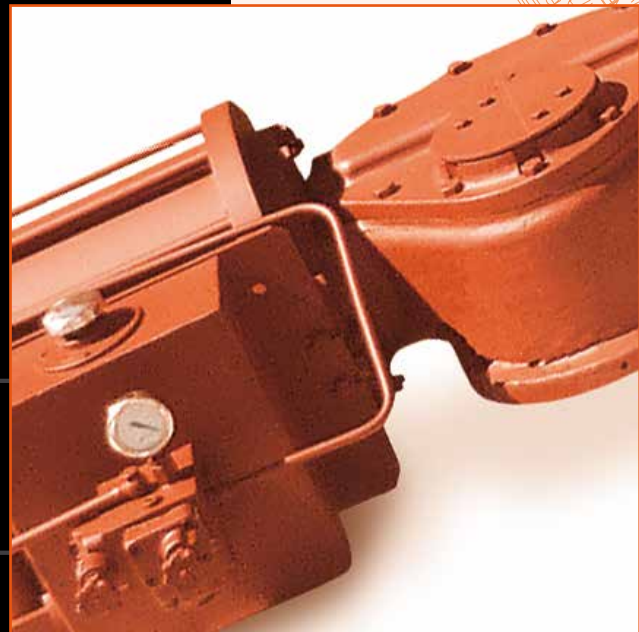


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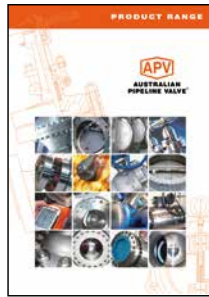
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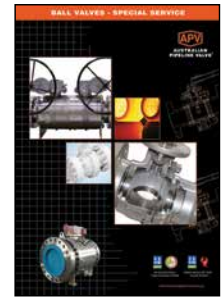
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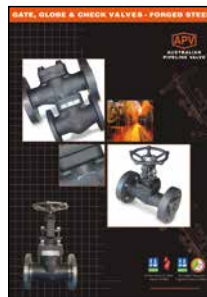
Ball Valves Floating Small Bore



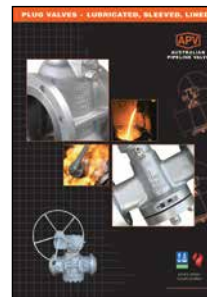
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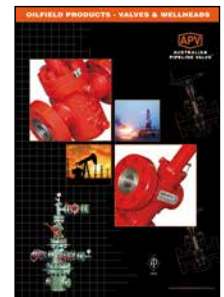
Gate, Globe & Check Valves - Cast Steel



Gate, Globe & Check Valves - Forged Steel



Plug Valves Lubricated, Sleeved & Lined

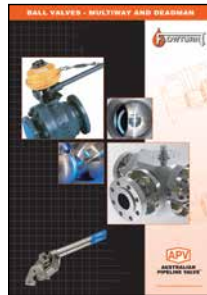


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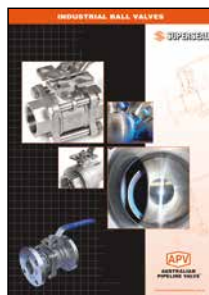
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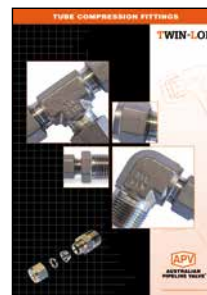
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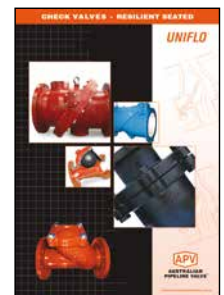
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INTRODUCTION

The G Range range of actuators provide a large torque range compact body design. G Range actuators, feature an improved Reaction Bar, with new replaceable bearings, a highly efficient wear and corrosion resistant coating system and a tension rod with a compressed spring. This enhanced design greatly improves efficiency, reduces wear and extends the actuator's life. The combining of these technologies, enhancements, and superior quality control techniques ensures a high quality assembly which becomes the heart of our extended service actuators - the G Range.



High Pressure Hydraulic GH Spring Return



Pneumatic GP Double Acting

ADVANTAGES

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 G Type 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 G Type models, allowing standardisation of accessory mounting hardware and installation practices.

Wear Resistant

The guide rod and piston rod have an advanced surface treatment, which combined with self-lubricating bearings, provides superior wear resistance and extends the life of all sliding components.

High Efficiency

The piston rod and guide block connection have superior surface finishes and self-lubricating bearings to maximise input energy transfer directly to the valve stem. Efficiency is further enhanced by the tension - loaded spring, minimising radial loads on the piston rod.

Long Service Life

The G Type actuators incorporate four stages of internal and external coatings to resist severe weather, chemical and petroleum environments. The inner surface of the air cylinder is coated with PTFE providing enhanced corrosion resistance and self-lubrication.

Modular Design

G Type actuators design provides field servicable drive, power, spring and over-ride modules. The modules are removable, serviceable and interchangeable without the need to remove the actuator from the valve. Modules are available for separate purchase to reduce spare parts inventory.

Spring Module

To ensure the safety of personnel during installation and maintenance, the spring module has been designed so that it can only be removed from the power module with the spring in the fully extended position. This prevents accidental release of the spring force, protecting personnel from injury and the actuator from accidental damage.

OVERVIEW



This instruction manual is for G Range double acting and spring return scotch yoke pneumatic & hydraulic actuators for all models including GP14, GP16, GP25, GP30, GP35, GP40, GP48, GP60.

Temperature range: -

Standard temperature: -20°C to 80°C

Low temperature: -40°C to 80°C

High temperature: -20°C to 120°C

Operating Pressure: -

Pneumatic actuator: 3~7 Bar

Hydraulic actuator: 60~150 Bar



Operating Media: -

Pneumatic actuator: dry and clean compressed air

Hydraulic actuator: hydraulic oil with viscosity within 40CST, or lower temperature hydraulic oil for low temperature applications.

Output Torque:

Double acting: 830~226, 400 Nm

Spring Return end torques: 307~71753 Nm

APV-Torqturn actuators are extremely strong, compact and can be specified for services with a wide range of pressures, temperatures and environments, for use in various valve sizes and types. G Range are a heavy duty, rugged, reliable, long life actuator, capable of meeting the rigorous demands required for the critical quarter turn application to operate low and high pressure ball, butterfly and plug valves. The G Range construction and design is a superior specification suitable for the demanding requirements of oil & gas transmission, offshore platforms, chemical, petrochemical, power and other industries.

The majority of this information is common knowledge to experienced valve & actuator users. When properly installed in applications for which they were designed, Australian Pipeline Valve (APV) - Torqturn actuators will give long reliable service. This instruction is only a guide for installation and operation on standard service and covers general maintenance and minor repairs. A professional APV approved actuator engineering facility should be utilised for reconditioning or major repairs.

**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 its 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 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.

2.0 INSTALLATION NOTES

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.

2.1 INSTALLATION, TUBE & FITTINGS



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

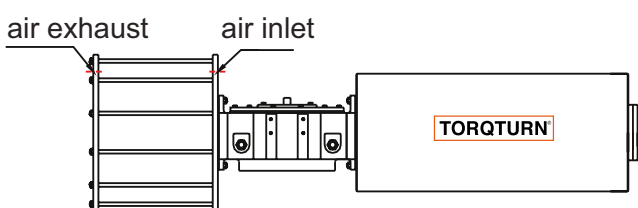
Caution

- 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. Refer to Table 1 below for air inlet sizes -

Table 1 - Air Inlet sizes

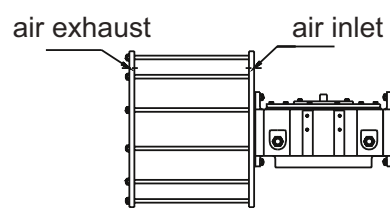
Actuator size	200	250	300	350	400	450	500
Air inlet size	3/8"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"
Actuator size	550	600	700	800	900	1000	1100
Air inlet size	3/4"	1"	1"	1 1/2"	2"	2"	2"

- 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.
- e. Pneumatic (air) & hydraulic actuator (oil) supply inlet positions are as per Figure 1 to 4 below.



Single Acting GP Pneumatic Actuator

Figure 1



Double Acting GP Pneumatic Actuator

Figure 2

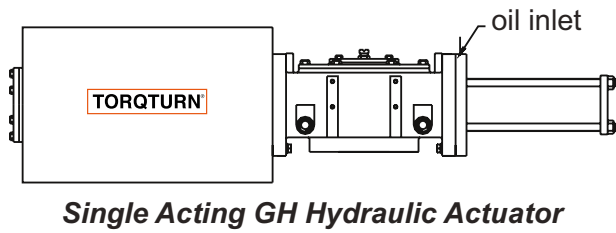


Figure 3

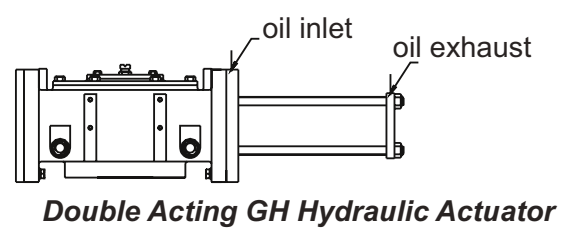


Figure 4

f. Dimensions and mounting positions of accessories refer Figure 5 to 6 below:

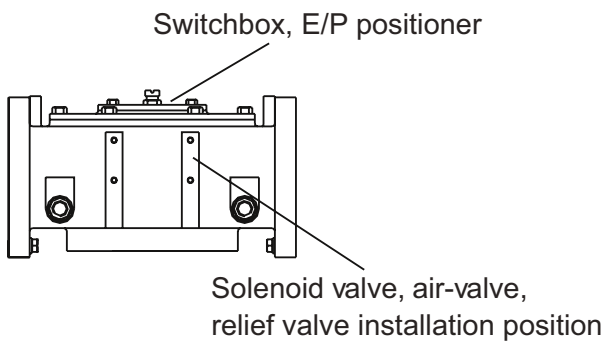


Figure 5

Bracket dimensions for solenoid valve, air valve, air set

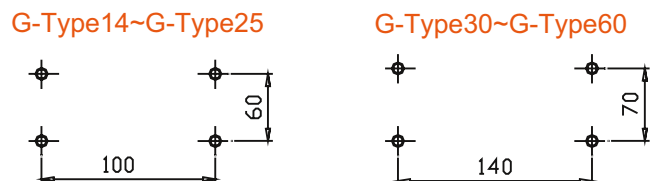


Figure 5A

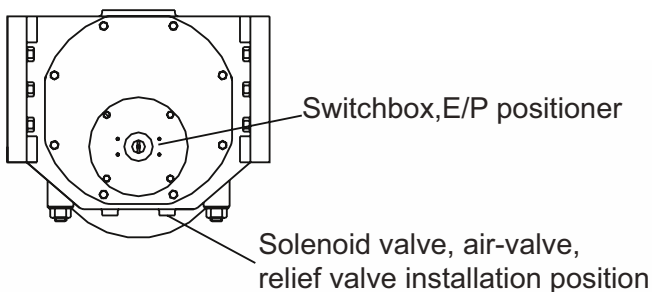


Figure 6

Top mount pad of switchbox & E/P positioner

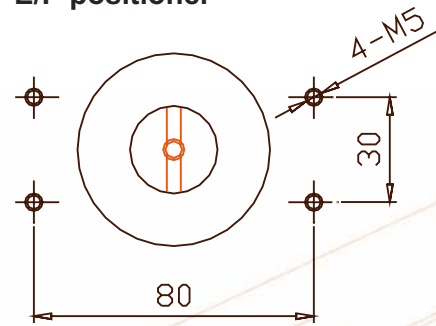


Figure 6A

2.2 OPERATION

2.2.1 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)

2.2.2 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.

2.3 MANUAL OVER-RIDE OPERATION

2.3.1 Manual Over-ride for Pneumatic & Hydraulic Actuators

The following manual types of over-rides are available for pneumatic & hydraulic actuators depending on the model/size.

a. Declutchable Worm Gear Manual Over-ride - DA Actuators

Double acting actuators G14, G16 & G25 are optionally available with a declutchable worm gear manual over-ride (refer Figure 7 & 8). 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 engages, then release the pull pin. After the pin has returned into the eccentric sleeve, close the equalising valve.

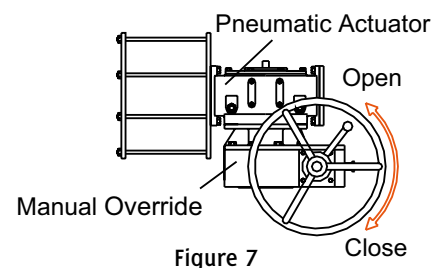


Figure 7

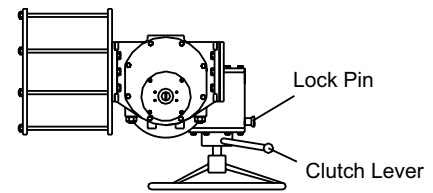


Figure 8

b. Hydraulic Manual Over-ride - DA Actuators

The hydraulic manual over-ride is optionally available for models G30XXX, G35XXX, G40XXX, G48XXX and G60XXX double acting pneumatic & hydraulic actuators (refer Figure 9 & 9A) the manual operating device is a hydraulic over-ride with a hand pump. When manual operating is required, firstly open the equalising valve (2) mounted on the pneumatic actuator, close ball valve (2) by operating the hand pilot valve to control the hydraulic cylinder's oil supply/exhaust, and operate the hand pump to energise opening or closing the valve manually. To return to automatic operation, set the handle of the 4 port 3 position manual direction valve (1) to the middle position and open ball valve (2), Manual over-ride is then disengaged.

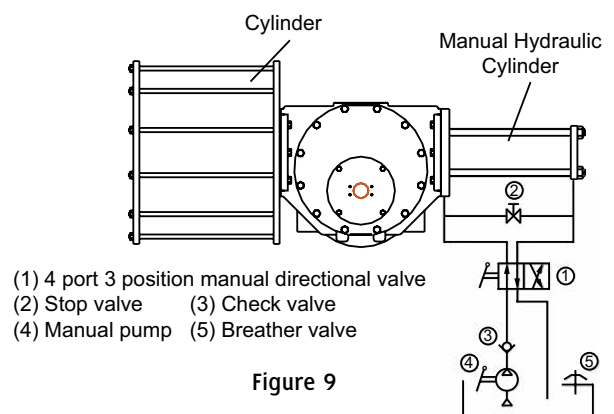


Figure 9

Refer to section 2.3.1-e for operation of hydraulic manual over-ride.

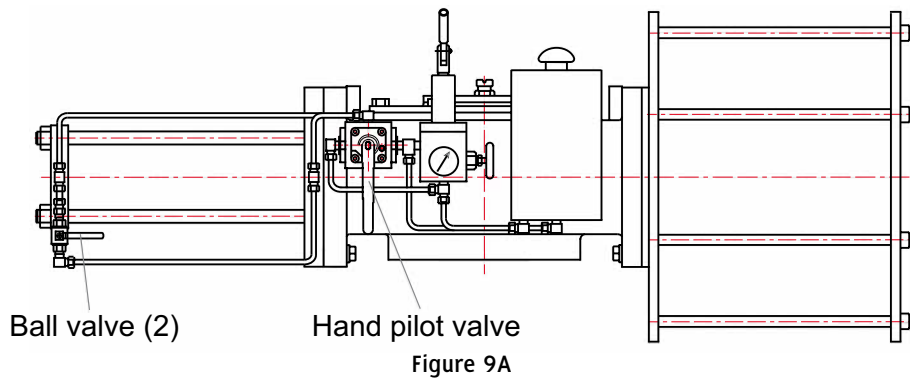


Figure 9A

c. Jackscrew Operator Manual Over-ride - SR Actuators

The jackscrew operator (Figure 10) is only available to suit models G 14XXX & G 16XXX single acting (spring return) pneumatic or hydraulic actuators. The jackscrew operator (Figure 10) is a side mounted operator. Turning the handwheel, controls the valve position by screwing the trapezoid screw into and out of the spring case (by compressing & decompressing the spring). To turn the valve, turn the jackscrew handwheel clockwise to compress the spring and move the valve one direction, counter-clockwise to decompress the spring and the valve will move in the other direction. If the actuator is set 'fail close' then compressing the spring will open the valve.

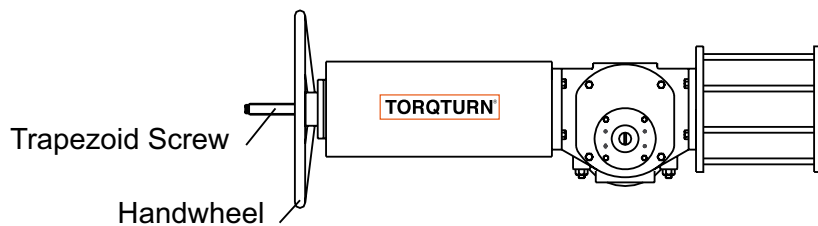


Figure 10

After manual operation, screw out the trapezoid screw until the spring is disengaged toward the actuator to return to auto-operation, check to ensure the spring can open fully and the spring is totally disengaged from the jackscrew. Avoid fully screwing out integral the trapezoid screw, as the screws also act as a position stop to ensure the valve is correctly returned to the full open or close position.

d. Hydraulic Manual Over-ride - SR Actuators

The hydraulic manual over-ride is available for G 25XXX ~ G 60XXX hydraulic and pneumatic spring return actuators. The hydraulic manual over-ride is a system which consists of manual pump, tank, globe valve, check valve and other parts, and is easy to operate and maintain (see Figures 11, 12 & 13). See section e. for operation.

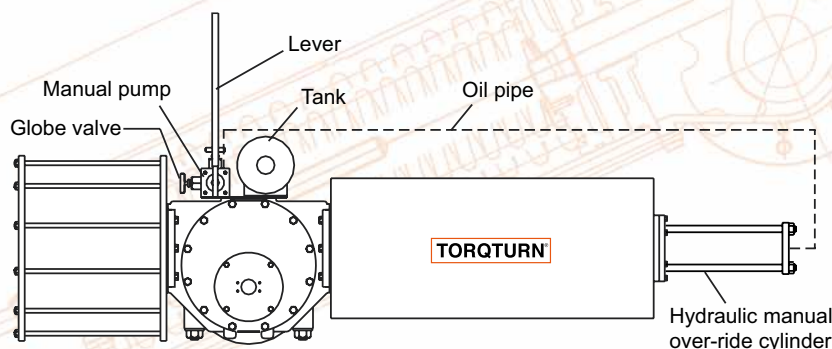


Figure 11

e. Operation of Hydraulic Manual Over-ride System

- 1) Close globe valve (1), open globe valve (2);
- 2) Inject oil to the oil cylinder by operating manual pump with lever handle (which will then activate the hydraulic cylinder which will in turn compress the spring in the case of spring return - fail close actuator) to open the valve (assuming the actuator is set 'fail closed').
- 3) To deactivate, close globe valve (2).
- 4) Once the valve is closed, open the globe valve (1) to revert to normal operation with no over-ride.

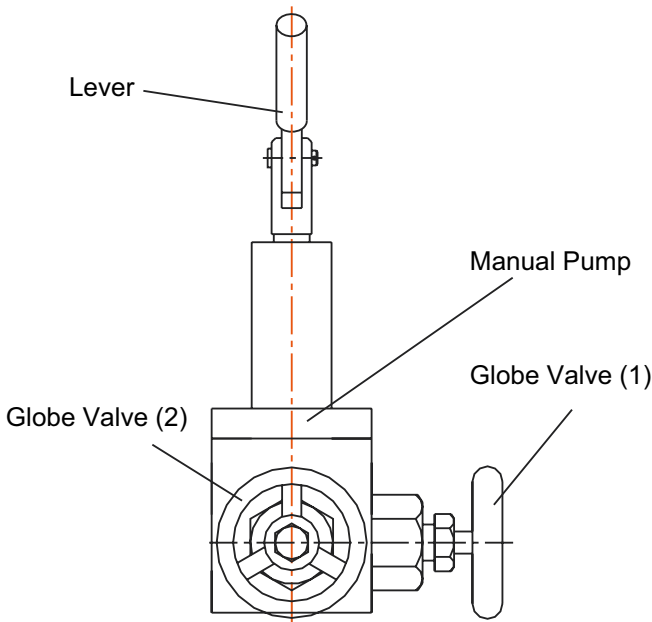
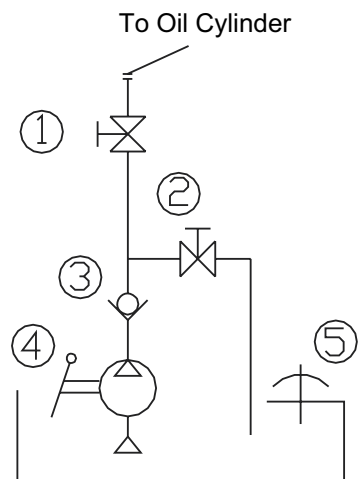


Figure 12



Hydraulic System Schematic
(Also refer Figure 9)

Figure 13

2.4 STROKE ADJUSTMENTS

The stroke adjustment (travel stop adjustment) can be made for hydraulic and pneumatic double acting and spring return actuators from 80° to 100° as follows:

Loosen the stroke nut then:

- a. Screw out the open position stroke bolt to increase the open position, screw in the open direction to decrease the open position.
- b. Screw out the close position stroke bolt to increase the closed position, screw in the close direction to decrease the closed position.

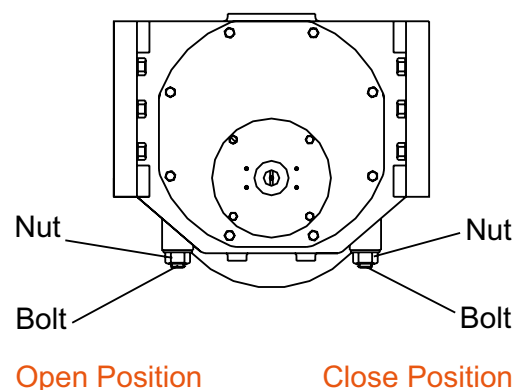


Figure 14

Note: tighten the lock nut after adjusting the appropriate on/off position.

2.5 ACTUATOR SIZING



All factors shown in section 2.5.1 to 2.5.3 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.

2.5.1 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.

2.5.2 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.

2.5.3 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 100°C to 218°C, use the torque multiplier given. For 0°C to 99°C no temperature multiplier is required. For operating temperatures less than 0°C and above 218°C consult Australian Pipeline Valve.

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

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

3.0 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.

4.0 MAINTENANCE INSTRUCTIONS

Once the APV-Torqturn actuator has been correctly assembled and installed it is ready for operation. Lubricants used at the time of adjustment along with the durable design of the actuator mean routine maintenance is not usually required. Modification or major overhaul can only be performed by an experienced APV approved actuator service facility.

To ensure long service life, trouble free operation and minimal maintenance, components of actuators both pneumatic & hydraulic are lubricated. These include the gearing surfaces and bearings which are

commonly covered with a teflon dry-film lubricant and corrosion inhibitor. Major internal components such as piston rods and tie bars are usually coated in electroless nickel or are stainless steel. All threaded fasteners, rollers, tracks, yoke bores, pins, gaskets and seals are coated with petroleum grease.

In addition to lubricants, correct instrument practices are also important. Foreign particles and debris can damage components such as seals, the solenoid and control valves, etc. Clean, dry air, gas or hydraulic fluid should be of high priority for acceptable operation and longevity. To assist with unit protection an in-line filter may be fitted to help prevent particles penetrating the cylinders of the actuator.



Caution

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.

4.1 REPAIR

Only a specialist actuator repairer should attempt repairs, if doing so take note of the following:

- a- The actuator's internal parts and external fitments shall be handled with care avoiding scratches or surface damage.
- b- All tools and equipment for handling the internal parts shall be soft coated.
- c- Actuators can be fitted with gaskets or seals in PTFE, Buna, Viton, etc., hence high or low temperatures will damage sealing components.

For all operations make reference to position number on part list of the applicable drawing listed.

4.2 ASSEMBLY OF OPTIONAL OVER-RIDE

4.2.1 To Assemble The Jackscrew On The Spring Module

- 1) Loosen the bolt on the spring end cap and take the spring end cap 42.
- 2) Assemble the jackscrew on the side of spring cylinder.
- 3) Screw and tighten the bolt connecting the jackscrew and spring cylinder.
- 4) Rotate the handwheel on the jackscrew and open/close the valve for 2~3 times to check if the manual over-ride works smoothly.

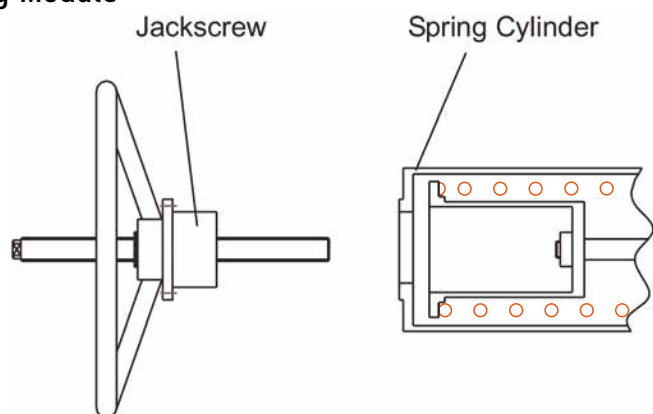


Figure 15

4.2.2 To Assemble The Hydraulic Manual Override Mechanism Onto The Spring Module

- 1) Loosen the bolt on the spring end cap and remove the spring end cap 42.
- 2) Fit the O-ring and stop collar to the O-ring of the hydraulic cylinder.
- 3) Assemble the hydraulic cylinder into the spring cylinder.

- 4) Fit the O-ring into the spigot of the spring cylinder side.
- 5) Assemble the spring cylinder cover on the spring cylinder.
- 6) Screw and tighten the bolt connecting the spring cylinder cover and the spring cylinder.
- 7) Refer to Figure 9 and section 2.3.1-b to assemble the manual pump onto the body cap, then screw and tighten the bolt.
- 8) Connect the stainless tube, high pressure fittings and the hydraulic cylinder.
- 9) Add some hydraulic oil into the tank of the manual pump, then power oil to the hydraulic cylinder by operating the lever on the manual pump. Activate the actuator, allowing it to run to the full open position, and check if there is leakage and if the manual over-ride works well.

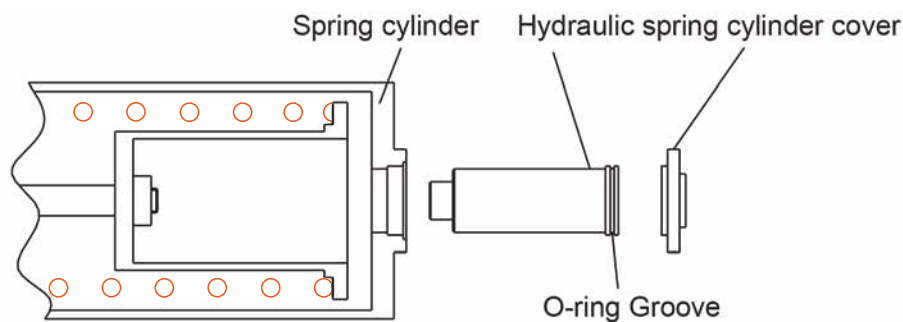


Figure 16

5.0 OPERATION NOTES

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 (refer to Appendix C). 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. If required, this enclosure may also be used as an optional oil bath. During usual circumstances APV-Torqturn pneumatic actuators do not require additional lubricants, however an air-line lubricator may be installed. Lubricated air improves performance of most control valves and solenoids (with the exception of positioners). Only lubricants compatible with the seals in the actuator and control valves should be used.

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.
- b) When manual operation is through a hydraulic over-ride, energise the hydraulic supply and then rotate the handwheel in the appropriate direction to operate actuator and valve.

- c) When manual operation is through a hydraulic over-ride on a spring return actuator, fully close block/by-pass valve and operate hand pump in order to over-ride actuator spring and operate actuator and valve.
- d) When manual operation is through a jackscrew handwheel, simply turn appropriate jackscrew handwheel to operate actuator and valve.

6.0 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



Caution

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

limited shelf life. Other parts are generally not required as spares.



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.

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

7.0 DESIGN FEATURES

7.1 GP RANGE

1. Safe Spring Lock

Positively locks the spring module in place under load. Prevents spring module detachment from the drive module.

2. Reduced Wear

The design of connection between the piston rod and the guide block compensates for side load deflection and there by reduces wear on the rod, bearings and seals.

3. Standardised Mounting

The NAMUR mounting configuration allows standardisation of mounting hardware for a wide range of shaft driven accessories.

4. Replaceable Bearings

Replaceable bearings protect sliding and rotating components, with suitability for either dry or lubricated working conditions.

5. PTFE Guide Bar

PTFE thrust bar prevents yoke pin axial movement, transferring axial loads directly to the drive module case.

6. Optional Over-ride

Internal hydraulic over-ride cylinder module for spring-return models doesn't increase actuator length.

7. Ease of Lifting

G25 and larger models are equipped with four lifting eyes for safe actuator handling during shipping installation and removal.

8. Integral Housing Vent

The main actuator housing incorporates an integral check valve in order to release overpressure.

9. 80°~100° Travel Adjustment

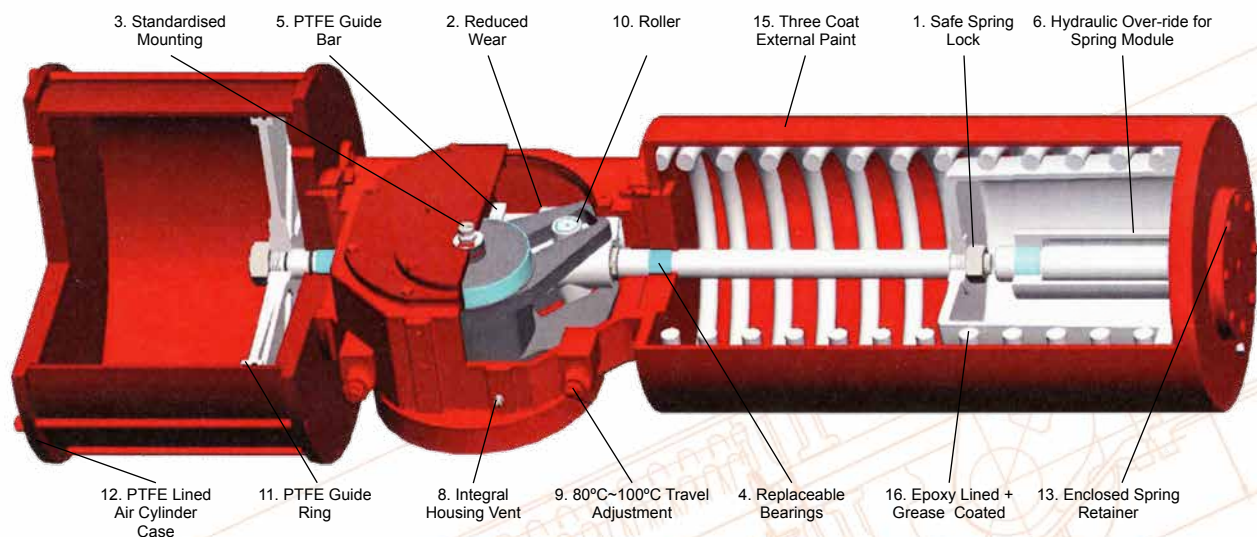
Bi-directional travel stops are integral to the actuator. The stops allow 80° ~ 100° total travel adjustment and are designed to prevent ingress of foreign matter and water.

10. Roller

Rollers are used which reduces friction between the yoke arm and pin, minimising wear to the yoke arm and pin.

11. PTFE Guide Ring

The PTFE Guide prevents metal to metal contact with the cylinder bore, thus ensuring the cylinder is not damaged by the piston whilst also reducing torque as well as ensuring ease of operation.



Pneumatic

7.2 GH RANGE

1. Safe Spring Lock

Positively locks the spring module in place under load. Prevents spring module detachment from the drive module.

2. Reduced Wear

The design of connection between the piston rod and the guide block compensates for side load deflection and there by reduces wear on the rod, bearings and seals.

3. Standardised Mounting

The NAMUR mounting configuration allows standardisation of mounting hardware for a wide range of shaft driven accessories.

4. Replaceable Bearings

Replaceable bearings protect sliding and rotating components, with suitability for either dry or lubricated working conditions.

5. PTFE Guide Bar

PTFE thrust bar prevents yoke pin axial movement, transferring axial loads directly to the drive module case.

6. Optional Over-ride

Internal hydraulic over-ride cylinder module for spring-return models doesn't increase actuator length.

7. Ease of Lifting

G25 and larger models are equipped with four lifting eyes for safe actuator handling during shipping installation and removal.

8. Integral Housing Vent

The main actuator housing incorporates an integral check valve in order to release overpressure.

9. 80°~100° Travel Adjustment

Bi-directional travel stops are integral to the actuator. The stops allow 80° ~ 100° total travel adjustment and are designed to prevent ingress of foreign matter and water.

10. Roller

Rollers are used which reduces friction between the yoke arm and pin, minimising wear to the yoke arm and pin.

11. Guide Ring

The Guide prevents metal to metal contact with the cylinder bore, thus ensuring the cylinder is not damaged by the piston whilst also reducing torque as well as ensuring ease of operation.

11a. Double Piston Seals

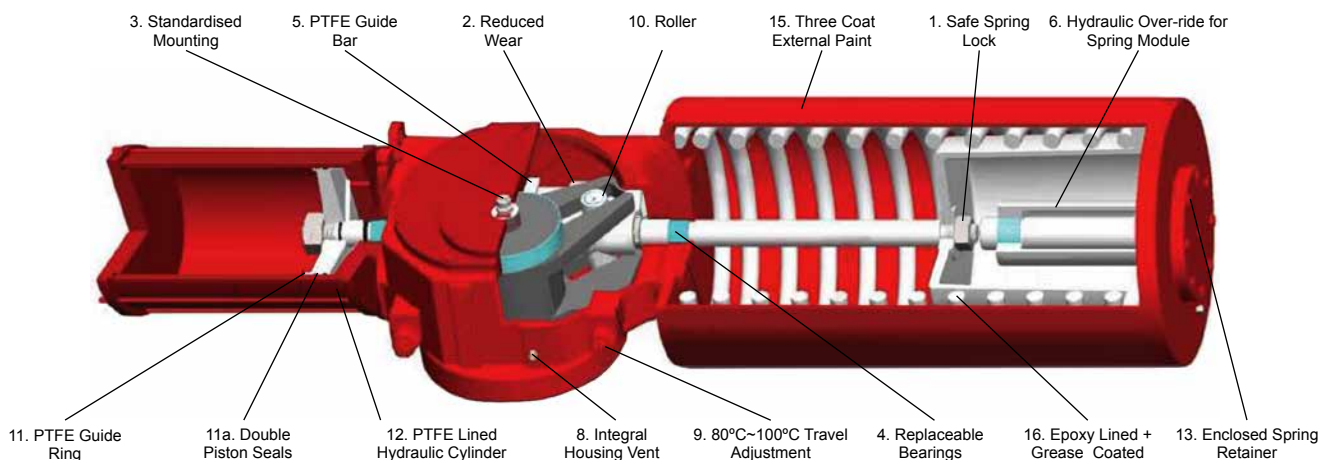
Hydraulic cylinders have double sealing with o-ring and dynamic seal ring to prevent metal to metal contact between cylinder and piston.

12. PTFE Lined Cylinder

The Air/Hydraulic Cylinder is PTFE lined to ensure smooth low torque operation over the life of the actuator and also prevent corrosion.

13. Spring Safety

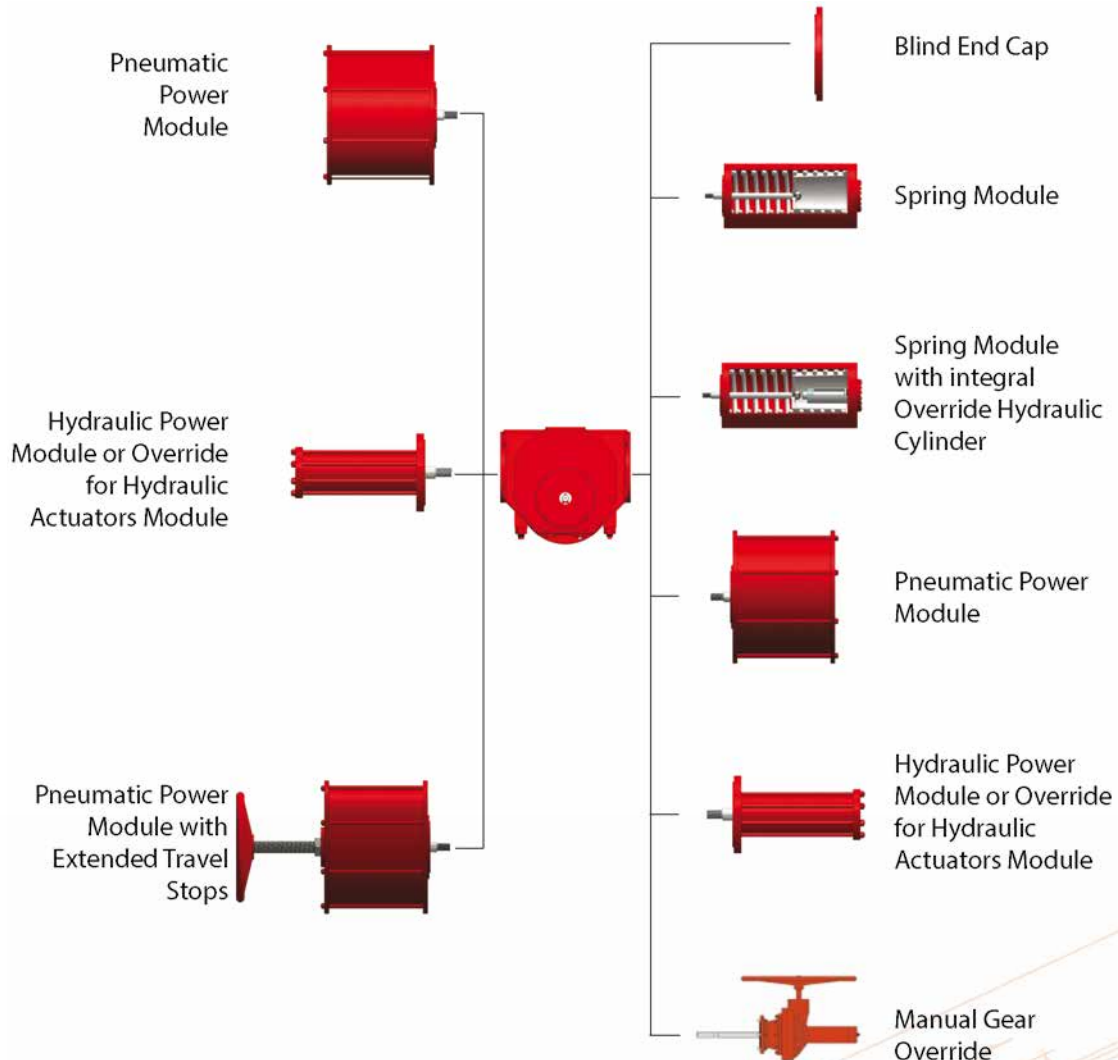
The retaining nut system & cover positively locks and covers the spring module to allow its safe removal and installation, eliminating accidental release of the spring force.



Hydraulic

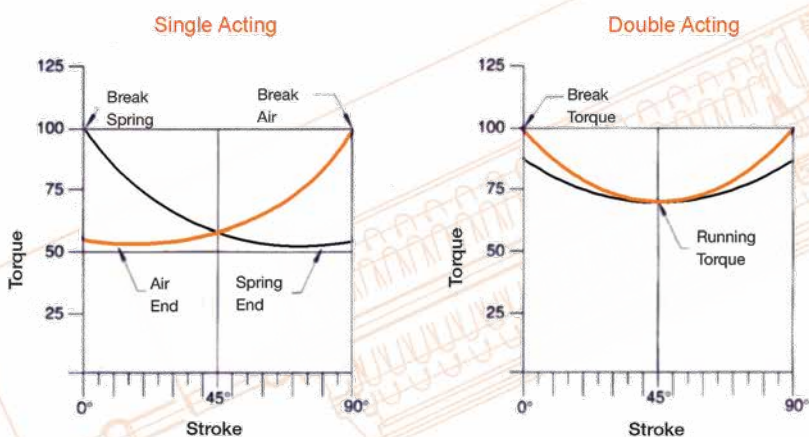
APPENDIX A

Modular Structure Description



G Range actuator is the module-in design which consists of the different module. The different function is available in the different combination.

Torque Characteristics



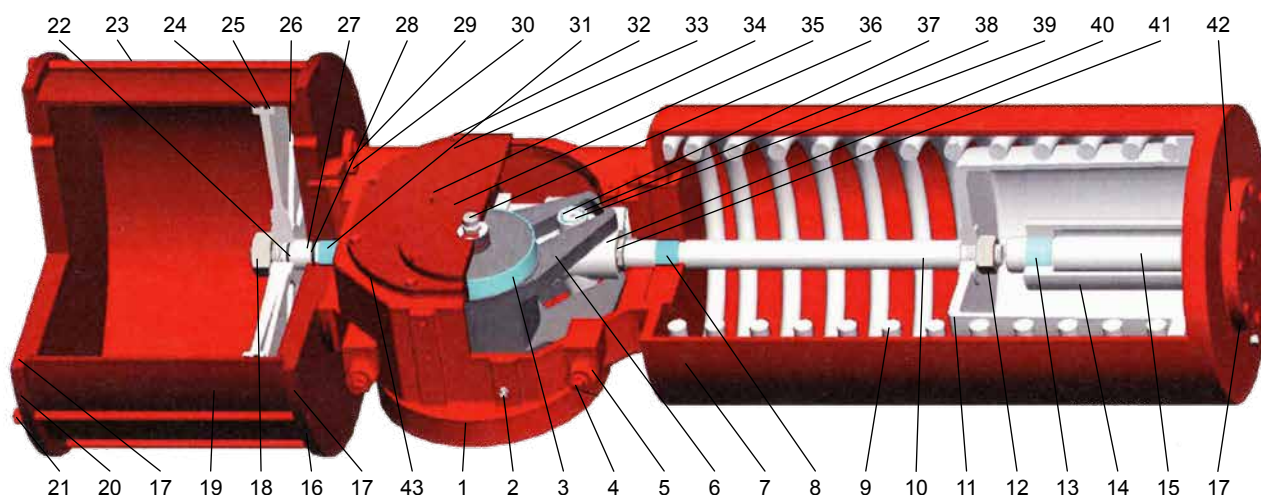
Non-declutchable mechanical over-ride for G30 and G48 spring-return models.

APPENDIX B

GP RANGE

Assembly Drawing & Parts List - Pneumatic - Indicative*

* Bill of materials shown (single acting - 'spring return' style) is indicative only and varies according to size, model, configuration, materials and style. Refer to as-built drawing.



No.	Name	Material	No.	Name	Material
1	Body	Ductile Iron+3 Coat Paint	23	Screw	Alloy Steel
2	Vent Valve	Carbon Steel	24	Guide Ring	Viton
3	Slide Bearing	Metal+PTFE	25	O-Ring	Viton
4	Adjust Stud	Alloy Steel	26	Piston	Ductile Iron
5	Nut	2H	27	Centre Bar	Alloy Steel
6	Yoke	Carbon Steel	28	O-Ring	Viton
7	Spring Case	Carbon Steel*Epoxy Lined+Grease Coated	29	Stud	Alloy Steel
8	Sliding Bearing	Metal+PTFE	30	Nut	2H
9	Spring	Alloy Steel	31	Sliding Bearing	Metal+PTFE
10	Tension Rod	Alloy Steel	32	Bolt	Carbon Steel
11	Spring Seat	Carbon Steel	33	Body Cap	Ductile Iron
12	Nut	2H	34	Bolt	Carbon Steel
13	Sliding Bearing	Metal+PTFE	35	Cover	Ductile Iron
14	Hydraulic Cylinder	Carbon Steel	36	Drive Shaft	Alloy Steel
15	Hydraulic Piston	Carbon Steel	37	Roller	Alloy Steel
16	Adaptor	Ductile Iron	38	Sliding Bearing	Metal+PTFE
17	O-Ring	Viton	39	Pin	Alloy Steel
18	Nut	2H	40	Guide Block	Ductile Iron
19	Cylinder	Carbon Steel+PTFE Lined	41	Nut	Carbon Steel
20	End Cap	Ductile Iron	42	Cover Plate	Carbon Steel
21	Tie Bar**& Nut	Alloy Steel*/2H	43	O-Ring	Viton
22	O-Ring	Viton			

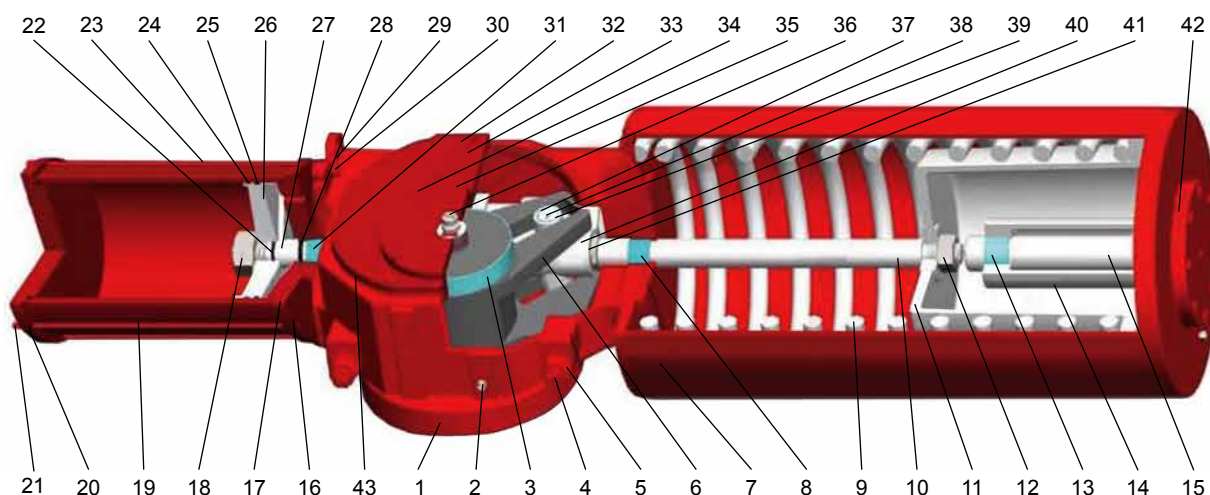
* Or Ductile Iron in smaller sizes. ** Stainless steel or no external tie option available.
Sample only, refer to as-built B.O.M. for each size

APPENDIX B CONT.

GH RANGE

Assembly Drawing & Parts List - Hydraulic - Indicative*

* Bill of materials shown (single acting - 'spring return' style) is indicative only and varies according to size, model, configuration, materials and style. Refer to as-built drawing.



No.	Name	Material
1	Body	Ductile Iron+3 Coat Paint
2	Vent Valve	Carbon Steel
3	Slide Bearing	Metal+PTFE
4	Adjust Stud	Alloy Steel
5	Nut	2H
6	Yoke	Carbon Steel
7	Spring Case	Carbon Steel*Epoxy Lined+Grease Coated
8	Sliding Bearing	Metal+PTFE
9	Spring	Alloy Steel
10	Tension Rod	Alloy Steel
11	Spring Seat	Carbon Steel
12	Nut	2H
13	Sliding Bearing	Metal+PTFE
14	Hydraulic Cylinder	Carbon Steel
15	Hydraulic Piston	Carbon Steel
16	Adaptor	Ductile Iron
17	O-Ring	Viton
18	Nut	2H
19	Cylinder	Carbon Steel+PTFE Lined
20	End Cap	Ductile Iron
21	Tie Bar**& Nut	Alloy Steel*/2H
22	O-Ring	Viton

No.	Name	Material
23	Screw	Alloy Steel
24	Guide Ring	Viton/PTFE
25	O-Ring	Viton
26	Piston	Ductile Iron
27	Centre Bar	Alloy Steel
28	O-Ring	Viton
29	Stud	Alloy Steel
30	Nut	2H
31	Sliding Bearing	Metal+PTFE
32	Bolt	Carbon Steel
33	Body Cap	Ductile Iron
34	Bolt	Carbon Steel
35	Cover	Ductile Iron
36	Drive Shaft	Alloy Steel
37	Roller	Alloy Steel
38	Sliding Bearing	Metal+PTFE
39	Pin	Alloy Steel
40	Guide Block	Ductile Iron
41	Nut	Carbon Steel
42	Cover Plate	Carbon Steel
43	O-Ring	Viton

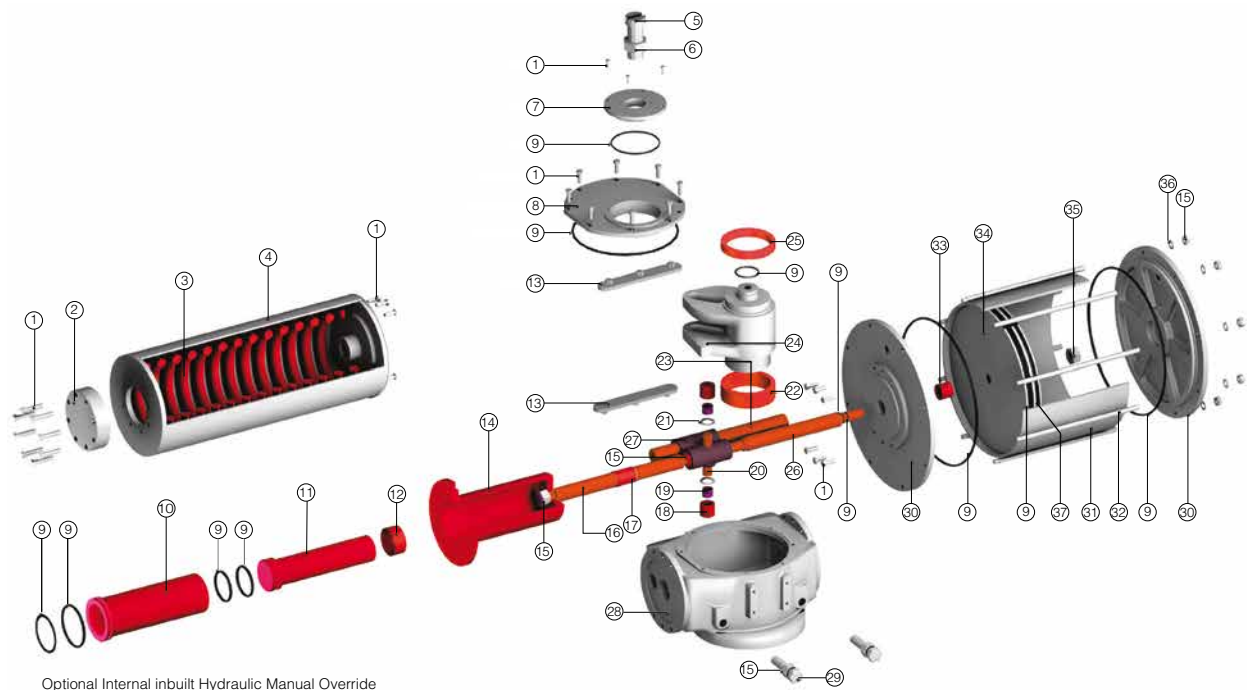
* Or Ductile Iron in smaller sizes. ** Stainless steel or no external tie option available.
Sample only, refer to as-built B.O.M. for each size

APPENDIX B CONT.

GP RANGE

Assembly Drawing & Parts List - Hydraulic - Indicative*

* Bill of materials shown (single acting - 'spring return' style) is indicative only and varies according to size, model, configuration, materials and style. Refer to as-built drawing.



Optional Internal inbuilt Hydraulic Manual Override

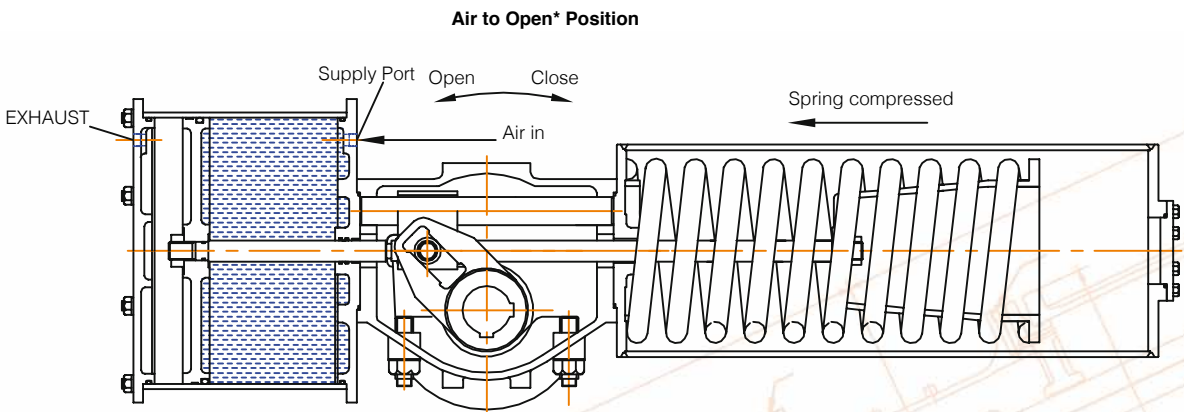
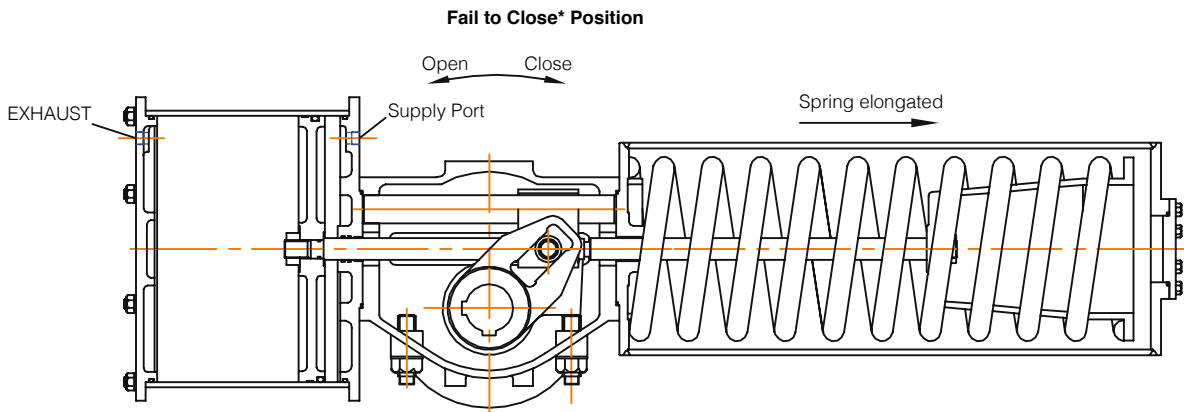
No.	Name	Material	No.	Name	Material
1	Bolts	Carbon Steel	20	Pin	Alloy Steel
2	Spring Case Cover	Carbon Steel	21	Spring Washer	Stainless Steel
3	Spring	Allo Steel	22	Sliding Bearing	Metal+PTFE
4	Spring Case	Carbon Steel	23	Centre Guide Bar	Alloy Steel Chromium Plated
5	Position Indicator	Stainless Steel	24	Para Arm Yoke	Carbon Steel/Ductile Iron
6	Nut	Stainless Steel	25	Sliding Bearing	Metal+PTFE
7	Shaft Cover	Ductile Iron	26	Guide Bar	Alloy Steel Chromium Plated/PTFE
8	Body Cover	Ductile Iron	27	Guide Block	Metal+PTFE
9	O-Rings	Viton	28	Body	Ductile Iron
10	Hydraulic Cylinder	Carbon Steel (optional)	29	Travel Stop Belt	Alloy Steel+ENP
11	Piston	Carbon Steel (optional)	30	Cylinder Cover	Carbon Steel
12	Bearings	Metal + PTFE (optional)	31	Pneumatic Cylinder	Carbon Steel PTFE Lined
13	Guide Strips	PTFE	32	Tie Bar Studs	Alloy Steel
14	Spring Seat	Carbon Steel+ZP	33	Sliding Bearing	Metal+PTFE
15	Adjustable Nuts	Alloy Steel+ENP	34	Piston	Ductile Iron
16	Spring Tension Rod	Alloy Steel Chromium Plated	35	Centre Bar Nut	Alloy Steel
17	Sliding Bearing	Metal+PTFE	36	Spring Washers	Spring Steel+ZP
18	Roller Thrust Bearing	Metal+PTFE	37	Dynamic Seal Ring	Viton
19	Roller Bearing	Metal+PTFE			

APPENDIX C

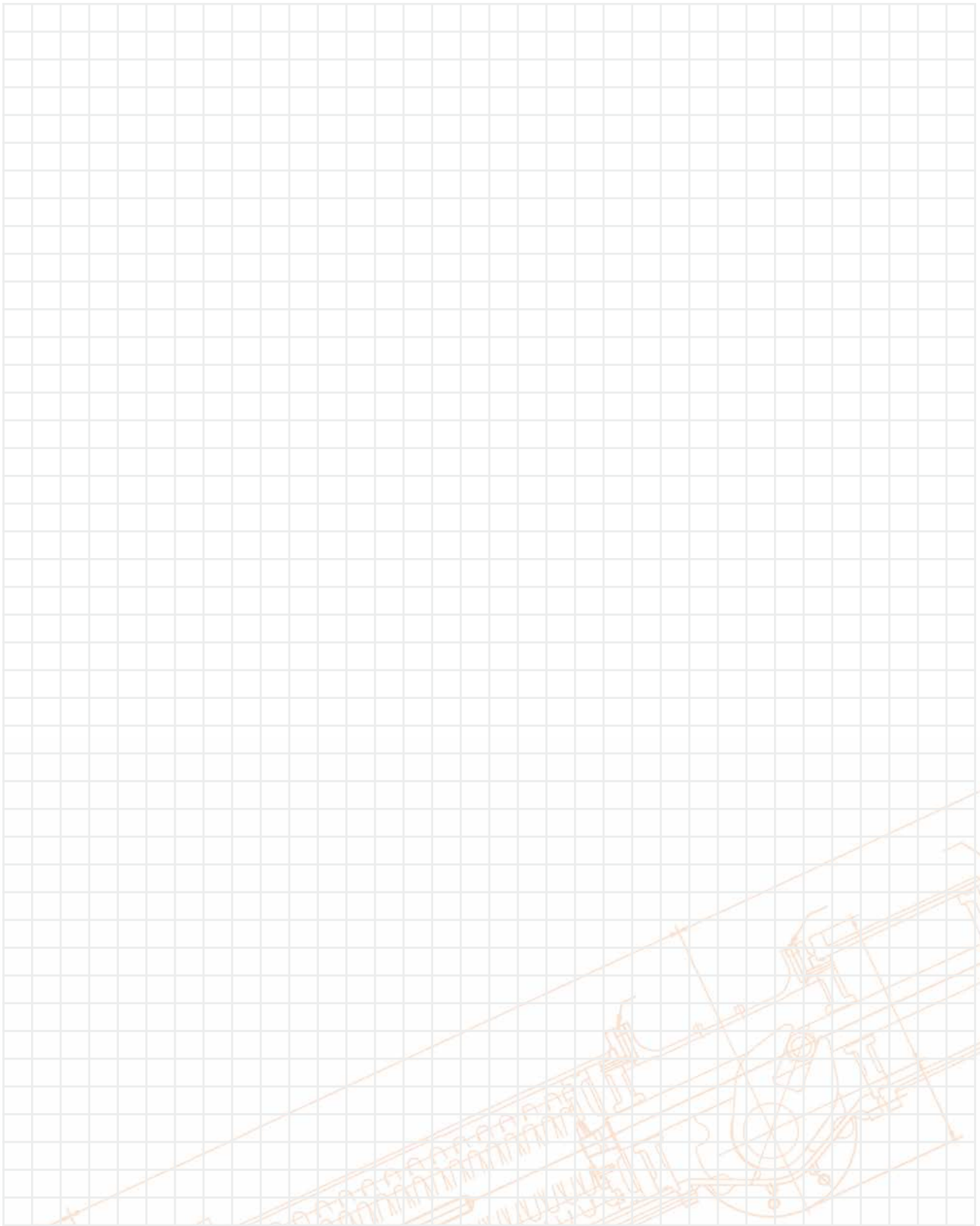
GH RANGE

Air Supply Diagram

* Open/closed is relative to mounting on valve and assume valve has actuator mounted to “fail closed”. Valve/Actuator can also be mounted “fail open” GH hydraulic has the same input & exhaust arrangement.



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



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