

**DIRECTIONS FOR ACTUATOR INSTALLATION**

**Valid for both, aluminium "AP Series" and AISI 316 (A4) Stainless Steel "AP-A Series", actuators.**

Duration and safety use of actuators and plants, for all operators within their range of action, also depends on the attention paid to the following directions.

- Installation, placing in service, use and maintenance of the actuators must be performed by skilled, experienced and informed personnel. We recommend observing the safety law requirements for accident's prevention, and to adopt appropriate safety devices: risk of serious personal injury!
- CAUTION: actuators must be used within working limits indicated in the technical data. Especially, do not exceed maximum allowed operating pressure and temperature: risk of serious personal injury!
- Move carefully, without crashes.
- Stock in warehouse between 0° C and + 40° C., even for long periods.
- Keep actuators in their original packaging, with the relevant contents slips.
- Construction materials, surface treatments and paintings are physically steady and chemically inactive only under the conditions which are indicated on the identification nameplate. Do not use actuators with inadequate protection in corrosive environments: damages may occur to external and internal components and to pneumatic seals: risk of serious personal injury!
- During operations, possible arising of oily fogs inside the device: filtrate exhaust feeding air or recycle through specific electro-valves.
- Actuator's lubrication is made by the manufacturer. Its operation warranty, identified as number of movements before main metallic part's substitution, is guaranteed for 1.000.000 manoeuvres (opening and closing). It is referred to standard models only.
- Antifriction plastic parts and rubber seals operation is guaranteed for 300.000 manoeuvres (opening and closing) before it has to be checked: they must be substituted in case of wear. If it is necessary, please substitute the complete spare-parts set.
- Springs operation is guaranteed for 100.000 manoeuvres (opening and closing) before it has to be checked: they must be substituted in case of corrosion marks, wear or side yield. If it is necessary, please substitute the complete spring-cartridges, do not disassembly it under any reason. CAUTION: do not remove covers if the actuator is not in rest position (see shaft top position): risk of serious personal injury!
- On model AP 032, all 120° and 180° models, in presence of air feeding and without valve, shaft ejection may occur, owing to the absence of anti-ejection key (part n. 05). For these models, anti-ejection is only obtained through seeger ring (part. n. 10).
- To move and install models starting to AP 160 and over (total weight over Kg 25), use lifting devices and the special eyebolts provided.
- Installation of the actuator is forbidden before the plant is declared in accordance to CE norms or to eventual technical norms that must regulate the plant's working.

In case of need, about correct operation, call please our Technical Office.

**ALUMINIUM "AP" SERIES ACTUATORS**  
**NOTICE AND NOTES FOR ACTUATORS USE IN EXPLOSIVE ENVIRONMENTS**  
**"ATEX" 2014/34/UE DIRECTIVE**

"AP" Series Rack & Pinion Actuators in aluminium alloy are carefully engineered and manufactured according to the relevant technical norms and safety european directives.

They can be used in "ATEX" 2014/34/UE Directive dangerous zones, according to the following manufacturer classification.

**Device Group II (surface) - Category 2 - G (gas) and D (dust) use**

- |                        |                          |  |
|------------------------|--------------------------|--|
| • Very Low Temperature | -60 +80 °C (-76 +176 °F) | <b>Ex II 2GD c Tmax=95 °C (203 °F)</b>   |
| • Low Temperature      | -40 +80 °C (-40 +176 °F) | <b>Ex II 2GD c Tmax=95 °C (203 °F)</b>   |
| • Standard             | -20 +80 °C (-4 +176 °F)  | <b>Ex II 2GD c Tmax=95 °C (203 °F)</b>   |
| • High Temperature     | -20 +150 °C (-4 +302 °F) | <b>Ex II 2GD c Tmax= 165 °C (329 °F)</b> |

**Due to the relevant safe condiction needs,  
for applications in that particular environment,  
carefully read please the above notices.**

- Before installation, please read our "Instruction manual for use and maintenance" carefully.
- Follow the use expected for actuators.
- Follow the indications of maximum temperature-environment of use, punched on identification nameplate.
- Don't let the actuator be fed by flammable, explosive or burning fluids (oxygen, acetylene etc...).
- Avoid the penetration of explosive atmospheres inside actuators.
- Do not hit the external parts of actuators (both aluminium and steel parts) through metallic objects (it may cause sparkles).
- Do not manually force actuators over the maximum output torque.
- Avoid accumulation of combustibile dusts on actuator surfaces.
- Avoid accumulation of electrostatic charges on insulating surfaces of APR, by providing suitable "grounding", using for example the valve fixing screws.
- All components and accessories installed on APR for drive and control purposes, must be suitable for those uses in accordance to the danger classification of the area.
- Maintenance operations on actuators must be made according to the norms in force, (for example EN 50281, EN 60079 etc...) and to the danger classification of the area.
- Do not make maintenance operations in places with explosive atmosphere.
- Verify springs functioning every 100.000 (one hundred thousand) cycles: substitute complete spring cartridges when necessary, but do not try to disassembly them.
- Verify all rubber sealing elements (a-ring s and plane gaskets) and all plastic anti-friction pads every 300.000 (three hundred thousand) cycles: substitute the complete spare-parts set when necessary.
- Use and operation not in accordance to a.m. notes, may cause danger or damage to people and things, and let every legal responsibility lose from Manufacturer side.

In case of need, about correct operation, call please our Technical Office.

**AISI 316 (A4) STAINLESS STEEL "AP-A" SERIES ACTUATORS  
NOTICE AND NOTES FOR ACTUATORS USE IN EXPLOSIVE ENVIRONMENTS  
"ATEX" 2014/34/UE DIRECTIVE**

"AP-A" Series Rack & Pinion Actuators in AISI 316 (A4) Stainless Steel are carefully engineered and manufactured according to the relevant technical norms and safety european directives.

They can be used in "ATEX" 2014/34/UE Directive dangerous zones, according to the following manufacturer classification.

**Device Group I (mines) - Category M2 - G (gas) and D (dust) use  
and  
Device Group II (surface) - Category 2 - G (gas) and D (dust) use**

• Very Low Temperature	-60 +80°C (-76 +176°F)	<b>Ex I M2 - II 2GD c Tmax=95°C (203°F)</b>
• Low Temperature	-40 +80°C (-40 +176°F)	<b>Ex I M2 - II 2GD c Tmax=95°C (203°F)</b>
• Standard	-20 +80°C (-4 +176°F)	<b>Ex I M2 - II 2GD c Tmax=95°C (203°F)</b>
• High Temperature	-20 +150°C (-4 +302°F)	<b>Ex I M2 - II 2GD C Tmax= 165°C (329°F)</b>

**Due to the relevant safe condiction needs,  
for applications in that particular environment,  
carefully read please the above notices.**

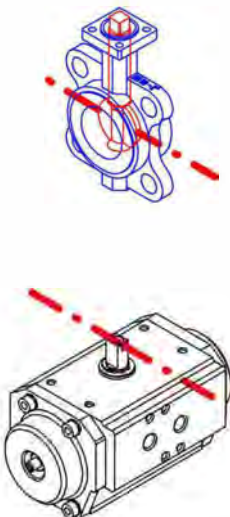

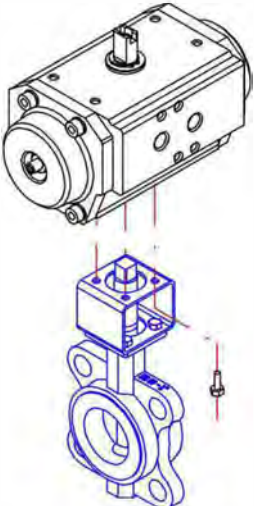
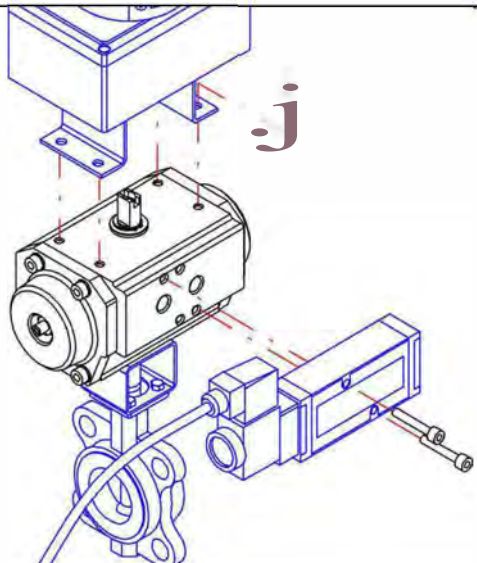
- Before installation, please read our "Instruction manual for use and maintenance" carefully.
- Follow the use expected for actuators.
- Follow the indications of maximum temperature-environment of use, punched on identification nameplate.
- Don't let the actuator be fed by flammable, explosive or burning fluids (oxygen, acetylene etc...).
- Avoid the penetration of explosive atmospheres inside actuators.
- Do not hit the external parts of actuators (both aluminium and steel parts) through metallic objects (it may cause sparkles).
- Do not manually force actuators over the maximum output torque.
- Avoid accumulation of combustibile dusts on actuator surfaces.
- Avoid accumulation of electrostatic charges on insulating surfaces of APR, by providing suitable "grounding", using for example the valve fixing screws.
- All components and accessories installed on APR for drive and control purposes, must be suitable for those uses in accordance to the danger classification of the area.
- Maintenance operations on actuators must be made according to the norms in force, (for example EN 50281, EN 60079 etc...) and to the danger classification of the area.
- Do not make maintenance operations in places with explosive atmosphere.
- Verify springs functioning every 100.000 (one hundred thousand) cycles: substitute complete spring cartridges when necessary, but do not try to disassembly them.
- Verify all rubber sealing elements (a-ring s and plane gaskets) and all plastic anti-friction pads every 300.000 (three hundred thousand) cycles: substitute the complete spare-parts set when necessary.
- Use and operation not in accordance to a.m. notes, may cause danger or damage to people and things, and let every legal responsibility lose from Manufacturer side.

In case of need, about correct operation, call please our Technical Office.

## INSTALLATION OPERATION

**Valid for both, aluminium "AP Series" and AISI 316 (A4) Stainless Steel "AP-A Series", actuators.**

For a safe install operation, follow please the above procedure.

 <p>1</p>	 <p>2</p>
<p>Make sure that both valve and actuator are closed.</p> <ul style="list-style-type: none"> <li>• Standard SR models normally closed.</li> <li>• Standard DA models, feed by port "B-4" in order to reach the correct positioning.</li> </ul>	<p>Assembly through screws, bracket and adapter.</p> <p>N.B. Not for valve/actuator direct assembly.</p>
 <p>3</p>	 <p>4</p>
<p>Insert actuator on top of adapter and assembly it through screws.</p>	<p>Connect accessories, making sure of the real position of the valve.</p> <p>Connect pneumatic/electrical feeding and verify correct operation.</p>

**Disassembly is made following all described operations, backwards.**

Pay attention to safety rules.

In case of difficulty, do not force the elements, but verify clearances, axis position, supplied feeding and correct torque dimensioning of valve and actuator.

In case of need, about correct operation, call please our Technical Office.

**ALUMINIUM "AP" = 90° ACTUATORS**  
**ALUMINIUM "AP-Y" = 120° ACTUATORS**  
**ALUMINIUM "AP-X" = 180° ACTUATORS**

**AISI 316 STAINLESS STEEL "AP-A" = 90° ACTUATORS**  
**AISI 316 STAINLESS STEEL "AP-A-Y" = 120° ACTUATORS**  
**AISI 316 STAINLESS STEEL "AP-A-X" = 180° ACTUATORS**

### **SPARE-PART SETS AND SPRINGS**

Please note that, depending on working conditions of the actuator, it may be necessary to make a "spare-part set" periodic substitution.

Antifriction plastic parts and rubber seals operation is guaranteed for 300.000 manoeuvres (opening and closing) before it has to be checked: they must be substituted in case of wear. If it is necessary, please substitute the complete spare-parts set.

Springs operation is guaranteed for 100.000 manoeuvres (opening and closing) before it has to be checked: they must be substituted in case of corrosion marks, wear or side yield. If it is necessary, please substitute the complete spring-cartridges, do not disassembly it under any reason. CAUTION: do not remove covers if the actuator is not in rest position (see shaft top position): risk of serious personal injury!

It may be also necessary to substitute a "spare-part set" for use at a different working temperature. In this case, please verify that both "spare-part set" and lubricant are suitable for the new environmental conditions (see "Actuator working temperatures" datasheet).

List of the spare-parts and assembly scheme: please refer to B Section (Aluminium AP Series) and H Section (AISI 316 Stainless Steel AP-A Series).



## ROTATION ADJUSTMENT

**Valid for both, aluminium "AP Series" and AISI 316 (A4) Stainless Steel "AP-A Series", actuators.**

Rotation adjustment of 90°-120°-180° actuators, is made by high precision electronic device, and normally not require further adjustment operation.

In event of need, by mean cover and piston travel-stop screw, you can adjust  $\pm 5^\circ$  the actuator rotation in both opening and closing directions.

The below figures shows the rotation adjustment operations, as also described in every actuator handbook.

### ADJUSTMENT IN CLOSING - 0°

**Warning!**  
Installation, adjustment and maintenance must be effected under safety conditions. Do not connect pneumatic/electrical feeding until all operations are terminated.

1 Take off covers loosening screws as per indicated numeration; pull out springs, if any, from pistons seats, Fig. 11.

0° Adjusting  
Einstellung 0°  
Reglage 0°  
Ajuste 0°  
Regolazione 0°

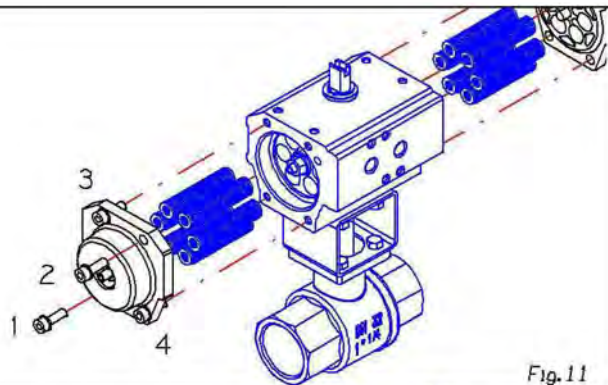


Fig. 11

2 Unscrew counter-bolt and dowel for regulation of the piston's travel from both sides of actuator, Fig. 12

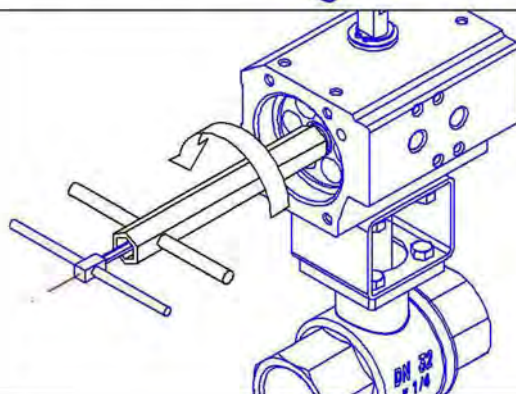


Fig. 12

3 Keep the stem slightly in tension, (by fix key for ball valves and by special dynamometrical key for butterfly valves) and regulate rotation of the actuator in closing (0°) on one side, adjusting piston's travel through the regulation dowel, Fig. 13.

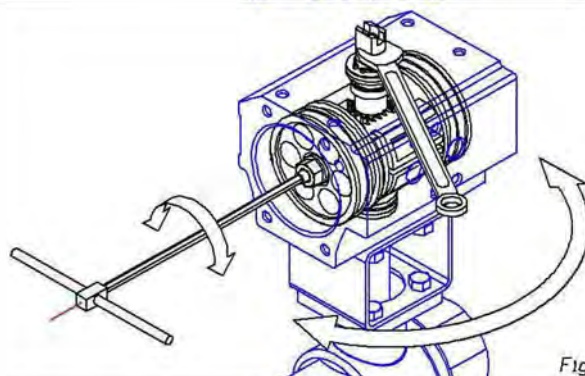


Fig. 13

4 When reaching the wanted point of enclosure, keep the regulation dowel in position and tighten the counter-bolt. Repeat this operation on the other side of the actuator, Fig. 14.

- Re-assembly springs, if any, and covers tightening screws a little at a time following the numeration, Fig. 11.

- Connect pneumatic/electrical feeding and verify correct operation.

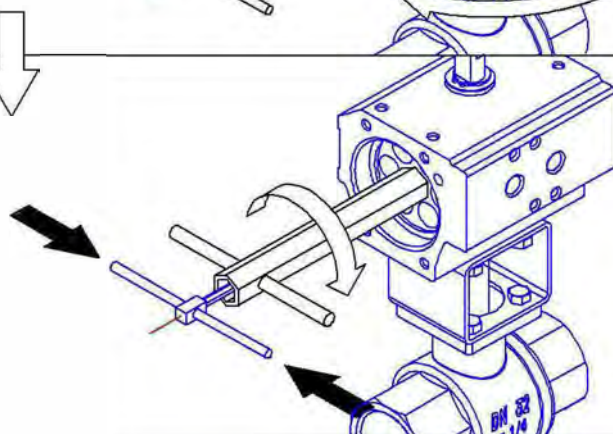


Fig. 14

## ROTATION ADJUSTMENT

Valid for both, aluminium "AP Series" and AISI 316 (A4) Stainless Steel "AP-A Series", actuators.

### ADJUSTMENT IN OPENING - 90°

**Warning!**  
Installation, adjustment and maintenance must be effected under safety conditions. Do not connect pneumatic/electrical feeding until all operations are terminated.

1 Unscrew counter-bolt and regulation dowel on both covers, Fig. 15.

2 Connect air feeding into port "A-2" to have actuator's opening, Fig. 16.

3 Regulate the rotation of the actuator in opening (90°) on one side, by adjusting piston's travel through its regulation dowel, Fig. 17.

4 When reaching the wanted point of opening, keep regulation dowel in position and tighten counter-bolt.  
Repeat this operation on the other side of the actuator, Fig. 18.

- Connect pneumatic/electrical feeding and verify correct operation.

90° Adjusting  
Einstellung 90°  
Reglage 90°  
Ajuste 90°  
Regolazione 90°

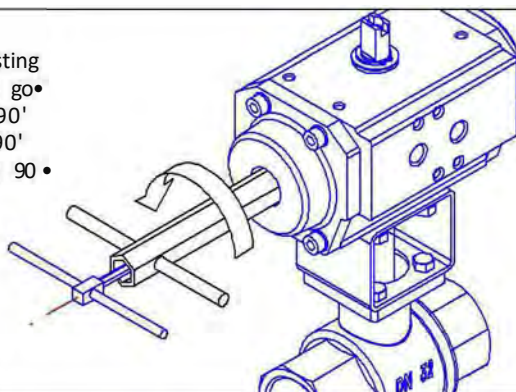


Fig.15

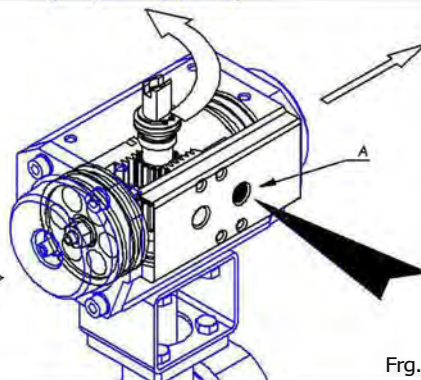


Fig.18

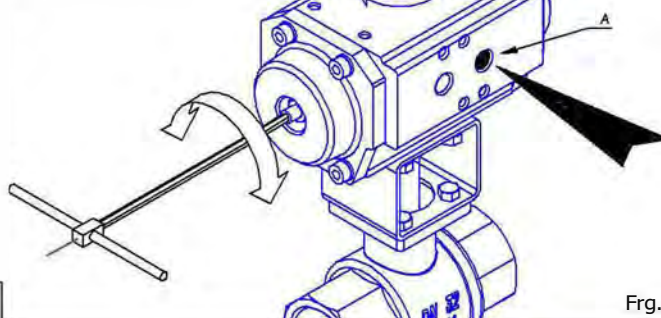


Fig.17

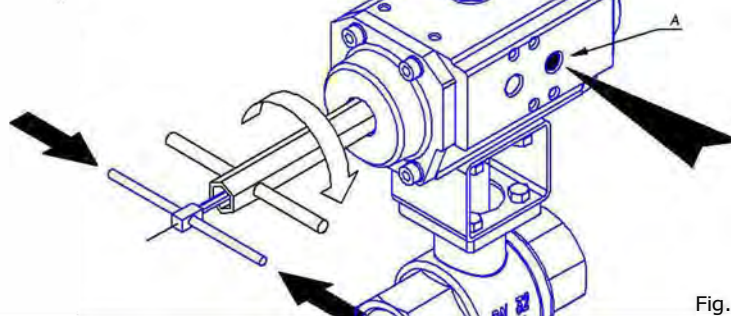


Fig.18



**MAINTENANCE, SPARE-PART SET AND SPRINGS SUBSTITUTION**

**Valid for both, aluminium "AP Series" and AISI 316 (A4) Stainless Steel "AP-A Series", actuators.**

In event of "spare-part set" and/or spring substitution, follow please the above procedure also listed on actuator handbook (held inside every actuator box).

**MAINTENANCE, SPARE PARTS SET AND SPRING SUBSTITUTION**

Actuator must be absolutely taken off from the plant where it is installed, disconnected from pneumatic and electrical feeding, and from possible accessories, see Fig.19.

**Warning!**

Installation, adjustment and maintenance must be effected under safety conditions. Do not connect pneumatic/electrical feeding until all operations are terminated. For all numbered parts, only complete spare-part sets are available.

TAKE OFF!  
ZERLEGEN!  
DEMONTERJ  
DESMONTARJ  
DISINSTALLARE!

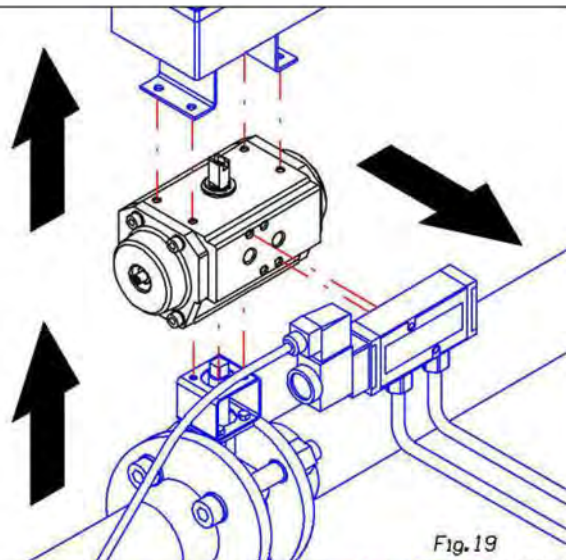


Fig. 19

DISASSEMBLY  
ENTFERNEN  
DEMONTER  
DESMONTAR  
SMONTARE

1 Take off covers loosening screws as per indicated numeration; pull out springs, if any, from pistons seats, Fig.20.

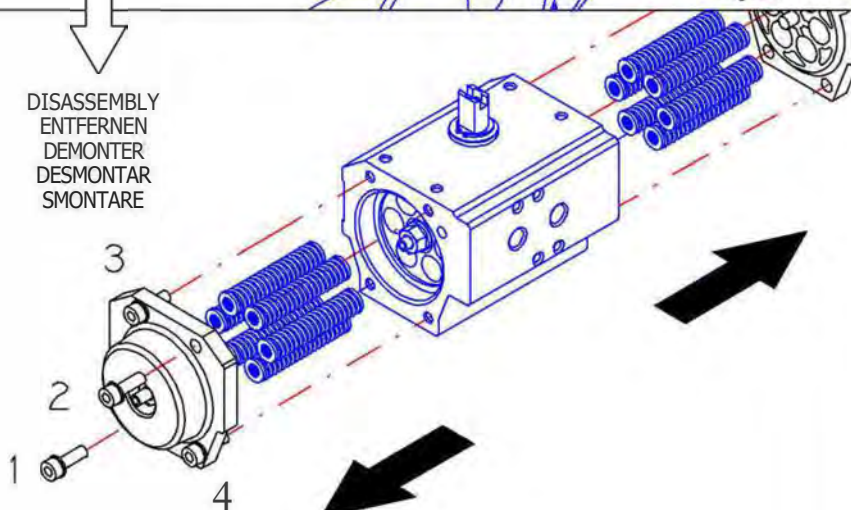


Fig. 20

TAKE OUT  
AUSZIEHEN  
EXTRAIRE  
EXTRAER  
ESTRARRE

2 Rotate stem in order to release pistons from shaft's rack. Take off pistons through a pair of pincers, Fig.21.

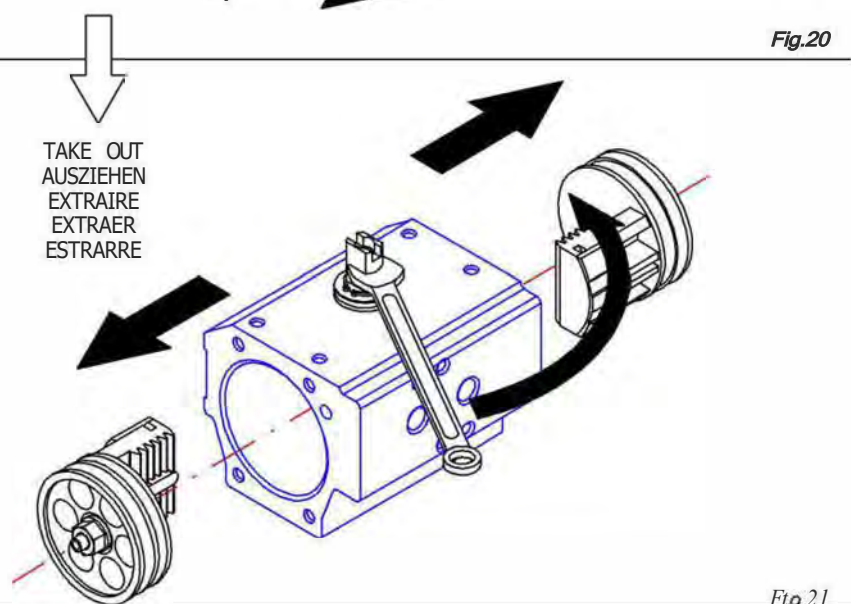


Fig. 21



3 Release seeger ring (part 10) from stem and take away: pinion thrust washer (part 23) and anti-friction washer (part. 24), Fig.22.

4 Extract shaft from actuator's body and take off: upper pilot ring for shaft (part 26), O-rings (part 06-07), lower pilot ring for shaft (part 25), Fig.23.

5 From both pistons take off: piston bearing (part 27), anti-ejection key (part 05), O-rings (part 12-19), piston head bearing (part 13), Fig.24.

\* Take note of the regulation dowel projection before disassembly.

RELEASE  
ABNEHEMEN  
DE CLAMPER  
EXTRAER  
SGANCIARE

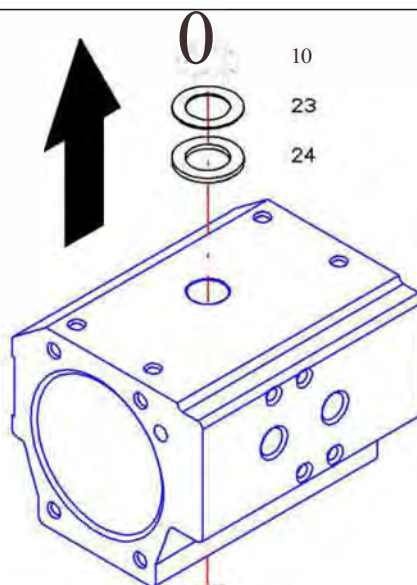


Fig.22

TAKE OUT  
ABNEHEMEN  
ENLEVER  
EXTRAER  
ESTRARRE

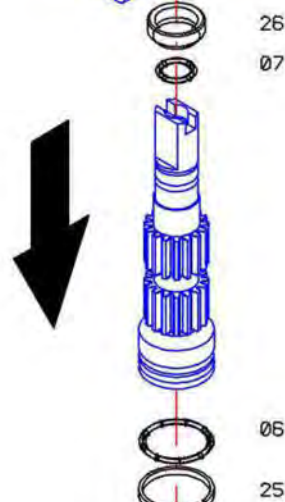


Fig.23

TAKE OUT  
ABNEHEMEN  
ENLEVER  
EXTRAER  
ESTRARRE

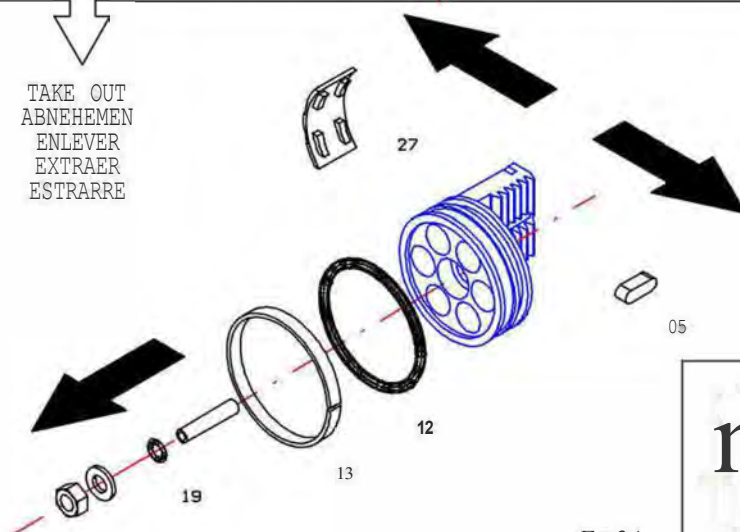


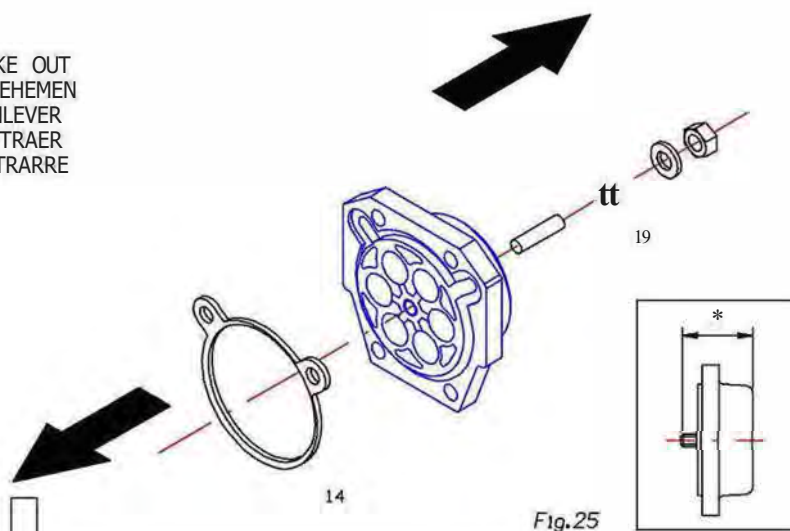
Fig.24

nu

6 From both covers take off:  
cover gasket (part 14), O-ring (part 19),  
Fig. 25

\* Take note of regulation dowel  
projection before disassembly.

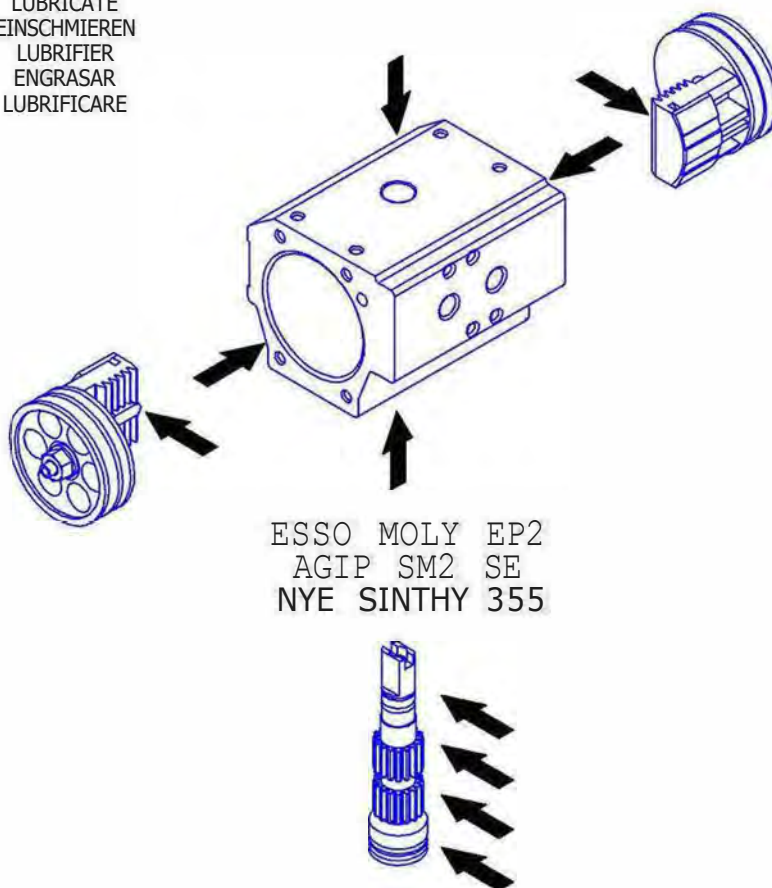
TAKE OUT  
ABNEHEMEN  
ENLEVER  
EXTRAER  
ESTRARRE



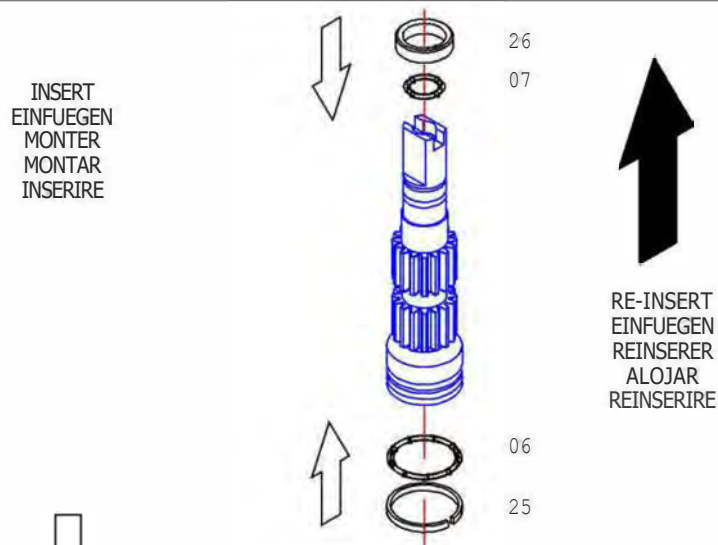
LUBRICATE  
EINSCHMIEREN  
LUBRIFIER  
ENGRASAR  
LUBRIFICARE

# **WARNING!**

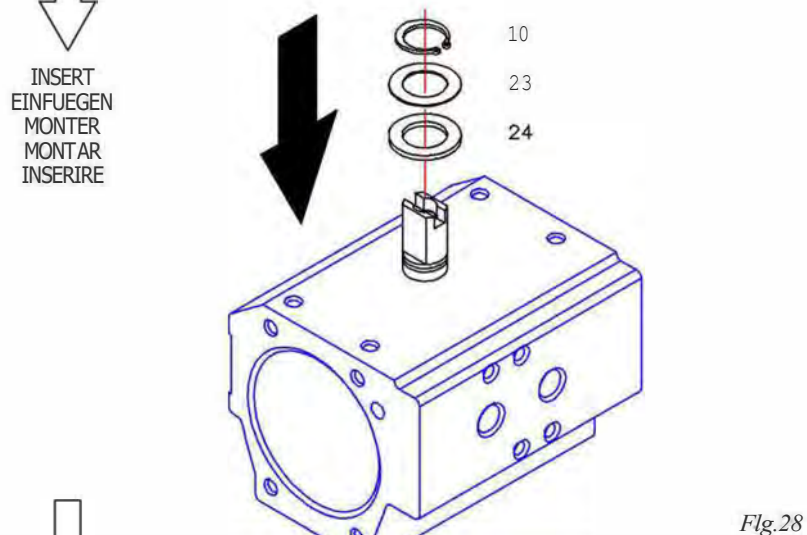
After disassembly all  
particulars to be substituted, and  
before proceeding with their  
replacement, carefully clean all  
components. Lubricating by  
molybdenum bisulphide grease  
ESSO MOLY EP-2, AGIP SM2 SE or  
by High Performances Syntetic  
Grease NYE SINTHY 355 or similar,  
fig. 26.



7 Assembly new spare-parts on shaft:  
upper pilot ring for shaft (part 26),  
O-rings (part 06-07), lower pilot ring for  
shaft (part 25), and replace shaft into  
actuator's body, Fig. 27.

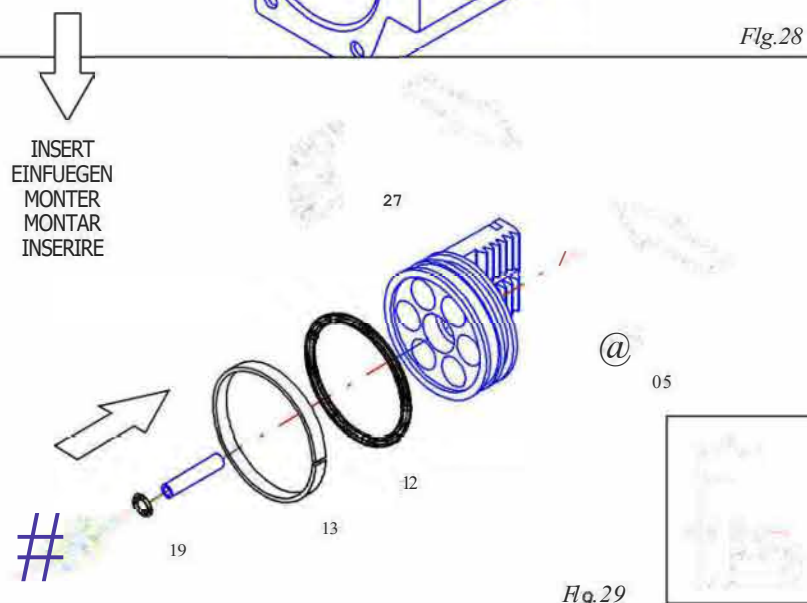


8 Slip new spare-parts on stem:  
pinion thrust washer (part 23),  
anti-friction washer (part 24), then  
replace seeger-ring (part 10) in its  
special seat, Fig. 28.



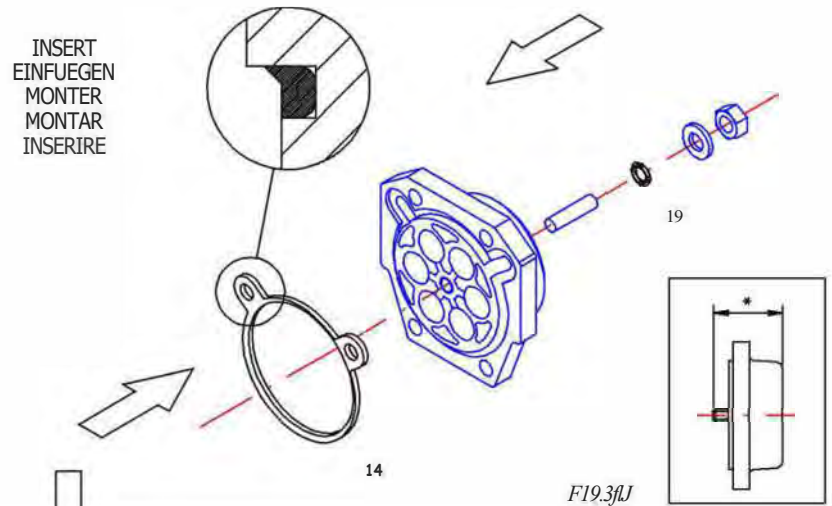
9 Assembly new spare-parts on  
pistons:  
piston bearing (part 27), anti-ejection  
key (part 05), a-rings (part 12-19),  
piston head bearing (part 13), Fig. 29.

\* P.N. Previous dowel projection.



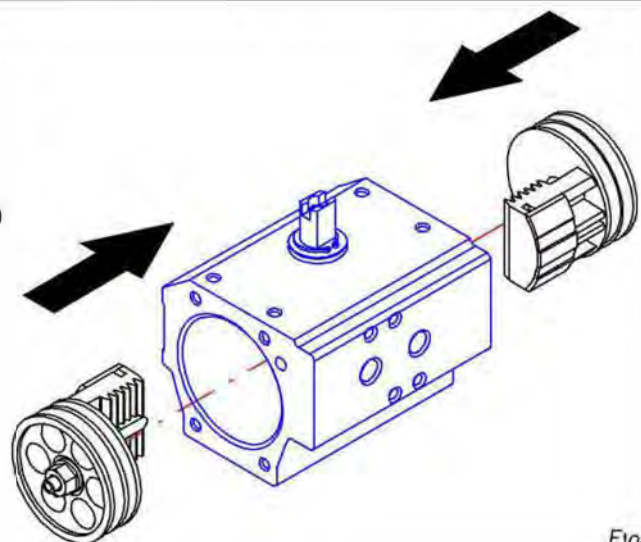
10 Assembly new spare-parts on covers:  
cover gasket (part 14), O-ring (part 19), Fig. 30.

\* P.N. Previous dowel projection.



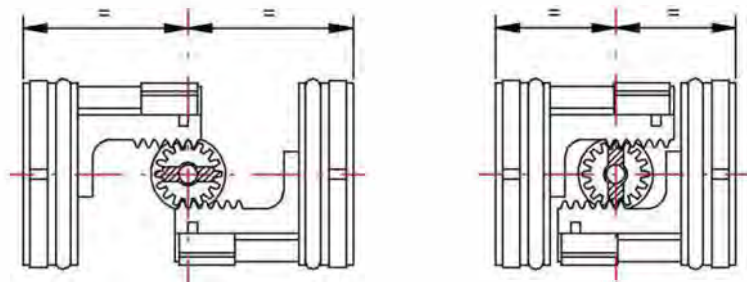
11 Replace pistons in the body in accordance to the required assembly variation, see Fig. 31 and TAB. A-B-C-D.

RE-INSERT  
EINFUEGEN  
REINSERER  
ALOJAR  
REINSERIRE  
(TAB A-B-C-O)



12a Make sure the pistons are "in right phase", this means they are engaged with the same tooth on shaft, and verify rotation, see Fig. 32-A and 32-B.

PAY ATTENTION!  
ACHTUNG!  
S'ASSURERI  
ASEGURARSEI  
ASSICURARSI I





12b Make sure the pistons are "in right phase", this means they are engaged with the same tooth on shaft, and verify rotation, see Fig. 32-A and 32-B.

PAY ATTENTION!  
 ACHTUNG!  
 S'ASSURER!  
 ASEGURARSE!  
 ASSICURARSI !

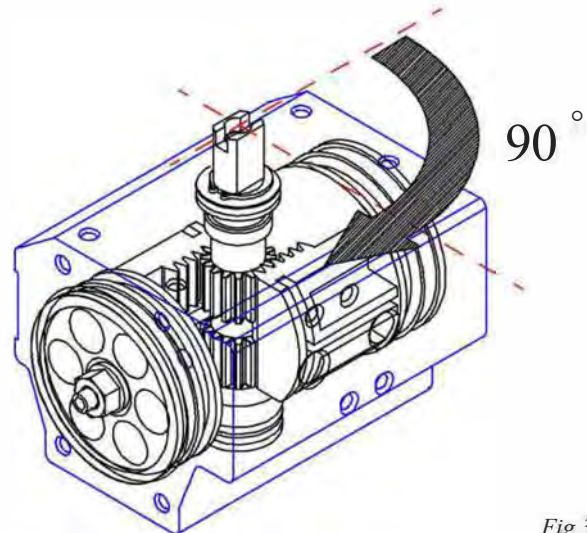
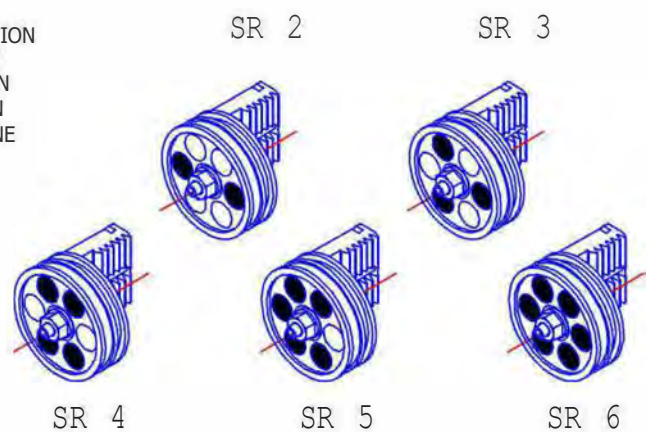


Fig.32-B

PAY ATTENTION  
 ACHTUNG  
 ATTENTION  
 ATENCION  
 ATTENZIONE



13 Replace eventual springs, following Fig. 33.

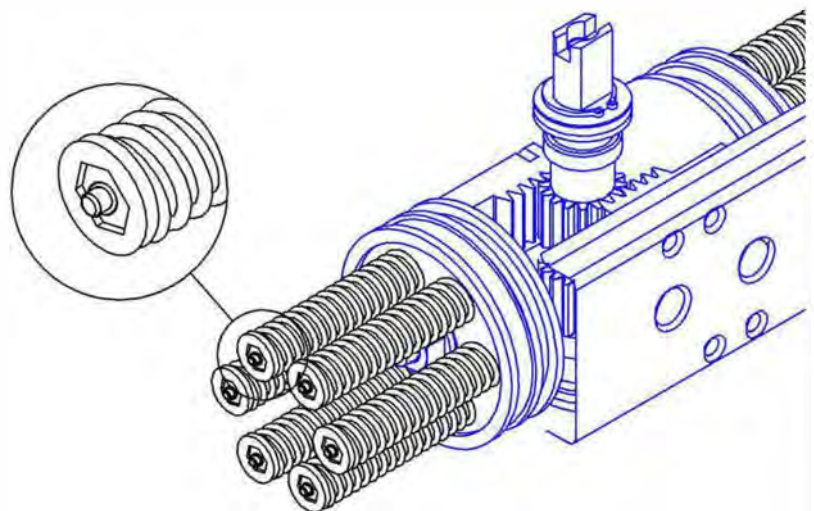
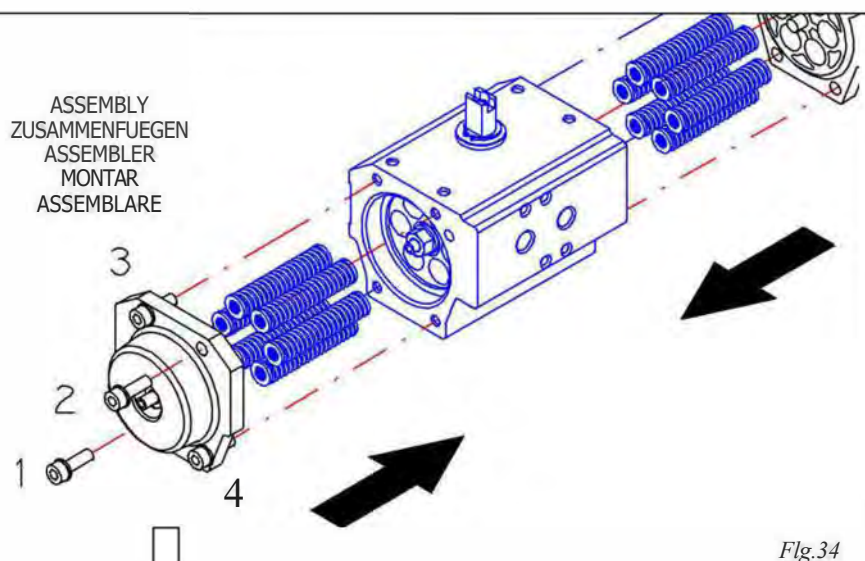


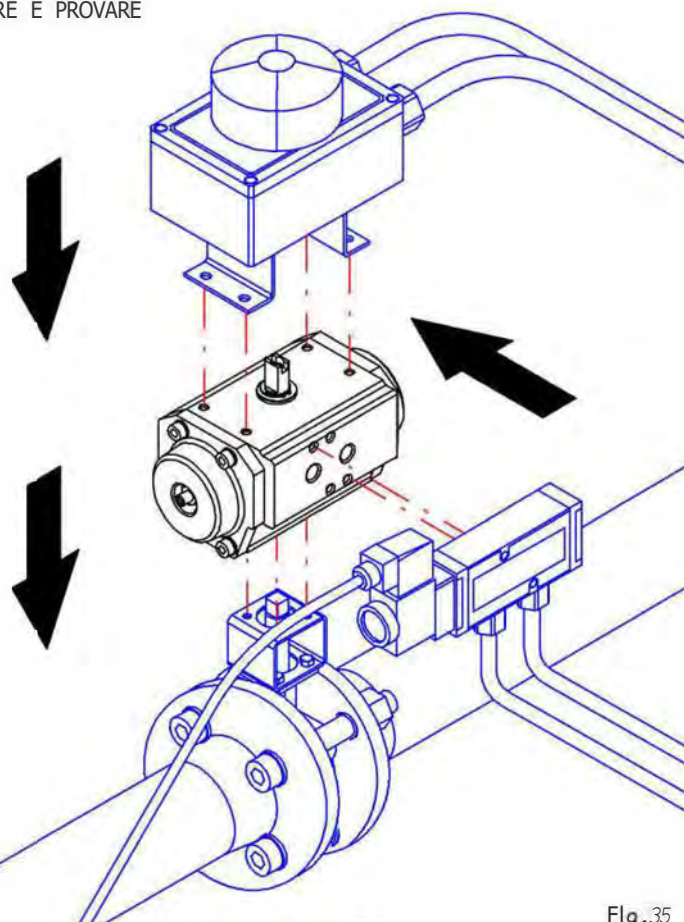
Fig.33

14 Assembly covers tightening screws following stated numeration, Fig.34.



15 Connect pneumatic/electrical feeding and verify correct operation, Fig.35.

RE-INSTALL AND CHECK  
INSTALLIEREN UND UEBERPRUFEN  
INSTALLER ET ESSAIER  
RE INSTALAR Y COMPROBAR  
REINSTALLARE E PROVARE

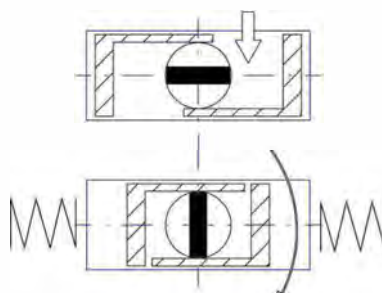
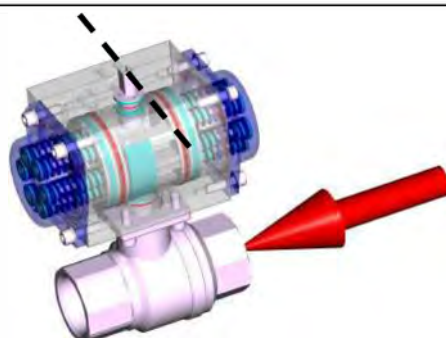
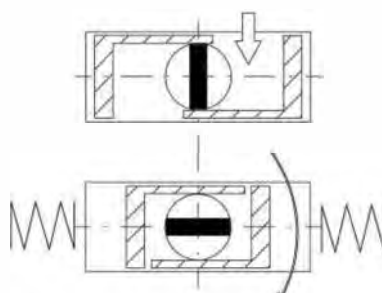
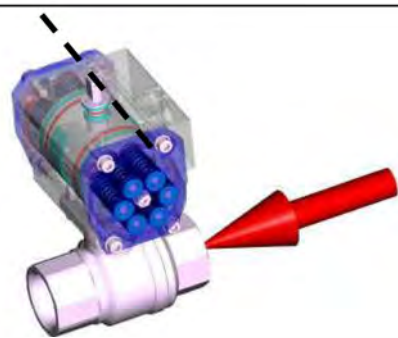
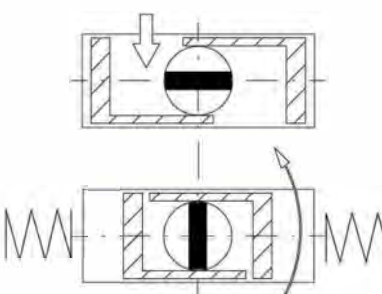
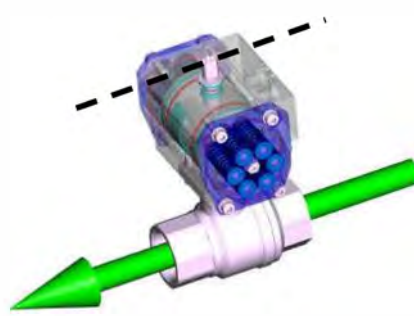
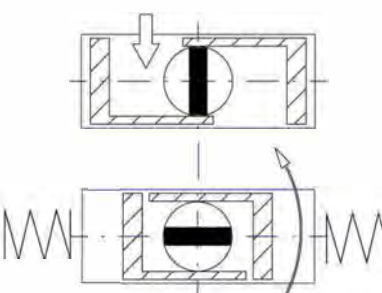
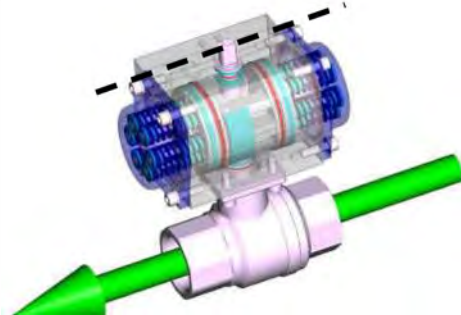


**ASSEMBLY VARIATIONS - ROTATION = 90°**

**Valid for both aluminium "AP" and AISI 316 (A4) Stainless Steel "AP-A" actuators.** There are four different assembly variations that are able to solve every need of valve/actuator placing combined with fail occurrence (fail-safe). They are mainly used for Spring Return"SR" operation.

The position of the upper part of actuator's shaft has to indicate the position of the valve. **ALPHAIR's standard assembly variation is: "A".**

**P.N. According to ISO 5211 - DIN 3337, closing rotation of the valve has to be clockwise.**

TYPE	ASSEMBLY SCHEME	TYPICAL APPLICATION	UTILITY
<b>A</b>			<b>SPRINGS CLOSE THE VALVE</b>  In event of fail, the valve is closed (fail-safe).
<b>B</b>			<b>SPRINGS CLOSE THE VALVE</b>  In event of fail, the valve is closed (fail-safe).
<b>C</b>			<b>SPRINGS OPEN THE VALVE</b>  In event of fail, the valve is opened.
<b>D</b>			<b>SPRINGS OPEN THE VALVE</b>  In event of fail, the valve is opened.



**ASSEMBLY VARIATIONS - V SERIES = 120° ROTATION**

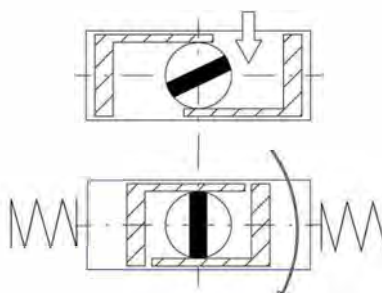
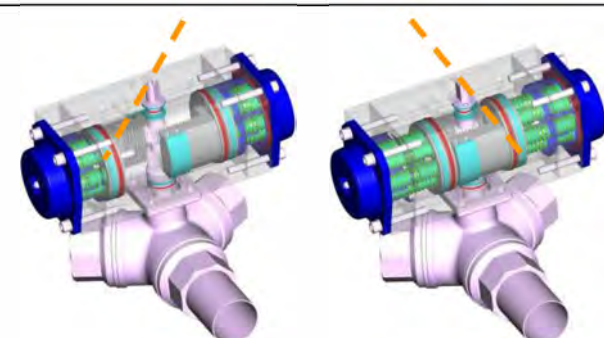
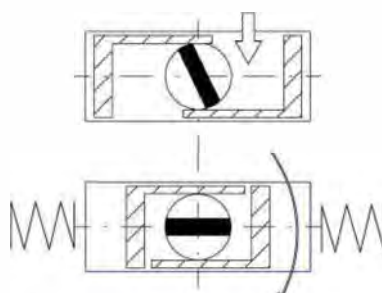
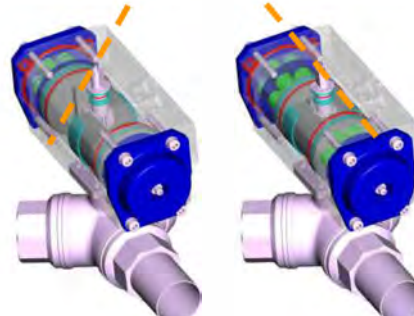
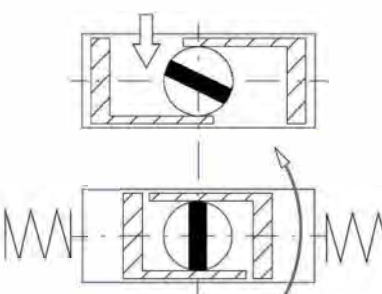
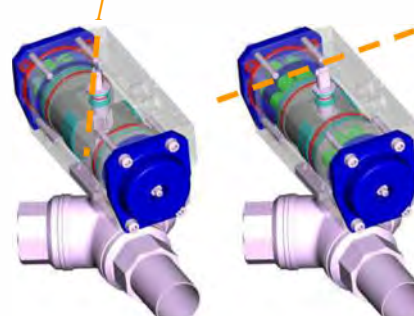
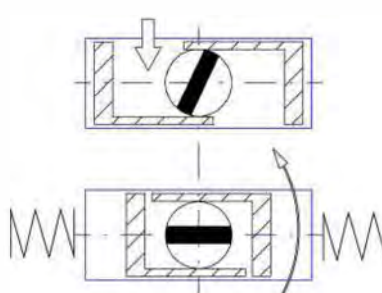
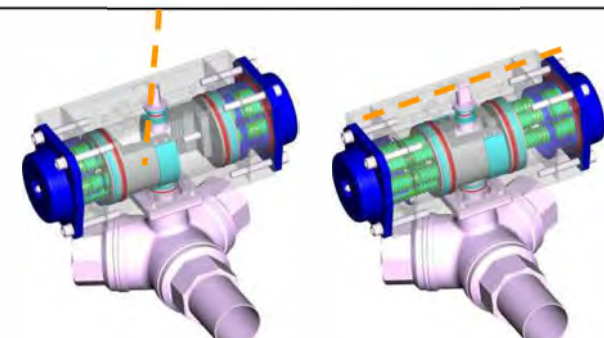
**Valid for both aluminium "AP" and AISI 316 (A4) Stainless Steel "AP-A" actuators.**

There are four different assembly variations that are able to solve every need of valve/actuator placing combined with fail occurrence (fail-safe). They are mainly used for Spring Return/"SR" operation.

The position of the stem cutting (upper shaft's part) has to indicate the position of the valve.

**ALPHAIR's standard assembly variation is: "A".**

**P.N. According to ISO 5211 - DIN 3337, closing rotation of the valve has to be clockwise.**

TYPE	ASSEMBLY SCHEME	OPEN PISTONS – CLOSED PISTONS
<b>A</b>		
<b>B</b>		
<b>C</b>		
<b>D</b>		



## ASSEMBLY VARIATIONS - X SERIES = 180° ROTATION

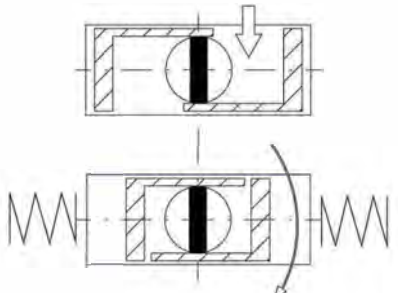
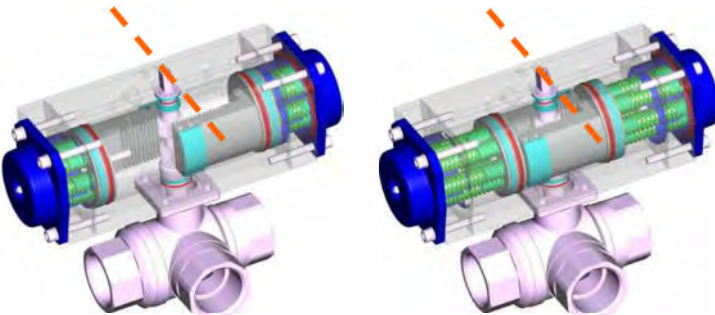
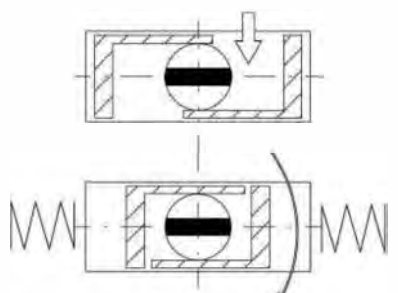
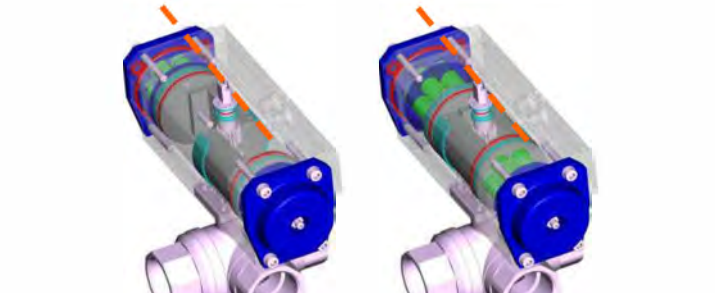
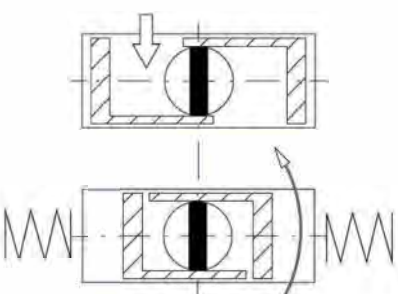
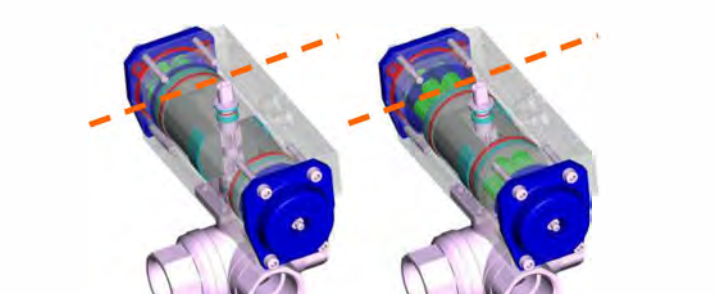
**Valid for both aluminium "AP" and AISI 316 (A4) Stainless Steel "AP-A" actuators.**

There are four different assembly variations that are able to solve every need of valve/actuator placing combined with fail occurrence (fail-safe). They are mainly used for Spring Return/"SR" operation.

The position of the stem cutting (upper shaft's part) has to indicate the position of the valve.

**ALPHAIR's standard assembly variation is: "A".**

**P.N. According to ISO 5211 - DIN 3337, closing rotation of the valve has to be clockwise.**

TYPE	ASSEMBLY SCHEME	OPEN PISTONS – CLOSED PISTONS
A		
B		
C		
D	