Installation & Operation Manual

(I-TORK PDS Series Pneumatic Actuator)



PDS-M0108/1010

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Many thanks for purchasing our I-Tork PDS Pneumatic Actuator!

For safe and proper operation, please read this manual carefully before using it and save it for reference.

Important Notice: The contents in this manual are subject to change without notice due to quality improvement.

1. General

I-Tork PDS series actuators are designed for rotary quarter turn valves and there are PD (Double Acting) and PS (Single Acting-with Spring Pack).

I-Tork PDS series actuators can be used with a 4~8Kg/㎠ range of air supply pressure. Standard air pressure is 5.5Kg/㎠.

PD : Pmax 8 bar (116 psi)

PS : Pmax 7 bar (110 psi)

ISO Mounting Design:

ISO 5211 for valve flange or mounting bracket.

VDE 3845 (Namur) for solenoid valve.

Operating Medium:

Filtered inert gas or air must be used, and exhaust air must be passed through silencer before being vented into the atmosphere. The dew point shall be equal to -20 °C or at least, 10 °C below the ambient temperature (ISO8573 Part1, Class 3). The maximum particle size shall not exceed 40 μm (ISO8573 Part1, Class 5). Max Pressure shall be 0.8 Mpa (8 bar) and the minimum design pressure for pressurized parts shall be 1.5 times the maximum operating pressure.

2. Scotch Yoke Principle & Adjustment;

I-Tork Actuators uses a Scotch Yoke assembly with angled slots.
This allows for a more compact design when compared to Rack & Pinion actuators. Scotch-Yoke technology is known as the most suitable actuator mechanism for valve and damper applications, as it produces higher torque at both ends (open and close) positions compare to Rack and Pinion, which has a constant output torque. The standard operation ambient temperature range is -20 ~ + 80 ℃.

Single Acting actuators have the pistons rotated 180° for a fail close position; this means any adjustment will take place in the open position. If the SR actuator is set to the 'Fail Open' position, then the adjustment will take place in the closed position. The adjustment angle for both is ±3° by Adjusting Screws.

The adjustment is done by loosening the Adjusting Screws, and I-Tork PDS have 2 Adjusting Screws for open and close positions.



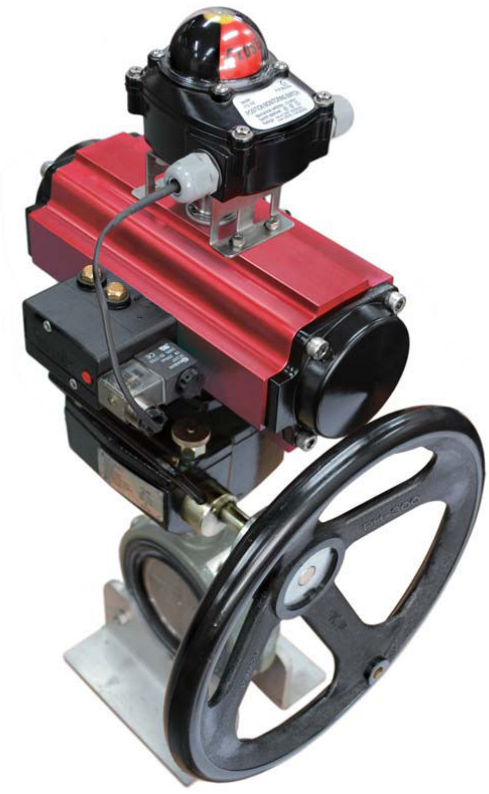
3. Important Safety Procedures

- **Caution**: Always disconnect the Air and Electrical supplies before carrying out any form of maintenance on an Actuator.

- **Caution**: When removing any ball valve or plug valve assemblies from a pipe system, isolate the piping system on which the Actuator is installed and relieve any media pressure that may be trapped in the valve cavities before removing the Actuator for maintenance.

- **Never** use 'Blow Out' the Pistons or the End Caps from the Actuator Body.

- **Never** turn the adjusting screws completely out when the actuator is under pressure.



4. Operation

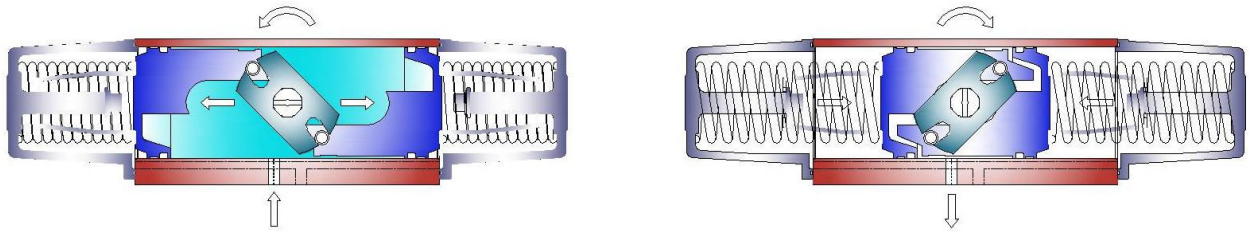
Figure 1 : PD (Double Acting)



Close **Open**

When air is supplied to the left port, the actuator will move to the Close position.
When air is supplied to the right port, the actuator will move to the Open Position.

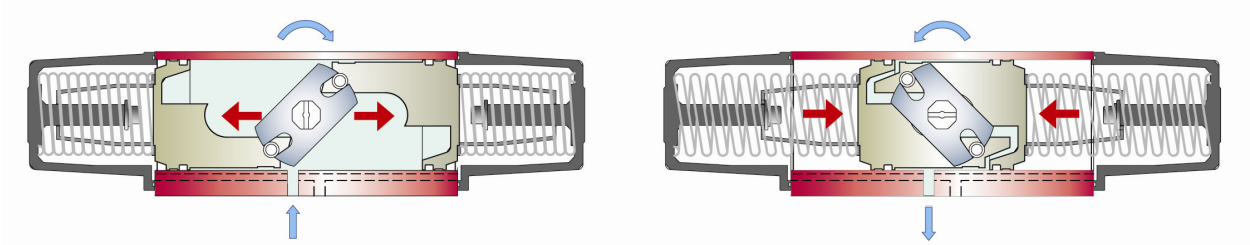
Figure 2 : PS (Single Acting) Fail Close Position



Open **Close (fail Position)**

When air is supplied to the left port, the actuator will move to the Open Position.
When the air supply fails, the actuator will move to the fail position (Close).

Figure 2 : PS (Single Acting) Fail Open Position



Close **Open (fail position)**

When air is supplied to the left port, the actuator will move to the Close position.
When the air supply fails, the actuator will move to the fail position (Open).

5. Lubrication Requirements:

I-Tork PDS generally do not require lubrication, however, oil mist lubrication is recommended for actuator which has performed more than 100,000 operation cycles.

Recommended Lubrication Grease:

Parts	Actuator Version	Grease
Cylinder Bore, Shaft Sealings	Standard & High Temperature	Dark Brown Grease ALVANIA RL2/DC111
Cylinder Bore, Shaft Sealings	Low Temperature	White Grease DC 111 (DOWCORNING)

6. Application

All quarter turn type valves and equipment as follows

1) Ball Valve(2 way, 3 way, 4 way), Screw end and flanged
2) Butterfly Valve
3) Plug Valve
4) Damper
5) etc

7. Installation and Piping

1) Selection of actuator

Determine the appropriate torques and strokes taking into consideration the following parameters and questions.

- **Valve Question**
- Valve: type, size, function and operation characteristics
  Operating Conditions: Media, Temperature, Pressure, Flow rate, Frequency of operation and required stroking time.
  Valve Torque Characteristics (seating/unseating, dynamic torque <when applicable>)
  Maximum Allowable Stem Torque Limitation

- **Actuator Question**
  Air Supply Pressure : Minimum and Maximum
  Operation: On/off or Control
  Acting: Double or Single (Fail Position open or close)
  Frequency of operation

- **Ancillary Question**
  Limit Switches: Type, Voltage, etc.
  Positioners: Pneumatic or Electro-Pneumatic
  Position Transmitters: Local Electrical Regulations
  Solenoid Valve: Type, Voltage, etc.

- **Environmental Conditions**
  Indoor, outdoor, saline, corrosive chemicals, etc.
  Enclosure Protection type
  Hazardous or non-Hazardous areas
  Ambient Temperature

2) Installation and Mounting on the Valve

I-Tork PDS can be mounted in any position, ie: Vertical or Horizontal.

It is very important that the actuator shaft and the valve stem are centered and must have a 0.5 ~ 1 mm gap between the actuator shaft and the valve shaft (or driving bush) depending on the actuator size. If the valve stem is too high, it may force the actuator shaft upward thus displacing the shaft seal. This would cause air leakage at the shaft seal.

Please note that the actuator has a hexagonal drive shaft.

Do not mount the actuator at a 45° angle.

All the mounting dimensions of PDS series follows international standard and as follows.

Top mounting hole : VDI/VDE3845

Top end of shaft : NAMUR for installation of Limit Switch Box or Positioner.

Bottom Mounting Hole: ISO5211

Bottom End of Shaft: Double Square for Easy Mounting (ISO5211)

3) Piping (Air Tubing)

All I-Tork PDS actuators can be piped with solid or flexible tubing with the solenoid valve mounted remotely from the actuator or by mounting a NAMUR designed solenoid valve directly onto the NAMUR mounting pad on the side of the actuator.

- **Precaution**

  Please check the environmental conditions (Temperature, Pressure, Characteristics of fluid, Piping standard) before piping.

  If air tubing connection is not properly fitted, it may cause lower torque, shorten the life cycle of actuator. Connection of actuator is PT 1/4" for PDS 40~200.

- **Solenoid valve**

  Be sure that the solenoid valve's connection type is compatible to the actuator's.

- **Operating**

  To operate the actuator, supply a clean and dry air through a filter regulator (this is strongly recommended)

  Power up the solenoid valve.

  The actuator should operate.

4) Storage

I-Tork PDS actuator's body is made of Hard-Anodized aluminum both inside and outside for protection against corrosion.

Store in a dry area and care to be taken when stacking the actuators.

Do not remove the air holes plugs until the actuator is ready for installation.

5) Manual Operation:

When operating the actuator manually, be sure that all compressed air is fully vented before carrying out the manual operation.

6) Adjusting Screw Adjustment

For Open Position

1. Operate Valve/Actuator assembly to the open position.
2. Remove Air supply
3. Loosen the lock nut on the adjusting screw
4. Turn the "Close" adjusting screw clockwise to reduce or counter clockwise to increase the travel.
5. Tighten the lock nut.
6. Connect air and check if the position is correct. (If not, repeat from 2)

For Close Position

7. Operate Valve/Actuator assembly to the close position.
8. Remove Air supply
9. Loosen the lock nut on the adjusting screw
10. Turn the "Open" adjusting screw clockwise to reduce or counter clockwise to increase the travel.
11. Tighten the lock nut.
12. Connect air supply and check if the position is correct. (If not, repeat from 8)

8. Dismantle and Assembly

(**For Replacing O-ring and other parts**.)

PD series (Double Acting)

Dismantling

Caution: Vent all compressed air from the actuator and disconnect all electric power before dismantling.

1) Loosen the adjusting screws (23).
2) Loosen both end cover bolts (26) using Hexagonal Wrench and dismantle.
3) Using the spanner, rotate the stem more than 90° until pistons are released automatically and pull out the pistons (3).
4) Loosen the Set Screw (27) of Scotch - Yoke (5).
5) Take the Snap Ring (21)/Washer (12)/Thrust Washer (11) out from the top of shaft.
6) Separate the shaft (4) from the body.
7) Replace the part.
8) For Assembly: Do the Reverse.

PS series (Single Acting)

Dismantling

Caution: Vent all compressed air from the actuator and disconnect all electric power before dismantling.

1) Loosen the adjusting screws (23).
2) Using hexagonal wrench, loosen 2 bolts (26) in a diagonal position on both end covers.

Then loosen the other 2 bolts in a diagonal position on both end covers slowly.
(Ensure spring pack pressure is released before removing bolts fully, if unsure, then remove 2 diagonal bolts only and insert longer bolts until spring pressure is released)

3) Take out the cover (28) and spring pack (22/29/30/31/32/33).
4) Using the spanner, rotate the stem more than 90° until pistons are released

automatically and pull out the pistons (3).

5) Loosen the Set Screw (27) of Scotch - Yoke (5).
6) Take the Snap Ring (21)/Washer (12)/Thrust Washer (11) out from the top of shaft.
7) Separate the shaft (4) from the body.
8) Replace the part.
9) For Assembly: Do the Reverse.

Converting PD to PS Actuators:

All I-Tork PD (Double Acting) actuators can be converted to PS (Single Acting) actuators by adding a spring pack as follows.

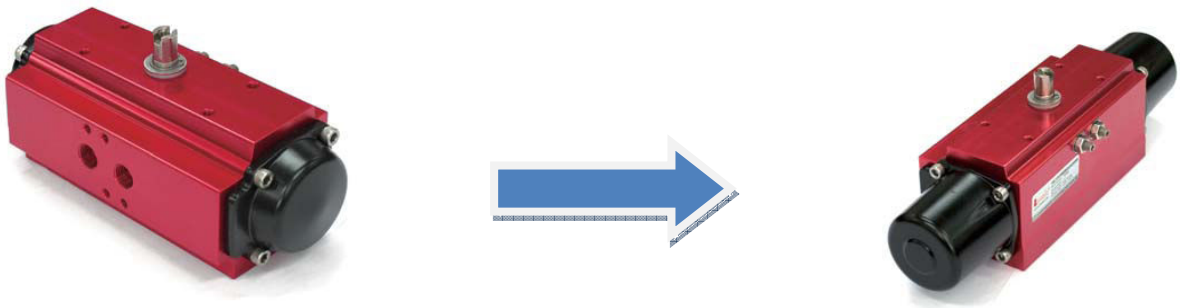
Caution: Vent all compressed air from the actuator and disconnect all electrical power before dismantling.

If 'Fail Open' position is required:

All parts are the same except for the addition of the spring pack; just the PD cover needs to be replaced with the appropriate PS spring pack.

If 'Fail Closed' position is required:

1. Loosen the Adjusting Screws (23) from the body.
2. Disassemble the End Covers (2).
3. Disassemble the Pistons (3) according to PD disassembly.
4. Rotate the Pistons (3) and Yoke (5) 180°; then assemble the pistons to the body.
5. Mount Spring Pack to the body when the pistons (3) are in their inner most position.



Disassembling of Spring Pack:

For safe disassembling of the spring packs, the following procedure must be carried out.

1. Disconnect all air and electrical supplies.
2. Springs must not be in the compress position (that is, the springs must be at fully extended position).
3. Loosen the bolts (26) of the end cover separate Spring Pack from the body.

Spring Packs

⇨ Pretension Bolt(33)/Spring Washer(32)/Plain Washer(31)/Spring Retainer(30) Spring(29)/O-Ring(22)/Spring Cover(28)/Bolt(26)

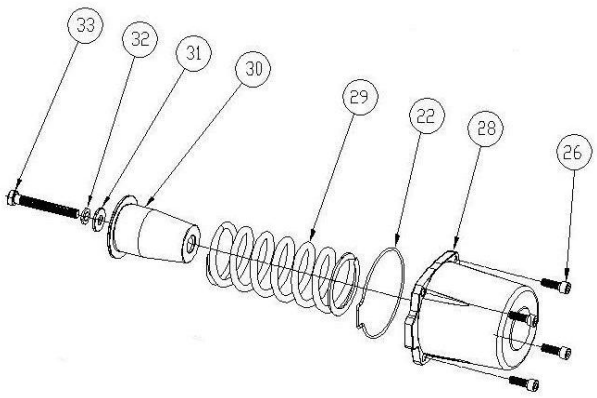
From PS 40 to PS100 (Single Spring per pack)

There are 2 Spring Options:
One is for 4.2 bar pressure;
The other is for 5.5 bar pressure.

From PS 125 to PS200 (Double Springs per pack)

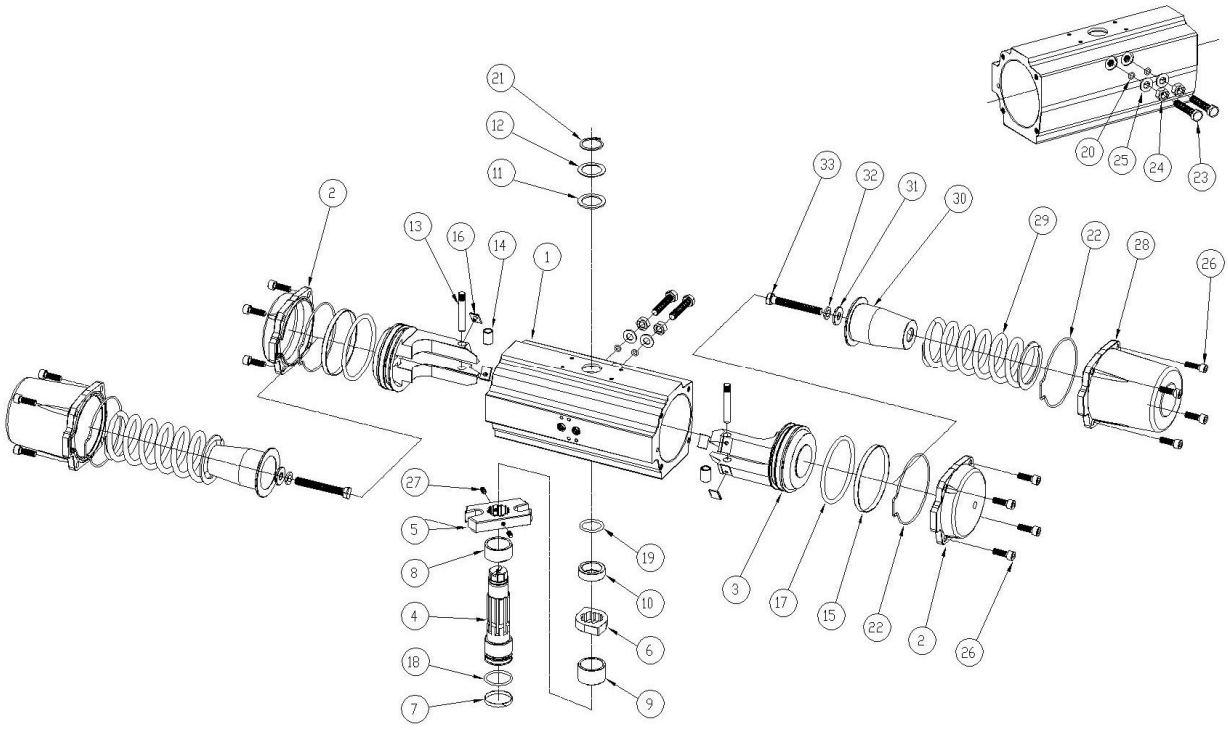
There are 2 Spring Options:
One is for 4.2 bar pressure.
The other is for 5.5 bar pressure.

<Remark> When placing order PS Single Acting type Pneumatic Actuator, please specify the Spring Option (4.2 bar or 5.5 bar).



9. PDS50~200 PART LIST

Part List No	Material	Part List No	Material	Part List No	Material
1. Cylinder	Aluminum	12.Washer-Shaft	Steel	23. Adjust screw	Steel
2. Cover	Aluminum	13. Roller Pin	Steel	24. NUT	Stainless Steel
3. Piston	Aluminum	14. Roller	Steel	25. Washer-Stopper	Stainless Steel
4. Shaft	Steel	15. Piston Guide – Shaft Pad	POM	26. HEX. Head Socket Bolt	Stainless Steel
5. Scotch yoke	Steel	16. Support Band	PTFE	27. Set Screw	Stainless Steel
6. Stopper	Steel	17. O-Ring - Piston	NBR	28. Spring Return Cover	Aluminum
7. Shaft Wearing	POM	18. O-Ring – Shaft, lower	NBR	29. Spring	Spring Steel
8. Support Ring - Lower	POM	19. O-Ring – Shaft - upper	NBR	30. Spring Retainer	Steel
9. Support Ring - Middle	POM	20. O-Ring - Stopper	NBR	31. Plane Washer	Steel
10. Support Ring - Upper	POM	21. Snap Ring	Stainless Steel	32. Spring Washer	Steel
11. Thrust Washer	POM	22. O-Ring- Cover	Stainless Steel	33. Pretension bolt	Steel



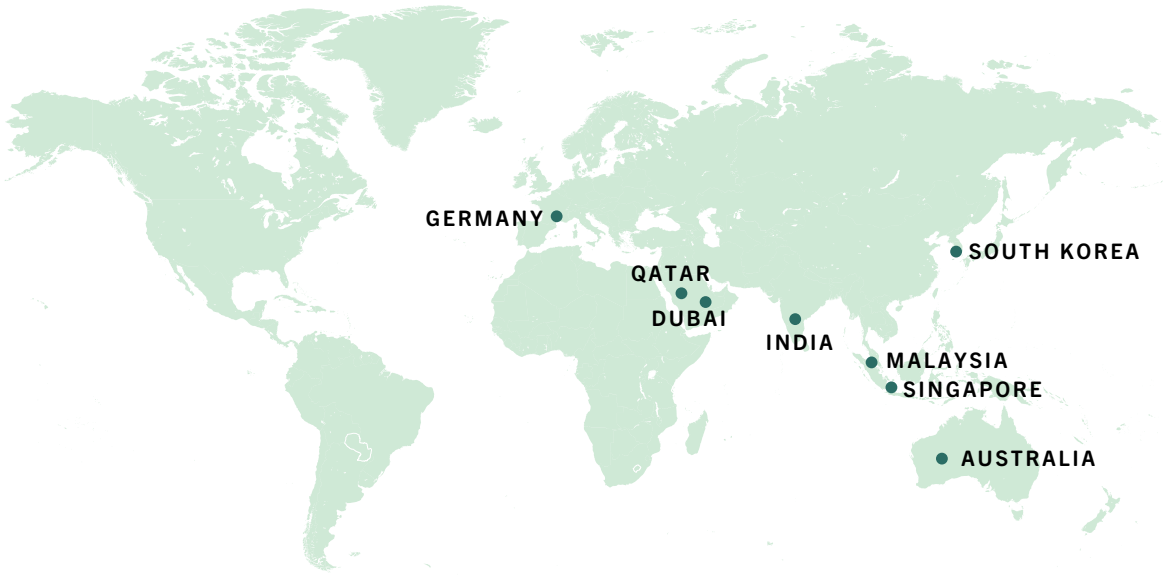
10. TROUBLE SHOOTING

Status	Possible Reason	Recommended action
Actuator doesn't work at all	Electric power line fails	Check the incoming voltage or power line
	Trouble in solenoid valve	Check voltage of solenoid Coil
		If coil is OK, check operation of spool valve by using manual button
	Blockage or leak in air supply line	Check air supply line
Actuator is working, but not smoothly	Air pressure is too low	Increase supply air pressure
	Blockage in air inlet/outlet lines by foreign material	Take out foreign material in the line
	Speed controller is locked	Open speed controller
	Air leakage through piston ring	Replace the piston ring
	Actual valve torque is too high	1) Increase air supply pressure 2) Replace with a larger actuator
Valve doesn't open or close fully	Stopper setting is wrong	Set stopper again
	Actual valve torque is too higher than specification.	Replace with a larger actuator
Air leakage	Piston or cover bushing o-ring worn out	Replace O-rings

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