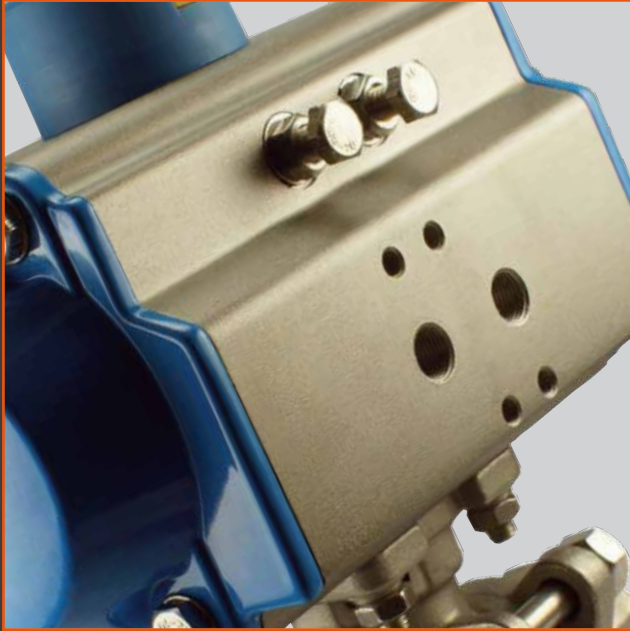


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**QUARTER TURN RACK &
PINION ACTUATORS**

**PNEUMATIC
RP SERIES**



**AUSTRALIAN
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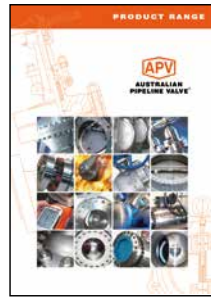
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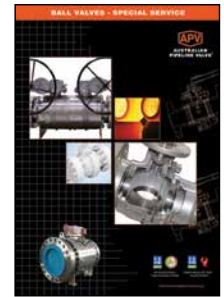
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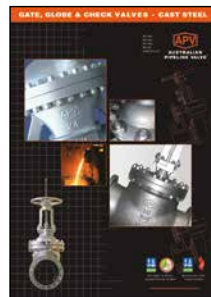
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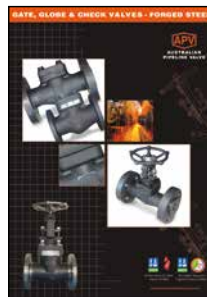
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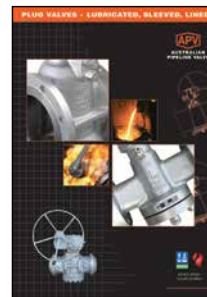
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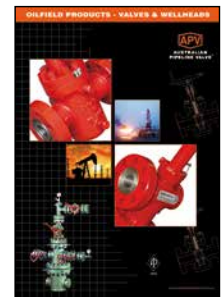
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Gate, Globe & Check Valves - Forged Steel



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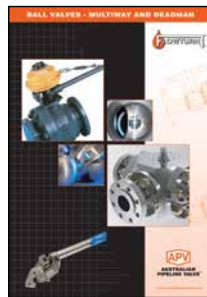


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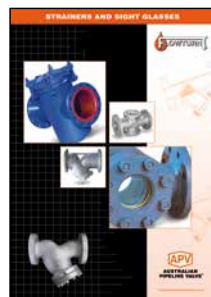
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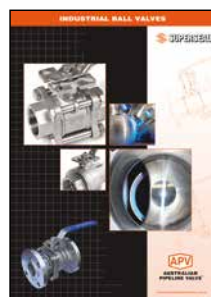
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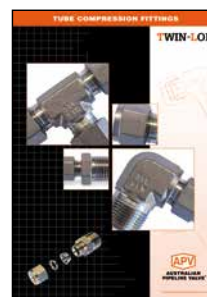
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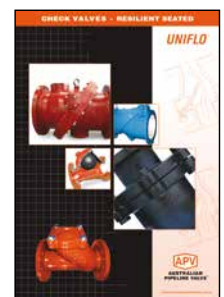
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Torqturn Actuators



TwinLok Tube Fittings



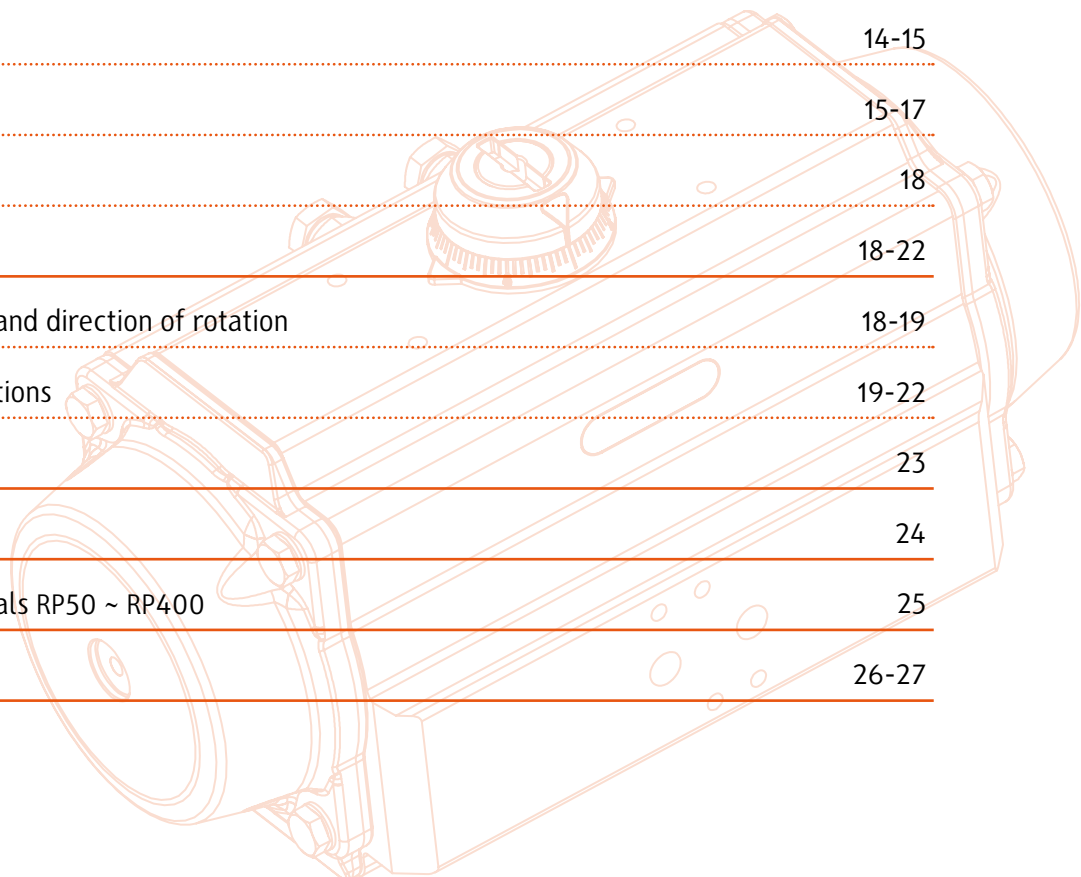
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Contact us for your local stockist/distributor

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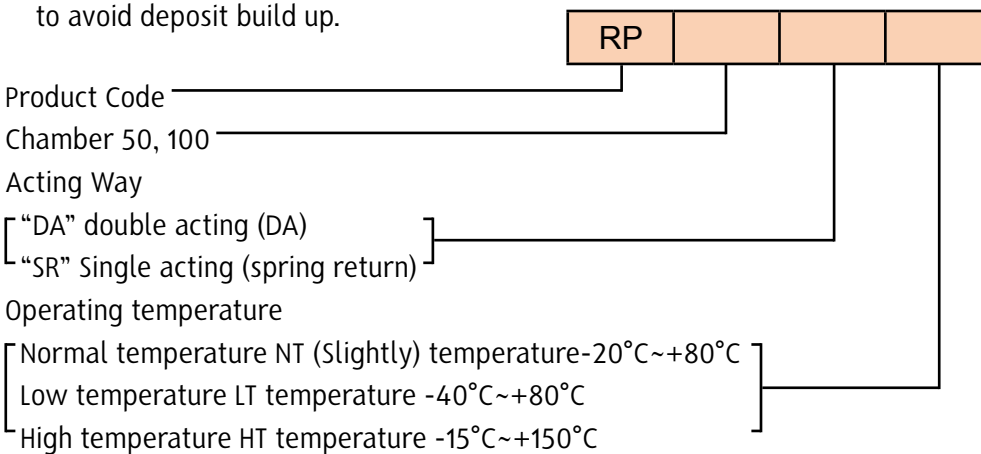
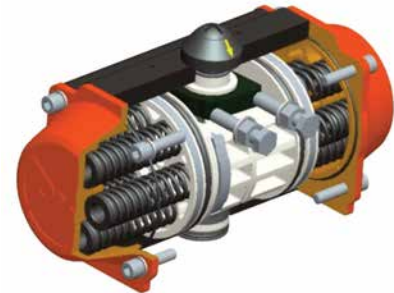


OVERVIEW

This instruction manual is for rack & pinion pneumatic actuators. The RP Series rack & pinion pneumatic actuator has been designed, developed and tested incorporating the latest technology and materials available, with some innovative design features. As a result of this product research we have obtained a high grade product with the following characteristics:



- Reliability
- High performance
- Wider product range permitting a more economical sizing selection.
- Innovative and patented universal drive shaft and multifunction position indicator
- Full compliance with latest worldwide specifications
- A wide selection of highest levels of corrosion protection technology
- Aesthetically compact and modern style with no external cavities to avoid deposit build up.



Operating media:

Dry or lubricated air or inert /non-corrosive gases on condition that they are compatible with internal actuator parts and lubricant. The operating media must have a dew point equal to -20°C (-40°F) or at least 10°C below the ambient temperature. The maximum particle size must not exceed 30 am

Supplying Pressure:

For Double Acting and spring Return actuators the maximum supply pressure is 8 Bar (116PSI). Minimum supply pressure is 2.5 Bar (36PSI)

Operating Temperature:

- Standard product from -20°C (-4°F) to +80°C (+176°F)
- Low temperature LT actuator with VMQ 'O' Rings from -40°C (-40°F)



to +80°C (+176°F)

- High temperature HT actuator with FPM 'O' Rings from - 15°C (+5°F) to +150°C (+302°F)



Caution

For low and high temperature service. Special lubricant is required. Please contact APV for each application. High and low temperature will vary changing the output torque of the actuator.

Stroke

There is ±5° adjustable angle at the position of open and end of close.

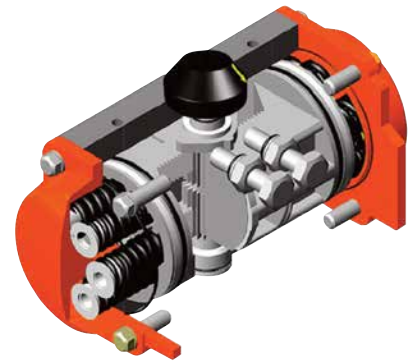
Operating Time:

See Technical Data Sheet

Lubrication:

Actuators are factory lubricated for the life under normal operating conditions.

The standard lubricant is suitable for use from -20°C (-4°C) +80°C (+176°F)



Construction:

Twin piston rack and pinion actuator design suitable for both indoor and outdoor installation.

Protection and Corrosion Resistance:

Actuators are supplied with corrosion protections for normal environments. For severe duties select from the protection level table or contact APV.



Note

We recommend that this entire document be read prior to proceeding with any installation. Do not attempt to repair this actuator, send it to APV or an APV approved repair facility. Australian Pipeline Valve and it's parent company take no responsibility for damage or injury to people, property or equipment. It is the sole responsibility of the user to ensure only specially trained actuator repair experts perform repairs under the supervision of a qualified supervisor.

RESPONSIBILITY FOR VALVE & ACTUATOR APPLICATION

The User is responsible for ordering the correct valves & actuators. The user is responsible for ensuring APV Valves & Actuators are selected and installed in conformance with the current pressure rating and design temperature requirements. Prior to installation, the nameplates and drawings should be checked for proper identification to ensure the valve & actuator is of the proper type, material and is of a suitable pressure class and temperature rating to satisfy the requirements of the service application.



Caution

Do not use valves & actuators in applications where either the pressure or temperature is higher than the allowable working values. Also, actuators should not be used in service media if not compatible with the material of construction, as this will cause chemical attacks, leakage and failure.

RECEIVING INSPECTION AND HANDLING

Valves & Actuators should be inspected upon receipt to ensure:

- Conformance with all purchase order requirements.
- Correct type, rating, size, body and materials and end connections.
- Any damage caused during shipping.



Caution

The User is advised that specifying an incorrect valve or actuator for the application may result in injuries or property damage. Selecting the correct valve and actuator type, rating, material and connections, in conformance with the required performance requirements is important for proper application and is the sole responsibility of the user.

SAFETY INFORMATION

The following general safety information should be taken in account in addition to the specific warnings and cautions specified in this manual. They are recommended precautions that must be understood and applied during operation and maintenance of the equipment covered in this I.O.M.



Caution

To avoid injury, never attempt disassembly while there are pressures either upstream or downstream. Furthermore, actuators with spring packs can rapidly close or open the valve on failure of air supply with extreme force. Also, entrapped dangerous fluids can be rapidly expelled, this can still happen when working on the actuated valve once it is removed from the line.



Caution

Spring packs are factory sealed and can be dangerous. Don not attempt to disassemble spring pack, send to an APV approved repairer.

This manual provides instructions for storing, general servicing, installation and removal of actuators.

APV and it's resellers refuses any liability for damage to people, property or plant as well as loss of production and loss of income under any circumstances but especially if caused by: Incorrect installation

or utilisation of the actuator or if the actuator installed is not fit for intended purpose. It is the sole responsibility of the user to ensure the valve type and materials are correctly specified.

1.0 WARNING

- It is important that the actuator is used only within the working limits indicated in the technical specifications.
- Do not operate the actuator over temperature limits: this could damage internal and external components (disassembly of spring return actuator may become dangerous).
- Do not operate the actuator over pressure limits: this could damage internal parts as well as cause damage to the housing and end-caps.
- Do not use the actuator in corrosive environments with incorrect protection: this could damage the internal and external parts.
- Do not disassemble individual spring cartridges, this may result in personal injury. If maintenance to springs is necessary, send them to Torqturn.
- Close and disconnect all air supply lines and make sure that air connections are vented during maintenance and installation on valve.
- Do not disassemble the actuator or remove end caps while the actuator is pressurised.
- Torqturn actuators are designed to be used only on valves.
- Before installing the actuator onto the valve make sure that the rotation direction and the position indicator are in the correct position.
- If the actuator is incorporated in a system or used within safety devices or circuits, the customer shall ensure that the national and local safety laws and regulations are observed.

2.0 WORKING CONDITIONS AND TECHNICAL DATA

Operating media: -

Dry or lubricated air or inert gases, provided that they are compatible with the actuator's internal parts and lubricant. The operating media must have a dew point equal to -20°C (-4°F) or at least 10°C below the ambient temperature. The maximum particle size contained into the operating media must not exceed $30\ \mu\text{m}$.

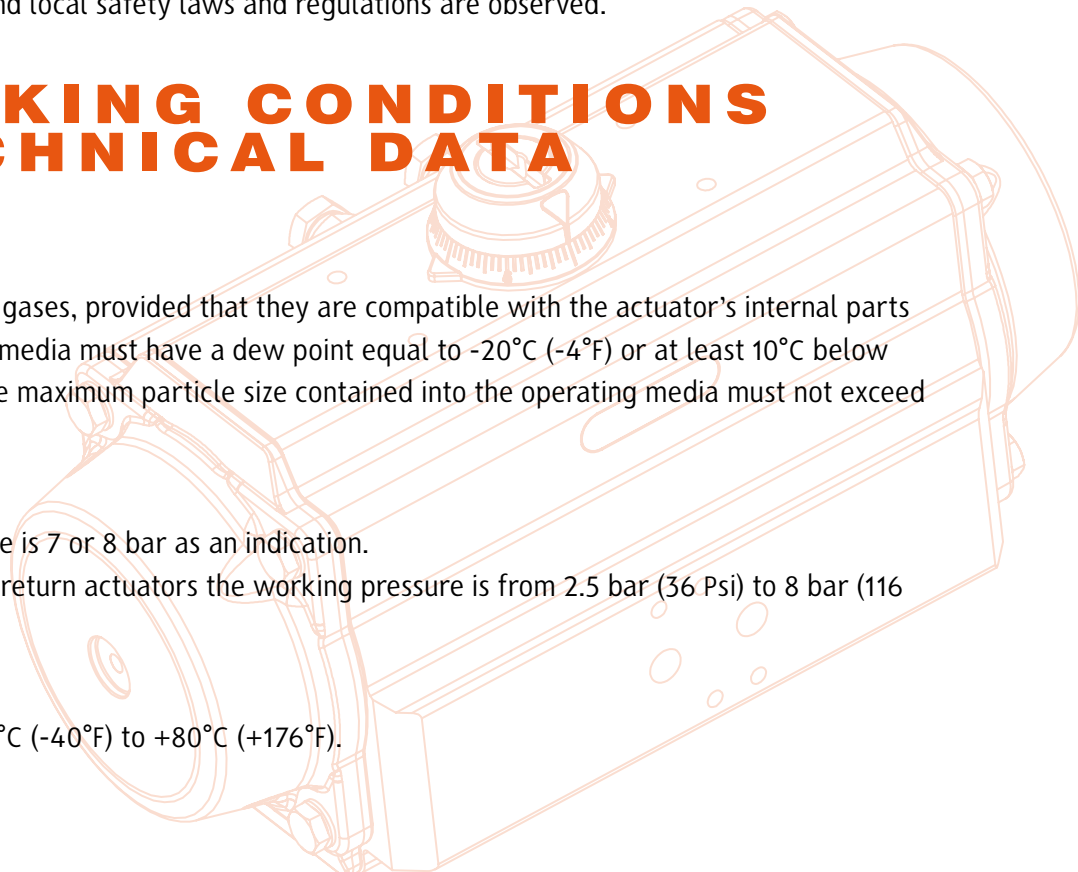
Supply pressure: -

The maximum supply pressure is 7 or 8 bar as an indication.

For double acting and spring return actuators the working pressure is from 2.5 bar (36 Psi) to 8 bar (116 Psi).

Operating temperature: -

Standard actuators from -40°C (-40°F) to $+80^{\circ}\text{C}$ ($+176^{\circ}\text{F}$).





Caution

For low and high temperature service, special grease and special components are required. Please contact us. Working at high or low temperature can affect the life and the output torque of the actuator.



Caution

The operating time depends on several factors such as supply pressure, supply system capacity (pipe diameter, flow capacity of pneumatic accessories), valve type, valve torque and figure, applied safety factor, cycle frequency, temperature, etc.

Rotation and stroke adjustment: -

The stroke for actuators is as follows:

Standard construction: 90° rotation with stroke adjustment at 0° and 90° (+ or - 4°)

Type 120° stroke: 120° rotation with stroke adjustment at 0° and 120° (+or-4°)

Type 180° stroke: 180° rotation with stroke adjustment at 0° and 180° (+or-4°)

Lubrication: -

The actuators are factory lubricated for the life of the actuator in normal working conditions.

The standard lubricant type GSTD is suitable for use from -40°C (-40°F) to +80°C (+176°F).

For extreme low temperature (LLT) and high temperature (HT) service, special grease is required: please contact us.

Construction: -

Rack & pinion actuator design suitable for both indoor and outdoor installations.

Water Ingress Protected

O-Rings are fitted on body caps and all joints. This ensures an effective seal to prevent ingress of water.

ISO Valve Mounting

The RP Series Actuators interface meets ISO standard, and meets the dimensional requirements of ISO defined for each torque range.

Standardised Interface

The shaft driven accessory interface conforms to NAMUR and are identical on all RP Series, allowing standardisation of accessory mounting hardware and installation practices.

Protection and corrosion resistance: -

All the actuators are supplied with corrosion protection for normal environments. For corrosion resistance of the different types of protection see technical data sheet. Before installing the actuator in aggressive environment, ensure that the selected protection level is suitable.

3.0 STORAGE & HANDLING

To ensure the seals remain flexible, and the actuator itself free moving during times of storage or intermediate services, air or nitrogen pressure should be cycled through the actuator at a minimum of three (3) times a month. Indoor storage is recommended for actuators in an environment where resilient seals can be preserved. To help keep out foreign particles and moisture; cylinder ports, control valve parts and body parts should be kept sealed.

4.0 INSTALLATION

Remove any existing manual gearing from the valve and move into the same position as the actuator (either both open or both closed). Inspect the stem adapter, valve stem, valve and actuator mounting surfaces for proper direction and any inconsistencies. In cases where the valve includes a lubricator fitting, this should be removed and a lubricator extension nipple installed. Refit the lubricator fitting into the extension nipple. If furnished loose, install the bushing for the stem adaptor over the valve stem, correctly position the set screw and mount actuator over bushing (parallel to the pipe). All nuts and bolts should be fastened evenly, ensuring the actuator is centred on the valve stem. Note: whilst the mounting bolts are loose the actuator can be cycled to help centre itself.

There are many actuator and valve variations, therefore it's not practical to list instructions for all kinds. The design of the mountings are kept simple for ease of installation. Actuators are factory shipped with the travel stops regulated for 90° revolution. However once the actuator is installed on the valve it will still require further stop adjustments. Reference should be made back to the valve manufacturer's recommendations for particular requirements. For valves that contain internal stops, the actuator must be adjusted at the same points. The "stopping" should be performed by the actuator itself. For valve without internal stops, adjust the actuator to the full open setting. Using this as a reference point, position the valve closed and adjust to the specifications recommended by the valve manufacturer for total rotation. High strength grades of steel like 410, F6, F51, 303, S31803, XM-19, 4140 and 17-4 PH are preferred for stem adaptors.

4.1 INSTALLATION, TUBE & FITTINGS



Caution

Avoid high temperature, low temperature, high moisture and corrosive applications unless the actuator has been designed for the application.

- a. Use brass or 316 stainless steel tubing, try to avoid vibration, secure piping to avoid leakage. In case of any vibration or impact during transportation, check tubing and fittings for leakage.

- b. Different pneumatic actuators have different air inlet sizes from 3/8” to 2” NPT. Using a smaller size piping (or reduce orifice valves, solenoids, etc.) will reduce opening speeds. **Table 1 - Air Inlet sizes**
- c. To ensure quick operation of the actuator, do not use a smaller tube or fitting size than the inlet size provided. Also valves with reduced orifices will reduce air flow.
- d. Operating media is filtered dry air, if dew point is over -15°C use a dryer.

4.2 OPERATION

4.2.1 Auto-Operation on/off

On/off operation for pneumatic & hydraulic actuated valve:

- A) The valve is open when solenoid valve is energised (fail close type)
- B) The valve is close when solenoid valve is de-energised (fail close type)
- C) The valve is close when solenoid valve is energised (fail open type)
- D) The valve is open when solenoid valve is de-energised (fail open type)

4.2.2 Modulating-Control Operation

Modulating control pneumatic & hydraulic actuated control valve:

- a) Input 4~20mA electric signals to the electro-pneumatic positioner, valve’s open degree is proportionally regulated in 0°~90° stroke through different current size the positioner achieves.
- b) Input 0.02~0.1MPa air signals to the pneumatic-pneumatic positioner, valve’s open degree is proportionally regulated on 0,~90° stroke through different air pressures the positioner supplies.

4.3 MANUAL OVER-RIDE OPERATION

Declutchable Worm Gear Manual Over-ride - DA Actuators

Double acting actuators are optionally available with a declutchable worm gear manual over-ride (refer Figure 1 & 2). Manual operating steps: firstly open the equalising valve on the pneumatic actuator, draw out the pull pin of the gear operator with one hand, simultaneously, use another hand to turn the clutch lever counter clockwise, until the worm and the worm gear engages, then release the pull pin. After the pin has returned into the eccentric sleeve, you can then operate the valve manually. Turn the handwheel clockwise to close the valve, turn the handwheel counter clockwise to open the valve. To return to automatic mode, first draw out the pull pin in the gear operator with one hand, simultaneously use another hand to turn the clutch lever clockwise until the worm and worm gear disengages, then release the pull pin. After the pin has returned into the eccentric sleeve, close the equalising valve.

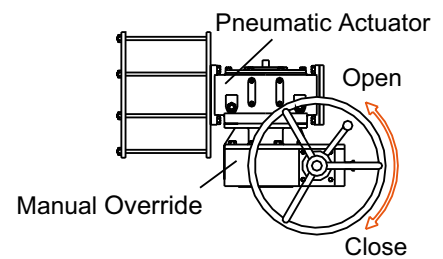


Figure 1

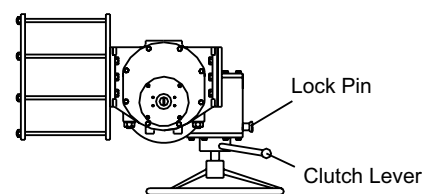


Figure 2

4.4 ACTUATOR SIZING



Caution

All factors shown in section 4.4.1 to 4.4.3 are only estimating guides and are based more on common smaller sizes valves. It is impossible to accurately estimate the effect on torque all the below factors will have. However, section 2.5.1 to 2.5.3 provide a rough guide and serve as a warning to ensure users are aware of the dramatic affect all the below factors can have on torque.

4.4.1 General Sizing Rules for Soft Seated Ball Valves

Valve and actuator torque values published are theoretical, however where required APV will perform a torque test prior to despatch. The real valve torque value can be higher depending upon the following listed factors as these factors can drastically increase (or decrease) the torque of soft seated ball valves. These factors will have a similar effect on soft seated butterfly valves. Metal to metal seated ball, butterfly and plug valves will also be effected but the torque implications will vary.

- 1) Fluid carrying dust, powder, abrasive particles (+50% to 125%). In extreme cases can be higher. i.e. Up to 200%.
 - 1a) Slurry, pulp, resins, paste (+50%) can be much higher in some cases.
- 2) Dry service (Dry Gas) (+30%).
- 3) High or low temperature (consult us).
- 4) Infrequent use (+30-50%) *1 - *2.
- 5) If a higher minimum air supply than used in the calculation is available more torque will be produced in the air operation phase, (do not exceed maximum air capacity of the actuator).
- 6) Torque is based on a maximum Delta P for class. If your actual working pressure is lower please advise as a smaller actuator may be possible.
- 7) Lubricated service (clean oil or other high lubricity fluid) (+15%).

*1 PTFE/RPTFE seats can require more torque to unseat after a period of time due to it's fluidity & 'memory'. For Devlon/Nylon Seat the valve torque is higher and PEEK® is even higher (of course this should be factored into torque of valve where applicable), however as these are harder materials (especially PEEK®) infrequent use has a lesser effect on the increase in torque.

*2 Where set fail closed, additional infrequent use safety factor only needs to be applied to spring stroke torques. Allow additional 50% safety factor if valve is being operated less than once per month.

4.4.2 Actuator Sizing for Ball Valves

Use the following 'ready reckoner' rough estimating guide* to calculate the torque values required to turn a ball valve through it's 90° travel. Consider torque requirements at these five basic positions:

BTO - Break open torque: the torque required to unseat the closed valve. 100% of the stated torque.

RTO - Opening torque: the torque needed to move the valve to the fully open position. Average 70% of stated BTO torque*.

ETO - Open breakout torque: the torque required to move the valve from the fully open position. 70% of

stated BTO torque*.

ETC - Closing torque: the torque required to reseal a closing valve. 85% of stated BTO torque*.

RTC - Running torque: the torque needed to keep the ball moving through it's travel. 50% of stated BTO torque*.

MAST- Maximum stem torque - refer to manufacturer.

*Average guide based on floating ball and smaller size trunnion ball valves. Large trunnion ball valves have slightly different ratios. Butterfly and plug valves have totally different ratios.

4.4.3 Elements that Effect Soft Seated Ball Valve Operating Torque

The below factors are only for use as a rough estimating guide only and apply to smaller diameter ball valves. Furthermore, the effects the following factors have will vary for trunnion ball valves, even in smaller sizes. For trunnion ball valves it is impossible to provide accurate multipliers, however the below factors will effect all types of soft seated valves in all sizes to a certain degree and should be taken into account when specifying safety factors.

For a particular size and differential pressure, the torque of soft seated ball valves depend on many factors. Use the torque multipliers stated below with the selected valve's stated 'break', 'end to close' and 'end to open' torques as needed for your application.

Seat Material: The friction force or degree of holding force depends on the seat material type.

Seat Material	Seat Type Multiplier* ¹
15% - 25% Glass RPTFE	1.0
Virgin PTFE	0.8
Carbon Graphite RPTFE	1.0
PEEK	2.3
Delrin	2.0

*1 - For floating ball valves up to 175 NM. For larger valves consult us.

Fluid Type: Torque values depend on media type. Torque will become higher with dry, gasses or liquids with solids and lower with oils. Torque multipliers are shown in the table (based on normal temperatures).

Fluid	Fluid Type Multiplier
Gas or superheated steam, clean / dry	1.2 - 1.3
Viscous fluid	1.4 - 1.6
Liquids containing abrasive solids	1.3 - 2.0* ²
Clean / non-lubricating	1.0
Clean / lubricating	0.8

*2 - Can be higher.

Frequency of Operation: When a valve remains in closed position for extended periods of time, the breakout torque increases.

Frequency	Frequency Multiplier
Once per day or greater	1.0
Once per week or greater	1.3
Once per month or greater	1.4
Once per 4 months or greater	1.5
Critical ESD services	1.8

Temperature Effect: For operating temperature from 80°C to 130°C, use the torque multiplier given. For 0°C to 80°C no temperature multiplier is required. For operating temperatures less than 0°C and above 140°C consult Australian Pipeline Valve.

$$\text{Temperature Multiplier} = \frac{\text{Temp } ^\circ\text{C}}{100}$$

The above is an approximate guide only, for estimating purposes.

4.5 ACTUATOR INSTALLATION INSTRUCTIONS

The Torqturn actuator is a pneumatic device for the remote operation of industrial valves. The actuator will operate through 90°, 120°, 135° and 180° rotation permitting the opening and closing of many types of valves up to 180° rotation. All the necessary technical information to install the actuator correctly and safely onto the valve i.e. dimensions, output torque, supply pressure, air volume, stroke adjustment, operating time and operating temperature.



- For safety reasons, the actuator must not be pressurised at any time during installation as it may result in injury.
- The utmost cleanliness is required during air supply connection the actuator i.e. the connecting pipe thread, fittings and seals must be clean and dirt-free.
- When fitting accessories onto the actuators, assemble them in such a way that the emergency control of the solenoid valve and the top of the drive shaft are easily accessible, should emergency manual operation be required.
- Before fitting onto the valve, make sure that the actuator/valve are correctly orientated, depending upon which direction of rotation is required.
- For spring return actuators, avoid dangerous and/or corrosive substances in the working environment enter into the external chambers by using adequate filters and/or solenoid valves.
- Remove plugs from actuator air connections during installation and operation. Protect the air connections not being used immediately.

Interfaces for actuator control and connections

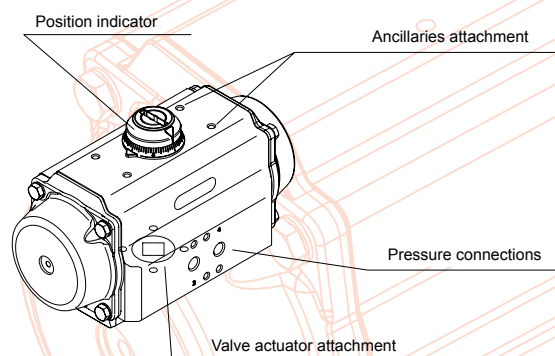


Figure 3

Solenoid valve mounting

Before mounting a solenoid valve, ensure that the actuator is in its normal position (closed position) with pistons inwards.

For standard rotation type “ST” (clockwise to close) assembly: the groove on the drive shaft or on the position indicator (2) must be horizontal to the longitudinal axis of the actuator in the closed position. Fit the solenoid valve (4) onto the actuator (3) using the provided screws (max. tightening torque see Table 1).

Switchbox mounting

Fit the switchbox and bracket (1) onto the actuator (3) using four screws provided (max. tightening torque see Table 1).

**Assembly of accessories:
solenoid valves and switchboxes**

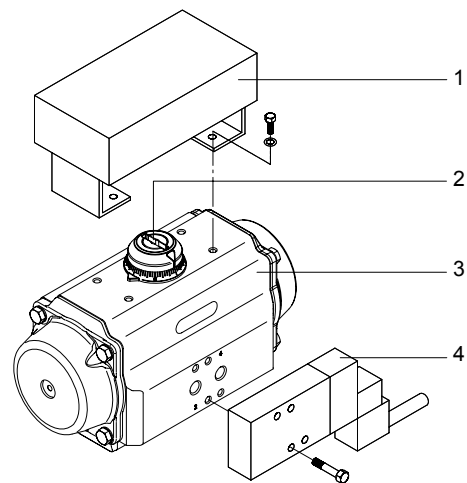


Figure 4

Before proceeding with the assembly of the actuator onto the valve, be sure that the actuator operates in the desired direction of rotation when pressurised and both actuator/valve are in the correct position.

It is important to note when using a spring return actuator for a fail safe operation, ensure that when air or electricity failure occurs the direction of rotation is correct for your application.

Fit the actuator (3) onto the valve (5). It is possible to assemble the valve onto the actuator in two ways:

Direct-mount: fit the stem of the valve (5) directly onto the female connection of the actuator (3) and bolt together through the valve ISO pad (max. tightening torque see Table 1).

Bracket-mount: mounting with a bracket (6) and coupling (7), the bracket is bolted to the actuator/valve to join them together and the coupling is used to connect the actuator output drive to the valve stem (max. tightening torque see Table 1).

Assembly of valve

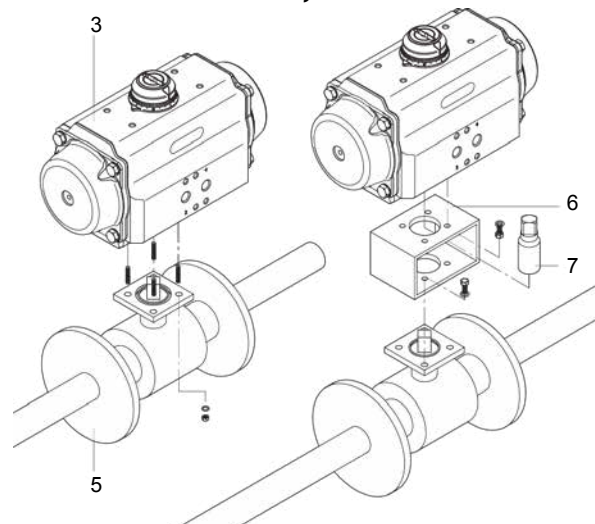


Figure 5

Tightening torque Table 1

M.	Nm	M.	Nm
M5	5 - 6	M14	132 - 138
M6	10 - 11	M16	200 - 210
M8	23 - 25	M20	390 - 410
M10	48 - 52	M24	675 - 705
M12	82 - 86	M30	1340 - 1400

5.0 COMMISSIONING

If the unit has been left in the same position for long periods, the packings and seals may have set. This means that when the actuator is again operated, possible leakage may come from the piston seals or rod packings. Cycling the unit several times will activate the packings and seals to work efficiently.

Many factors will effect the rate of operation:

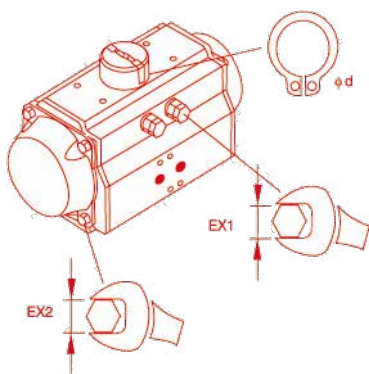
- a) how far away it is from the source of pressure
- b) the diameter and pressure of the supply line
- c) the size of the airline supply valve orifice
- d) the torque requirements of the valve
- e) the actuator size
- f) impurities in the valve stem seat
- g) temperature and viscosity of media

As any one of these factors effects the other, a typical operating time is difficult to forecast. However, operating time can be decreased as follows:

- a) larger diameter and higher pressure of the supply line
- b) larger airline control valve orifice size
- c) high speed exhaust valves

Flow control valves may be used to indicate the flow of exhaust however this will reduce running time. We do not recommend measuring the incoming source or exhaust flow to great lengths as this may cause inconsistent operation.

6.0 MAINTENANCE INSTRUCTIONS



The following provides the end user with all the required information necessary for maintenance. Under normal operating conditions the actuator requires only periodic observation to ensure proper adjustment.

Rebuilding of the actuators is only permitted by personnel of Australian Pipeline Valve, or to personnel which are properly instructed. By contravention the guarantee expires.

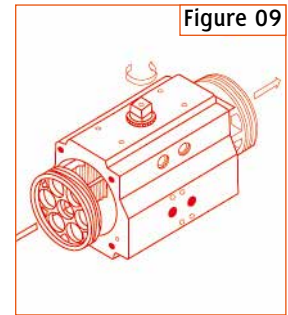
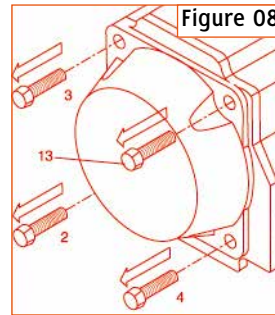
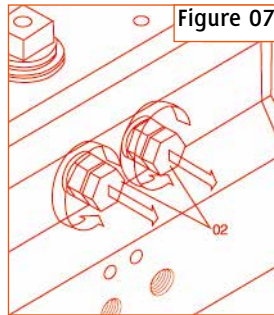
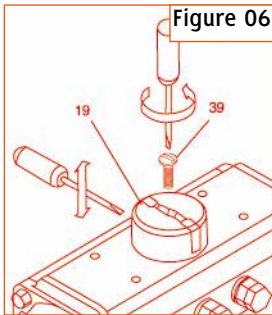
Spare kits for maintenance are available to replace all seals and bearings (soft components listed in Table 2) that may be necessary between 300,000 and 1,000,000 cycles depending on operating and/or environment conditions and actuator size.

Spare Parts Components Table 2

Model	EX1 mm	EX2 mm	ø dmm	Model	EX1 mm	EX2 mm	ø dmm
50	10	8	14	145	22	17	45
63	10	10	16	160	22	19	48
75	13	10	22	180	24	19	52
88	13	10	25	200	30	22	58
100	17	13	26	240	30	24	68
115	19	13	36	265	36	22	80
125	19	17	38	330	46	24	90

6.1 DISASSEMBLY

When disassembly of actuator is required for maintenance, firstly remove the actuator from the valve before performing any disassembly operations. It is important to verify that the actuator is not pressurised. Always use caution and double check that the ports 2 and 4 are vented and are free from any accessory and/or device. When the actuator is a spring return unit, make sure that the actuator is in the failed position before disassembling.



6.1.1 Removal of position indicator (Part No. 19), Figure 06

- Remove cap screw (39) if fitted
- Lift position indicator (19) off shaft, it may be necessary to pry gently with a screwdriver.

6.1.2 Removal of stop cap screws (Part No. 02), Figure 07

- Remove both stop cap screws together with nut (04) and washer (03)
- Remove stop screw o-rings (11) and discard if replacing all soft parts.

6.1.3 End caps disassembly (Part No. 30 right and 31 left) for model 180 to 330 the 2 end caps (30) are symmetric, Figure 08

- Remove cap screw (End cap 13) in the sequence shown in the Figure 08.



Caution

When disassembling a spring return actuator, the end cap (30 and 31) should be loose after unscrewing end cap bolts (13) 4 - 5 turns. If there is still force on the end cap after 4 - 5 turns of the end cap bolts, this may indicate a damaged spring cartridge and any further disassembly should be discontinued. Further disassembly of the end caps may result in injury. Return the actuator to Australian Pipeline Valve for further maintenance.

- For spring return actuators, always remove spring cartridge
- Remove end cap o-rings (14) and discard if replacing all soft components.

6.1.4 Pistons disassembly (Part No. 40), Figure 09

- Holding the body (50) in a vice or similar device, rotate the drive shaft (60) until the pistons (40) are released.

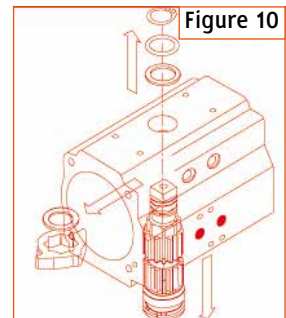


Air pressure should not be used to remove the pistons from the body

- Remove piston o-rings (16) using a small screwdriver, remove the piston back (05) and piston head (15) bearings. Discard bearings when replacing all soft components.

6.1.5 Pinion shaft disassembling (Part No. 60), Figure 10

- Remove spring clip (18) carefully, using nap-ring pliers, remove the external thrust bearing (08) and thrust washer (10).
- Apply downward force to the top of drive shaft (60) until it is partially out of the bottom of the body when it is possible to remove the octi-cam (01) and internal thrust bearing (08), then push the pinion (60) completely out of the bottom of the body. If pinion does not remove freely gently tap the top of the shaft with a plastic mallet.
- Remove the top and bottom pinion bearings (06) and (07) and top and bottom pinion o-rings (20 and 21).
- Discard bearings (06) and (07), internal and external thrust washer (08) and o-rings (20) and (21) if replacing all soft components.



When all components are disassembled, those not being replaced should be properly cleaned and inspected for wear prior to being greased and re-assembled.



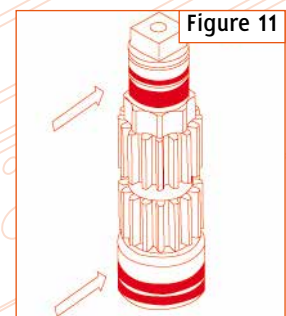
Only a trained actuator specialist should attempt any disassembly or conversion. Actuators can be under high spring loads and are dangerous devices. Valves can be rapidly slammed shut, possible safety threat. Entrapped dangerous fluid can be rapidly expelled.

6.2 ASSEMBLY

Prior to assembly, ensure all components are perfectly clean and free from damage. Please see point 3 for recommended lubricants.

6.2.1 Drive shaft assembly (Part No. 60), Figures 11 and 12

- Install top and bottom pinion bearings (06) and (07) and top and bottom pinion o-rings (20) and (21) onto the shaft.
- Grease the outside surface of the drive shaft (60) in the body (50), install the octi-cam (01) in the correct position as shown in Figure 12 related to the bottom and top of the drive shaft and the rotation of the actuator when

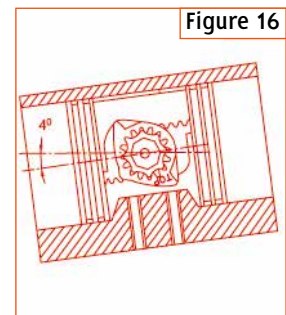
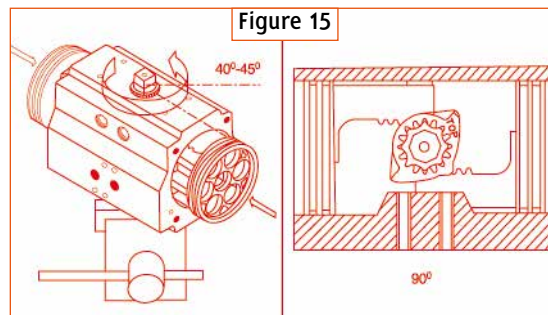
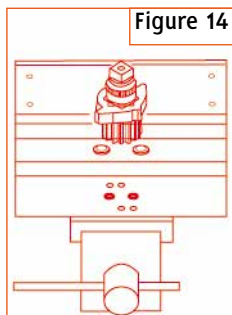
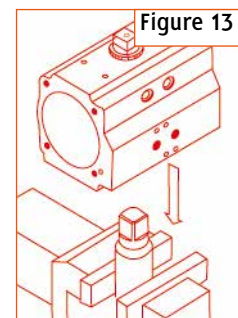
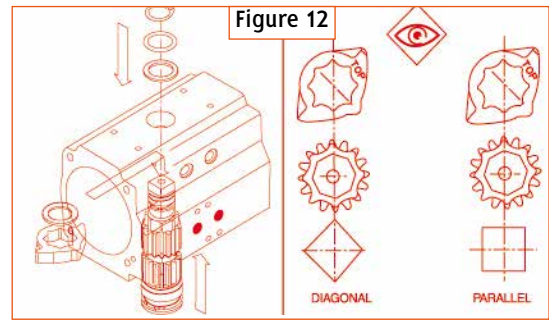


energised and install internal thrust bearing (08). Insert completely the drive shaft in the body.

- Fit external thrust bearing (08), thrust washer (10) and then external circlip (18) using snap ring pliers.

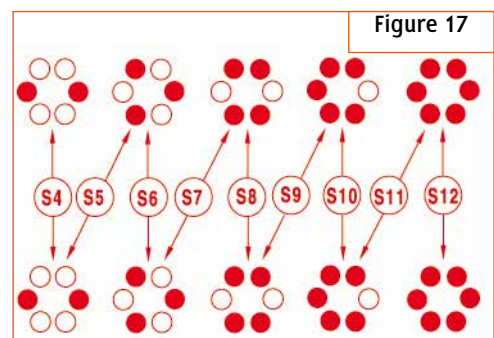
6.2.2 Pistons assembly (Part No. 40), Figures 13, 14, 15 and 16

- Install piston o-rings (16), the piston skirt (05) and piston head (15) bearings.
- Grease the internal surface of the body (50) and the piston (40) rack teeth.
- Hold the body (50) in a horizontal position by inserting the top of the shaft into a vice or the bottom of the shaft connection into a mal drive fitted in a vice as shown in Figure 13.
- Ensure that the octi-cam is in the right position as shown in Figure 14.
- For standard rotation assembly (clockwise to close) rotate the body (50) about 40-45° counterclockwise from bottom view or clockwise from top view depending on which way the shaft has been linked as shown in Figure 15.
- Press the two pistons (40) simultaneously inside the body (50) until the pistons are engaged and rotate the body clockwise from the bottom view or counterclockwise from top view until the stroke is complete.
- Ensure that when the pistons are inserted that they both mesh at the same time. Check fully closed and open positions as shown in Figure 16.



6.2.3 End cap (Part No. 30 right and 31 left) and spring cartridge (17) assembly (for model 180 to 330 the 2 end caps 30 are symmetric), Figures 17, 18 and 19

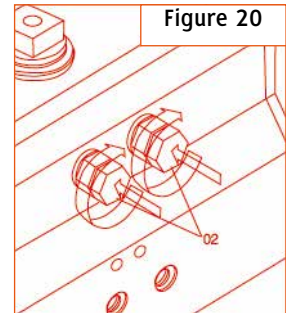
- Lubricate the body.
- For spring return actuator insert the proper quantity of spring cartridge according to the pattern shown in Figure 17 (referring to the total number of springs). Insert spring cartridge (17) as shown in Figure 18.
- Fit end cap o-ring seal (14) into the groove in the end cap, on both end caps.



- Fit end caps onto the body (50), verifying that the o-ring remains in the groove.
- Insert all the cap screws (13) and tighten each only partially. Complete tightening by following the sequence indicated in Figure 19.

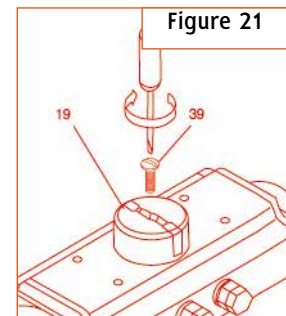
6.2.4 Assembly of stop cap screws (Part No. 02), and stroke adjustment Figure 20

- Insert on both the stop cap screw (02), the nut (04), the washer (03), and the o-ring in (11).
- Fit the stop cap screw (02) in the body.



6.2.5 Stroke adjustment for standard rotation actuator (Clockwise to close)

- 0° (Close) position stroke adjustment with actuator in close position, screw or unscrew the right (from top view) stop cap screw (02) until the desired stop position is achieved. Then tighten the stop adjustment nut (04) to lock it in place.
- 90° (open) position stroke adjustment with actuator in open position, screw or unscrew the left (from top view) stop cap screw (02) until the desired stop position is achieved, then tighten the stop adjustment nut (04) and lock it in place.



6.2.6 Assembly of position indicator (Part No. 19 and 39), Figure 21

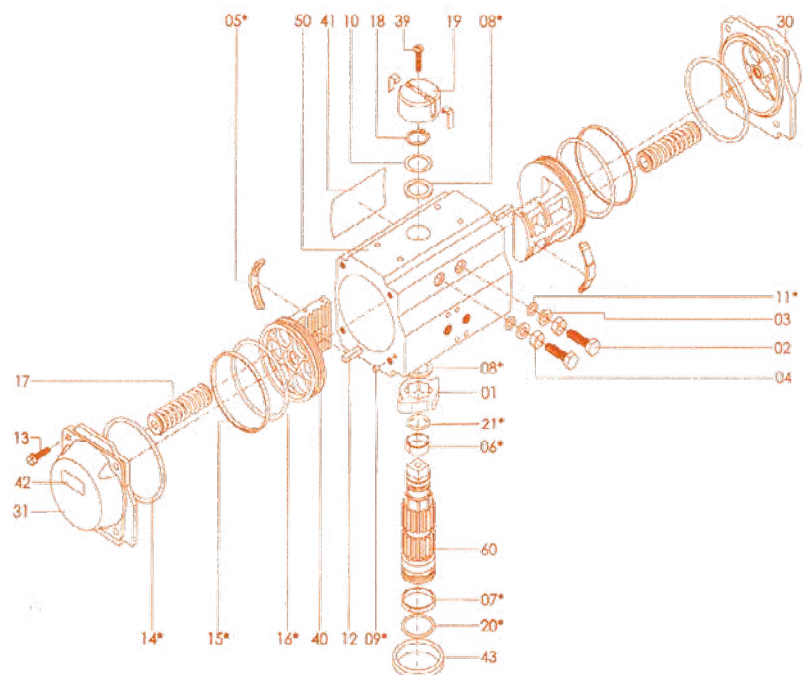
- Fit position indicator (19) on the shaft verifying that it indicates the correct actuator position.
- Then fit cap screws (39) where fitted.

Suggested* spare parts for maintenance

Part No	Unit QTY	Part Description
01	1	Octi-Cam (Stop arrangement)
02	2	Stop Cap Screw
03	2	Washer
04	2	Nut (Stop screw)
05*	2	Bearing (Piston back)
06*	1	Bearing (Piston top)
07*	1	Bearing (Piston bottom)
08*	2	Thrust Bearing (Pinion)
09*	2	Plug
10	1	Thrust Washer (Pinion)
11*	2	O-ring (Stop screw)
12	2	Piston Guide
13	8/12/16(A)	Cap Screw (End cap)
14*	2	O-ring (End cap)
15*	2	Bearing (Piston head)
16*	2	O-ring (Piston)
17	min.5 max.12	Spring (Cartridge)
18	1	Spring Clip (Pinion)
19	1	Position Indicator
20*	1	O-ring (Pinion bottom)
21*	1	O-ring (Pinion top)
30(B)	1	Right End Cap
31(B)	1	Left End Cap
39	1	Cap Screw (Indicator)
40	2	Piston
41	1	Actuator Identification Label
42	2	End Cap Label
43	1	Spigot (Only on request)
50	1	Body
60	1	Drive Shaft

Note (A): 12 pcs for model 265

*Suggested spares



6.3 STORAGE

6.3.1 Storage Instructions

If the actuator is not for immediate use, the following precaution must be taken for storage:

- Store the actuator in a clean and dry environment and at a temperature between -20°C (-4°F) and +40, C (+104°F).
- It is recommended that the actuator be stored in its original box.
- Do not remove the plastic plugs on air supply ports.

6.3.2 Lifting and Handling

It is recommended to lift the actuators with proper, adequate and permitted systems in relation to the actuator weight and by following the ruling laws in terms of safety and health protection. The weight of the actuators is indicated on the Torqturn catalogue and on the related technical data sheets. During the lifting and the handling of the actuators, it is recommended to avoid clashes and/ or accidental falls in order to avoid irreparable damages to the actuators and to compromise the functionality.

Contact APV for any information and technical data sheets.

7.0 OPERATION

Typical operation of the actuator involves applying pressure to the appropriate pressure inlet(s) of a double acting or spring return cylinder by means of a suitable control valve. APV-Torqturn actuators are sized to ensure the required valve torque is produced at the supply pressure selected by the customer.

All APV-Torqturn actuators feature a fully enclosed body cavity which ensures protection for all moving parts and eliminates the possibility of injury to operating personnel. APV-Torqturn pneumatic actuators do not require additional lubricants.

When using APV-Torqturn actuators manually, the supply pressure is required to be vented or equalised on either side of the power piston (with some provision for handling the minor difference in displacement of opposing sides of the cylinder position).

- a) When operation is a 'declutchable' gearbox, move the lever until the mechanism is engaged. With this done, the gearbox then operates actuator and valve.

7.1 OPERATING FUNCTION AND DIRECTION OF ROTATION

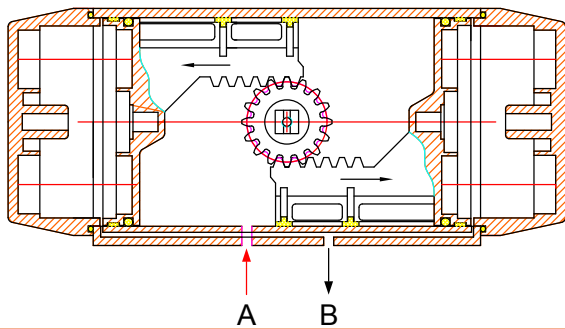
The actuator is a pneumatic device for remote operation of industrial valves. The operation (90°,120°,135° or 180° rotation) may be activated by different methods:

- Direct mounting of solenoid valve (5/2 for double acting, 3/2 for spring return) to pressure connections 2 and 4, connected to supply and control lines.
- Screwed connection (to pressure connections 2 and 4) with air lines from separate control cabinet.

The standard rotation (when port 4 is pressurized or for spring action) is clockwise to close. When port 2 is pressurized, counter-clockwise rotation is obtained. Torqturn actuators can be supplied with different types of assembly/rotation direction depending on the type of required operation and/or installation, see technical data sheets.

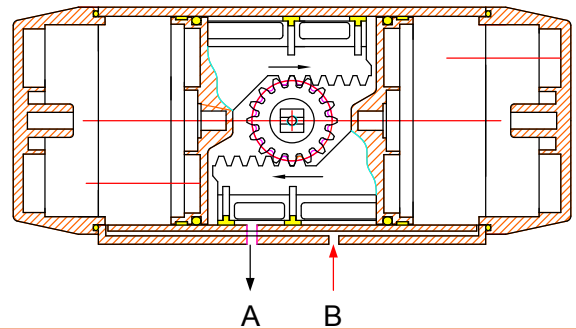
Standard Rotation

Double-acting



Counter Clock Wise

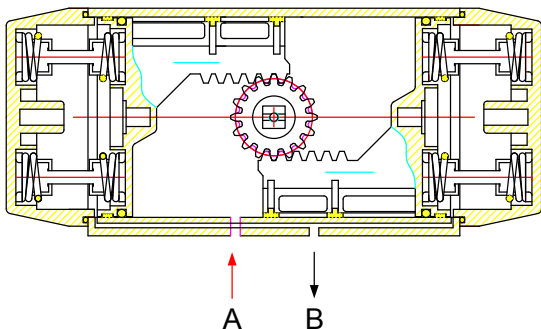
Air to Port A forces the pistons outwards, causing the pinion to turn counterclockwise while the air is being exhausted from Port B.



Clock Wise

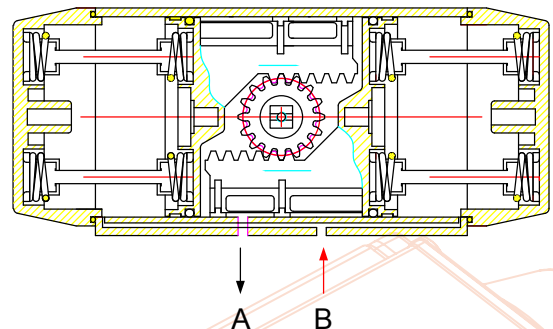
Air to Port B forces the pistons inwards, causing the pinion to turn clockwise while the air is being exhausted from Port A.

Single-acting (Spring Return)



Counter Clock Wise

Air to Port A forces the pistons outwards, causing the springs to turn compress the pinion turns counterclockwise while air is being exhausted from Port B.



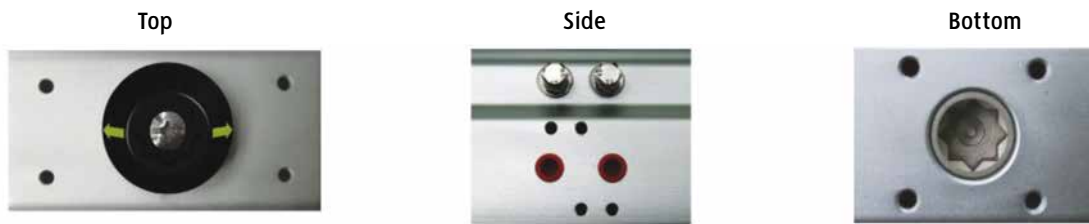
Clock Wise

Loss of air pressure, the stored energy in the springs forces the pistons inwards, the pinion turns clockwise while air is being exhausted from Port A.

7.2 OPERATING SPECIFICATIONS

Operating data Quarter Turn

Model	DN Ø(mm)	Revolution of travel adjusted 1"	Air consumption of open (L)	Air consumption of close (L)	Open Time (Sec)		Close Time (Sec)		Weight (kg)	
					DA	SR	DA	SR	DA	SR
RP50	50	1/6 turn	0.09	0.15	0.2	0.25	0.25	0.3	0.96	1.06
RP63	63	1/6 turn	0.16	0.26	0.25	0.3	0.3	0.35	1.58	1.7
RP75	75	1/6 turn	0.31	0.49	0.3	0.35	0.4	0.5	2.7	3.15
RP88	88	1/5 turn	0.51	0.78	0.4	0.5	0.5	0.6	3.8	4.4
RP100	100	1/5 turn	0.71	1.11	0.5	0.6	0.7	0.9	5.4	6.51
RP125	125	1/5 turn	1.54	2.34	0.9	1.1	1.2	1.4	10.2	12.6
RP145	145	1/5 turn	2.41	3.78	1.2	1.4	1.5	1.8	14.5	18.1
RP160	160	1/4 turn	3.14	4.92	1.5	1.7	1.8	2.1	19.8	24
RP180	180	1/4 turn	4.26	6.89	2	2.2	2.4	2.8	25	31.6
RP200	200	1/4 turn	5.94	9.46	2.7	3.2	3.5	4	35.5	45.1
RP240	240	1/4 turn	10	15.2	3.5	4	4.1	4.6	53	64
RP265	265	1/4 turn	14.5	21.38	4	4.5	4.5	5	83	102
RP300-600		Refer to separate specification sheet								



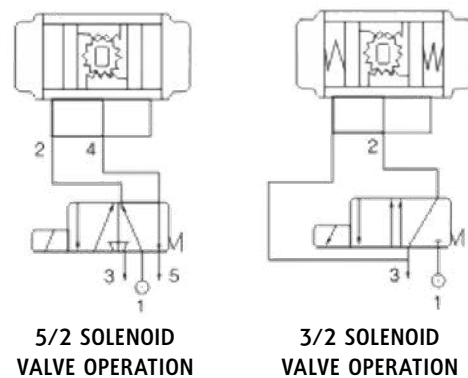
The side connection conforms to the VDI/VDE 3845 NAMUR standard and can be installed to the solenoid valve directly. The top connections conforms to VDI/VDE 3845 NAMUR standard and the limit switch or positional and solenoid can be installed directly. The bottom connection conforms to ISO 5211 and DIN3337 standard and can be installed on the valve directly. (Star hole and square hole can be chosen according to the requirements).



Each actuator is marked with a serial number, air connection and bottom mounting holes are marked for easy track and distinction.

Top mounting pad configuration is in accordance with VDI/VDE 3845 Namur specification in order to permit simple and easy installation of the ancillary like switchboxes and positioners. APV can supply many different types of switchboxes and positioners for any application.

Air supply connection is in accordance with VDI/VDE3845 Namur specification to provide simple and easy solenoid valve installation direct mount avoiding piping and fittings. APV can also supply Namur solenoid valves: 5/2 and 3/2 way in all standard voltages, D.C or A.C.



1. Ancillaries installation without multi-function indicator.

The actuator can be supplied upon request with a NAMUR that replaces the standard indicator and has the Namur drive slot permitting:

- 1 Accessories such as limit switch and positioner
- 2 Indicating the position of actuator via the Namur slot
- 3 Manual operation in emergency
- 4 Operating at high temperature.



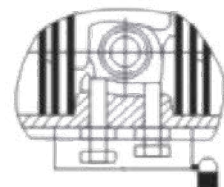
2. External stroke adjustment

A great saving of time is achieved, when mounting the actuator on the valve, through the service friendly adjustment of both end positions with precise cam system. The rotation angle is easily changeable with a special cam system. Safety for emergency cases is possible through blocking of the actuator. This new feature can be used by simply changing the screw into a longer one.



3. Lock-out capability in full open or full-closed position

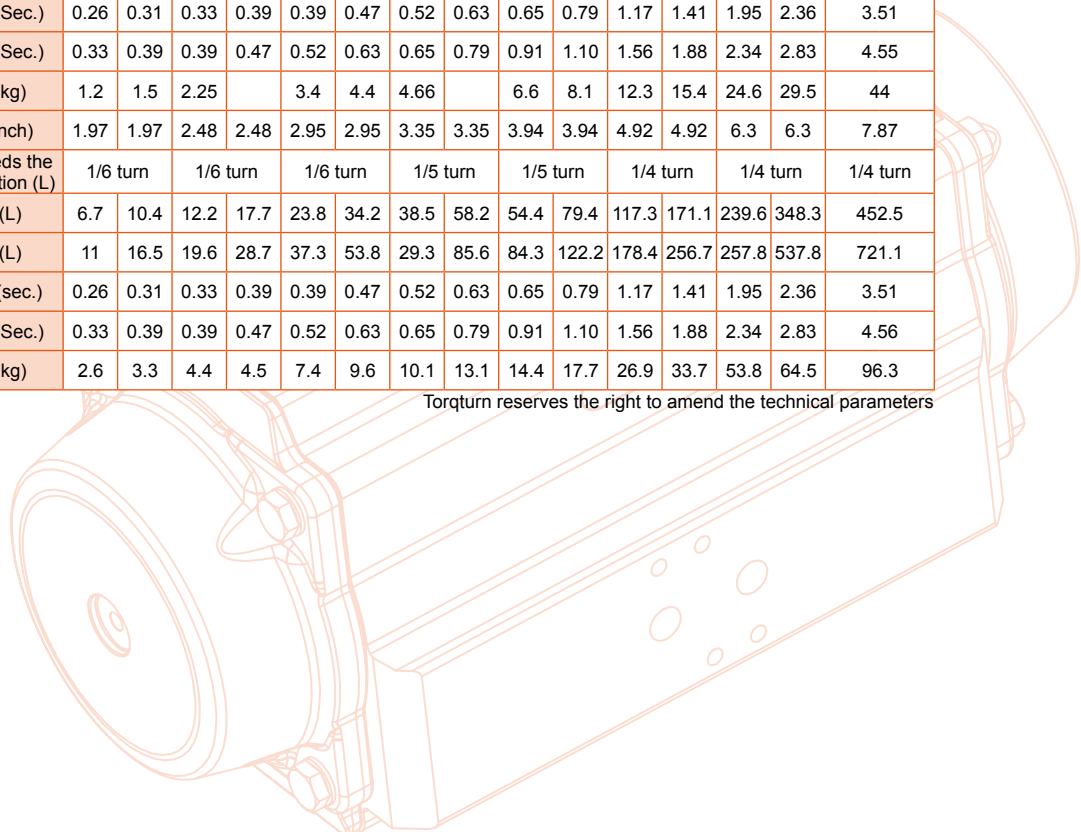
The actuator offers an economical solution when it is required to lock the Actuator in the full-open (90°) or fully closed (0°) position. The actuator can be supplied with a Special bolt and locking device to permanently lock the actuator in position by using a padlock and prevent unwanted operation.



Operating data 3 Position Actuation

Model Type			RP50DA		RP63DA		RP72DA		RP88DA		RP100DA		RP125DA		RP180DA		RP200DA	
			120°X	180°X	120°X	180°X	120°X	180°X	120°X	180°X	120°X	180°X	120°X	180°X	120°X	180°X	120°X	180°X
Metric System	Cylinder Bore	mm	50		63		75		85		100		128		180		200	
	Travelling schedule adjustment	Needs the rotation (L)	1/6 turn		1/6 turn		1/6 turn		1/5 turn		1/5 turn		1/4 turn		1/4 turn		1/4 turn	
	Opens to the air cylinder volume	(L)	0.11	0.17	0.2	0.29	0.39	0.56	0.63	0.92	0.9	1.3	1.9	2.9	3.9	5.7	4.4	
	Closes to the air cylinder volume	(L)	0.18	0.27	0.32	0.47	0.61	0.88	0.97	1.4	1.42		2.9	4.2	6.2	8.8	11.8	
	Open time	S (Sec.)	0.26	0.31	0.33	0.39	0.39	0.47	0.52	0.63	0.65	0.79	1.17	1.41	1.95	2.36	3.51	
	Closes times	S (Sec.)	0.33	0.39	0.39	0.47	0.52	0.63	0.65	0.79	0.91	1.10	1.56	1.88	2.34	2.83	4.55	
	Approximate weight	(kg)	1.2	1.5	2.25		3.4	4.4	4.66		6.6	8.1	12.3	15.4	24.6	29.5	44	
British System	Cylinder Bore	(inch)	1.97	1.97	2.48	2.48	2.95	2.95	3.35	3.35	3.94	3.94	4.92	4.92	6.3	6.3	7.87	
	Travelling schedule adjustment	Needs the rotation (L)	1/6 turn		1/6 turn		1/6 turn		1/5 turn		1/5 turn		1/4 turn		1/4 turn		1/4 turn	
	Opens to the air cylinder volume	(L)	6.7	10.4	12.2	17.7	23.8	34.2	38.5	58.2	54.4	79.4	117.3	171.1	239.6	348.3	452.5	
	Closes to the air cylinder volume	(L)	11	16.5	19.6	28.7	37.3	53.8	29.3	85.6	84.3	122.2	178.4	256.7	257.8	537.8	721.1	
	Open time	S (sec.)	0.26	0.31	0.33	0.39	0.39	0.47	0.52	0.63	0.65	0.79	1.17	1.41	1.95	2.36	3.51	
	Closes times	S (Sec.)	0.33	0.39	0.39	0.47	0.52	0.63	0.65	0.79	0.91	1.10	1.56	1.88	2.34	2.83	4.56	
	Approximate weight	(kg)	2.6	3.3	4.4	4.5	7.4	9.6	10.1	13.1	14.4	17.7	26.9	33.7	53.8	64.5	96.3	

Torqturn reserves the right to amend the technical parameters



Three Position Torqturn Actuator

Three position Torqturn actuator provides an operation of 0°, 45°, 90° or 0°, 90°, 120° and 180°. The midway position is achieved by a mechanical stop of movement of the 2 auxiliary pistons. The midway stop positions are adjustable. Example: 90° actuator can provide 20°, 30°, 50°, 70° etc. The following is the principle of valve operation:



1. Fully Closed Position

From Figure 11 we can see that this position is obtained when air is supplied to port 4 and port 2 is in the state of exhaust air.

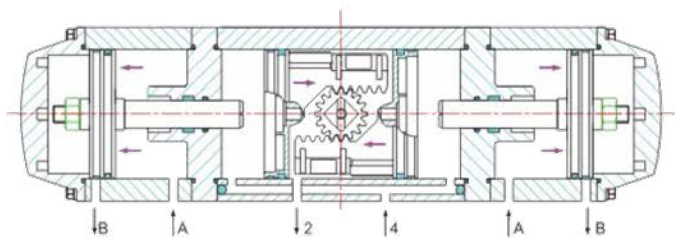


Figure 11

2. Fully Open Position

From Figure 12 we can see that this position is obtained when air is supplied to port 2 and port A, meantime, port 4 and port B are in the state of exhaust air.

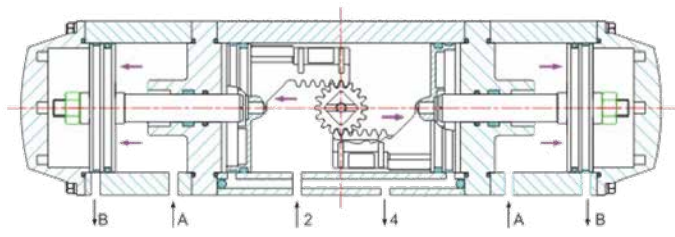


Figure 12

3. Midway Position

From Figure 13 we can see that this position is obtained when air is supplied to port 2 and port B, meantime, port 4 and port A are in the state of exhaust air. In fact the midway position is achieved by a mechanical stop of movement on the two auxiliary pistons.

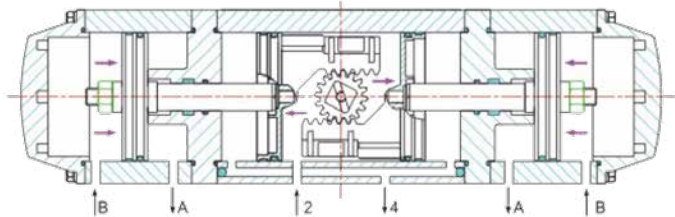


Figure 13

ACCESSORIES AVAILABLE

- | | | | |
|------------------------|---------------|--------------------|----------------|
| 1. Connecting Brackets | 2. Couplings | 3. Solenoid Valves | 4. Switchboxes |
| 5. Proximity Sensors | 6. Gear Boxes | 7. Positioners | |

8.0 SPARE PARTS SUPPLY

Replacement parts are available for all APV-Torqturn actuators. Published parts list drawings include recommended spare parts. It should be remembered that these parts are of resilient material and have a limited shelf life. Other parts are generally not required as spares.



Caution

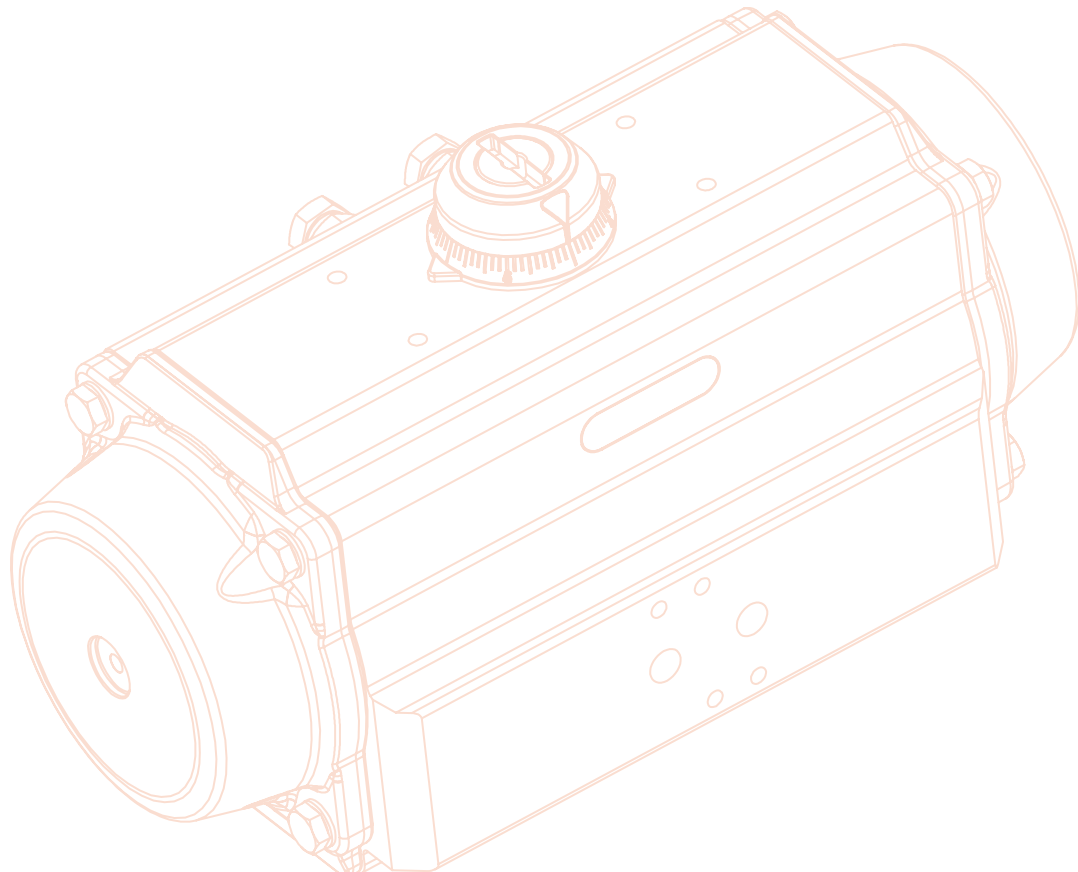
Do not attempt to repair this actuator, send to an authorised APV repair facility.

When ordering replacement parts, it is important to include the complete actuator model number and serial number along with the part numbers required.



Caution

Please note the following safety warnings: - The spring pack is energised. Do not attempt to open the outer casing while spring is compressed. Do not put hand inside valve while the spring return actuator is still energised.



9.0 DESIGN FEATURES

Indicator

Position indicator with NAMUR is convenient for mounting accessories such as Limit Switch box, Positioner and so on.

Pinion

The pinion is high-precision and integrative, made by nickelled-alloy steel, full conform to the latest standards of ISO 521, DIN33337, NAMUR. The dimensions can be customised and the stainless steel is available.

Cylinder

According to the different requirements, the extruded aluminium alloy ASTM6005. Body also optionally treated with hard anodised powder polyester paint. PTFE or Nickel plated.

Ends Caps

Die-casting aluminium powder polyester painted in different colours, PTFE or Nickel plated.

O-Rings

NBR rubber O-rings provide trouble-free operation at standard temperature ranges. For high and low temperature applications Viton or Silicon.

Pistons

The twin rack pistons are made from Die-casting aluminium treated with hard anodised or made from cast steel with galvanisation, symmetric mounting position, long cycle life and fast operation, reversing rotation by simply inverting the pistons.

Travel adjustment

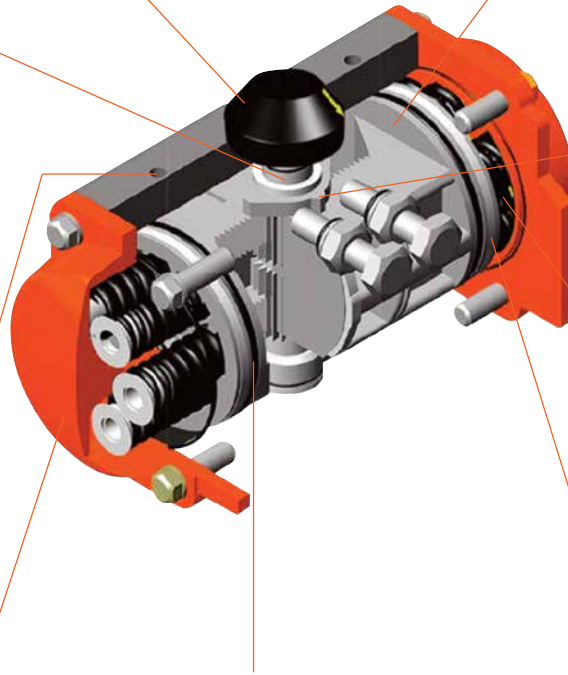
The two independent external travel stop adjustment bolts can adjust $\pm 5^\circ$ at both open and close directions easily and precisely.

High performance springs

Preloaded coating springs are made from high quality material for resistant to corrosion and longer service life, which can be demounted safely and conveniently to satisfy different requirements of torque by changing quantity of springs.

Bearings & Guides

Made by low friction and longlife compound material, avoid the direct contacting between metals.

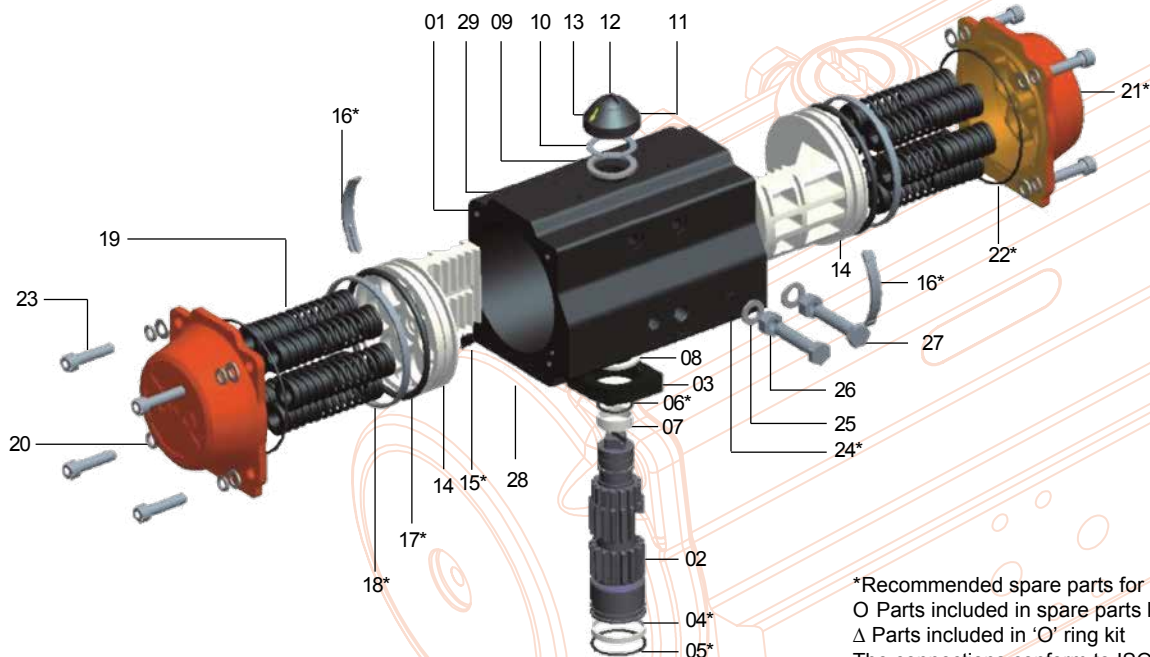


APPENDIX A

Parts & Materials RP50 ~ RP400

Part No.	Spare Parts	Unit Qty.	Part	Material	Corrosion Protection	Optional Material
1		1	Body	Extruded Aluminium Alloy	Anodised	-
2		1	Drive Shaft	Steel Alloy	Oxidation	-
3		1	Adjust Cam	45#	-	-
4*	○	1	Bottom Bearing	POM	-	-
5*	○△	1	'O' Ring (Pinion Bottom)	NBR	-	FPM/MQ
6*	○△	1	'O' Ring (Pinion Top)	NBR	-	FPM/MQ
7*	○	1	Top Bearing	POM	-	-
8		2	Thrust Bearing (Pinion)	POM	-	-
9		1	Washer	Stainless Steel	Nickel Plated	-
10		1	Circlip	Stainless Steel	-	-
11		1	Indicator	Nylon PA	-	-
12		1	Screw	Nylon PA	-	-
13		2	Indicator Flake	Nylon PA	-	-
14		2	Piston	Die Cast Aluminium Alloy	Anodised	-
15*	○	2	Plug	POM	-	-
16*	○	2	Bearing (Back Piston)	POM	-	-
17*	○	2	Bearing	POM	-	FPM/MQ
18*		2	'O' Ring (Piston)	NBR	-	-
19		5-12	Spring	Steel Alloy	-	-
20		1	Left End Cap	Die Cast Aluminium Alloy	Anodised	-
21		1	Right End Cap	Die Cast Aluminium Alloy	Anodised	-
22*	○△	2	'O' Ring (End Cap)	NBR	-	FPM/MQ
23		8C	Screw	Stainless Steel	-	-
24*	○△	2	'O' Ring (Stop Screw)	NBR	-	FPM/MQ
25		2	Washer	Stainless Steel	-	-
26		2	Nut	Stainless Steel	-	-
27		2	Adjustment Screw	Stainless Steel	-	-
28		2	Plug	NBR	-	FPM/MQ
29		1	Label	Polyester-Aluminium	-	-

Torqturn reserves the right to amend the technical parameters



*Recommended spare parts for maintenance
 ○ Parts included in spare parts kits
 △ Parts included in 'O' ring kit
 The connections conform to ISO5211

APPENDIX B

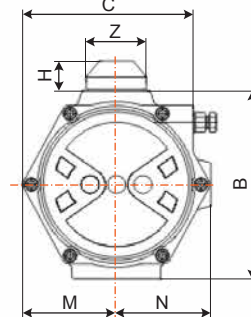
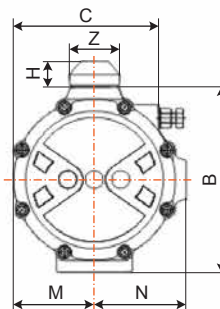
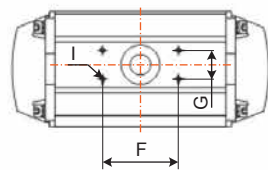
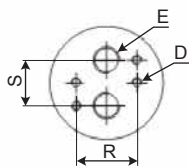
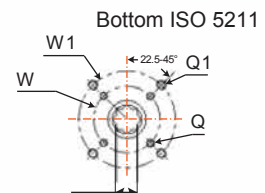
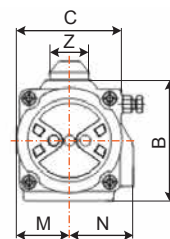
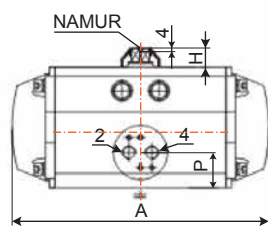
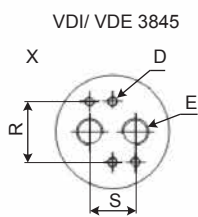
Dimensions

(DA/SR)	RP50	RP63	RP75	RP88	RP100	RP125	RP145	RP160	RP180	RP200	RP240	RP265	RP300	RP350	RP400	RP500	RP600
ISO5211	F04	F05	F05/07	F05/07	F07/10	F07/10	F10/12	F10/12	F10/14	F10/14	F12/16	F16	F16	F16	F25	M	C
A	142	163	215	253	270	345	409	439	488	543	629	740	885	944	1062		
B	69	85	102	115	127	157	176	196.5	220	244	300	330	390	440	464		
C	58	72	86.5	97	110	135.3	156	168.5	191	210.5	250.5	298.5	305	360	385		
D	M5X10	M5X10	M5X10	M5X10	M5X10	M5X10	M5X10	M5X10	M5X10	M5X10	M5X10	M6X10	M6X10	M6X10	M6X10		
E(NPT)	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	3/8"	3/8"	1/2"	1/2"	1/2"		
F	80	80	80	80	80	80	80	80	130	130	130	130	130	130	150		
G	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30		
H	20	20	20	20	20	30	30	30	50	50	50	50	50	50	50		
I	M5x8	M5x8	M5x8	M5x8	M5x8	M5x8	M5x8	M5x8	M5x8	M5x8	M5x8	M5x8	M5x8	M5x8	M5x8		
M	29	36	43.5	49.2	55.3	69.5	79	88	98	108	130.5	163.5	170	200	217.5		
N	41	47	53	56.3	67	82	91	98.5	107	112.5	130.5	166	193	222	246		
O	11	14	17	17	22	27	27	27	36	36	46	46	55	55	60		
P	27	29	29	32	37	45.5	52.5	52	58	62.5	78	165.5	195	200	212		
Q	42	50	50	50	70	70	102	102	102	102	125	165	165	165	254		
QI	-	-	70	70	102	102	125	125	140	140	165	-	-	-	-		
R	32	32	32	32	32	32	32	32	32	32	45	45	45	45	45		
S	24	24	24	24	24	24	24	24	24	24	40	40	40	40	40		
T	12	16	18	18	22	27	32	32	39	39	49	69	69	69	65		
W	M5	M6	M6	M6	M8	M8	M10	M10	M10	M10	M12	M20	M20	M20	M20		
WI	-	-	M8	M8	M10	M10	M12	M12	M14	M14	M16	-	-	-	-		
ØZ	41	41	41	41	41	56	65	65	80	80	115	115	115	115	115		

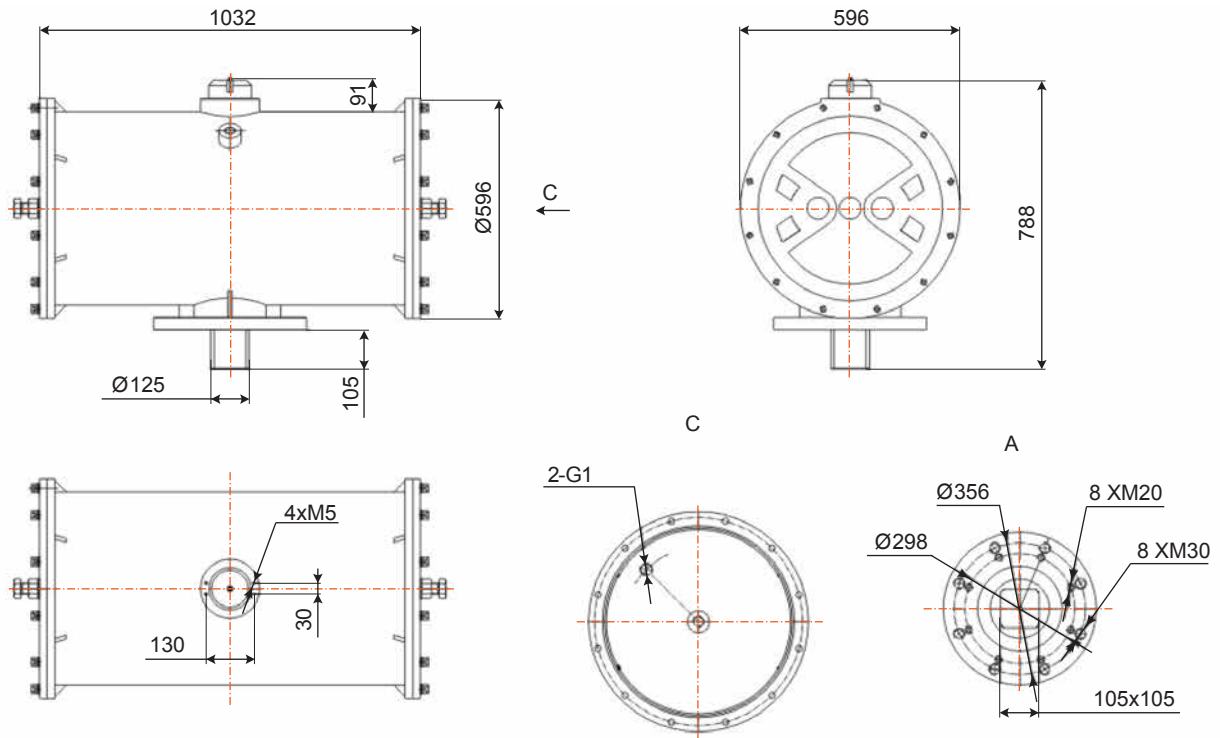
See Drawing Next Page (Double Acting Only)

See Drawing Next Page (Double Acting Only)

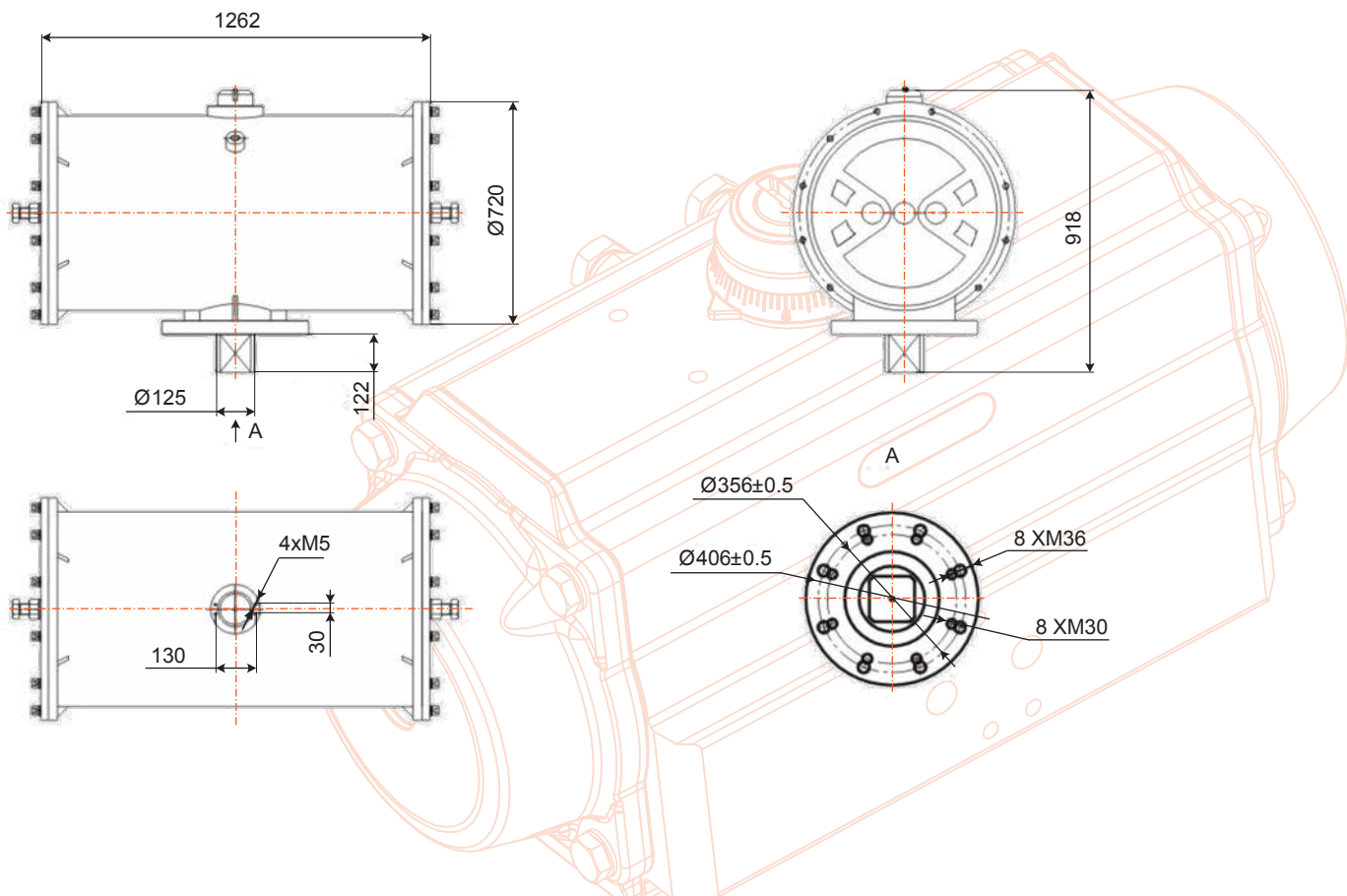
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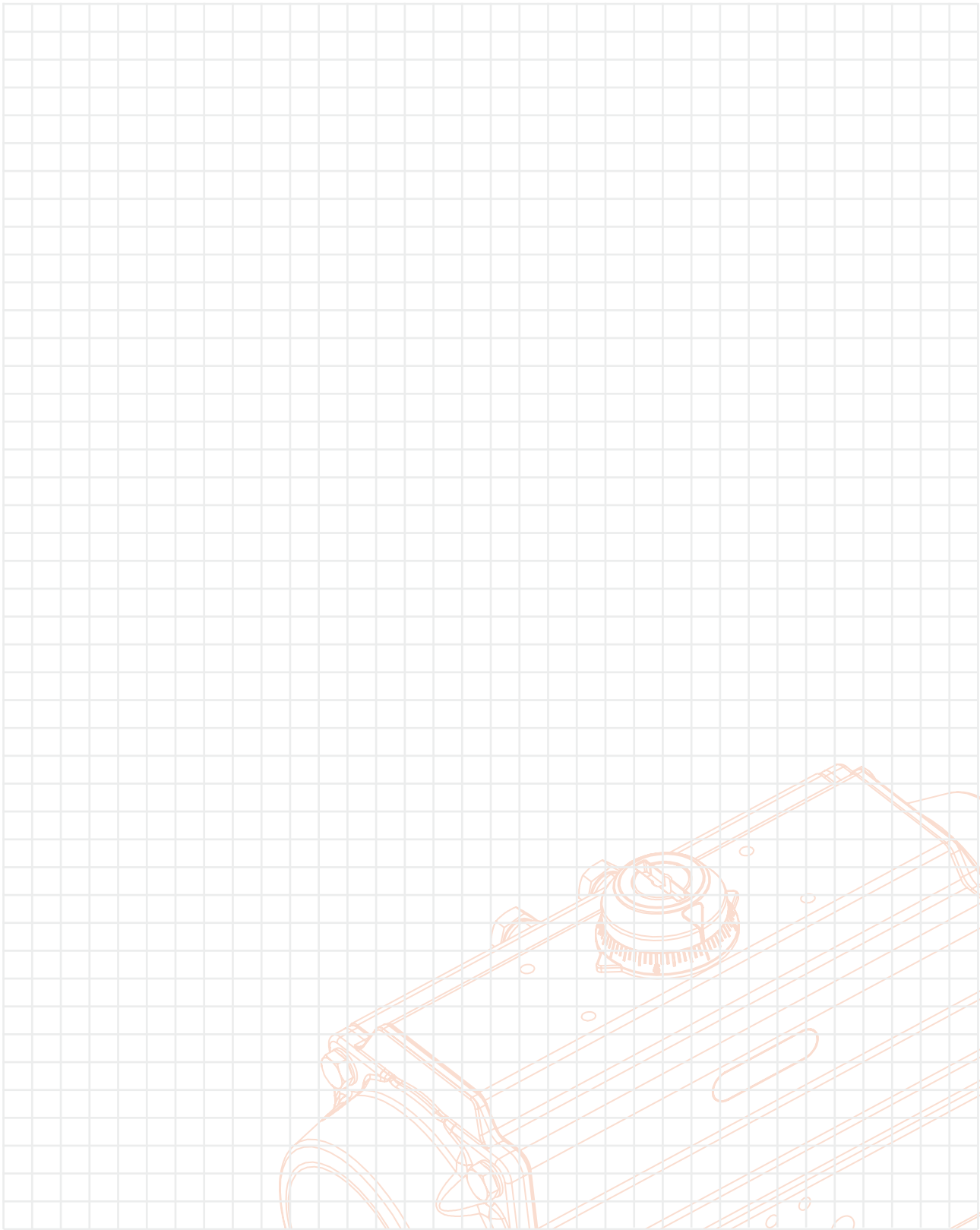
Dimensions RP500



Dimensions RP600



A large grid of graph paper for taking notes, consisting of 30 columns and 40 rows of small squares.



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