

**BEST-TORQUE** pneumatic actuators

**Vapco**

own the flow



**JIRCA**  
INTERNATIONAL S.P.A.

# Specifications

Our standard Best-Torque actuators type AP, a rack and pinion design, are supplied in 2 different types, double acting (12 types) and single acting (11 types). In a rack and pinion type actuator the linear kinetic energy is directly transformed into a “quarter turn” operation with a constant output torque over the full stroke. Both double acting and spring return actuators have twin cylinders horizontally opposed and incorporate piston guides to ensure correct contact between rack and pinion, at any pressure. High quality materials are employed throughout the construction and, the compact design is readily fitted to any type of valve. The actuators are suitable for both indoor as outdoor use.

Double acting type AP-D and single acting type AP-S..

Annex X of ATEX Directive 94/9/EC:

## Technical features

|                    |  |
|--------------------|--|
| Air supply:        | Dry air - non lubricated<br>min.2 barg – max.10 barg: DA<br>min.3 barg – max.10 barg: SA |
| Stroke:            | 90° (+5° or -5°) with standard travel stops  |
| Lubrication:       | All moving parts are factory lubricated for cycle life of the actuator                   |
| Temperature range: | -20°/+100°C<br>On request -50°/+150°C<br>or +20°/+150°C                                  |

## Dimensions

For both double as single acting identical

## Material specifications

|           |                                  |
|-----------|----------------------------------|
| Body:     | Aluminium (black) hard anodized  |
| End Caps: | Aluminium black epoxy coated     |
| Pinion:   | Steel Kanigen coated (rust free) |
| Pistons:  | Aluminium                        |
| Guide:    | Acetal resin                     |
| O-rings:  | Nitrile rubber                   |
| Springs:  | Spring steel, zinc plated        |
| Bolts:    | Stainless steel                  |

## Connections

|                 |                      |
|-----------------|----------------------|
| Valve mounting: | ISO 5211             |
| End switch:     | VDI/VDE (except AP0) |
| Solenoid valve: | NAMUR                |

## Selection of actuators

Required data:

- Torque figures of valve (incl. safety factor of at least 25%)
- available air supply
- Usage

## Double acting actuators

Determine the required valve torque (this should include a safety factor of at least 25%; however you should always consult valve manufacturer for exact torque with applicable medium) as well as the minimum available air supply. Refer to the pressure/torque table and select the minimum air supply column applicable. Follow this column down until a value not less than that required is found. Next, read across to the left hand column and read the model number to be ordered. e.g. Valve torque 80 Nm plus 25% = 100 Nm, minimum operating pressure 5 barg. By reading down the 5 barg column a figure without going below 100 Nm is 119 Nm. The model number therefore shown in the left hand column is AP4D.

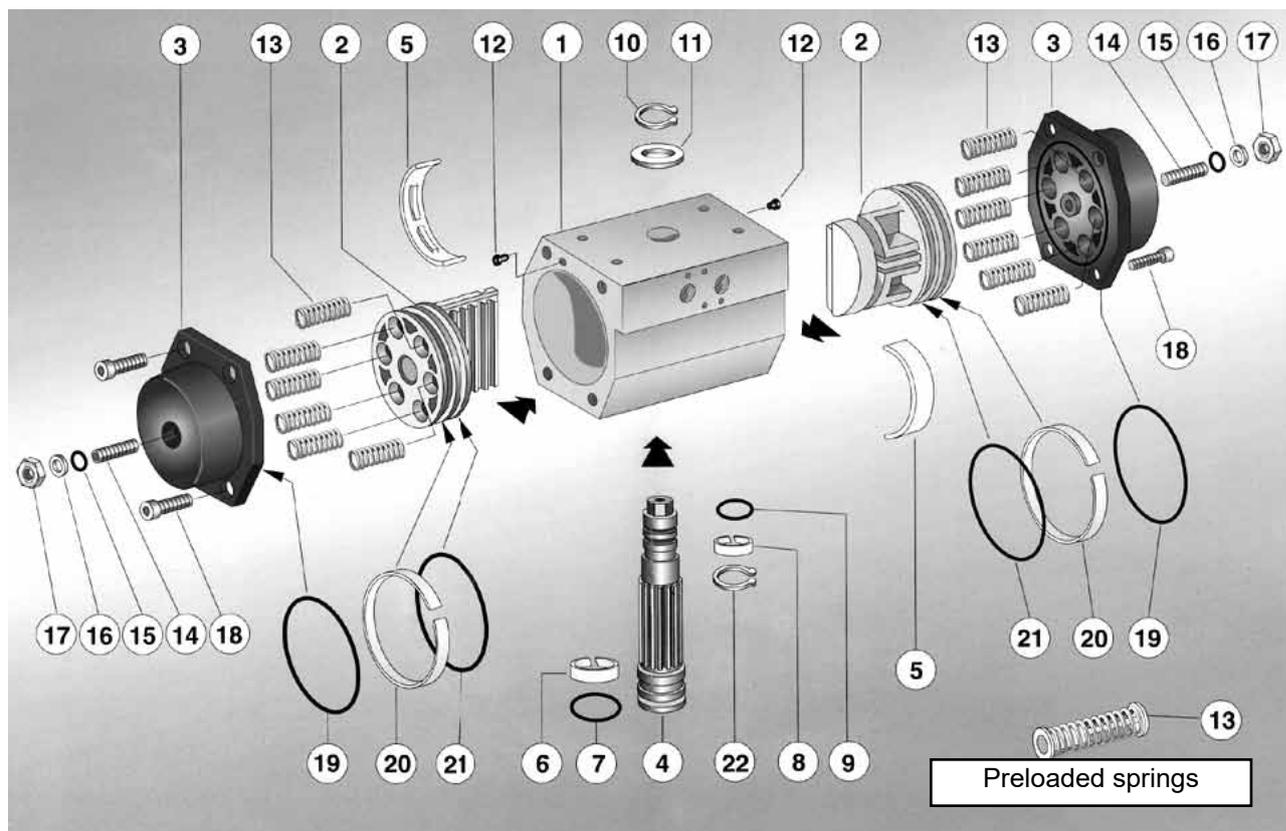
## Single acting actuators

Determine the required valve torque (this should include at least 25% safety margin; however you should always consult valve manufacturer for exact torque with applicable medium), and the minimum operating pressure available. Select from the “Spring stroke/end” table a value that is not less than the required valve torque (including safety margin). Next refer to the pressure table and select under your minimum pressure and “END” torque column a figure not less than that required (including safety margin). e.g. Valve torque 80 Nm plus 25% = 100 Nm, minimum operating pressure 6 barg. Checking the “Spring Stroke/End” column that the nearest value is 100 Nm. By following the line across to the vertical 6 barg END torque column, a figure of 101.6 Nm is shown, therefore the suitable actuator is the AP4.5S6. In a normal valve shutdown situation the actuator would operate the valve to break out at less than 101.6 Nm and close at less than 100 Nm. If the “END” torque at operating pressure is too low, continue down the column until an acceptable value is found, compare with the corresponding “Spring Stroke/End” column to ensure that this also is adequate. This model may be used.

## Versions

Besides the standard version we can provide the actuator with Kanigen coated end caps and body. With the APM version it is possible to adjust the stroke on both sides.

# Sectional drawing

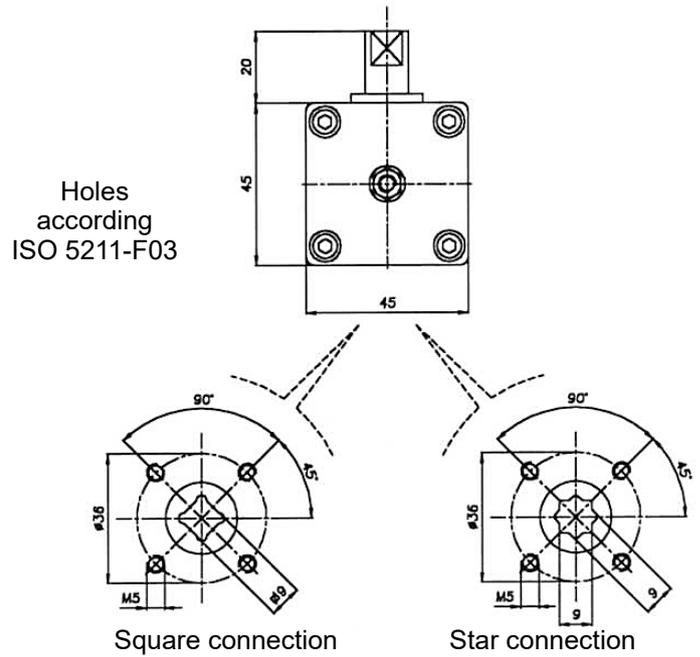
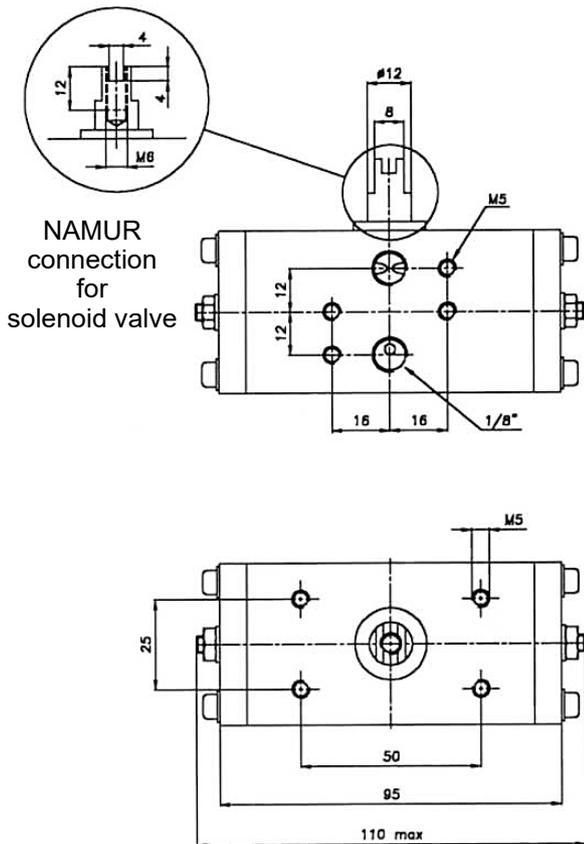


| Item | Description   | Quantity | Material                      | Item | Description             | Quantity | Material        |
|------|---------------|----------|-------------------------------|------|-------------------------|----------|-----------------|
| 1    | Body          | 1        | Aluminium anodized            | 12   | Plug                    | 2*       | Buna-N          |
| 2    | Pistons       | 2        | Casted Aluminium              | 13   | Springs (Preloaded)     | +        | Spring steel    |
| 3    | End-caps      | 2        | Casted Aluminium epoxy coated | 14   | Stroke adjustment screw | 2        | Stainless steel |
| 4    | Pinion        | 1        | Steel Kanigan coated          | 15   | O-ring                  | 2*       | Buna-N          |
| 5    | Piston guide  | 2*       | Acetal resin                  | 16   | Washer                  | 2        | Fibre           |
| 6    | Guide ring    | 1*       | Acetal resin                  | 17   | Nut                     | 2        | Stainless steel |
| 7    | O-ring        | 1*       | Buna-N                        | 18   | Bolts                   | 8        | Stainless steel |
| 8    | Guide ring    | 1*       | Acetal resin                  | 19   | O-ring                  | 2*       | Buna-N          |
| 9    | O-ring        | 1*       | Buna-N                        | 20   | Guide ring              | 2*       | Acetal resin    |
| 10   | Circlip       | 1        | Stainless steel               | 21   | O-ring                  | 2*       | Buna-N          |
| 11   | Thrust washer | 1        | Polyamid                      | 22   | Circlip                 | 1        | Edelstahl       |

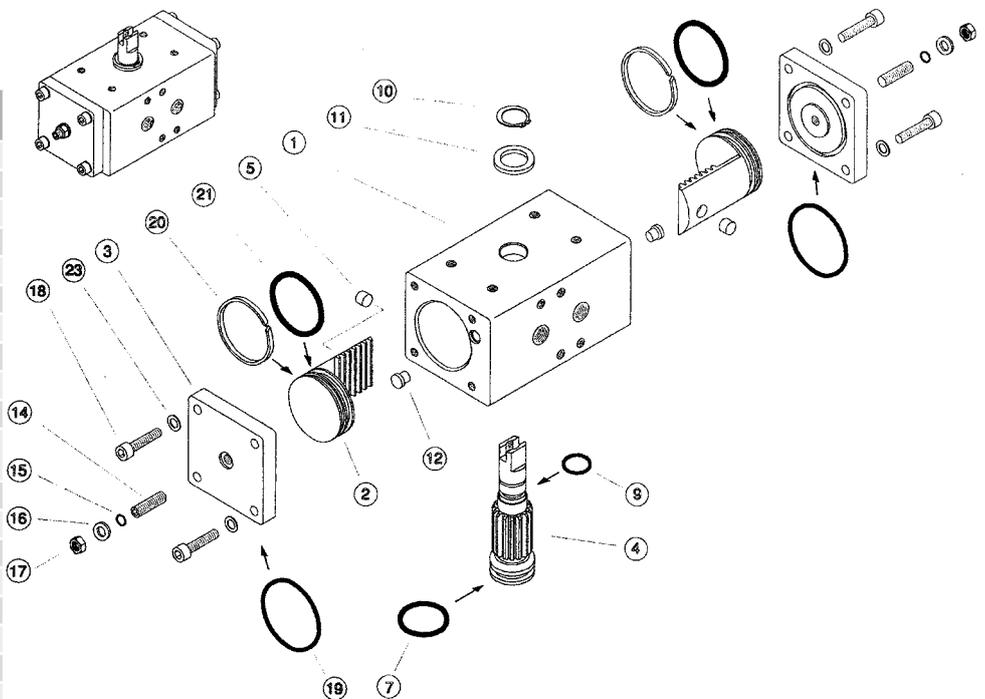
Aluminum center ring for positioning the actuator according ISO5211 standard on request.

- \* recommended spare parts, complete in standard repairkit
- + depending on need

# Dimensional drawing AP0

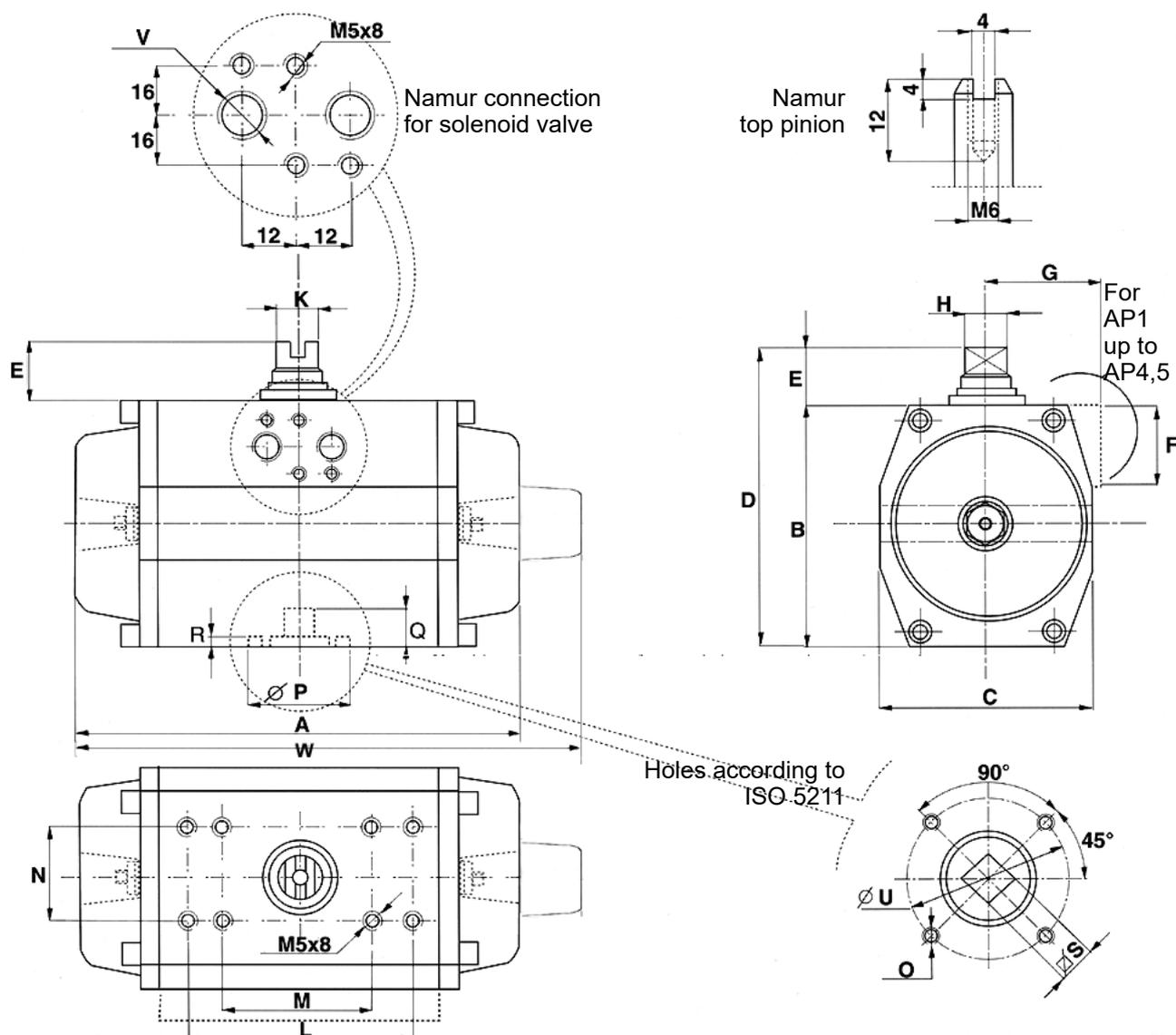


| Item | Description           | Quantity |
|------|-----------------------|----------|
| 1    | Body                  | 1        |
| 2    | Piston                | 2        |
| 3    | End-caps              | 2        |
| 4    | Pinion                | 1        |
| 5    | Piston guide          | 2*       |
| 7    | O-ring                | 1*       |
| 9    | O-ring                | 1*       |
| 10   | Circlip               | 1        |
| 11   | Thrust washer         | 1*       |
| 12   | Plug                  | 2*       |
| 14   | Screw external stroke | 2        |
| 15   | O-ring                | 2*       |
| 16   | Plain washer          | 2        |
| 17   | Nut                   | 2        |
| 18   | Bolts                 | 8        |
| 19   | O-ring                | 2*       |
| 20   | Piston guide          | 2*       |
| 21   | O-ring                | 2*       |
| 23   | Plain washer          | 8        |



\* recommended spare parts, complete in standard repairkit

# Dimensional drawing AP1 bis AP10



## Dimensions [mm]

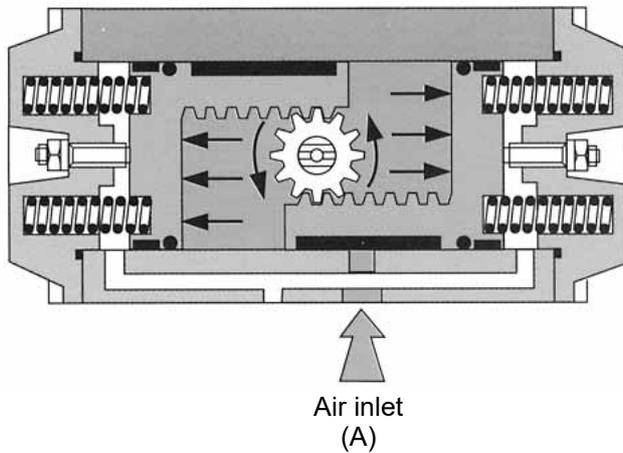
| Model | A   | W*  | B   | C   | D   | E  | F  | G    | H  | K  | L   | M  | N  | P     | Q  | R   | S-S     | T      | U      | V    | ISO 5211STD.   |
|-------|-----|-----|-----|-----|-----|----|----|------|----|----|-----|----|----|-------|----|-----|---------|--------|--------|------|----------------|
| AP1   | 142 | 162 | 67  | 60  | 87  | 20 | 42 | 41   | 12 | 8  | -   | 80 | 30 | 25    | 10 | 2   | 9/11**  | M5/M6  | 36/50  | 1/8* | F03/F05        |
| AP2   | 155 | 171 | 83  | 73  | 103 | 20 | 42 | 44.5 | 12 | 8  | -   | 80 | 30 | 30/35 | 12 | 2   | 11/14** | M5/M6  | 42/50  | 1/4* | F04/<br>F05*** |
| AP3   | 213 | 240 | 100 | 85  | 120 | 20 | 50 | 49.5 | 14 | 10 | -   | 80 | 30 | 35    | 16 | 3   | 14/17** | M6/M8  | 50/70  | 1/4* | F05/F07        |
| AP3.5 | 236 | 268 | 110 | 98  | 130 | 20 | 50 | 53   | 19 | 14 | -   | 80 | 30 | 55    | 20 | 3.5 | 17/22** | M8     | 70     | 1/4* | F07            |
| AP4   | 276 | 304 | 125 | 110 | 145 | 20 | 50 | 58   | 19 | 14 | -   | 80 | 30 | 55    | 20 | 3.5 | 17/22   | M8/M10 | 70/100 | 1/4* | F07/F10        |
| AP4.5 | 310 | 350 | 142 | 128 | 172 | 30 | 58 | 69   | 28 | 20 | 130 | 80 | 30 | 70    | 24 | 3.5 | 17**/22 | M10    | 102    | 1/4* | F10            |
| AP5   | 366 | 405 | 155 | 140 | 185 | 30 | -  | -    | 28 | 20 | 130 | 80 | 30 | 70    | 24 | 3.5 | 17**/22 | M10    | 102    | 1/4* | F10            |
| AP5.5 | 388 | 442 | 176 | 160 | 206 | 30 | -  | -    | 36 | 28 | 130 | 80 | 30 | 85    | 29 | 3.5 | 22**/27 | M12    | 125    | 1/4* | F12            |
| AP6   | 468 | 500 | 200 | 175 | 230 | 30 | -  | -    | 36 | 28 | 130 | 80 | 30 | 85    | 29 | 3.5 | 22**/27 | M12    | 125    | 1/4* | F12            |
| AP8   | 563 | 612 | 250 | 215 | 300 | 50 | -  | -    | 48 | 32 | 130 | -  | 30 | 100   | 38 | 5   | 27**/36 | M16    | 140    | 1/4* | F14            |
| AP10  | 750 | 838 | 335 | 290 | 385 | 50 | -  | -    | 48 | 32 | 130 | -  | 30 | 100   | 50 | 5   | 36**/46 | M20    | 165    | 1/4* | F16            |

\* dimension W is only for APM series  
 \*\* on request  
 \*\*\* F04 or F05  
 Double square (star) as standard

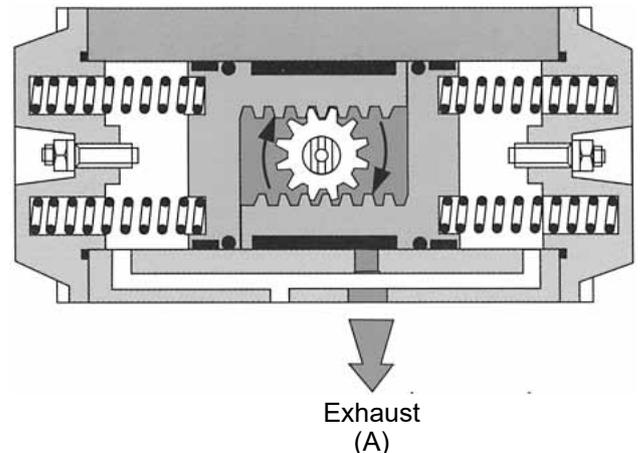
# Principal of operation - single acting actuators

Pressure applied to Port 'A' will cause the inner chambers to be pressurised, forcing the pistons outward to compress the springs. The pinion is rotated anti-clockwise. Upon release of pressure through Port 'A' the springs will exert pressure to close the pistons and rotate the pinion clockwise rapidly. This action will often be used to close a 90° turn valve in shutdown mode..

## Anti-clockwise output rotation



## Clockwise output rotation



### Airconsumption per stroke (free air) in dm3 at 5.6 barg (80 psig)

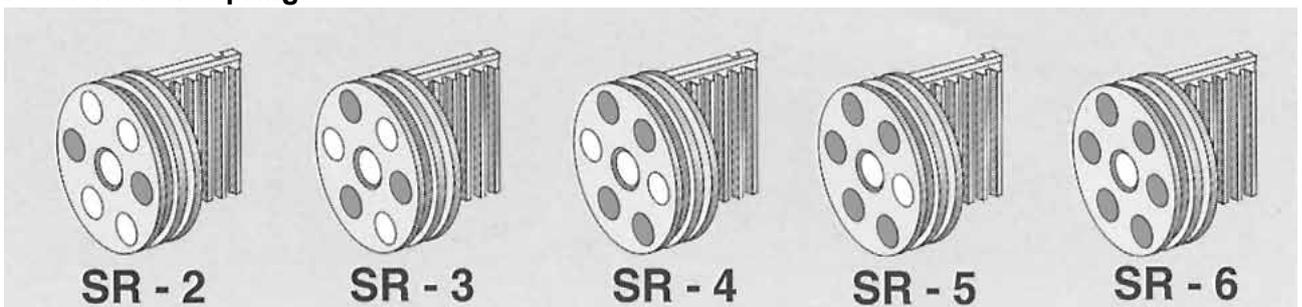
| Model                      | AP1 DA/<br>SR | AP2 DA/<br>SR | AP3 DA/<br>SR | AP3.5 DA/<br>SR | AP4 DA/<br>SR | AP4.5 DA/<br>SR | AP5 DA/<br>SR | AP5.5 DA/<br>SR | AP6 DA/<br>SR | AP8 DA/<br>SR | AP10 DA/<br>SR |
|----------------------------|---------------|---------------|---------------|-----------------|---------------|-----------------|---------------|-----------------|---------------|---------------|----------------|
| counter clockwise DA or SA | 0.08          | 0.12          | 0.24          | 0.48            | 0.68          | 1               | 1.4           | 1,6             | 3.2           | 5.3           | 14.2           |
| Clockwise (only DA)        | 0.10          | 0.16          | 0.44          | 0.56            | 0.96          | 1.6             | 2.16          | 2.56            | 4             | 8.6           | 16.5           |

### Opening/closing time in seconds at 5.6 barg (80 psig)

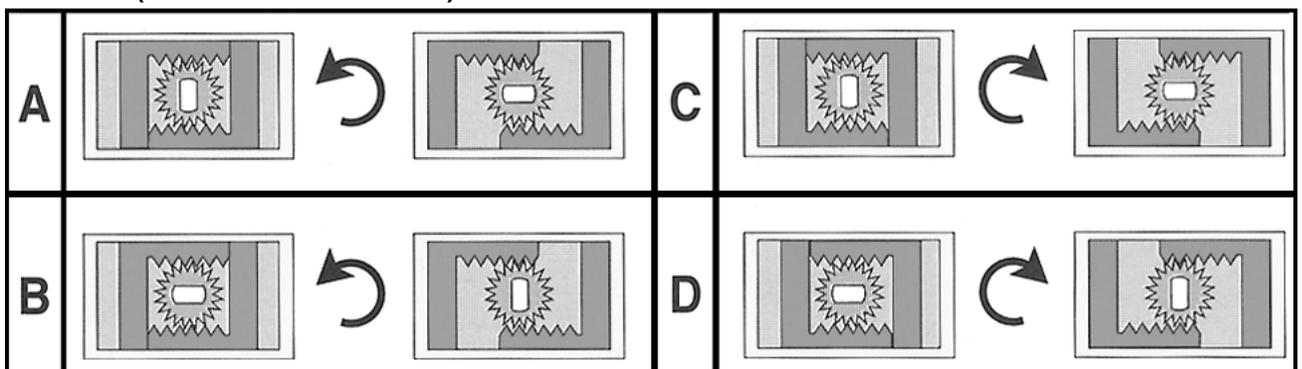
| Model         | AP1  | AP2  | AP3  | AP3.5 | AP4  | AP4.5 | AP5     | AP5.5  | AP6    | AP8  | AP10 |
|---------------|------|------|------|-------|------|-------|---------|--------|--------|------|------|
| Double acting | < 1s | < 1s | < 1s | < 1s  | < 1s | < 1s  | < 1.25s | < 1.5s | 1.5-2s | 3-4s | 5-6s |
| Singel acting | < 1s | < 1s | < 1s | < 1s  | < 1s | < 1s  | 1.5-2s  | 2s     | 2-3s   | 4-6s | 7-8s |

\* faster acting upon request

### Postion of the springs



### Rotation (Standard is version A)



# Torque output (Nm) - single acting actuators

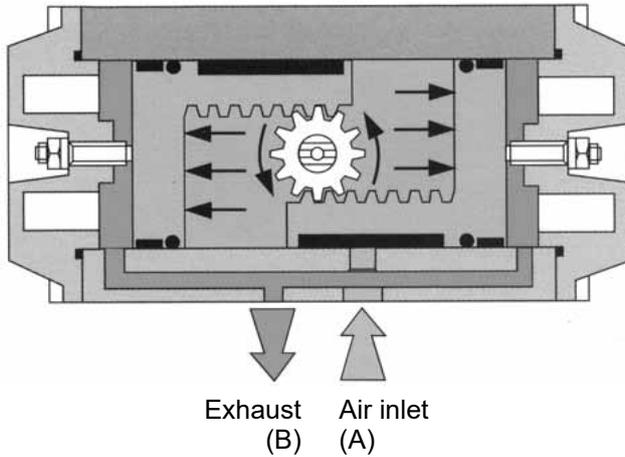
| Model   | No. Springs for each side of cap | Operating pressure |       |                |        |                |        |                |        |                |        |                 |        |            |        |
|---------|----------------------------------|--------------------|-------|----------------|--------|----------------|--------|----------------|--------|----------------|--------|-----------------|--------|------------|--------|
|         |                                  | 3 bar / 44 psi     |       | 4 bar / 58 psi |        | 5 bar / 73 psi |        | 6 bar / 87 psi |        | 7bar / 102 psi |        | 8 bar / 116 psi |        | Federkraft |        |
|         |                                  | 0°                 | 90°   | 0°             | 90°    | 0°             | 90°    | 0°             | 90°    | 0°             | 90°    | 0°              | 90°    | 90°        | 0°     |
| AP1SR   | 2                                | 6.5                | 5.4   | 9.4            | 8.3    | 12.4           | 11.3   | 15.3           | 14.2   | 19.3           | 18.2   | 22.4            | 21.3   | 3.5        | 2.4    |
|         | 3                                | 5.3                | 3.7   | 8.2            | 6.6    | 11.2           | 9.6    | 14.1           | 12.5   | 18.1           | 16.5   | 21.2            | 19.6   | 5.2        | 3.6    |
|         | 4                                | 4.1                | 1.9   | 7.0            | 4.8    | 10.0           | 7.8    | 12.9           | 10.7   | 16.9           | 14.7   | 20.0            | 17.8   | 7.0        | 4.8    |
|         | 5                                | =                  | =     | 3.1            | 2.7    | 8.8            | 6.1    | 11.7           | 9.0    | 15.7           | 13.0   | 18.8            | 16.1   | 8.7        | 6.0    |
|         | 6                                | =                  | =     | =              | =      | 7.6            | 4.3    | 10.5           | 7.2    | 14.5           | 11.2   | 17.6            | 14.3   | 10.5       | 7.2    |
| AP2SR   | 2                                | 10.3               | 8.5   | 15.0           | 13.2   | 19.7           | 17.9   | 24.4           | 22.6   | 29.1           | 27.3   | 33.8            | 32.0   | 5.6        | 3.8    |
|         | 3                                | 8.4                | 5.7   | 13.1           | 10.4   | 17.8           | 15.1   | 22.5           | 19.8   | 27.2           | 24.5   | 31.9            | 29.2   | 8.4        | 5.7    |
|         | 4                                | =                  | =     | 11.2           | 7.6    | 15.9           | 12.3   | 20.6           | 17.0   | 25.3           | 21.7   | 30.0            | 26.4   | 11.2       | 7.6    |
|         | 5                                | =                  | =     | =              | =      | 14.0           | 9.5    | 18.7           | 14.2   | 23.4           | 18.9   | 28.1            | 23.6   | 14.0       | 9.5    |
|         | 6                                | =                  | =     | =              | =      | 12.1           | 6.7    | 16.8           | 11.4   | 21.5           | 16.1   | 26.2            | 20.8   | 16.8       | 11.4   |
| AP3SR   | 2                                | 22.0               | 18.0  | 32.0           | 28.0   | 42.0           | 38.0   | 52.0           | 48.0   | 62.0           | 58.0   | 72.0            | 68.0   | 12.0       | 8.0    |
|         | 3                                | 18.0               | 12.0  | 28.0           | 22.0   | 38.0           | 32.0   | 48.0           | 42.0   | 58.0           | 52.0   | 68.0            | 62.0   | 18.0       | 12.0   |
|         | 4                                | =                  | =     | 24.0           | 16.0   | 34.0           | 26.0   | 44.0           | 36.0   | 54.0           | 46.0   | 64.0            | 56.0   | 24.0       | 16.0   |
|         | 5                                | =                  | =     | =              | =      | 30.0           | 20.0   | 40.0           | 30.0   | 50.0           | 40.0   | 60.0            | 60.0   | 30.0       | 20.0   |
|         | 6                                | =                  | =     | =              | =      | 26.0           | 14.0   | 36.0           | 24.0   | 46.0           | 34.0   | 56.0            | 44.0   | 36.0       | 24.0   |
| AP3.5SR | 2                                | 41.5               | 30.0  | 58.5           | 47.0   | 75.5           | 64.0   | 92.5           | 81.0   | 109.5          | 98.0   | 126.5           | 115.0  | 21.0       | 9.5    |
|         | 3                                | 32.0               | 20.0  | 49.0           | 37.0   | 66.0           | 54.0   | 83.0           | 71.0   | 100.0          | 88.0   | 117.0           | 105.0  | 31.0       | 19.0   |
|         | 4                                | =                  | =     | 43.0           | 20.0   | 60.0           | 37.0   | 77.0           | 54.0   | 94.0           | 71.0   | 111.0           | 88.0   | 48.0       | 25.0   |
|         | 5                                | =                  | =     | =              | =      | 53.0           | 33.0   | 70.0           | 50.0   | 87.0           | 67.0   | 104.0           | 84.0   | 52.0       | 32.0   |
|         | 6                                | =                  | =     | =              | =      | 47.0           | 22.0   | 64.0           | 39.0   | 81.0           | 56.0   | 106.4           | 73.0   | 63.0       | 38.0   |
| AP4SR   | 2                                | 52.7               | 42.4  | 76.7           | 66.4   | 100.7          | 90.4   | 123.7          | 113.4  | 149.7          | 139.4  | 173.7           | 175.2  | 28.6       | 18.3   |
|         | 3                                | 43.0               | 28.0  | 67.0           | 52.0   | 91.0           | 76.0   | 114.0          | 99.0   | 140.0          | 125.0  | 164.0           | 153.6  | 43.0       | 28.0   |
|         | 4                                | =                  | =     | 58.0           | 38.0   | 82.0           | 62.0   | 105.0          | 85.0   | 131.0          | 111.0  | 155.0           | 132.0  | 57.0       | 37.0   |
|         | 5                                | =                  | =     | =              | =      | 73.0           | 47.0   | 96.0           | 70.0   | 122.0          | 96.0   | 146.0           | 110.4  | 72.0       | 46.0   |
|         | 6                                | =                  | =     | =              | =      | 64.0           | 33.0   | 87.0           | 56.0   | 113.0          | 82.0   | 137.0           | 88.8   | 86.0       | 55.0   |
| AP4.5SR | 2                                | 96.8               | 77.5  | 140.4          | 121.1  | 184.0          | 164.7  | 227.6          | 208.3  | 271.2          | 251.9  | 314.8           | 295.5  | 53.3       | 34.0   |
|         | 3                                | 79.8               | 50.9  | 123.4          | 94.5   | 167.0          | 138.1  | 210.6          | 181.7  | 264.2          | 225.3  | 297.8           | 268.9  | 79.9       | 51.0   |
|         | 4                                | 62.8               | 24.2  | 106.4          | 67.8   | 150.0          | 111.4  | 193.6          | 155.0  | 237.2          | 198.6  | 280.8           | 242.2  | 106.6      | 68.0   |
|         | 5                                | =                  | =     | 89.4           | 41.1   | 133.0          | 84.7   | 176.6          | 128.3  | 220.2          | 171.9  | 263.8           | 215.5  | 133.3      | 85.0   |
|         | 6                                | =                  | =     | 72.4           | 14.4   | 116.0          | 58.0   | 159.6          | 101.6  | 203.2          | 145.2  | 246.8           | 188.8  | 160.0      | 100.0  |
| AP5SR   | 2                                | 123.7              | 99.4  | 178.7          | 154.4  | 234.7          | 210.4  | 289.7          | 265.4  | 345.2          | 320.9  | 400.7           | 376.4  | 67.6       | 43.3   |
|         | 3                                | 103.0              | 66.0  | 158.0          | 121.0  | 214.0          | 177.0  | 269.0          | 232.0  | 324.5          | 287.5  | 380.0           | 343.0  | 101.0      | 64.0   |
|         | 4                                | =                  | =     | 136.0          | 87.0   | 192.0          | 143.0  | 247.0          | 198.0  | 302.5          | 253.5  | 358.0           | 309.0  | 135.0      | 86.0   |
|         | 5                                | =                  | =     | =              | =      | 170.0          | 109.0  | 225.0          | 164.0  | 280.5          | 219.5  | 336.0           | 275.0  | 169.0      | 108.0  |
|         | 6                                | =                  | =     | =              | =      | 148.0          | 75.0   | 203.0          | 130.0  | 258.5          | 185.5  | 314.0           | 241.0  | 203.0      | 130.0  |
| AP5.5SR | 2                                | 176.2              | 132.8 | 258.7          | 215.3  | 337.5          | 294.1  | 416.4          | 373.0  | 495.2          | 451.8  | 574.0           | 530.6  | 100.0      | 56.6   |
|         | 3                                | 147.9              | 82.8  | 230.4          | 165.3  | 309.2          | 244.1  | 388.1          | 323.0  | 466.9          | 401.8  | 545.7           | 480.6  | 150.0      | 84.9   |
|         | 4                                | 119.5              | 32.8  | 202.0          | 115.3  | 280.8          | 194.1  | 359.7          | 273.0  | 438.5          | 351.8  | 517.3           | 430.6  | 200.0      | 113.3  |
|         | 5                                | =                  | =     | 173.7          | 65.3   | 252.5          | 144.1  | 331.4          | 223.0  | 410.2          | 301.8  | 489.0           | 380.6  | 250.0      | 141.6  |
|         | 6                                | =                  | =     | 145.3          | 15.3   | 224.1          | 94.1   | 303.0          | 173.0  | 381.8          | 251.8  | 460.6           | 330.6  | 300.0      | 170.0  |
| AP6SR   | 2                                | 257.0              | 200.0 | 371.0          | 314.0  | 484.0          | 427.0  | 597.0          | 540.0  | 711.5          | 645.5  | 825.0           | 768.0  | 140.0      | 83.0   |
|         | 3                                | 215.0              | 130.0 | 329.0          | 244.0  | 442.0          | 357.0  | 555.0          | 470.0  | 669.5          | 584.5  | 783.0           | 698.0  | 210.0      | 125.0  |
|         | 4                                | =                  | =     | 287.0          | 174.0  | 400.0          | 287.0  | 513.0          | 400.0  | 627.5          | 514.5  | 741.0           | 628.0  | 280.0      | 167.0  |
|         | 5                                | =                  | =     | =              | =      | 358.0          | 217.0  | 471.0          | 330.0  | 535.5          | 444.5  | 699.0           | 558.0  | 350.0      | 209.0  |
|         | 6                                | =                  | =     | =              | =      | 316.0          | 147.0  | 429.0          | 260.0  | 543.5          | 374.5  | 657.0           | 488.0  | 420.0      | 251.0  |
| AP8SR   | 2                                | 478.0              | 386.0 | 691.0          | 599.0  | 904.0          | 812.0  | 1116.0         | 1024.0 | 1331.0         | 1239.0 | 1704.0          | 1452.0 | 252.0      | 160.0  |
|         | 3                                | 398.0              | 260.0 | 611.0          | 473.0  | 824.0          | 686.0  | 1036.0         | 898.0  | 1251.0         | 1113.0 | 1464.0          | 1326.0 | 378.0      | 240.0  |
|         | 4                                | =                  | =     | 531.0          | 347.0  | 744.0          | 560.0  | 956.0          | 772.0  | 1171.0         | 987.0  | 1384.0          | 1200.0 | 504.0      | 320.0  |
|         | 5                                | =                  | =     | =              | =      | 664.0          | 434.0  | 876.0          | 646.0  | 1091.0         | 861.0  | 1304.0          | 1074.0 | 630.0      | 400.0  |
|         | 6                                | =                  | =     | =              | =      | 584.0          | 308.0  | 796.0          | 520.0  | 1011.0         | 735.0  | 1224.0          | 948.0  | 756.0      | 480.0  |
| AP10SR  | 2                                | 1181.0             | 957.0 | 1720.0         | 1496.0 | 2259.0         | 2035.0 | 2798.0         | 2574.0 | 3337.0         | 3113.0 | 3876.0          | 3652.0 | 660.0      | 436.0  |
|         | 3                                | 963.0              | 628.0 | 1502.0         | 1167.0 | 2041.0         | 1706.0 | 2580.0         | 2245.0 | 3119.0         | 2784.0 | 3658.0          | 3323.0 | 969.0      | 654.0  |
|         | 4                                | =                  | =     | 1284.0         | 837.0  | 1823.0         | 1376.0 | 2362.0         | 1915.0 | 2901.0         | 2454.0 | 3440.0          | 2993.0 | 1319.0     | 872.0  |
|         | 5                                | =                  | =     | =              | =      | 1605.0         | 1046.0 | 2144.0         | 1585.0 | 2683.0         | 2124.0 | 3222.0          | 2663.0 | 1649.0     | 1090.0 |
|         | 6                                | =                  | =     | =              | =      | =              | =      | 1909.0         | 1254.0 | 2448.0         | 1793.0 | 2987.0          | 2332.0 | 1980.0     | 1325.0 |

\* Standaard execution time with 10 springs (each side 5 springs = S5).  
Other springs quantities upon advise.

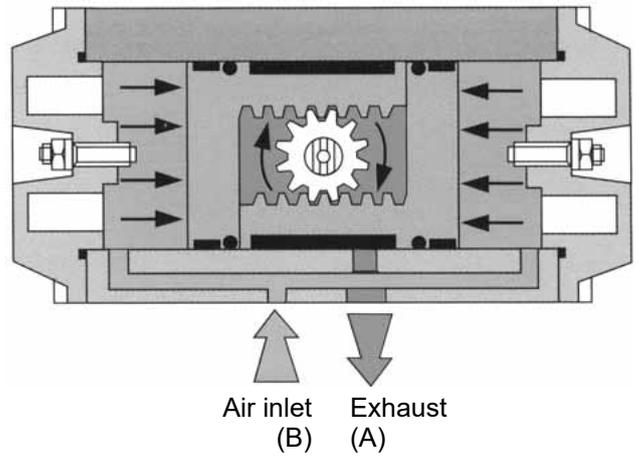
# Principle of operation - double acting

Anti-clockwise output operation is achieved by inserting pressure into Port 'A', to force the pistons apart thus rotating the actuator pinion clockwise. During this operation, air from the outer chambers is exhausted through Port 'B'. clockwise output operation is achieved by reverse of the above and inserting pressure into Port 'B'.

**Anti-clockwise output rotation**



**Clockwise output rotation**



## Torque output (Nm) - double acting actuators

| Model    | Operation pressure [bar] |        |        |        |        |         |         |
|----------|--------------------------|--------|--------|--------|--------|---------|---------|
|          | 2 bar                    | 3 bar  | 4 bar  | 5 bar  | 6 bar  | 7 bar   | 8 bar   |
|          | 30 psi                   | 44 psi | 58 psi | 73 psi | 87 psi | 102 psi | 116 psi |
| AP0 DA   | 2.4                      | 3.6    | 4.8    | 6.0    | 7.3    | 8.5     | 9.7     |
| AP1 DA   | 5.9                      | 8.9    | 11.8   | 14.8   | 17.7   | 21.7    | 24.8    |
| AP2 DA   | 9.4                      | 14.1   | 18.8   | 23.5   | 28.2   | 32.9    | 37.6    |
| AP3 DA   | 20                       | 30     | 40     | 50     | 60     | 70      | 80      |
| AP3.5 DA | 34                       | 51     | 68     | 85     | 102    | 119     | 136     |
| AP4 DA   | 48                       | 71     | 95     | 119    | 142    | 163     | 192     |
| AP4.5 DA | 87.2                     | 130.8  | 174.4  | 218    | 261.6  | 305.2   | 348.8   |
| AP5 DA   | 111                      | 167    | 222    | 278    | 333    | 388.5   | 444     |
| AP5.5 DA | 157.6                    | 236.4  | 315.3  | 394.1  | 473    | 551.8   | 630.6   |
| AP6 DA   | 227                      | 340    | 454    | 567    | 680    | 794.5   | 908     |
| AP8 DA   | 426                      | 638    | 851    | 1064   | 1276   | 1491    | 1704    |
| AP10 DA  | 1078                     | 1617   | 2156   | 2695   | 3234   | 3773    | 4312    |

## Weight [kg]

| Model         | AP0D | AP1 | AP2 | AP3 | AP3.5 | AP4 | AP4.5 | AP5  | AP5.5 | AP6  | AP8  | AP10 |
|---------------|------|-----|-----|-----|-------|-----|-------|------|-------|------|------|------|
| Double acting | 0.4  | 0.9 | 1.3 | 2.5 | 3.8   | 4.9 | 8.3   | 10.1 | 14.6  | 19.5 | 36.7 | 110  |
| Single acting |      | 1   | 1.5 | 2.9 | 4.3   | 5.8 | 9.5   | 12.1 | 17    | 22.9 | 43.8 | 128  |

# Installation - Maintenance - Guarantee

## Installation

Before the actuator is mounted on the valve, one should determine the direction of rotation as well as the position you require to adjust by means of adjustment screws. Since the "Best-torque" actuators have the ISO 5211 mounting pattern and a square output drive, they can be mounted parallel as well as square to the piping. Also no different actuator has to be used for "normally open" and "normally closed". After mounting the actuator on the valve, please check whether you have to adjust the "End-of-stroke" position of the actuators, by means of the adjustment screws in the end caps. When the actuator has "problems" opening and/or closing the valve, the following should be checked:

- air supply, Air volume
- torque of the valve (this can go up because of various reasons)
- actuator shaft and valve shaft are aligned properly, so that there is no friction between the two.

## Maintenance

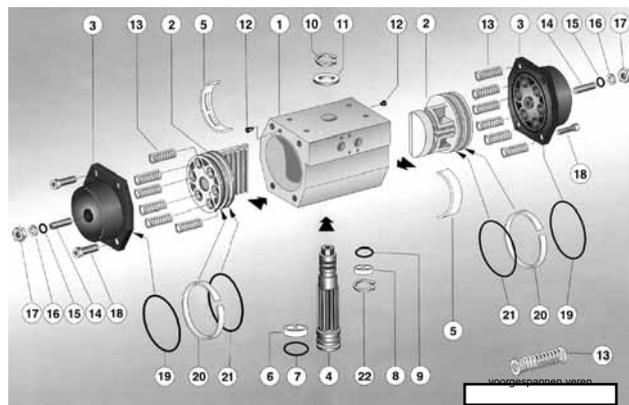
All actuators are, under "normal" circumstances, completely maintenance free. In case of extreme weather conditions, or extreme operation-frequencies, or other unfavourable circumstances, the following precautions should be made:

- all air connections should be depressurized
- all electrical components should be disconnected

## Guarantee

Every component is individually and thoroughly tested prior to assembly. Each actuator will be stamped on completion of full tests being carried out. Test certificates are available on request, at time of order placement, together with chemical analysis and mechanical tests of material used in the construction. Customer or third party inspection at our works before forwarding is possible at all times. Special tests and/or other requests, outside our product range, at cost. Best-torque guarantees their equipment against faulty material, design and testing, for a period of 18 months from shipment, or 12 months from installation, whichever is the shortest. Best-torque reserves the right to interrupt production and/or modify components and/or construction of their product, without obligation to substitute or modify materials previously supplied.

## Disassembly



- Remove end cap bolts (14) from end cap (3)
- Take off end caps (3)
- Turn pinion (4) clockwise (or anti-clockwise), so that pistons (2) get out of the body (1)
- Remove circlip (10) from pinion (4)
- Remove the pinion (4) from the body simply by finger pressing, from above.
- Replace following parts; if necessary:

### On the pistons (2):

- piston "O"-rings (21) 2 off
- nylon guide rings (20) 2 off
- piston guides (5) 2 off

### On the end caps (3):

- end cap "O" rings (19) 2 off
- "O" rings stroke adjustment screws (15) 2 off

### On the pinion (4):

- "O" rings (7+ 9)
- guide rings (6+8)

### On the body (1):

- plug(12) 2 Stuck

## Assembly

Follow the above procedure in reverse steps.