# Pneumatic Rotary Actuators


*(AP SERIES)*


*(APM SERIES)*

CE II 2 G/D

## *Foreword*

Thanks to its achieved experience in the field of the automation, since last 1979 SIRCA INTERNATIONAL has been producing and selling its rotary pneumatic actuators series AP.

The actuators are of rack and pinion type, and a kinetic energy turns a linear moving into a rotary one.
The opposed movement of the pistons is protected, as performed in a cylinder, on which extremities two end-cups are inserted.

They can be easily mounted on each type of equipment, and have light weight.

You can easily mount any fitting on them (limit switches, solenoid valves, positioners, disengageable gear boxes, levers, and so on).

They find their best appliance on the actioning of ball, butterfly and plug valves, which have a rotation angle of 90°; they can also be used on other equipment, having rotation angle of 120°-180°.

The torque they generate is proportional to the air supply pressure; therefore, a higher supply pressure corresponds to a higher torque.

Both double acting and spring return actuators have twin cylinders horizontally opposed and incorporate piston guides to ensure correct contact between the rack and pinion, at any pressure.

Double acting and spring return models are of similar overall size.

***Sirca Actuators offer an excellent cost-performance ratio***

## SPECIFICATIONS

- **Pressure range:**
2 bar (29 psig) to 8 bar (116 psig) double acting
3 bar ( 44 psig) to 8 bar (116 psig) spring return
max. working pressure 10 bar (145 psig).

- **Supply:**
filtered dry or lubricated air.
For non corrosive gas water or light hydraulic oil please check with Sirca's technical department.

- **Temperature range:**
STD -20°C (-4°F) a + 80°C (175°F)
on request +20°C (+68°F) a +150°C (302°F)
on request - 50°C (-58°F) a +100°C (212°F).

- **Rotation:**
counterclockwise when Port'A' is pressurized;
clockwise when PORT 'B' is pressurized
and for spring return actuators (see principle of operation).

- **Stroke:**
90° with standard adjustment ±3° (AP Series)
or bi-directional travel adjustment ±5° (APM Series).

- **Lubrication:**
all moving parts are factory lubricated for cycle life of the actuator.

- **Construction:**
in accordance to "Equipment or Protective system intended for use in potentially explosive atmosphere directive 94/9/CE".
Suitable for indoor and outdoor installation.

- **Connections:**
bottom drilling to match valve is in accordance with ISO 5211/DIN 3337 Interface for solenoid valve, shaft top end and top drilling to assemble accessories are in accordance with VDI / VDE 3845, NAMUR.

- **Inspection:**
each unit is hydraulically tested and certified and guaranteed for a minimum of 500.000 moves.

## MATERIALS

- **Actuator body:**
extruded aluminium alloy.

- **End cap:**
pressure die casting aluminium alloy

- **Pinion:**
E.N.P. Carbon steel or 303 S.S.

- **Piston:**
pressure die casting aluminium alloy

- **Guide:**
Acetal resin

- **"O" rings:**
Buna-n (NBR), FKM or Silicone

- **Springs:**
Epoxy coated spring steel

- **Screws and nuts:**
Stainless Steel

SIRCA
INTERNATIONAL S.P.A. (ITALY)

## AIR CONSUPTION FOR STROKE AIR (FREE AIR) in liters

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

## OPENING / CLOSING TIME (sec) at 5.6 bar/*80 p.s.i.*

| Model | AP1 | AP2 | AP3 | AP3.5 | AP4 | AP4.5 | AP5 | AP5.5 | AP6 | AP8 | AP10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Double Acting | Less than 1 Sec | Less than 1 Sec | Less than 1 Sec | Less than 1 Sec | Less than 1 Sec | Less than 1 Sec | Less than 1.25 Secs | Less than 1.5 Secs | 1.5÷2 Secs | 3÷4 Secs | 5÷6 Secs |
| Spring Return | Less than 1 Sec | Less than 1 Sec | Less than 1 Sec | Less than 1.5 Sec | Less than 1.5 Secs | Less than 1 Sec | 1.5÷2 Secs | 2 Secs | 2÷3 Secs | 4÷6 Secs | 7÷8 Secs |

## *WEIGHTS in Kgs

| Model | AP1 | AP2 | AP3 | AP3.5 | AP4 | AP4.5 | AP5 | AP5.5 | AP6 | AP8 | AP10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Double Acting | 1.15 | 1.60 | 2.80 | 4.28 | 5.80 | 8.26 | 11.63 | 14.15 | 21.70 | 40.10 | 110 |
| Spring Return* | 1.27 | 1.85 | 3.36 | 4.91 | 6.92 | 9.72 | 14.15 | 17.35 | 25.90 | 48.62 | 128 |

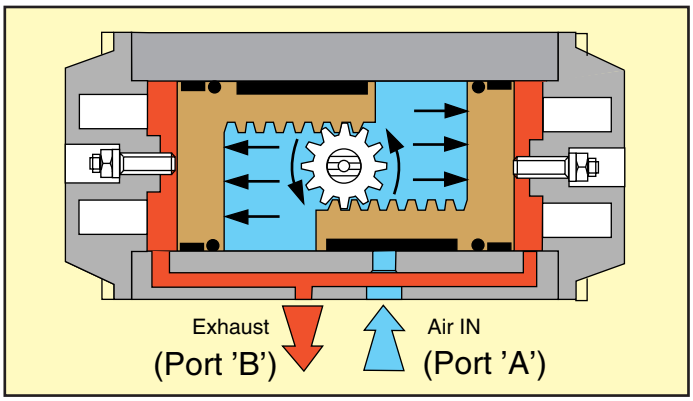
** Weights considering 6 (six) springs on each side of the caps*

## DOUBLE ACTING ACTUATOR (DA) ISO 5211

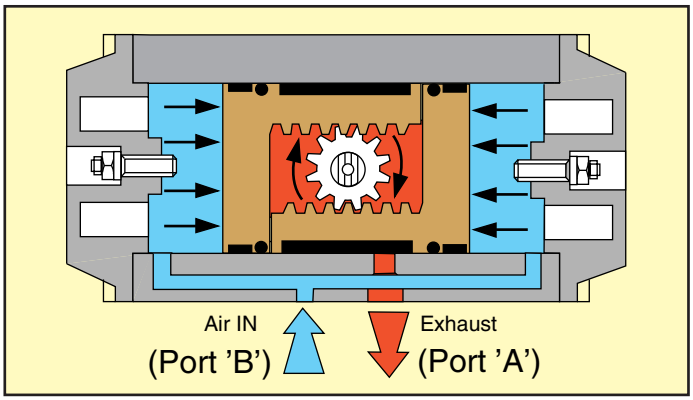
### PRINCIPLE OF OPERATION

Counter clockwise output operation is achieved by inserting pressure into **Port "A"**, to force the pistons apart thus rotating the actuator pinion counter clockwise.
During the 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"**.

**COUNTER CLOCKWISE OUTPUT ROTATION**




**CLOCKWISE OUTPUT ROTATION**

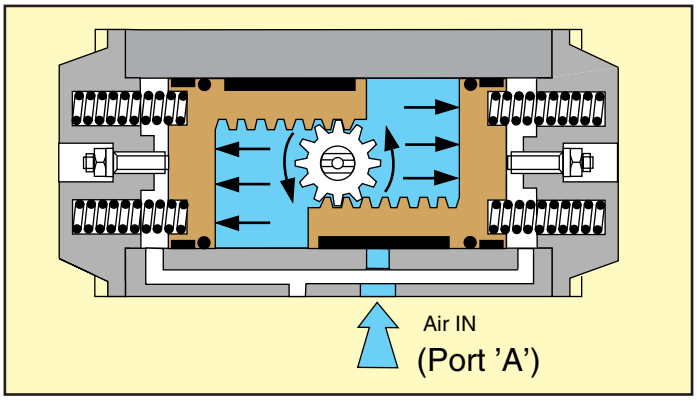



## SPRING RETURN ACTUATOR (SR) ISO 5211

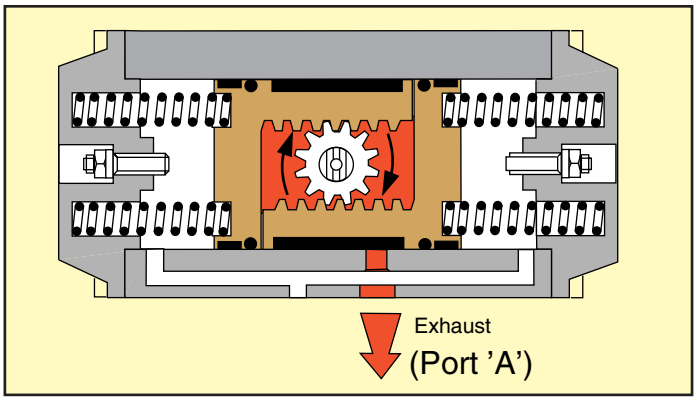
### PRINCIPLE OF OPERATION

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 counter counteil 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.

**COUNTER CLOCKWISE OUTPUT ROTATION**




**CLOCKWISE OUTPUT ROTATION**




## TORQUE OUTPUT DOUBLE ACTING ACTUATORS (DA) in Nm

| Model | OPERATING PRESSURE - bar / *p.s.i.* | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | 30 | 44 | 58 | 73 | 87 | 102 | 116 |
| 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 | 168 | 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 |

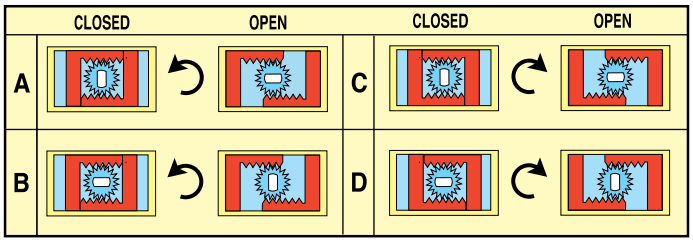
*NOTE: The output torque of selected actuator should never be less the requised valve torque*

## TORQUE OUTPUT SPRING RETURN ACTUATORS (SR) in Nm

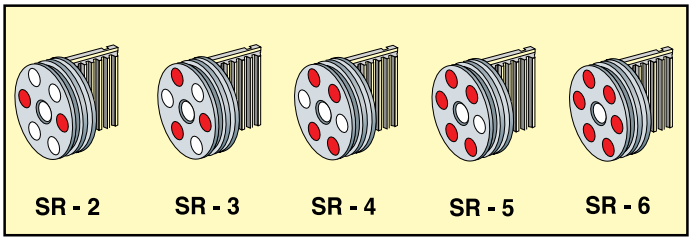
| Model | N° of Springs for each side of cap | OPERATING PRESSURE - bar / *p.s.i.* | | | | | | | | | | | | SPRING STROKE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 3 / 44 | | 4 / 58 | | 5 / 73 | | 6 / 87 | | 7 / 102 | | 8 / 116 | | | |
| | | 0° | 90° | 0° | 90° | 0° | 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 | 50.0 | 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 | 254.2 | 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 | 102.0 |
| 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 | 585.5 | 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 | 989.0 | 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 |

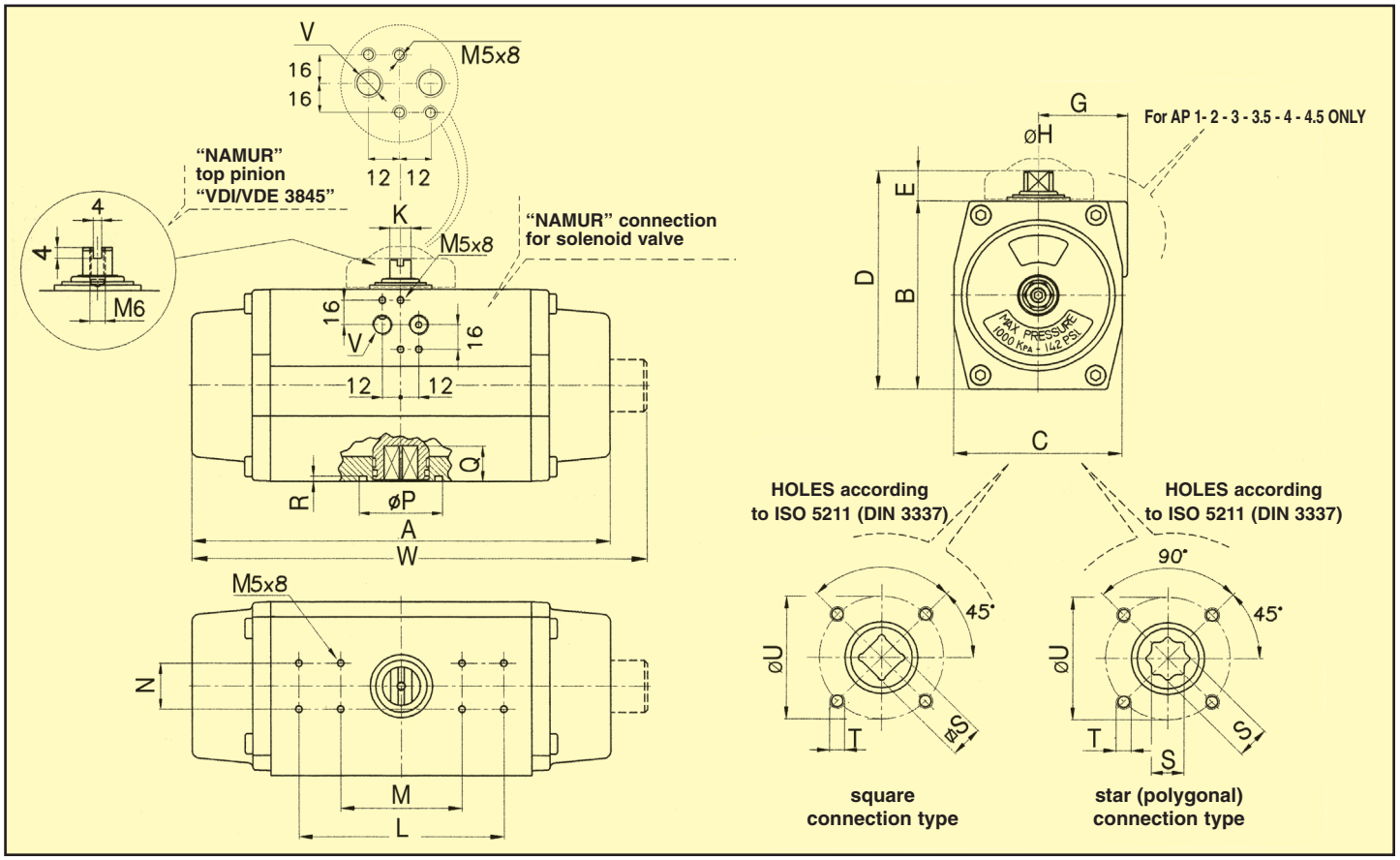
*NOTE: The output torque of selected actuator should never be less the requised valve torque*

## MOUNTING VARIATIONS




## RIGHT ARRANGEMENT OF SPRINGS






## DIMENSIONS in mm

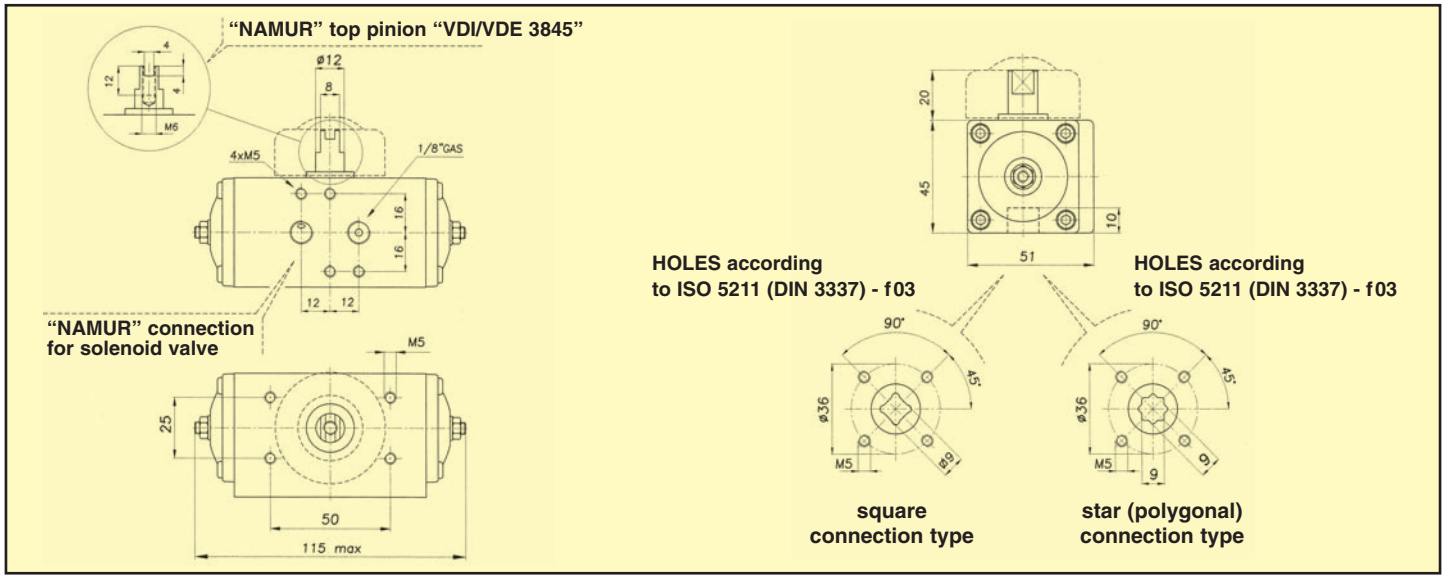
| Model | A | W* | B | C | D | E | F | G | H | K | L | M | N | P | Q | R | ⍁ S-S | T | U | V | ISO 5211 STD. | ISO 5211 SPECIAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **AP1** | 142 | 162 | 67 | 60 | 87 | 20 | 42 | 41 | 12 | 8 | - | 80 | 30 |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

**Dimension W only for APM series*

***Dimension on request*

****To be chosen when ordering*

## PNEUMATIC ACTUATOR AP0DA MODEL




### TORQUE OUTPUT DOUBLE ACTING (DA) in Nm

| OPERATING PRESSURE | | | | | | | |
|---|---|---|---|---|---|---|---|
| bar | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| *p.s.i.* | 29 | 44 | 58 | 73 | 87 | 102 | 116 |
| Nm | 2.4 | 3.6 | 4.8 | 6 | 7.3 | 8.5 | 9.7 |

### AIR CONSUMPTION FOR STROKE (FREE AIR) in Liters

| | |
|---|---|
| Counter Clockwise | 0.04 |
| Clockwise (DA only) | 0.05 |

### OPENING/CLOSING TIME (sec.) at 5.6 bar/*80 p.s.i.*

| | |
|---|---|
| Double Acting | Less Than 0.5 sec |

**WEIGHT: Kg 0.58**