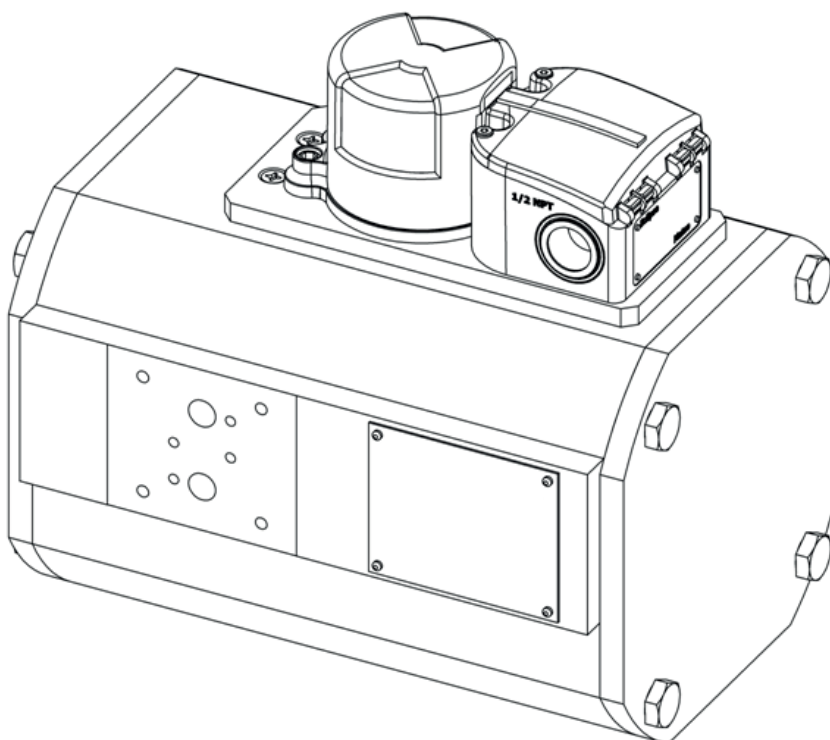


# Rack and pinion quarter-turn actuator

Series F1A, F1F and F1O

Installation, maintenance and  
operating instructions



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Please note any additional information for projects in addition to the IMO.

Subject to change without notice.

All trademarks are property of their respective owners.



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 actuator.

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

These instructions provide the customer/operator with important information in addition to the customer/operator's normal operation and maintenance procedures. Since operation and maintenance philosophies vary, Valmet does not attempt to dictate specific procedures, but to provide basic limitations and requirements created by the type of equipment provided.

These instructions assume that operators already have a general understanding of the requirements for safe operation of mechanical and electrical equipment in potentially hazardous environments. Therefore, these instructions should be interpreted as applied in conjunction with the safety rules and regulations applicable at the site and the particular requirements for operation of other equipment at the site.

These instructions do not intend to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired, or should particular problems arise which are not covered sufficiently for the customer/operator's purposes the matter should be referred to Valmet.

The rights, obligations and liabilities of Valmet and the customer/operator are strictly limited to those expressly provided in the contract relating to the supply of the equipment. No additional representations or warranties by Valmet regarding the equipment or its use are given or implied by the issue of these instructions.

These instructions contain proprietary information of Valmet and are furnished to the customer/operator solely to assist in the installation, testing, operation and/or maintenance of the equipment described. This document shall not be reproduced in whole or in part nor shall its contents be disclosed to any third party without the written approval of Valmet.

## 1.1 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 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:

#### 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 chapter, lifting ropes for a valve combination should be fastened around it. The weights are shown in chapter 3.3. Dropping may result in personal injury or damage to the equipment.

## 1.2 Welding notes

### WARNING:

Welding and/or grinding stainless steel and other alloys containing chromium metal may cause the release of hexavalent chromium. Hexavalent chromium(VI) or Cr(VI), is known to cause cancer. Be sure to use all appropriate personal protective equipment (PPE) when welding metals containing chromium.

### NOTE:

A qualified welder must do the installation welding. The welder and welding procedure should be qualified in accordance with ASME Boiler and Pressure Vessel Code Section IX or other appropriate regulation.

### CAUTION:

To prevent damage to the seat and seals, do not allow the temperature of the seat and body seal area to exceed 94°C (200°F). It is recommended that thermal chalks be used to check the temperature in these areas during welding.

### CAUTION:

Ensure that any weld splatter does not fall onto the valve closing members eg. ball, disc or seats. This may damage critical seating surfaces and cause leaks.

## 1.3 Warnings and safety notes

### NOTE:

Each chapter of the following IMO contains individual warnings, notes and safety instructions which are highlighted by that must be followed and respected without exception.

## 1.4 General disclaimers

### NOTE:

Please read and follow the instructions and notes on the general disclaimers of liability for the receipt of goods, storage, handling, operation, and maintenance of the valve at the end of this IMO.

## 1.5 Product & function description

Neles™ rack and pinion quarter-turn actuators are used to turn the shaft between 0° and 90° and is designed to be used in demanding high cycle applications.

### Specifications:

- Maximum Supply Range: 10 bar<sup>1)</sup> (116 psi)
- Temperature Range:
- Standard: -20 °C to +80 °C
- Options: -40 °C to +80 °C
- Torque Range: 30Nm to 25 000 Nm (at 5 bar)
- Supply Media: Air

<sup>1)</sup> Actuator sizes F1A, F1F, F1O 0015 - 0500 max. supply pressure 10 bar  
Actuator sizes F1A, F1F, F1O 1000 - 5000 max. supply pressure 6 bar

### Standards:

- Actuator to valve mounting:  
EN12116 ISO5211/1
- Actuator to solenoid mounting:  
Nemur, VDI/VDE3845
- Actuator to accessory mounting:  
Nemur, VDI/VDE3845

### Function description:

The actuator works pneumatically. When compressed air is supplied to them, two pistons are forced apart or back together again. In the course of this movement, they turn the actuating shaft - with which they are engaged - through 90°.

The Neles rack and pinion quarter-turn actuator is available in three types in order to satisfy the different requirements made in practical application.

Type F1A is what is known as the "double-acting" version (see Figure 1 Type F1A). This means that the pistons are moved in both operating directions by means of pneumatic pressure.

If the energy supply is interrupted, the actuator stops in its current position.

Type F1O is alike type F1A double acting, but construction is design for BO-series high cycling valve (Only sizes 0060, 0120, 0250 and 0500).

Type F1F is what is known as the "single-acting" version. This means that the pistons are only moved pneumatically in one direction. If the energy supply is interrupted, the resilience of the springs means that they automatically move back to their original position and the pistons are as a result forced into their end position.

Normal operation mode is "spring to close" (see Figure 2 Type F1F – "spring to close"). The direction of the safety action can be changed by changing the orientation of the piston (see Figure 3 Type F1F – "spring to open").

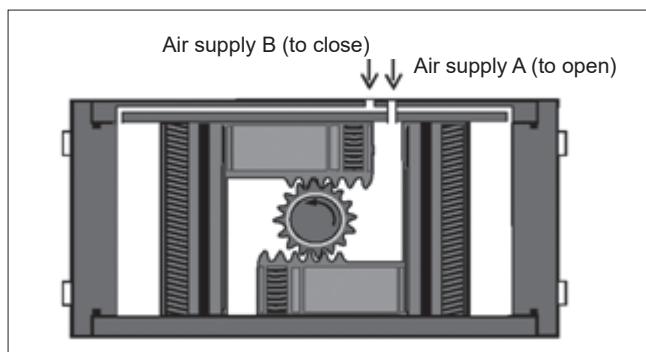


Fig. 1 Type F1A

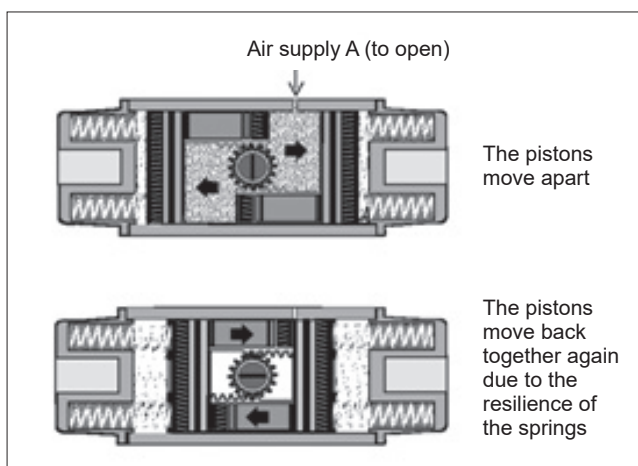


Fig. 2 Type F1F\_\_C– "spring to close"

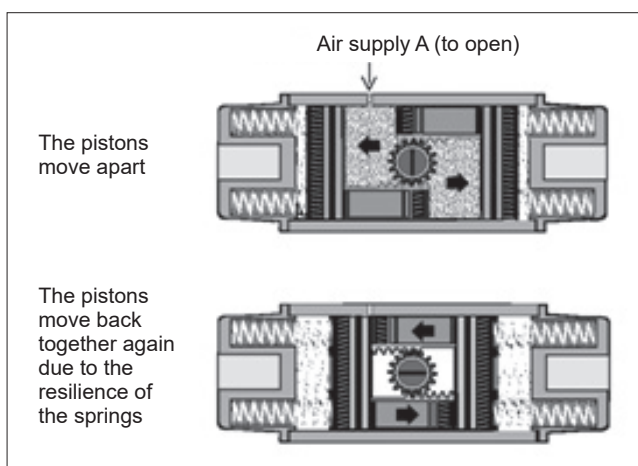


Fig. 3 Type F1F\_\_O. – "spring to open"

## 1.6 Intended use

The actuator supplied to you has been specially designed to satisfy the specific requirements. If you intend to use the actuator for a different purpose, please ask our experts beforehand whether the actuator is suitable for the demands of the application you are planning. We will be delighted to give you the necessary advice.

The actuators can only be used to carry out a movement amounting to 90° at the most.

The actuators are designed for temperatures of between -20 °C (option -40 °C) and +80 °C. When the valves are to be heated up to temperatures that are higher than this, adapters may need to be included between the valve and the actuator to guarantee the necessary cooling. Valmet experts will be glad to advise you on this.



All installation work must be carried out by appropriately trained skilled personnel.

Please make sure that you always use genuine spare parts.

One of the requirements which proper use of the actuator involves is that the operating, installation and maintenance personnel have read and understood this instruction manual.

Valmet does not accept any liability either for structural alterations that are made without the express approval of the Valmet plant or for injuries and damage to property that are caused by improper use of the actuator.

## 1.7 Scope of delivery

The Neles rack and pinion quarter-turn actuator is delivered in one of two different versions i.e. as Type F1A ("double-acting") version or Type F1F ("single acting" version).

The actuator is ready for operation when it is delivered. If you have ordered a manual emergency actuation facility, mechanical stops or electro-pneumatic accessories, all of these parts are assembled and ready for operation when they are supplied.

A nameplate into which the model code has been embossed is attached to the actuator (see 1.6).

The safety setting C (= fail to close) or O (= fail to open) specified on the model plate is implemented as follows.

- For double-action drive units of Type F1A, by the electro pneumatic accessories.
- For single-action drive units of Type F1F by the electro pneumatic accessories and/or the fitted springs.

## 1.8 Visual inspection

Before it left the factory, the actuator was checked by our quality assurance department to make sure it works properly and was set for operation in accordance with your specifications.

Please check the actuator for any transport damage after you have removed the packaging materials. If you find that any of the parts delivered have been damaged, please inform our specialists immediately.

## 1.9 Marking and identification



Fig. 4

The actuator specifications are placed on the type plate (see Figure 4).

In case of maintenance and repair you need the information of the type plate.

CO.NR.: = Job number of manufacturer  
Type = Type code of the actuator  
YEAR = Year of manufacture  
Serial-NR.: = Serial number of manufacturer

## 1.10 Contact

Please contact the manufacturer or manufacturer's representative. Addresses and phone numbers are printed on the back cover. See also [www.valmet.com/flowcontrol/valves](http://www.valmet.com/flowcontrol/valves) for the latest documentation.

## 2. TRANSPORT, RECEPTION AND STORAGE

Check the actuator including the equipment for any damage that may have occurred during transport.

Store the actuator carefully before installation, preferably indoors in a dry place.

Store temperature = -20° ... 80 °C

Humidity 85 %max (non-condensing)

The actuator is usually delivered in the closed position.

A actuator Type F1F ("single-acting" version) is delivered in a position determined by the spring.

Transport the actuator on-site not until the installation will be executed.

Lift the actuator according to figure nearby. (see Figure 5).

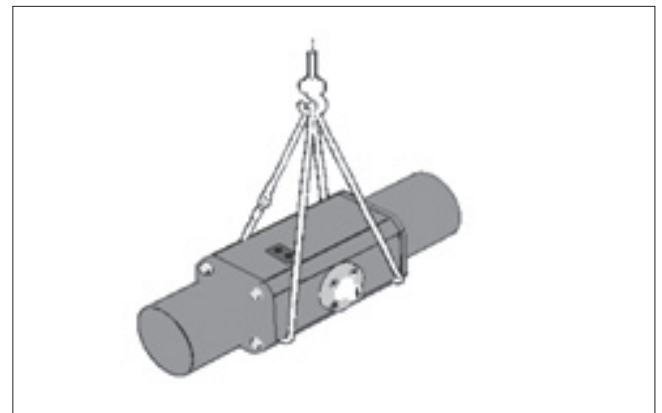


Fig. 5

## 3. MOUNTING AND DEMOUNTING

Only qualified personnel is permitted to execute installation work on the actuator!



### 3.1 Actuator air supply

Dry compressed air can be used in the actuators up to models F1A, F1F, F1O 0500, i.e. they do not require air that contains oil. For the models F1A, F1F, F1O 1000 up to F1A, F1F, F1O 5000 you need oiled air. The maximum permitted supply pressure is indicated on the type plate.

### 3.2 Installation planning

Consider the following points before you start to install the actuator:

- You must install the actuator in such a way that it is always easily accessible. This applies in particular to a possible manual emergency actuation facility as well.
- The energy supply to actuators that are operated pneumatically must not be connected until the actuator has been installed.

### 3.3 Preparation

In the case of larger actuators, you will need lifting equipment in order to install the actuator at the required location. The actuator model and its size are indicated on the nameplate. You will find the weight of the actuator in chapter 7.

### 3.4 Mounting the actuator

Carry out the following procedure when you are fitting the actuator:

- Cautiously push the actuating shaft onto the valve shaft. When you are doing this, make sure that the actuator comes to rest exactly and flatly against the adapter, so that no stresses can be created on the valve shaft.
- If you are fitting the actuator to a Neles butterfly valve, make sure that the groove on the actuating shaft corresponds to the position of the shut-off disc (see Figure 6).

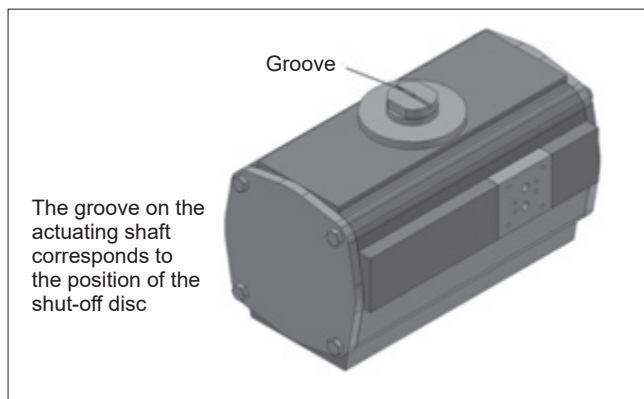


Fig. 6

If it is necessary, you can turn the actuating shaft of the actuator 90°. This is possible because the actuating shaft in the actuator has teeth all the way round it. Should you need to do this, remove the actuating shaft in accordance with the instructions given in chapter "Maintenance".

- Attach the actuator to the adapter with four bolts up to 0500 type F1A/F1F/F1O respectively eight bolt up to 5000 type F1A/F1F/F1O\_1000 .
- Connect the energy supply in a final operation (see Figure 7).

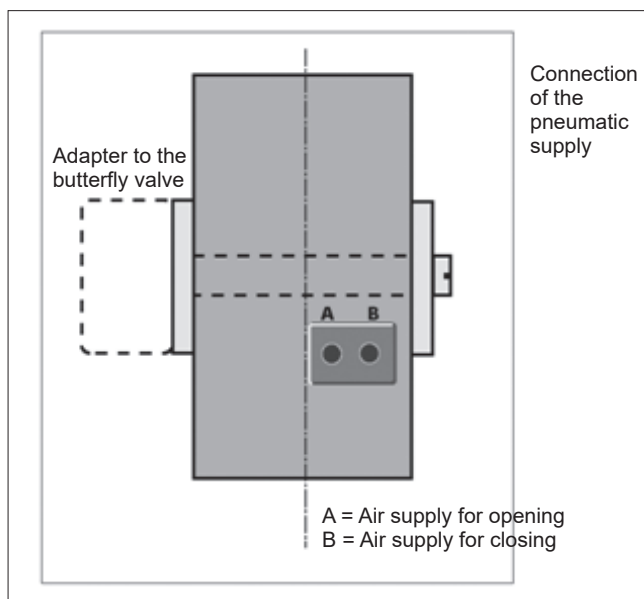


Fig. 7

#### CAUTION:

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

#### CAUTION:

Beware of the cutting movement of the valve!

### 3.5 Demounting the actuator

If the actuator is installed on a pipe, the following conditions have to be met before the actuator is removed:

Make sure that no trouble will be caused by removing the actuator.

Check carefully whether a hot medium has been running through the pipe and whether the actuator has cooled down enough so that there is no further danger due to extreme temperatures.

Check to make sure that the actuator is depressurized and the supply air is disconnected.

If the actuator has to be removed from the valve, mark the position of the actuator to the bridge and to the body with a permanent marker before dismounting. (see Figure 8)



If you are not removing the actuator yourself, warn the staff who are carrying out this assignment.

#### Removal

Carry out the following operations in the specified order when you are removing the actuator

Switch off the energy supply to the actuator.

Secure the actuator with ropes. (see Figure 9 and Figure 10)

Transport the actuator in such a way that it cannot move or be damaged in the course of the transport operation.



#### CAUTION:

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

#### CAUTION:

Beware of the cutting movement of the valve!



## 4. TOOLS

For maintenance of the actuator you will need a special tool in addition to the usual ones.

These special clamp can be ordered from Valmet with the ordering numbers listed below.

Special clamp for actuator size	Ordering No.
F1A, F1F, F1O 30	446830
F1A, F1F, F1O 60	446860
F1A, F1F, F1O 120	446920
F1A, F1F, F1O 250	446850
F1A, F1F, F1O 500	446800
F1A, F1F, F1O 1000	-
F1A, F1F, F1O 2500	-
F1A, F1F, F1O 5000	-



Fig. 9

## 5. ORDERING SPARE PARTS

When ordering spare parts, always include the following information:

- Type code (on the type plate – see chapter 1.6 ) with information about torque and pressure
- If possible, a picture of the type plate
- Name of plant, date of start-up
- Number of the parts list, part number, name of the part and quantity required

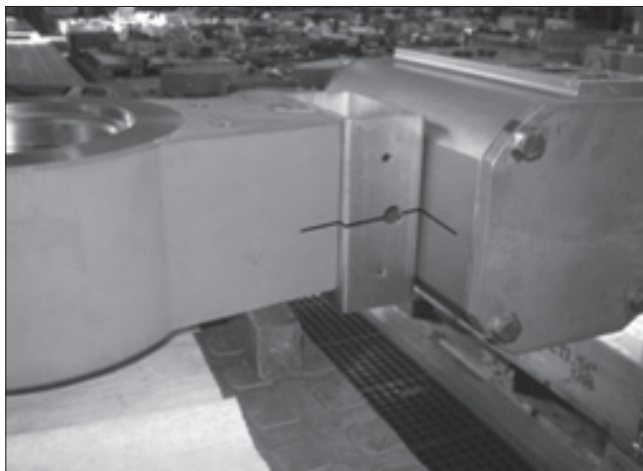


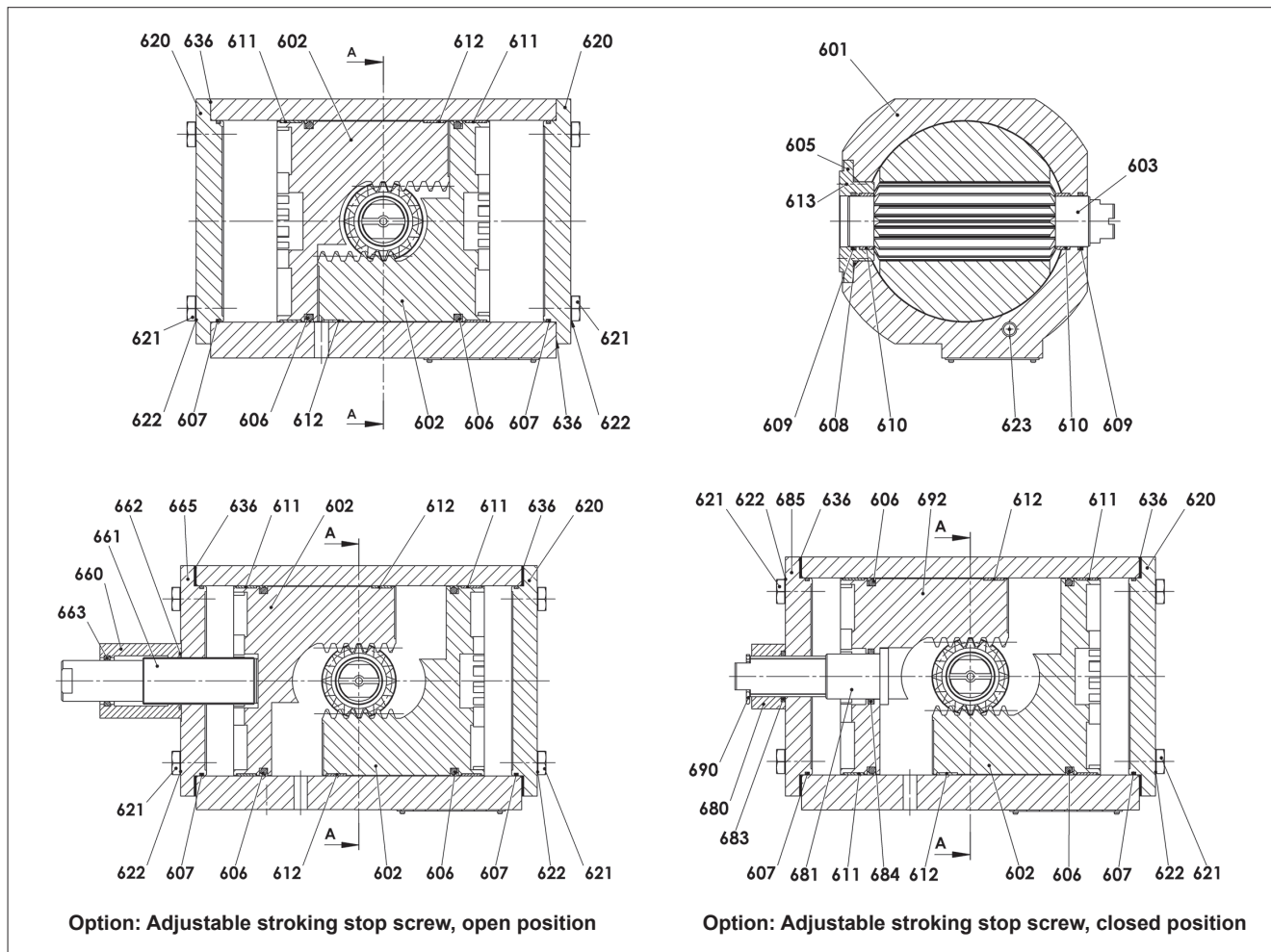
Fig. 8



Fig. 10

## 6. SECTIONAL VIEW AND PARTS LIST

### Double acting actuator Type F1A 15-500 series



Pos	Qty.	Description	Material for sizes * A500 (Standard temperature)	Spare part set
601	1	Body	Aluminium 3.3206	
602	2/1**	Piston	Aluminium 3.2381.62/3.2371.61*	
603	1	Shaft	1.4021	
605	1	Bearing flange	3.2315-E	
606	2	Keilpac	PTFE/NBR	X
607	2	O-ring	NBR	X
608	1	O-ring	NBR	X
609	2	O-ring	NBR	X
610	2	Bearing bushing	DU	X
611	2	Bearing bushing	DU	X
612	2	Bearing pad	DU	X
613	4	Cylinder head screw	A4-70	
620	2/1*/1**	End cap	3.2381.02-E	
621	8	Hexagon head screw	A2-70	
622	8	Retaining plate	A2	
623	2	Threaded pin	45H	
636 <sup>1)</sup>	12	Distance plate	A2	
660*	1	Lock nut/** Hexagonal nut	1.0037 coated	
661*	1	Stop pin/** Bolt	1.0037 coated	
662*	1	O-ring	FKM	X*
663*	1	O-ring	NBR	X*
665*	1	End cap	3.3547-E	
680**	1	Hexagonal nut	A2-70	
681**	1	Bolt	1.4021	
683**	1	O-ring	FKM	X**
684**	1	O-ring	NBR	X**
685**	1	End cap	3.3547	
690**	1	Split pin	Steel	
692**	1	Piston	3.2381.62	

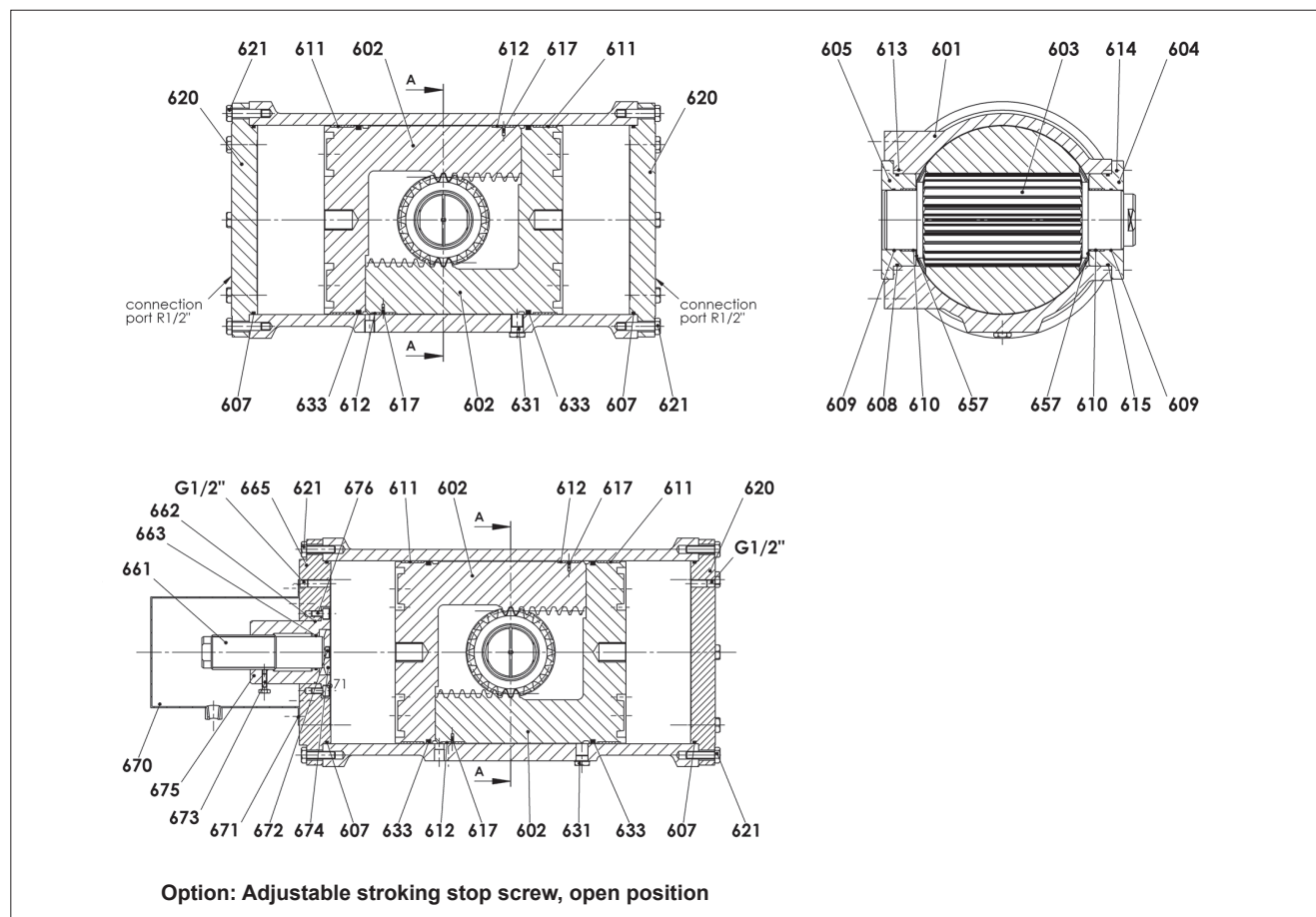
\* HBA = External stroke limit

\*\* HBI = Internal stroke limit

<sup>1)</sup> only at special devices



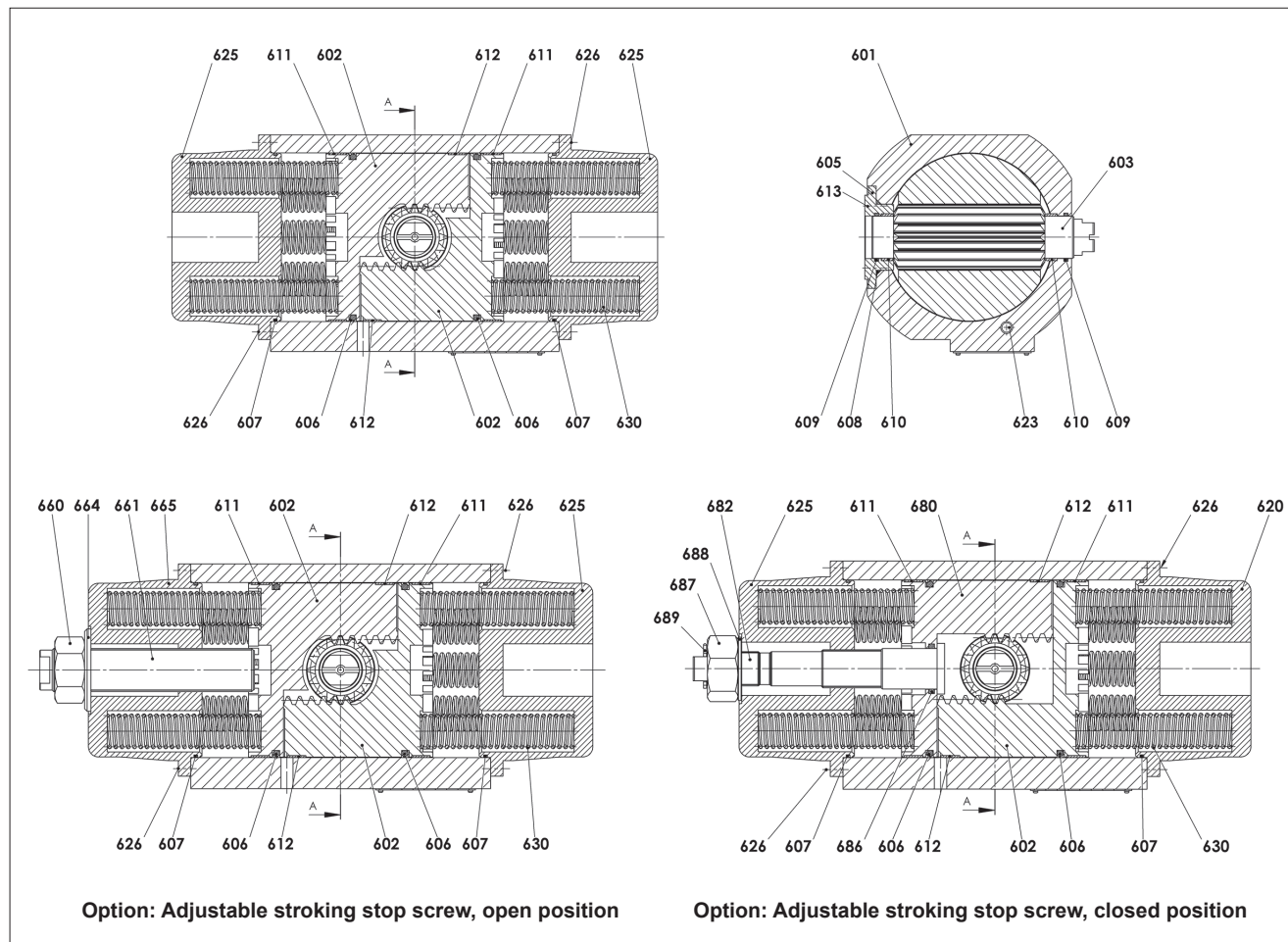
## Double acting actuator Type F1A 1000-5000 series



Pos	Qty.	Description	Material	Spare part set
601	1	Body	0.6025+0,15C	
602	2	Piston	0.6025+0,15C	
603	1	Shaft	1.4021	
604	1	Bearing flange	0.6025	
605	1	Bearing flange	0.6025	
607	2	O-ring	NBR	X
608	1	O-ring	NBR	X
609	2	O-ring	FKM	X
610	2	Bearing bushing	DU	X
611	2	Bearing bushing	DU	X
612	2	Bearing pad	DU	X
613	4	Cylinder head screw	A4-70	
614	4	Cylinder head screw	A4-70	
615	1	O-ring	NBR	X
617	2	Countersunk screw	4.8 coated	
620	2/1*	End cap	1.0037 coated	
621	16	Hexagon head screw	8.8 coated	
631	1	Plug screw	5.8 coated	
633	2	O-ring	NBR	X
657	2	Thrust bearing	DU	X
661*	1	Bolt	1.4057	
662*	1	O-ring	FKM	X*
663*	1	O-ring	FKM	X*
665*	1	End cap	1.0037 coated	
670*	1	Protective cap	1.4301	
671*	4	Hexagon head screw	A2-70	
672*	1	Cylinder head screw	A2-70	
673*	1	Hexagon head screw	A2-70	
674*	1	Stop plate	1.4021	
675*	1	Bearing bushing	2.0966F64	
676*	4	Cylinder head screw	A2-70	

\* Type F1A 1000-HBA

## Single acting actuator Type F1F 15-500 series



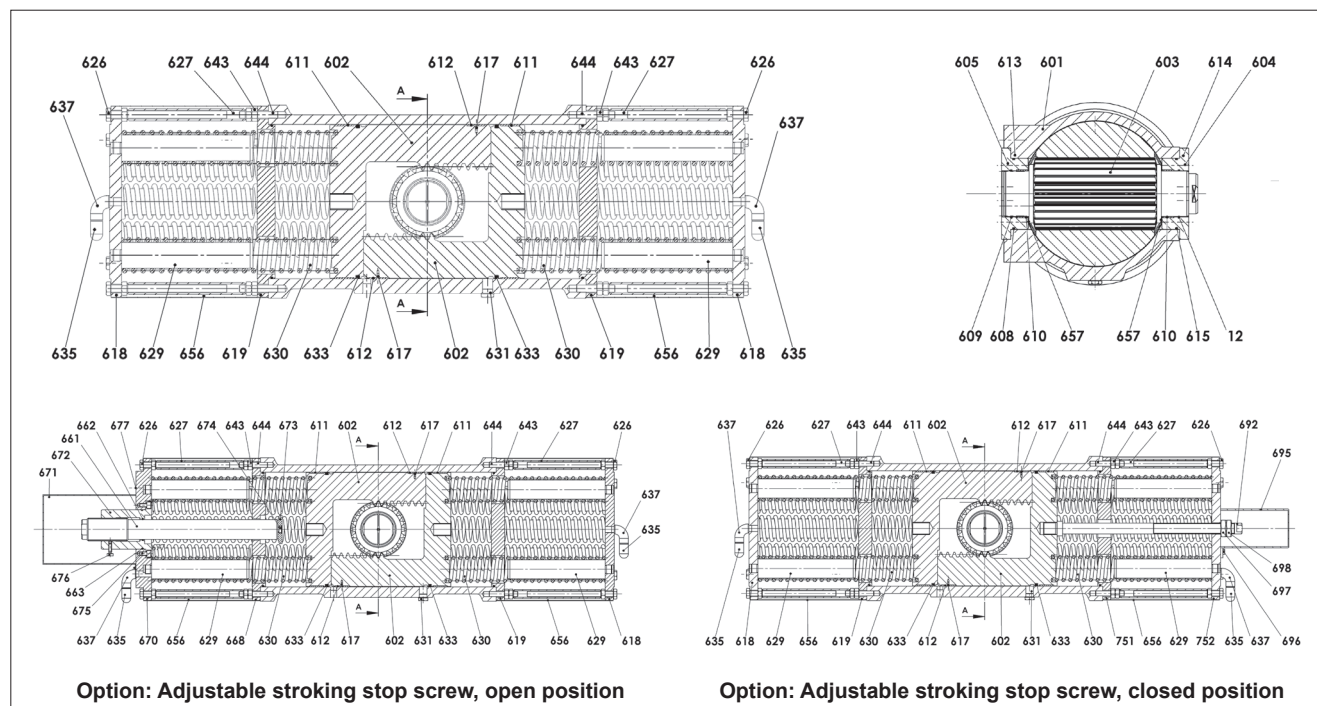
Pos	Qty.	Description	Material for sizes * F500 (Standard temperature)	Spare part set
601	1	Body	Aluminium 3.3206	
602	2	Piston	Aluminium 3.2381.62/3.2371.61*	
603	1	Shaft	1.4021	
605	1	Bearing flange	3.2315-E	
606 <sup>1)</sup>	2	Keilpac / O-ring	PTFE/NBR	X
607	2	O-ring	NBR	X
608	1	O-ring	NBR	X
609	2	O-ring	NBR	X
610	2	Bearing bushing	DU	X
611	2	Bearing bushing	DU	X
612	2	Bearing pad	DU	X
613	4	Cylinder head screw	A4-70	
620**	1	End cap	3.2371.61-E	
625	2/1*/1**	End cap	3.2371.61-E	
626	8	Hexagon head screw	A2-70	
628	2	Sealing	Rubber	
630	10/12*/16**	Helical compression spring	Spring steel	
660*	1	Hexagonal nut	8.8 coated	
661*	1	Stroke limitation shaft	1.0037 coated	
664*	1	Disc	1.4021	
665*	1	End cap	3.2371.61	
680**	1	Piston	3.2371.61	
682**	1	Bolt	1.4021	
686**	1	O-ring	NBR	X**
687**	1	Hexagon nut	8.8 coated	
688**	1	Thrust bearing	1.4021	
689**	1	Eyebolt	steel	

\* HBA = External stroke limit

\*\* HBI = Internal stroke limit

<sup>1)</sup> O-ring for models F1F 1000 up to F1F 5000

# Single acting actuator, Type F1F 1000-5000 series

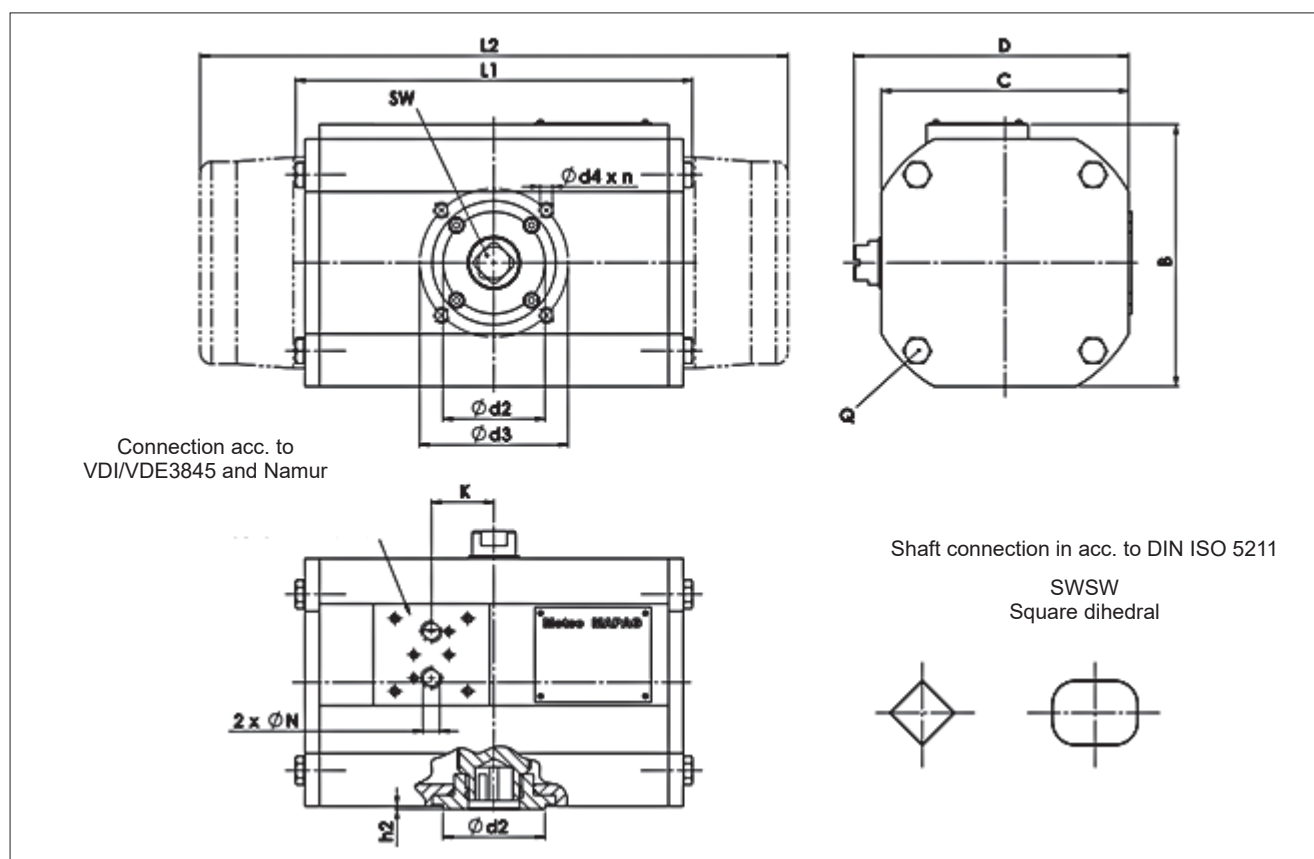


Pos	Qty.	Description	Material	Spare part set
601	1	Body	0.6025+0,15C	
602	2	Piston	0.6025+0,15C	
603	1	Shaft	1.4021	
604	1	Bearing flange	0.6025	
605	1	Bearing flange	0.6025	
608	1	O-ring	NBR	X
609	2	O-ring	FKM	X
610	2	Bearing bushing	DU	X
611	2	Bearing bushing	DU	X
612	2	Bearing pad	DU	X
613	4	Cylinder head screw	A4-70	
614	4	Cylinder head screw	A4-70	
615	1	O-ring	NBR	X
617	2	Countersunk screw	4.8 coated	
618	2/1*/1**	Spring cap	1.0037 coated	
619	2/1*/1**	Spring cap	1.0037 coated	
626	16	Hexagon head screw	8.8 coated	
627	16	Clamping screw	1.0570 coated	
629	10/12*/12**	Spring guiding	3.2315 depending on spring torque	
630	10/12*/12**	Helicalcompression spring	Spring steel	
631	1	Screw plug	5.8 coated	
633	2	O-ring	NBR	X
635	2	Silencer	G1/2"	
637	2	Fitting-elbow	Malleable cast iron	
643	16	Hexagonal nut	8.8 coated	
644	16	Threaded bolt	8.8 coated	
656	2	Protective plate	1.0037 coated	
657	2	Back up ring	DU	X
661*	1	Bolt	1.4057	
662*	1	O-ring	FKM	X*
663*	1	O-ring	FKM	X*
668*	1	Guiding plate	1.0037 coated	
670*	1	Spring plate	1.0037 coated	
671*	1	Protective cap	1.4301	
672*	1	Bearing bushing	2.0966F64	
673*	1	Stop plate	1.4021	
674*	1	Cylinder head screw	A2-70	
675*	4	Cylinder head screw	8.8 coated	
676*	1	Hexagon head screw	A2-70	
677*	4	Hexagon head screw	A2-70	
692**	1	Bolt	1.4057	
695**	1	Protective cap	1.0037 coated	
696**	4	Hexagon head screw	A2-70	
697**	1	Hexagonal nut	A2-70	
698**	1	Hexagonal nut	8	
751**	1	Spring cap	1.0037 coated	
752**	1	Spring plate	1.0037 coated	

\* Type F1F 1000-HBA

\*\* Type F1F 1000-HBI

## 7. DIMENSIONS AND WEIGHTS



Actuator Type	A (double acting)	F (single acting)	F1A, F1F, F10					A	F	A	F
	L1*	L2*	B	C	D	K	N	Q		Weight kg	
15	223	351	100	100	120	36	G 1/8"	M8x20	M8x60	5,5	6,5
30	257	387	135	135	155	42	G 1/4"	M8x25	M8x70	11	14
60	280	405	170	170	190	43	G 1/4"	M10x25	M10x75	16	21
120	370	635	195	210	240	66	G 1/4"	M10x30	M10x110	28	56
250	410	720	260	275	310	77	G 1/4"	M12x35	M12x130	51	85
500	575	1050	290	305	345	110	G 1/4"	M16x40	M16x200	100	160
1000	750	1340	400	385	425	---	G 1/2"	---	---	420	580
2500	870	1450	570	580	630	---	G 1/2"	---	---	1050	1250
5000	930	1600	740	745	795	---	G 1/2"	---	---	1700	1900

\*Dimension figures in mm

Type	F1A, F1F, F10								
	d2	d3	d4x1 l= depth of thread	n	h2	SW square	SW dihedral	Flange connection	Swept volume dm³ / switching
15	35	50	M6x10	4	3	14	14	F05	0,28
30	55	70	M8x12	4	3	17	17	F07	0,60
60	70	102	M10x16	4	3	22	22	F10	1,16
120	85	125	M12x20	4	3	27	27	F12	2,42
250	100	140	M16x25	4	4	36	36	F14	4,80
500	130	165	M20x28	4	5	46	46	F16	9,25
1000	200	254	M16x25	8	5	55	55	F25	18,2
2500	230	298	M20x30	8	5	75	75	F30	46,7
5000	260	356	M30x44	8	5	70...90	70...90	F35	91,0

\*Dimension figures in mm

## 8. TROUBLESHOOTING

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 Appendix Maintenance
	Cylinder damaged by impurities	Note installation position recommendation. Cylinder damage always requires replacement.
	Worn-out actuator bearings	Check condition of bearings in accordance with Appendix Maintenance. 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.
	Play in the joint between actuator and valve	Replace necessary parts.

## 9. SAFETY INSTRUCTIONS

Please pay attention to the following safety instructions when doing maintenance and when operating the high-performance disc valve:

1. Because of safety reasons you are not allowed to carry out modifications to the method of operation of the disc valve or its actuator.
2. Only specialist staff is allowed to carry out installation work on the high-performance disc valve.
3. There is the danger during the functional test that the high-performance disc valve will move uncontrollably suddenly because of the energy supply. Therefore, make sure that the valve can under no circumstances move or even tip during the functional test.
4. Take care during the installation of valves with the safety position "spring open". If the disc extends over the installation length of the valve, the valve has to be closed before installation (pneumatically, hydraulically etc.). Make sure particularly that the energy supply is safely fixed and cannot be damaged or torn in any way during installation.
5. If the energy supply is suddenly interrupted, the valve opens abruptly. This can lead to severe injuries and damage to materials.
6. During possible maintenance work there is considerable risk of injury by the accidental use of the remote control. If you plan a remote control for the work with the high-performance disc valve, make sure that the energy supply of the actuator is switched off.
7. Make sure that the cleaning substance cannot cause any unwanted chemical reactions in connection with possible residues in the high-performance disc valve.
8. If you work in the area of the sealing surface of the disc, secure the disc with wooden wedges to prevent the risk of crushing. Take care that by doing this the sealing surface of the disc is not damaged.
9. If the seals are destroyed by a medium which is too hot, the medium used could leak at the shaft.

## 10. MAINTENANCE

### 10.1 Maintenance interval

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. Make sure you always check the condition of the O-rings when completing servicing operations. You should check and if necessary replace the O-rings (606 - 609), the bearing seats (610 and 611), the bearing segments (612) and - on type F1F - the springs (630) after two years at the latest.

### 10.2 Preliminary

In order to avoid longer shutdowns during the maintenance work, suitable spare parts should be kept ready or procured in time. Take into account delivery times and transportation.

Before you dismount the actuator, the following requirements must be fulfilled:

Make sure that the pipeline is free of pressure and free of process gases and fluids.

Check that the actuator has cooled down or warmed up enough so that there is no risk any more of extreme temperatures.

Protect yourself if necessary with the appropriate protective clothing, eye-protection glasses and a respiratory protection.

The operator's safety instructions have to be followed.

If you do not undertake the dismounting yourself, inform the specialist staff and, if necessary, make protective clothing available for them.

When installing and dismounting the actuator, the valve must be closed in order to rule out damage during installation and dismounting.





## 10.3 Demounting

When dismounting the actuator, please proceed as follows:

Close the butterfly valve.

Mark the position of the actuator to the bracket and to the valve body with a permanent marker before dismounting. (see Figure 8 ) In this way you can find the right position of the valve when re-mounting and so it cannot trigger an error function.

Switch off the energy supply of the actuator

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

Secure the actuator with ropes.

Unscrew the actuator mounting screws of the bracket and pull the actuator carefully off the valve shaft.

Lift and transport the actuator carefully to protect it from damage.



In case of demounting the actuator in combination with the valve beware of the cutting movement of the valve!

## 10.4 Replacement of the O-rings

When you want to replace the O-rings on the pistons and on the actuating shaft, please proceed as follows:

- Remove the actuator as outlined in chapter 10.3.

### For F1 sizes 15 up to 250:

- In the case of type F1A, now remove the bolts (621) on both covers (620) and in the case of type F1F, now remove the bolts (626) on both end covers (620/625), so that the springs are no longer applying any pressure to the pistons. Pay special attention that the end covers (620/625) detach from actuator body when end cap retaining screws (626) are loosened, but not yet removed. The length of the bolts has been calculated to make sure that the springs can be released completely! Replace the O-ring (607).

### For F1 sizes 500 and bigger:

Remove the cover sheets (656). The bigger sizes have more screws and nuts installed and it is very important to ensure that the screw 644 and clamping screw 627 will remain in lower position (at 644, 643 and 627 side) when the screw (626) will be removed. This must be done step by step and symmetrically at all screws (626) to release the spring package by detaching the cover plate (618).

- Now turn the actuating shaft manually using an open-ended wrench. Push the two pistons outwards in this way until they are no longer engaged by the toothed actuating shaft.
- Remove both of the pistons and replace the O-rings (606), the bearing seats (611) and the bearing segments (612).
- When the bolts (613) on the bearing flange (605) have been undone, force the actuating shaft out of the body in order to replace the O-rings (608) and (609) as well as the bearing seat (610) on the actuating shaft.

## 10.5 Reassembly

Proceed as follows when you are installing the actuating shaft and the pistons again:

Make sure you only use our special tool for installation purposes. If you do not, it is possible that the Keilpac may be damaged while it is still being fitted, so that it does not do its job properly.

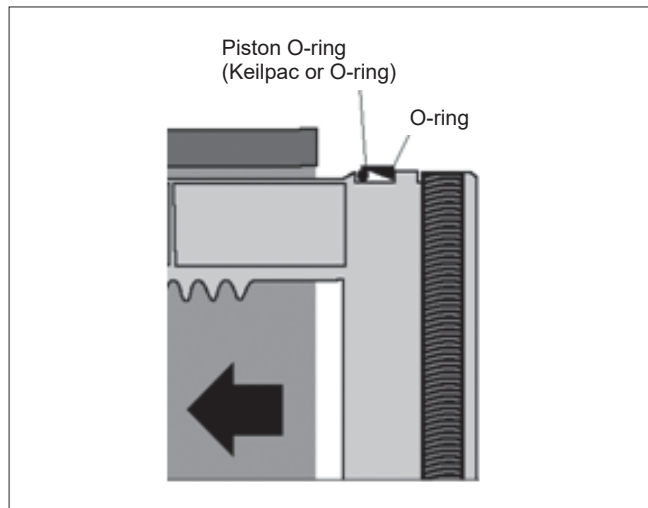


Fig. 11 Pushing the piston into position

### Reassembly order

- Equip the piston with new bearings and O-ring (see Figure 11). Pushing the piston into position (see Figure 11). Put the special clamp around the bearing O-ring and tighten it until you reach the stop. The turning element on the clamp must point towards the teeth of the piston while you are doing this. The turning element fits exactly in the phase of the actuator body. Place the piston with the clamp on the assembled actuator body (see Figure 13) and then knock the piston out of the clamp (see Figure 14) and into the body (see Figure 15). Turn the actuator body round and follow the same procedure with the second piston.
- To align the piston, put the actuator in a horizontal position and turn the selector shaft slowly with the help of an open-ended spanner so that the pistons move apart and the selector shaft can be turned without having any further effects. While you are doing this, make sure that the pistons do not fall out again.
- Now push both pistons inwards at the same time. The distances "a" (see Figure 12) must be identical.
- Move the pistons inwards again manually with the help of the open-ended wrench applied to the actuating shaft.
- Now put the two end covers (type F1A) or the two spring covers and springs (type F1F) back on again.
- Do not put the actuator into operation until you have tightened all the attachment bolts (14/14a) securely. Before you start operating the actuator again, you should also make sure to check that it is working properly.
- Now switch the energy supply back on again.



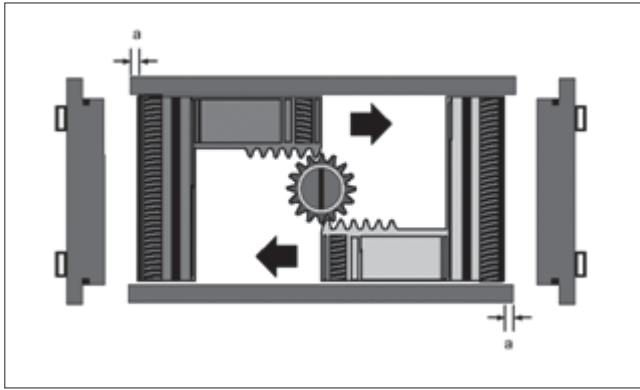


Fig. 12



Fig. 13

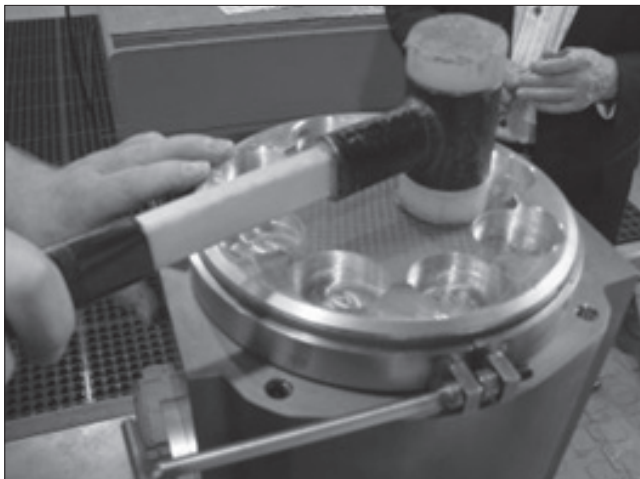


Fig. 14



Fig. 15

## 10.6 Maintenance instructions

The mainsprings of single-acting actuators type F1F have to be replaced after a maximum of one million switching cycles or every two years, whatever may occur first.

When used in a corrosion-encouraging atmosphere or at the beginning of corrosion, respectively, the springs have to be replaced at an earlier stage.

### Replacements:

Actuator	Spring-N°	Qty
F1F15	410502	8-16
F1F30	410503	8-16
F1F60	410504	8-16
F1F120	410505	8-16
F1F250	410087	8-16
F1F500	410099	8-16
F1F1000	410508	8-16
F1F2500	410508	16-40
F1F5000	410509	18-36

## 10.7 Spare parts

Most of the spare parts depend on the technical specification of your system.

Every time you place an order for spare parts, please indicate to us therefore not only the spare part number listed below but also the order number allocated by the Valmet plant under which the actuator was planned and supplied to you.

Our guarantee commitments only apply if genuine spare parts are used.

# 11. TYPE CODE

Neles™ actuator, series F1A, F1F and F1O

Standard selection:

Rack and pinion actuator.

Example for a standard single acting actuator F1F, size 120, outside stroke limitation, square profile connection, 10 springs, double action spring support to close operation.

1.	2.	3.	4.	5.	6.	7.	8.
F1F	0120	A	A	4	S	10	S

1. sign	PRODUCT SERIES / DESIGN
F1A	Standard rack and pinion, double acting
F1F	Standard rack and pinion, single acting spring return / double action spring support
F1O	Standard rack and pinion, double acting for BO-series high cycling valve (note: only sizes 0060, 0120, 0250, 0500)

2. sign	SIZE OF ACTUATOR
	0015, 0030, 0060, 0120, 0250, 0500; 1000; 2500; 5000
	Size = output torque of actuator in [Nm] per bar instrument air.

3. sign	CONSTRUCTIONS
O	ordinary (O-ring)
K	(K) – Keilpac for sizes 0030 ... 0500
R	(RACY) with Keilpac; standard for LINDE PSA only (sizes: 0060; 0120; 0250)
OPTIONS	
G	(NG) – standard + Emergency lock off gear with hand operation (not for BDO type)
A	(HBA) standard + Outside stroke limitation
I	(HBI) standard + Inside stroke limitation
AI	(HBAI) standard + Out- and inside stroke limitation
H	(NH) Emergency hydraulic pump operating
HA	(NH-HBA) Emergency hydraulic pump operating + Outside stroke limitation
GI	(NG-HBI) Emergency lock off gear with hand operation + Inside stroke limitation
GA	(NG-HBA) Emergency lock off gear with hand operation + Outside stroke limitation
Y	Special design

4. sign	CYLINDER AND HOUSING MATERIALS
A	Aluminum cylinder and aluminum housing hard coated (sizes <= 0500)
S	GG25 cylinder and GG25 housing (sizes >= 1000)
Y	Special design

Bearing: DU, drive shaft: 13% Cr steel

5. sign	DRIVE SHAFT CONNECTION
4	Square profile (all Neles valves, incl. BO with actuator size 0060, excl. BAX)
6	Polygon profile (for BAX valve type only) P4C18x15 for size 0030
7	Polygon profile (for BAX valve type only) P4C25x21 for size 0030 or 0060
8	Polygon profile (for BAX valve type only) P4C32x27 for size 0060 or 0120
9	Polygon profile (for BAX valve type only) P4C35x30 for size 0250
0	Round shaft end with key (size: 0120, 0250, 0500 for BO valve type only)
Y	Special design

6. sign	SEALING RINGS / DRIVE SHAFT MATERIAL - TEMPERATURE RANGE
S	Standard temperature range (-20°C ... +80°C)
M	Cold temperature -40°C
Y	Special, to be specified

7. sign	NUMBER OF SPRINGS (only for type F1F)	for actuator size
	02 – 04 – 06 – 08 – 10 – 12 – 14 – 16	15 / 30 / 60 / 120 / 250 / 500 / 1000
	02 - 04 - 06 - 08 - 10 - 12 - 14 - 16 - 18 - 20 - 22 - 24 - 26 - 28 - 30 - 32 - 34 - 36 - 38 - 40	2500
	09 - 18 - 27 - 36	5000

8. sign	SPRING OPERATING MODE (only for type F1F)	
for F1F size 15, 30, 60, 120, 250, 500		
C	Fail to close	(CW - clock wise operation)
O	Fail to open	(CCW - counter clock wise operation)
S	Double action spring support to close	(CW - clock wise operation)
for F1F size 1000, 2500, 5000		
CB	Fail to close spring mounting BOTH sides for sizes	(CW - clock wise operation)  1000 and number of springs >= 08 2500 and number of springs >= 20 5000 and number of springs >= 18
OB	Fail to open spring mounting BOTH sides for sizes	(CCW - counter clock wise operation)  1000 and number of springs >= 08 2500 and number of springs >= 20 5000 and number of springs >= 18
CR	Fail to close spring mounting RIGHT side for sizes	(CW - clock wise operation)  1000 and number of springs < 08 2500 and number of springs < 20 5000 and number of springs < 18
OR	Fail to open spring mounting RIGHT side for sizes	(CCW - counter clock wise operation)  1000 and number of springs < 08 2500 and number of springs < 20 5000 and number of springs < 18
CL	Fail to close spring mounting LEFT side for sizes	(CW - clock wise operation)  1000 and number of springs < 08 2500 and number of springs < 20 5000 and number of springs < 18
OL	Fail to open spring mounting LEFT side for sizes	(CCW - counter clock wise operation)  1000 and number of springs < 08 2500 and number of springs < 20 5000 and number of springs < 18
Y	Special, to be specified	

## 12. GENERAL DISCLAIMER

### 12.1 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. 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.

### 12.2 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.
7. Beware of Disc & Ball movement even when the valve is disassembled. Discs and balls may move simply due to the weight of the part or change in position of the valve. Keep hands or other body parts away from locations where they may be injured by movement of the ball or disc. Do not leave objects near or in the valve port which may fall in and need to be retrieved.

### 12.3 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. Do not exceed the maximum storage temperatures given in the IMO (installation, maintenance, and operating instructions).
5. Keep the original packaging on the valve as long as possible to avoid environmental contamination by dust, water, dirt, etc.
6. Remove the valve endcaps just before mounting into the pipeline.
7. 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.
  - The butterfly valve's offset shaft creates greater disc area on one side of the shaft. This will cause the valve to open when pressurized from the preferred direction without a locking handle or an actuator installed.
  - **WARNING:** DO NOT PRESSURIZE THE BUTTERFLY VALVE WITHOUT A HANDLE OR AN ACTUATOR MOUNTED ON IT!
  - **WARNING:** DO NOT REMOVE A HANDLE OR AN ACTUATOR FROM A BUTTERFLY VALVE UNDERPRESSURE!
  - Before you install the butterfly valve in or remove it from the pipeline, cycle the valve closed. Butterfly valves must be in the closed position to bring the disc within the face to face of the valve. Failure to follow these instructions will cause damage to the valve and may result in personal injury.

### 12.4 Operating

8. The type plate (nameplate, or engraved markings) on the valve gives the information of max. process co





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