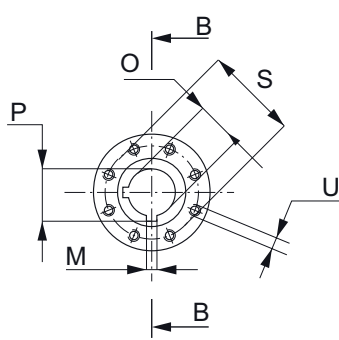
9.2 Attachment dimensions

DIRECTION A - A



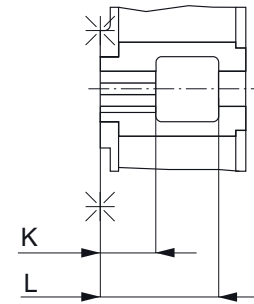
B1C6...25

DIRECTION A - A



B1C32...752

DIRECTION B - B



B1C	Dimensions, mm								Mounting face
	O (H8)	M	P	K (keyway)	L	S	U	N	
6	15	4.76	17.0	40	90	50	M6	4	F05
	20	4.76	23.3						
	25	6.35	27.9						
6	15	4.76	17.0	40	90	70	M8	4	F07
	20	4.76	23.3						
	25	6.35	27.9						
9	15	4.76	17.0	50	90	70	M8	4	F07
	20	4.76	23.3						
	25	6.35	27.9						
	35	9.52	39.3						
11	20	4.76	23.3	60	105	102	M10	4	F10
	25	6.35	27.9						
	35	9.52	39.3						
	40	9.52	44.4						
13	55	12.70	60.8	75	130	125	M12	4	F12
17	55	12.70	60.8	80	160	140	M16	4	F14
20	70	19.05	78.3	105	195	140	M16	4	F14
25	95	22.22	105.5	140	235	165	M20	4	F16
32	105	25.40	116.3	155	280	254	M16	8	F25
40	95	22.22	105.5	180	340	298	M20	8	F30
	105	25.40	116.3						
	120	31.75	133.9						
50	120	31.75	133.9	200	430	356	M30	8	F35
	60	31.75	149.2						
	75	31.75	149.2						
502	120	31.75	133.9	250	470	406	M36	8	F40
	135	31.75	149.2						
	150	31.75	166.8						
	165	38.10	182.0						
180	44.45	199.4							

B1C	Dimensions, in								Mounting face	
	O (H8)	M	P	K (keyway)	L	S	U	N		
6	0.59	0.19	0.67	1.57	3.54	1.97	M6	4	F05	
	0.79	0.19	0.92							
	0.98	0.25	1.10							
6	0.59	0.19	0.67	1.57	3.54	2.76	M8	4	F07	
	0.79	0.19	0.92							
	0.98	0.25	1.10							
9	0.59	0.19	0.67	1.97	3.54	2.76	M8	4	F07	
	0.79	0.19	0.92							
	0.98	0.25	1.10							
	1.38	0.37	1.55							
11	0.79	0.19	0.92	2.36	4.13	4.02	M10	4	F10	
	0.98	0.25	1.10							
	1.38	0.37	1.55							
	1.57	0.37	1.75							
13	2.17	0.50	2.39	2.95	5.12	4.92	M12	4	F12	
17	2.17	0.50	2.39	3.15	4.72	5.51	M16	4	F14	
20	2.76	0.75	3.08	4.13	7.68	5.51	M16	4	F14	
25	3.74	0.87	4.15	5.51	9.25	6.50	M20	4	F16	
32	4.13	1.00	4.58	6.10	11.02	10.00	M16	8	F25	
40	3.74	0.87	4.15	7.09	13.39	11.73	M20	8	F30	
	4.13	1.00	4.58							
	4.72	1.25	5.27							
50	4.72	1.25	5.27	7.87	16.93	14.02	M30	8	F35	
	60	5.31	1.25							5.87
	75	5.31	1.25							5.87
502	4.72	1.25	5.27	9.84	18.50	15.98	M36	8	F40	
	5.31	1.25	5.87							
	5.91	1.25	6.57							
	6.50	1.50	7.17							
752	7.09	1.75	7.85							

10. TYPE CODE

Pneumatic double-acting cylinder actuator, B1C									
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
B1	C	-	S	Q	U	50/120	H	E	X

1.	Product group
B1	Cylinder actuator with attachment dimensions acc. to ISO 5211

2.	Series
C	Double acting, pneumatic, protection class IP66.

3.	Construction
-	Standard construction without sign
H	Manual hydraulic override (excl. sizes 6 & 9, & if sign 8. is "A")
M	Centre piece for manual operation (not possible, if 6. sign is U)

4.	Cylinder and housing materials
-	Aluminium cylinder and EN 1561-GJL-200 housing, standard materials, without sign. Except if sign 8. is arctic version "A" then housing and piston always EN 1563-GJS-400-15.
S	Carbon steel cylinder and EN 1561-GJL-200 housing and piston. Except if sign 8. is arctic version "A" then housing and piston always EN 1563-GJS-400-15. (Not available with size 6).
B	Aluminium cylinder and EN 1563-GJS-400-15 housing and piston, (Not available with size 6). When 8. sign is "A", without sign, standard material.
X	Carbon steel cylinder and EN 1563-GJS-400-15 housing and piston, (Not available with size 6).

5.	Special construction
-	Standard construction without sign
D	Simple Service Lock Up with mechanical locking device for piston movement limit on housing end. Locking with long screw to close position. (Not available with size 502, 602, 752).
Q	Service lock up with mechanical locking device for piston movement limit on housing end. Locking with long screw to close position.
W	Service lock up with mechanical locking device for piston movement limit on cylinder end. Locking with long screw to open position.
QW	Service lock up with mechanical locking device for piston movement limit on housing and cylinder ends. Locking with long screw to close as well as to open position.
Z	Actuator equipped with shock absorber on cylinder end, for temperatures -20... +120 °C
N	Actuator equipped with shock absorber on housing end, for temperatures -20... +120 °C
P	Actuator equipped with automatic latching device for closed position. Design is made mainly for actuator locking device of capping valve. No free motion.
T	Actuator equipped with manual latching device. Actuator can be locked to open position allowing about 20 degrees' motion.
K	Handwheel on cylinder end (sizes 9 to 25).
L	Handwheel on housing end (sizes 9 to 25).
R	Handwheel both on cylinder end and housing end (sizes 9 to 25).
RK	Handwheel on cylinder end with wormgear (sizes 32 to 75). Not used in 502, 602 and 752.
RL	Handwheel on housing end with wormgear (sizes 32 to 75). Not used in 502, 602 and 752.
RR	Secondary handwheel with wormgear (sizes 32 to 75). Not used in 502, 602 and 752.
Y	Special

6.	INTERFACE FOR ADDITIONAL DEVICES (positioner, limit switch)
U	Interface according to VDI/VDE 3845, standard construction.

7.	Actuator size
	6/15 6/20 6/25 - 9/15 9/20 9/25 9/35 - 11/20 11/25 11/35 11/40 - 13/55 - 17/55 - 20/70 - 25/95 - 32/105 - 40/95 40/105 40/120 - 50/120 50/135 - 502/120 502/135 502/150 502/165 502/180
	E.g. 50/120 = actuator size / shaft bore diameter. Note special sizes (B1C 50 and 502 with oversized cylinder): 60 - max. supply pressure 8.5 bar 75 - max. supply pressure 5 bar 602 - max. supply pressure 8.5 bar 752 - max. supply pressure 5 bar

8.	Materials of seals and bearings (all versions ATEX II 2 G/D h and ATEX II 3 G/D h)
-	Standard construction without sign (-20° to +70 °C)
HL	For temperatures -20... +120 °C and long-run option L
CL	For temperatures -40... +70 °C, and long-run option L
C	For temperatures -40... +70 °C
A	For temperatures -55... +70° C. Arctic service model. Not available if 3. sign is "H" or 11. sign is "M". Size 6 not available.
F	Oversized NPT connections: fast operation
F1	Larger oversized NPT connections: faster operation
L	Long-run option
S	Super long-run option (-20 to +70 °C)
D	DU-bearings - for sizes 32...502 Note: Not applicable with L, CL and HL options
Y	Special

9.	Screw material
-	Stainless steel (standard) for sizes 6-32. Steel, zinc coated and passivated (standard) for sizes 40 and bigger. Steel, zinc coated and passivated for all sizes with steel cylinder, sign 4 is S or X.
E	Stainless steel for sizes 40 and bigger with aluminium cylinder. Stainless steel for all sizes with steel cylinder, sign 4 is S or X.

10.	Non-standard operation range
-	Standard, X=0, Y=90
X	Valve closed position is limited. X can be any value between 0-90°. For example, when closed position is limited to 30 °, X = 30 (never fully closed).
Z	Valve open position is limited. Z can be any value between 90-0°. For example, when open position is limited to 70 °, Z = 70 (never fully open).
XZ	Valve closed and open position are limited. For example, X = 30 (closed position is limited to 30°) For example, Z = 70 (open position is limited to 70°)

11.	Special construction
6	Protection class IP66M
7	Protection class IP67/IP67M
G	Oxygen service model
M	K-mass fire protection
T	Tropicalization

APPENDIX 1: General safety warning

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 center of gravity (CG) of the equipment being lifted. Make sure the CG is always under the central lifting point.
2. Actuators may be equipped with lifting threads/lugs on the body or cylinder end caps. These 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.

Work activities on the actuator

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. Always make sure that the pipeline / valve pressure or temperature don't result in any risk when maintenance work is starting or being executed.
5. 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.
6. When the actuator is being serviced and the actuator is connected to the valve, never touch the inside of the valve. There is a high risk of serious injury to hands and/or fingers if the valve suddenly starts to operate due to malfunction.

General disclaimers

Receive, handle and unpacking.

1. Respect the safety warnings above!
2. Actuators are critical components for pipelines to control valves with high pressure fluids and must therefore be handled with care.
3. Store actuators and equipment in a dry and protected area until the equipment is installed.
4. Do not exceed the maximum storage temperatures given in the IMO (installation, maintenance, and operating instructions).
5. Keep the original packaging on the actuator as long as possible to avoid environmental contamination by dust, water, dirt, etc.

6. Remove the actuator or related accessories pneumatic supply port transportation protective caps just before connecting into plant supply network.

Operating

7. The identification plate (nameplate, or engraved markings) on the actuator gives the information of max. operating and ambient conditions.
8. Temperatures and pressures must never exceed values marked on the actuator identification plate. Exceeding these values may cause damage or personal injury.
9. Never exceed the actuator torque preset values (air supply, position). Application of excessive torque may cause damage to the valve.
10. Valmet actuators typically are designed to be used in atmospheric conditions. Do not use actuators under external pressurized conditions unless specifically designed and explicitly marked for this service.
11. As the use of the actuator is application specific, a number of factors should be taken into account when selecting an actuator for a given application. Therefore, some situations in which the actuators are used are outside the scope of this manual.
12. It is the end user's responsibility to confirm compatibility of the actuator materials with the intended service, however if you have questions concerning the use, application, or compatibility of the actuator for the intended service, contact Valmet for more information.
13. Never use enriched or pure oxygen as actuator supply medium.
14. Actuators intended for use in or with explosive atmospheres must be equipped with a grounding device and marked according ATEX (or equivalent international standards).
15. Extremely fast actuator operating strokes should be avoided especially if repeating cycles. Stroke speed should be limited by restrictor valves in such cases.

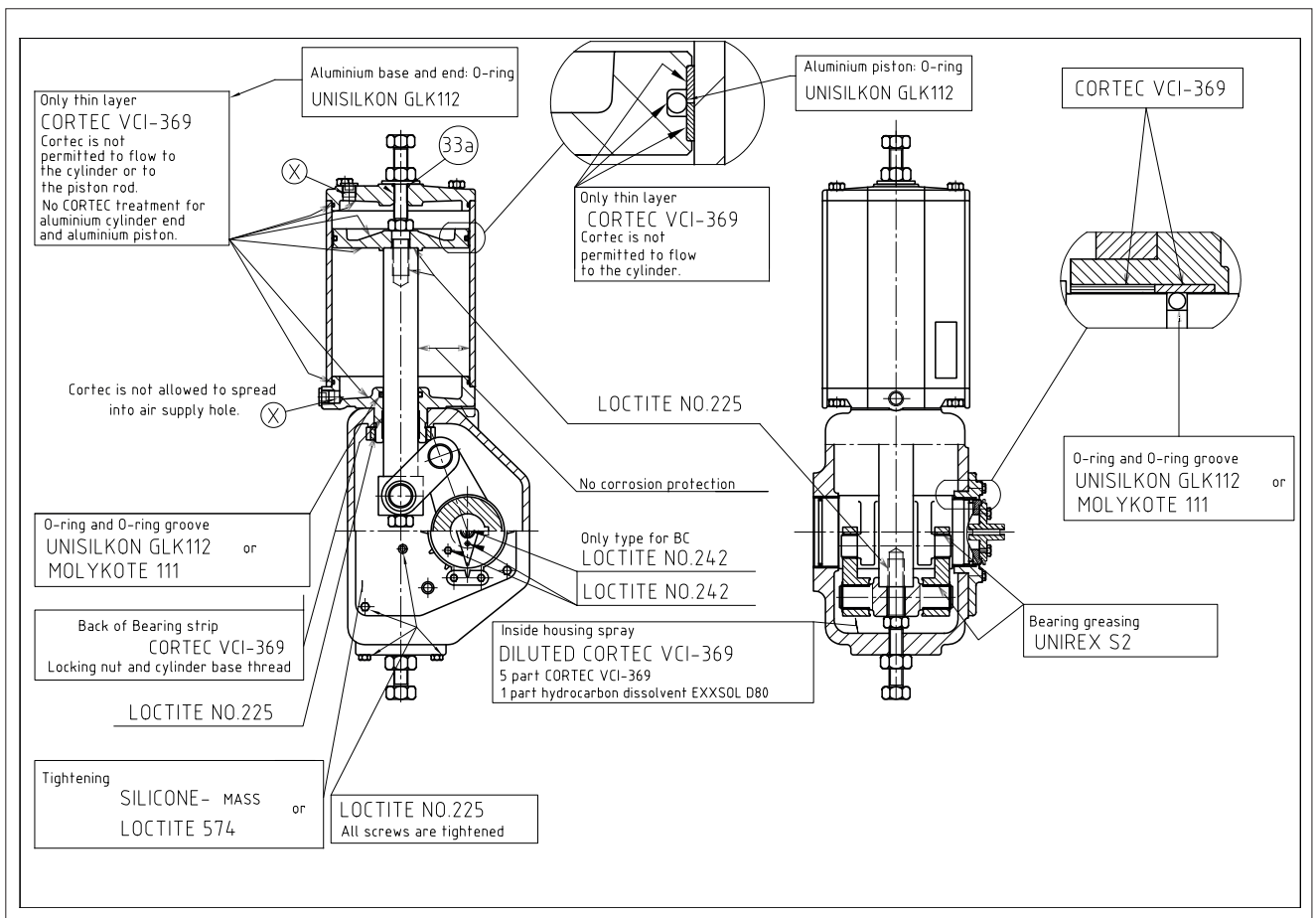
Maintenance

16. Respect the safety warnings above!
17. Plan service and maintenance actions, that spare parts, lifting devices and service personnel is available.
18. Maintain the actuator within the recommended minimum maintenance intervals or within the recommended maximum operating cycles.
19. Always make sure that the actuator is depressurized before starting any kind of maintenance work at a actuator.
20. Always check the position of the (valve) actuator 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 actuator yoke/driver arm/lever arm key way position
 - Consider that the positioner may give wrong signals.
21. Sealing and bearing materials (soft parts) should be changed when the actuator is maintained. Always use original equipment manufacturers (OEM) spare parts to ensure proper performance of the repaired actuator.
22. Do not use sharp tools, grinding machines, or files to work on functional surfaces such as sealing or bearing surfaces as this can damage these surfaces.
23. All pressure containing parts must be inspected visually for damage or corrosion. Damaged parts must be replaced.

24. Check the condition of the hard bearings and counter surfaces. Replace parts if there are significant wear, scratches, or damage.
25. Make sure that the actuator and its accessories is positioned in the correct planned orientation into the pipeline.
26. If the actuators are marked to be suitable for explosive atmospheres the correct function of the discharging device must be tested before returning to service.
27. Always work in a clean environment. Avoid getting particles inside the actuator due to machining, grinding, or welding nearby.
28. Never store a maintained actuator without pneumatic supply port protection.
29. 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.

APPENDIX 2:

B1 series lubrication instruction



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