DelTech Controls L.L.C.

DelTorq Series 20 – ACTUATORS

TECHNICAL DATA SHEET T.D.S. NO. – 20 – 105 / R1 ISSUE DATE : NOV – 2004	**INSTALLATION, OPERATION AND MAINTENANCE MANUAL**

(Please read the entire instructions carefully before installation or servicing.)

Guarantee :

"Our liability in respect of any defect in or failure of the goods supplied or for any loss, injury or damage attributable onward is limited to making goods by replacement or repair defects which under proper use appear therein and arise solely from faulty materials and workmanship within a period of 18 calendar months after the original goods shall have been first shipped or 12 calendar months from the date of installation, whichever is earlier provided that such defective parts are returned without charge to our factory for examination. No other warranty is either expressed or implied."

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1. General:
This manual contains the important information regarding the installation, operation and troubleshooting of the 'DelTorq' pneumatic actuators. Please read these instructions carefully before operating the actuator.

Warning:
- It is important that the actuator should only be used within the pressure limits indicated in our technical specifications.
- Operating the actuator over pressure limits will damage internal parts as well as cause damage to the housing.
- Operating the actuator over temperature limits will damage internal and external components (disassembly of spring return actuator may become dangerous).
- Operating the actuator in corrosive environments with incorrect protection may damage the internal and external parts.
- Do not disassemble the individual spring cartridges. Disassembly may result in personal injury.
- Isolate all airlines and make sure that actuator air connection is vented before installation or servicing of the actuator.
- Do not remove end caps or disassemble the actuator while the actuator is pressurised.
- Before installing onto a valve, make sure that the rotation of the valve and the actuator are the same and that the position indicator orientation is also correct.
- If the actuator is 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. Technical Data:

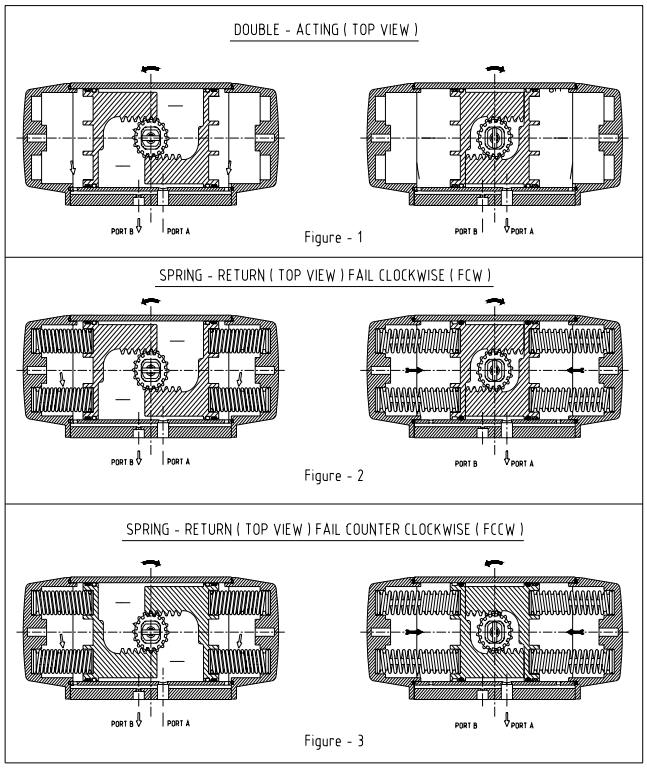
Operating Media: Dry or lubricated air, non-corrosive and inert gas, or light hydraulic oil.
Air Supply: 8 bar (116 PSI) Maximum.
Temperature:
Standard: -4 °F to 175°F (-20°C to 80°C)
Viton 'O' Rings : -4 °F to 300°F (-20°C to 150°C)
Siilicon 'O' Rings : -40 °F to 175°F (-40°C to 80°C)
Lubrication: Factory lubricated for the life of the actuator under normal conditions.
Construction: Suitable for indoor and outdoor use.
External Travel Stops: ±5° adjustment on 90° stroke.

3. Installation:
1. Ensure that the desired failure mode is correct (Refer to figure no. 1,2 & 3). The 'DelTorq' actuator typically operates counter clockwise to open and clockwise to close, it is possible to change this style of operation. If the spring return actuator is not set up in the configuration desired, follow the disassembly procedure section 5.2. Reverse the orientation of the pistons, then reassemble following the assembly procedure, section 5.3.
2. Mount the actuator to the valve as per the desired orientation (parallel or perpendicular to the pipeline).
3. Connect a regulated air supply to the NPT fitting in the actuator housing. ***Caution: The maximum operating pressure is 116 psi (8 bar).***
4. Adjust the stroke adjustment bolts following assembly section 5.3.5. Stroke adjustment bolts can be adjusted by up to ±5°.

4. Operation:

The 'DelTorq' actuators have simple operational characteristics. Port 'A' (facing the ports and reading right to left) is connected to the interior cavity between the pistons directing the airflow into/out of the interior cavity. Port 'B' is connected to the end cap cavities directing airflow into/out of the end cap area.

1 Double Acting (Figure 1): Air supplied through port 'A' forces the piston away from each other causing the pinion to rotate counter clockwise (with exhaust air exiting through port 'B'). Air introduced through port 'B' forces the piston towards each other causing the pinion to rotate clockwise (with exhaust air exiting through port 'A').



2 Spring Return:

2.1 Fail Clockwise (FCW) (Standard Scope of Supply) (Figure 2): Air introduced through port 'A' forces the piston away from each other, compressing springs and causing the pinion to rotate counter clockwise (with exhaust air exiting through port 'B'). Upon loss /release of air pressure, springs forces the piston towards center position causing pinion to rotate clockwise (FCW) (with exhaust air exiting through port 'A').

2.2 Fail Counter Clockwise (FCCW) (Figure 3) : Air introduced through port 'A' forces the piston away from each other, compressing springs and causing the pinion to rotate clockwise (with exhaust air exiting through port 'B'). Upon loss /release of air pressure, springs forces the piston towards center position causing pinion to rotate counter clockwise (FCCW) (with exhaust air exiting through port 'A').

5 Maintenance:

5.1 General :
'DelTorq' actuator can be supplied with Metric / UNC fasteners. Under normal operating conditions, the actuator requires only periodic observation to ensure proper adjustment. Service kits are available to replace seals and bearings (soft parts). These parts are identified in Figure 22 and listed in Table 3. Table 1 lists kit numbers.

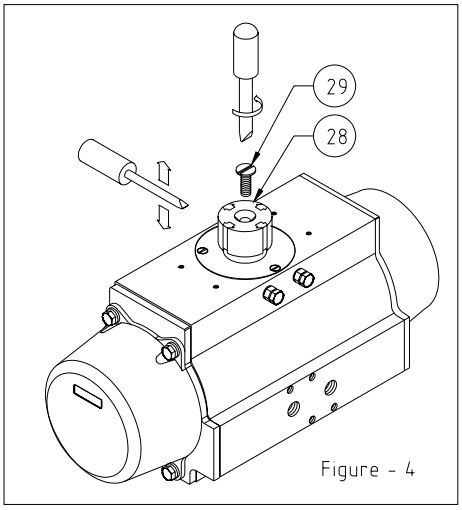
Table 1

Actuator	Service Kit
052	20.SK.052.XX.0
065	20.SK.065.XX.0
075	20.SK.075.XX.0
085	20.SK.085.XX.0
100	20.SK.100.XX.0
115	20.SK.115.XX.0
125	20.SK.125.XX.0
160	20.SK.160.XX.0
210	20.SK.210.XX.0
270	20.SK.270.XX.0

5.2 Disassembly:

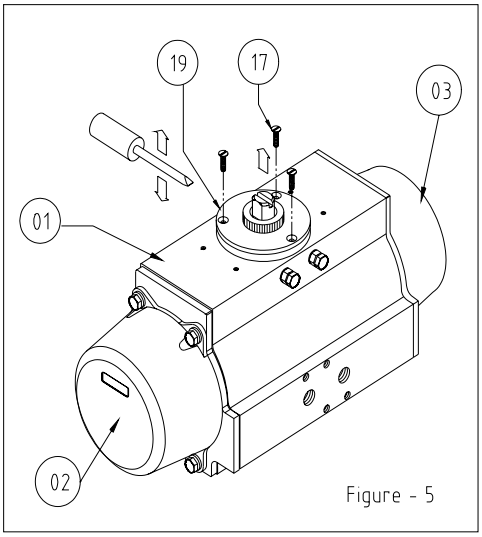
When disassembly of the actuator is required for maintenance, remove the actuator from the valve. Ensure proper lifting procedures are followed when moving or carrying actuators. **Caution: Do not use M5 VDE/VDI mounting holes for lifting the actuator.**
When disassembling the ‘‘DelTorq’’ actuators, use caution and be certain that the actuator is free from accessories and the air supply is disconnected. When the actuator is a spring-return unit, make sure that the actuator is in the failed position before disassembling.

1. Removal of Local Position indicator (28) (Figure 4) :



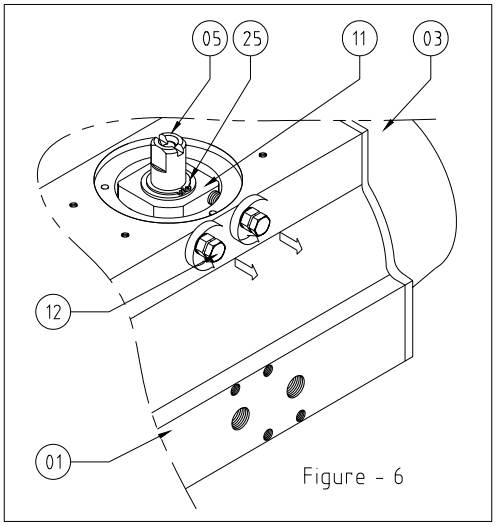
a) Remove the counter sunk screw (29), if fitted.
b) Remove the Local position indicator (28) from the pinion (05). It may be necessary to pry gently with a screwdriver.

2 Removal of Top Cover Plate (19) Assembly (Figure 5) :



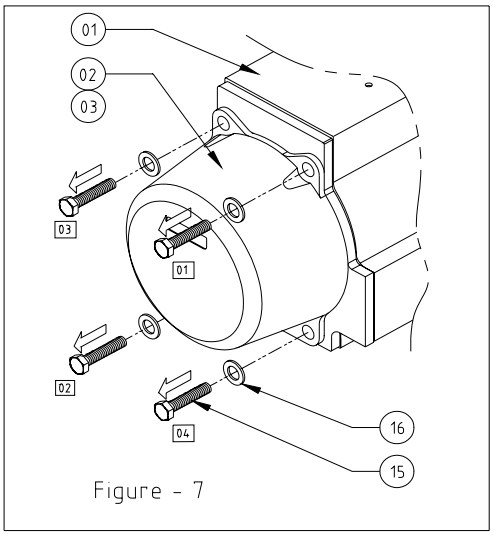
a) Remove the counter screws (17).
b) Remove the top cover plate (19) from the pinion with the help of knurling provided on Top Cover Plate. It may be necessary to pry gently with a screwdriver.
c) Remove the top cover plate ‘O’ ring (20) and discard, if replacing soft parts.

3 Removal of Stroke Adjustment Bolts (12) (Figure 6):



a) Remove both the Stroke Adjustment Bolts (12) together with nut (13) and washer (14). Replace the Stroke Adjustment Bolts (12) in case of excessive wear observed on the bolt surface.

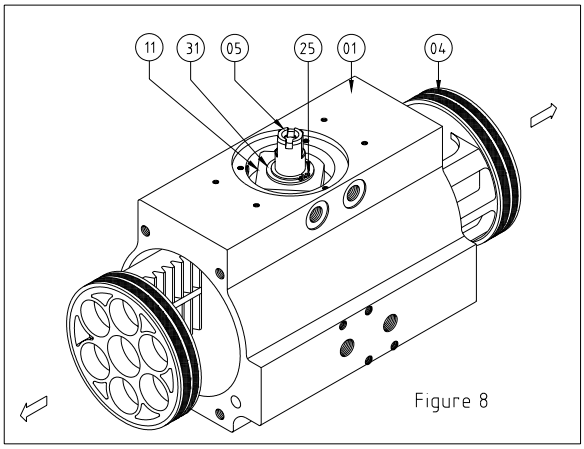
4 End Cap (02,03) Disassembly (Figure 7):



a) Remove the end cap bolts (15) in the sequence shown in the figure 7.
Caution: ***When disassembling a spring return actuator, the end cap (02,03) should be loose after unscrewing end cap bolts (15) 4-5 turns. If there is still force on the end cap bolt (15), this may indicate a damaged spring cartridge and any further disassembly should be discontinued. Further disassembly of the end caps may result in serious personal injury. Return the actuator to DelTech for further maintenance.***

b) For spring return actuators, remove spring cartridges (26).
c) Remove end cap ‘O’ rings (24) and discard if replacing all soft parts.

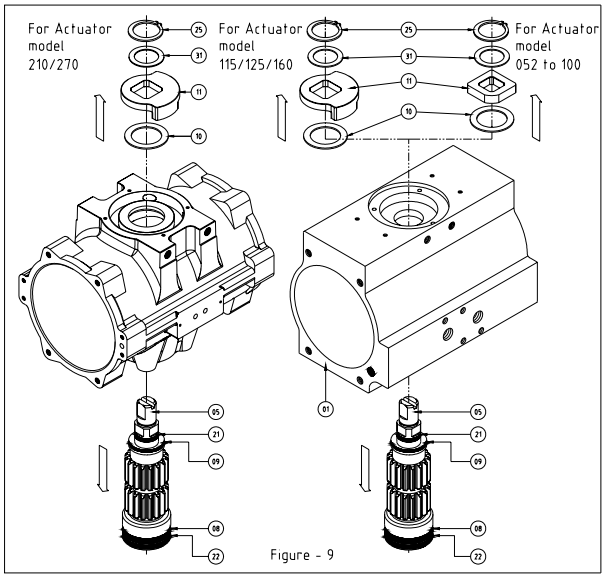
5. Piston (04) Disassembly (Figure 8):



a) Hold the body (01) in a vice or similar device. Rotate the pinion (05) until the pistons (04) reach the end positions (i.e. the piston rack teeth disengages with pinion teeth). **Caution: *Air pressure should not be used to remove the pistons from the body*.** Clean and inspect the piston teeth for signs of wear. Replace pistons, if wear seems excessive.

b) Remove piston 'O' rings (23), piston guide band (07). Discard the 'O' rings and guide band, if replacing the soft parts.

6. Removal of Pinion (05), Cam (11) and bearings (08,09) (Figure 9) :



a) Remove the circlip (25) using a circlip plier.

b) Remove the cam retaining washer (31), cam (11), cam bearing (10). It may be necessary to pry gently to cam with a screwdriver. Observe the cam surfaces for excessive wear, where the Stroke adjustment bolts are resting and the cam ID (Square c/s). Replace the cam, if excessive wear is observed.

c) Apply a downward force to top of the pinion (05) so that the pinion will move completely out of the bottom of the body (01). If the Pinion (05) does not move freely, gently tap with a plastic mallet.

d) Remove the top and bottom bearings (08,09) and top and bottom 'O' rings (21,22). Discard if replacing all soft parts.

7. Cleaning and inspection:

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

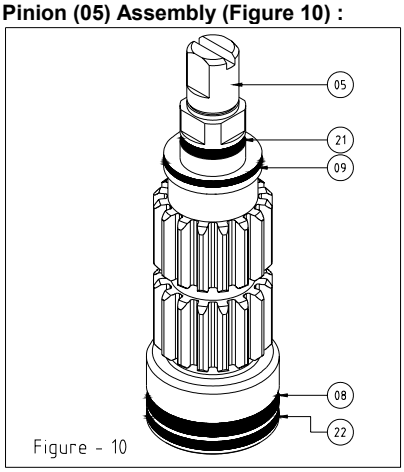
5.3 Assembly:

Prior to assembly, ensure that all components are clean and undamaged.

It is recommended to use the lubricants as mentioned in Table 2.

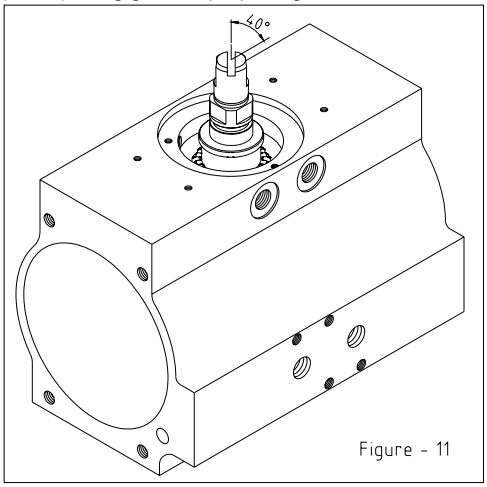
Table 2: Recommended Lubricants	
General Use	CASTROL GREASE - AP3

1. Pinion (05) Assembly (Figure 10) :



a) Install the top and bottom bearings (08,09) and 'O' rings (21,22) onto the pinion (05).

b) Apply grease to the pinion bearings (08,09), shaft 'O' rings (21,22) using general-purpose grease listed in table 2.



c) Insert the pinion (05) into the body (01) from the bottom side. ensure that bottom surface of the pinion should be around 0.5mm inside the body bottom face and the pinion top slot orientation is as shown in figure 11.

2. Piston (04) Assembly (Figure 12 & 13):

a) Fit piston pad (06), piston guide band (07), piston o-rings (23) on the pistons (04).

b) Apply grease to the internal bore of the body (01) & to the piston rack teeth using recommended general - purpose grease listed in table 2.

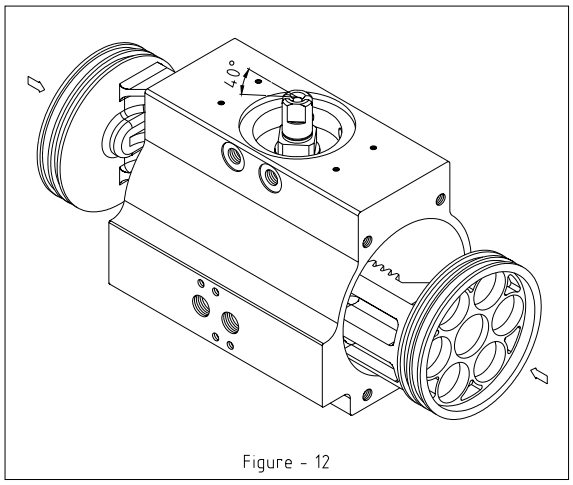


Figure - 12

c) Press the two pistons simultaneously in the body bore until the pinion racks are engaged and rotate the pinion until the stroke is completed. Take care that the pistons are oriented correctly as per the fail position of the actuator (The standard fail action of actuator is fail clockwise). Refer Fig 12 & Fig 13.

d) To ensure that the piston (04) teeth are evenly engaged, fully compress both the pistons inward and measure the distance from the edge of the body to the piston (04) face on each side, shown as dimension 'A' in figure 13. If a different value is obtained on each side, remove the pistons and repeat from step 2c.

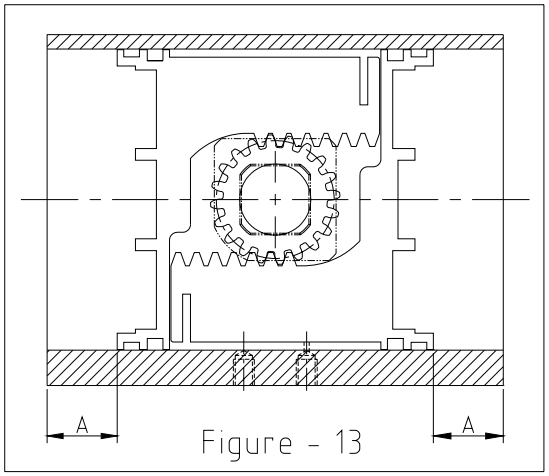


Figure - 13

e) Temporarily install the local position indicator (28) onto the pinion (05) to determine whether the correct stroke is obtained. Ensure that the arrow in the local position indicator (28) will rotate a minimum of 5° beyond the 90° vertical centerline of the actuator body (01) and a minimum of 5° beyond the 0° horizontal centerline of the actuator body as shown in figure 14. If the proper stroke is not obtained, remove the pistons and repeat from step 2c. Once proper stroke is obtained, remove the local position indicator (28).

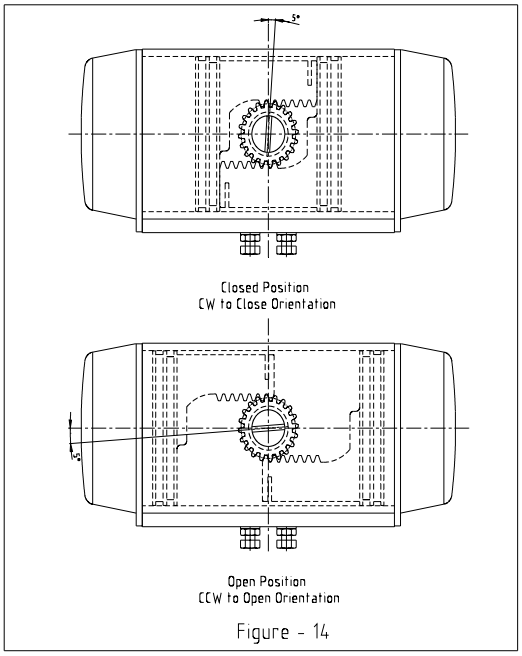


Figure - 14

3 Cam (11) Assembly (Figure 15):

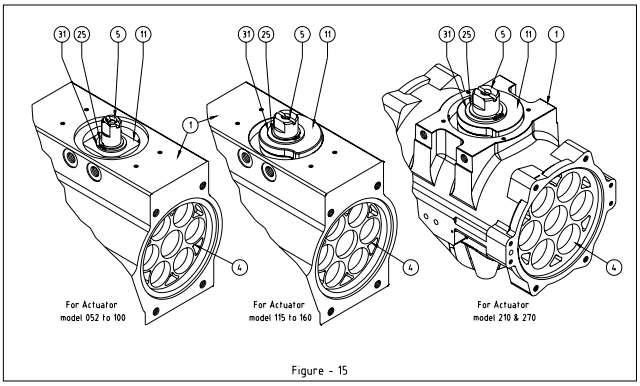


Figure - 15

a) Insert the cam bearing (10) and cam (11). Ensure that the cam orientation is as shown in the figure 15.
b) Insert the circlip (25) using the circlip plier.

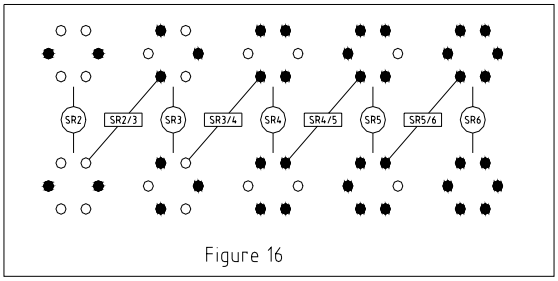


Figure 16

SPRING RETURN ACTUATORS.

- For spring return actuator, insert the proper quantity of the spring cartridges (26) according to the pattern shown in Fig 16 (referring to the total number of springs). Insert the spring cartridges (26) as shown in Fig 17.

- Apply grease to the end cap 'O' rings (24). Fit the 'O' rings (24) into the groove in each end cap (02,03). Fit the Plug Transfer port (30) inside the body (01) on each side. Fit the end caps. Insert all the end cap bolts (15) and hand tighten. Complete tightening by following the sequence indicated in Fig 18.

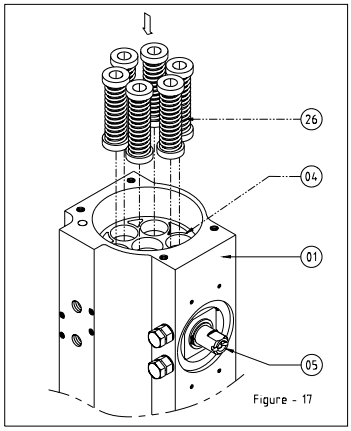


Figure - 17

DOUBLE ACTING ACTUATORS.

- Apply grease to the end cap 'O' rings (24). Fit the 'O' rings (24) into the groove in each end cap (02,03). Fit the Plug Transfer port (30) inside the body (01) on each side.
- Fit the end caps (02,03) onto the body (01), verifying that the 'O' rings (24) remain in the groove. Insert all the end cap bolts (15) and hand tighten. Complete tightening by following the sequence indicated in Fig 18.

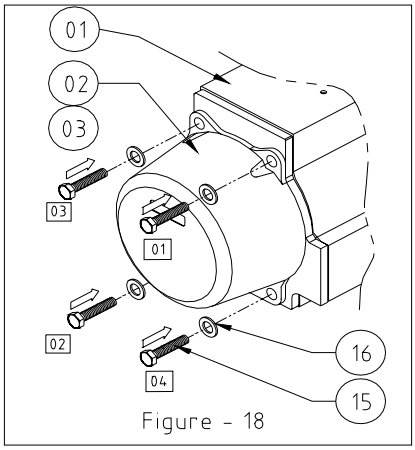


Figure - 18

4. Assembly of Stroke Adjustment Bolts (12) :

a) Insert the nut (13), washer (14) onto the stroke adjustment bolt.

b) Screw in the bolts (12) into the body (01).

5. External Travel Stop Adjustment (Figure 19) :

The stroke adjustment bolt to the right controls the clockwise end of travel, while to the left controls the counter-clockwise end of travel.

a) Cycle the actuator to the clockwise end of travel and determine if the pinion top slot is in the proper position (In most of the applications this will be perpendicular to the actuator body i.e. at 90^0)

b) If the pinion top slot is not in the correct position, turn the right stop adjustment bolt (12) IN to reduce actuator travel, or OUT to increase actuator travel.

c) When the correct clockwise position is obtained, hold the adjusting bolt (12) stationary while tightening the nut (13).

d) Cycle the actuator to the counter-clockwise end of travel and measure to determine if the pinion top slot is in the proper position. (In most of the applications, this will be parallel to the actuator body i.e. at 0^0).

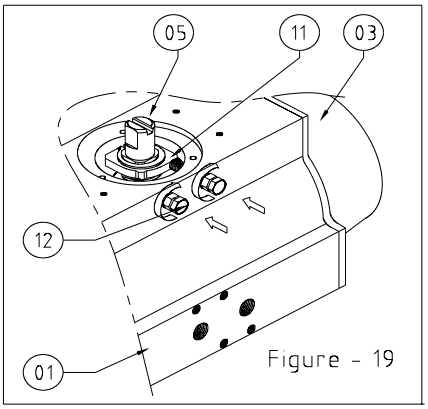


Figure - 19

e) If the pinion top slot is not in the correct counter-clockwise position, turn the left stop adjustment bolt (12) IN to reduce actuator travel, or OUT to increase actuator travel.

f) When the correct counter-clockwise position is obtained, hold the adjusting bolt (12) stationary while tightening the nut (13).

6. Top Cover Plate Assembly (Figure no 20):

- Paste the top cover plate gasket (18) to the top cover plate (19) by using suitable paste/solution.
- Fit the 'O' ring (20) using grease inside the top cover plate.
- Insert the top cover plate (19) onto the pinion (05).
- Fit the three counter sunk screws (17) on the cover plate.

7. Local Position indicator Assembly (Figure no 21):

- Fit local position indicator (28) assembly onto the pinion (05). Ensure that it indicates the correct Actuator position.
- Tighten the counter sunk screw (29) to secure the local position indicator

8. Actuator Lock Out Arrangement :

For 052-100 Models (Refer to fig no-23 & 24):

- To lock the actuator at fully closed condition, cycle the actuator to clockwise end of travel. Rotate the right stroke adjustment bolt OUT & left stroke adjustment bolt completely IN. (Refer to fig No-23)
- To lock the actuator at fully opened condition, cycle the actuator to counter clockwise end of travel. Rotate the left stroke adjustment bolt OUT & right stroke adjustment bolt completely IN. (Refer to fig No-24)

For 115-160 Models (Refer to fig no-25 & 26):

- To lock the actuator at fully closed condition, cycle the actuator to clockwise end of travel, till the counter on the cam is inline with backside tapping. Rotate the right stroke adjustment bolt OUT. Insert the locking bolt from backside as shown in fig no 25.
- To lock the actuator at fully open condition, cycle the actuator to counter clockwise end of travel, till the counter on the cam is inline with backside tapping. Rotate the left stroke adjustment bolt OUT. Insert the locking bolt from backside as shown in fig no 26.

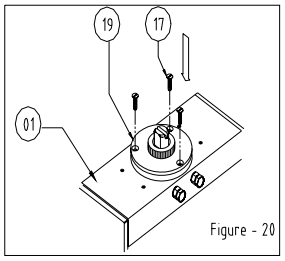


Figure - 20

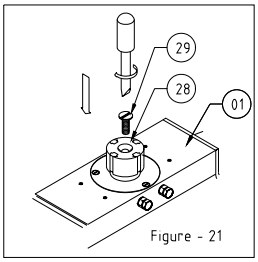
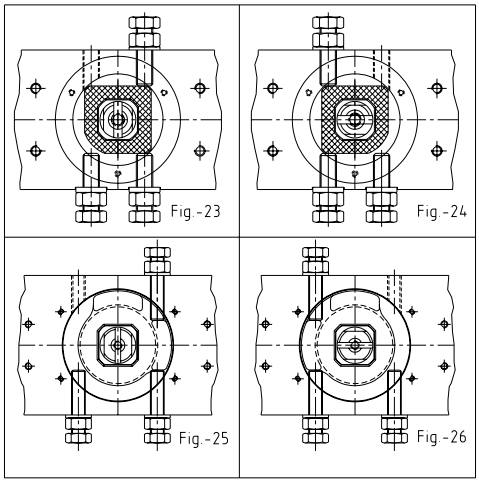


Figure - 21



6. Storage :

All the 'DelTorq' actuators are factory lubricated for one million cycles under normal operating conditions. The ports are plugged to prevent material from entering the actuator during the shipment. If the actuators are not for immediate use, the following precautions must be taken during storage.

a) Store in a dry environment.
b) It is recommended that the actuator be stored in its original box.
c) Do not remove the plastic plugs on the air supply ports.

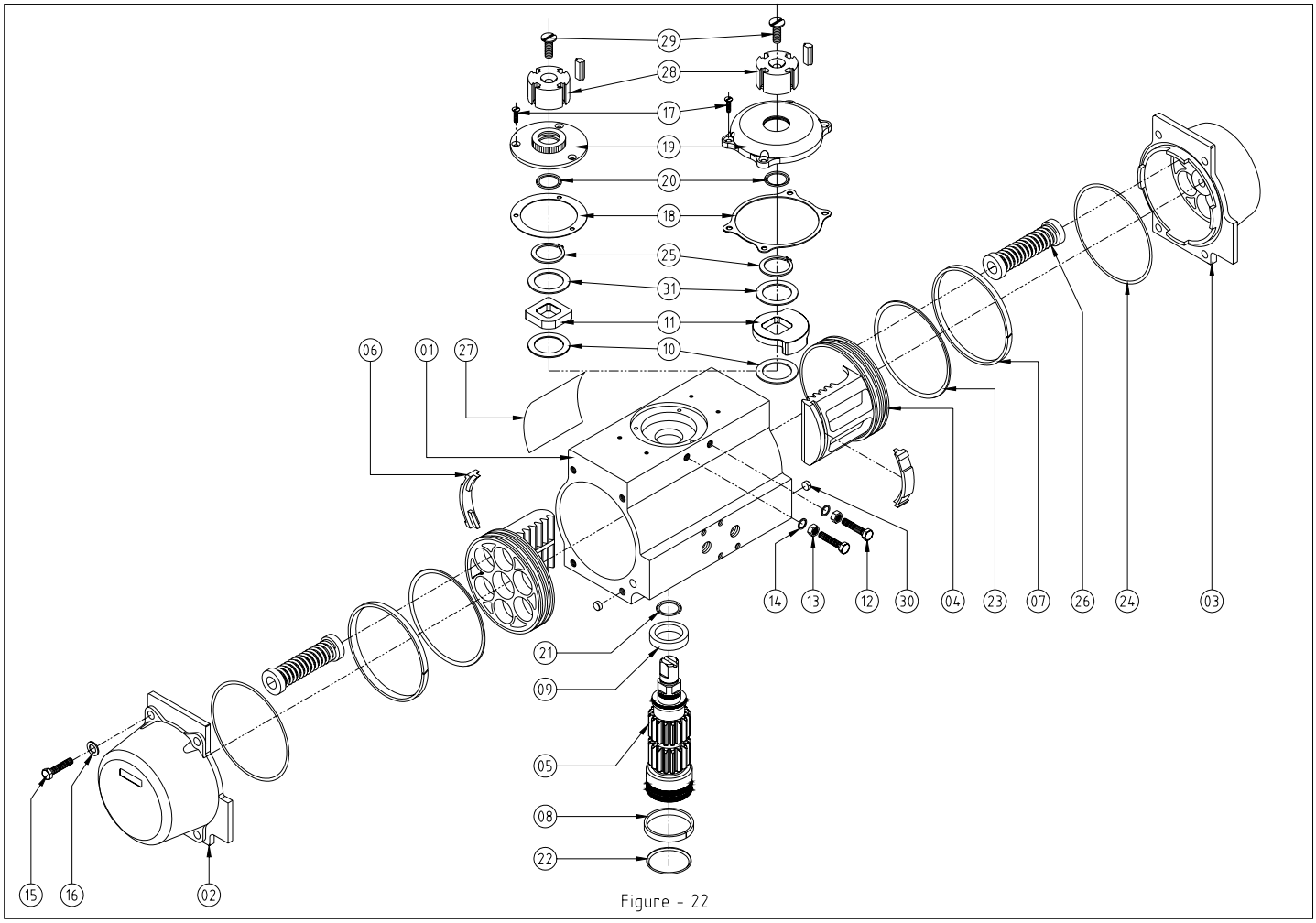


Figure - 22

TABLE - 3

No.	PART DESCRIPTION	MATERIAL (052 TO 160)	MATERIAL (210 & 270)	QTY
01.	BODY	ASTM B221, 6063-T6	BS 1490 LM9	01
02.	LEFT END CAP	LM24 (BS 1490)	BS 1490 LM24	01
03.	RIGHT END CAP	LM24 (BS 1490)	BS 1490 LM24	01
04.	PISTON	LM24 (BS 1490)	BS 1490 LM 25	02
05.	PINION	En19 + (ENP)	En8 + (ENP)	01
06.*	PISTON PAD	NYLON (Mos 2 Filled)		02
07.*	PISTON GUIDE BAND	NYLON (Mos 2 Filled)		02
08.*	BOTTOM PINION BUSH	DELRIN		01
09.*	TOP PINION BUSH	DELRIN		01
10.*	CAM BEARING	DELRIN		01
11.	CAM	ASTM A351 Gr. CF8		01
12.	STROKE ADJUSTING BOLT	S.S 304		02
13.	STROKE ADJUSTING NUT	S.S 304		02
14.	STROKE ADJUSTING WASHER	S.S 304		02
15.	END CAP BOLT	S.S 304		08
16.	END CAP WASHER	S.S 304		08
17.	C'SK SCREW(Top Plate Cover)	S.S 304		03
18.	ACTUATOR GASKET	Nitrile Rubber		01
19.	TOP COVER PLATE	LM6 (BS 1490)		01
20.*	O' RING	Nitrile Rubber		01
21.*	PINION TOP O' RING	Nitrile Rubber		01
22.*	PINION BOTTOM O' RING	Nitrile Rubber		01
23.*	PISTON O' RING	Nitrile Rubber		02
24.*	END CAP O' RING	Nitrile Rubber		02
25.	CIRCLIP	Spring Steel		01
26.**	SPRING CARTRIDGE	VD Si Cr DIN 17223 / Equivalent		--
27.	ACTUATOR IDENTIFICATION LABEL	————		01
28.	LOCAL POSITION INDICATOR	PVC		01
29.	C'SK SCREW (Indicator)	S.S 304		01
30.*	PLUG TRANSFER PORT	Nitrile Rubber		02
31.	CAM RETAINING WASHER	SS 304		01

* Suggested spare parts for maintenance
** Valid for Spring Return Actuator only

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