



**MANUAL FOR DFA  
SCOTCH YOKE  
ACTUATOR**

(2014-4-24)

**ZHEJIANG DINGFENG FLUID AUTOCONTROL EQUIPMENT CO.,LTD.**

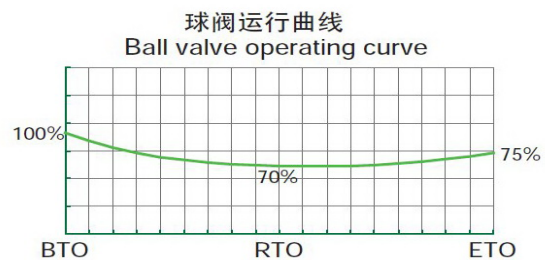
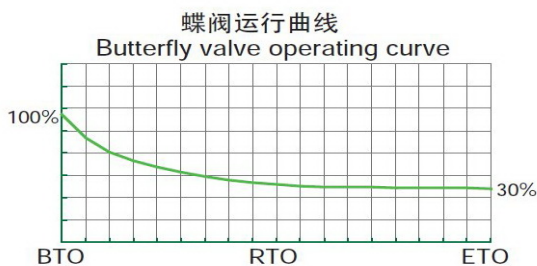
## 1. Overview

The scotch yoke actuator produced by our company is suitable for water, gas, oil, chemicals and mining field, with characteristics of large output torque, long life-span. The multifunctional and module design is unique and more helpful to stronger starting torque and closing torque. With the valve turning, the actuator output torque changes accordingly and becomes to biggest at valve open or shut when working. So, the features of actuator output torque accords with situation when ball valve and butterfly valve open or shut. Especially, with replaceable and adjustable spring module application, actuator benefits to the demand of different valve torque features so that customers are able to change the valve and actuator match flexibly, mostly use valve performance and prolong valve average life-span. The product is fit to drive quarter-turn ball valves, butterfly valves, plug valves with large nominal diameter.

## 2. Model Selection

When confirming the actuator size(it will be more economical and reasonable to choose the right actuator size if we know the torque features that valves needed in running process), firstly increasing safety factor on the basis of valve torque is necessary, as per different mediums: 25% safety factor for clean and lubricative mediums, 30% safety factor for steam and rough mediums, 50% safety factor for gas without lubricant, 60% safety factor for gas mixed with dust. Secondly, check the torque sheet for double acting or single acting according to the air supply, you will get the right actuator size.

Generally, ball valve and butterfly valve operating curve as follows:



### ①. Double acting example(refer to torque sheet in the catalog)

Max running torque(ball valve)= 9830N.m

Safety factor(25%)=9830 N.m × ( 1+25 % ) = Max.12288 N.m,

Min.12288\*70%Nm=8601.6Nm

Air supply: 4bar

Check DFA scotch yoke actuator torque along column under 4bar in the sheet, the proper data: START/END output torque: 14800Nm (more than12288Nm) , meanwhile RUN output torque: 8880Nm(more than 8601.6Nm), Concerned size is DFA30-550DA, so the right size actuator is it.

### ②Spring return acting example (refer to technical sheets)

Max torque(butterfly valve open or shut) =6000 Nm

Safety factor ( 30 % ) =6000 Nm× ( 1+30 % ) =7800 Nm

Air supply: 5bar

Check DFA scotch yoke actuator end (0°) torque of spring return column, find Min.torque 5700 Nm and Max.torque 8000 Nm (adjustable spring for output torque), 7800 Nm is in this torque range, and meanwhile output torque START(0°) and END(0°) under 5 bar are: (Max.12700Nm, Min.10400 Nm) and (Max.9900N.m, Min.7600 Nm) which can meet 7800 Nm. So, Concerned DFA30-550-S4/5 is right size, but check DFA30-500-S5/6 is able to meet 7800Nm requirement, which one is more suitable? Because 550 cylinder diameter is more than 500, the cost shall be more accordingly, we recommend DFA30-500-S5/6 is more economical..

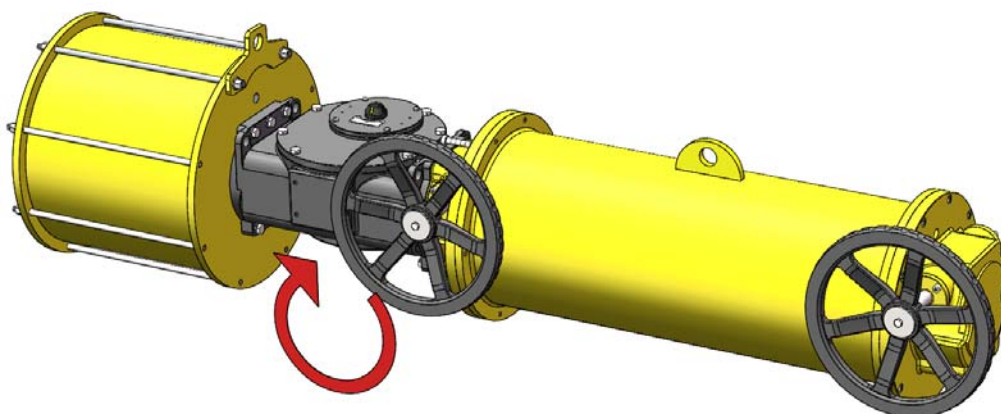
### 3. Installation

The accurate installation of actuator and valve directly influence the safe operation and life-span of actuator. Reasonable installation ensures the same shaft angle of actuator and valve as well as equally fixing the studs on the flanges.

### 4. Adjustment

After installation, test the actuator and valve together. Open the change-over valve (if there's no manual operator, there's no change-over valve), pressure the valve; exchange the two air-in holes with air supply 0.4-0.6Mpa, observe the opening and closing of valve (if it's in place), flexible and without pause. And do the experiment several times. If there's a solenoid valve, adjust the manual button of solenoid valve before electrify adjustment.

Ways of adjust the torque within a narrow range: the hand wheel next to the middle of the actuator is for adjusting the spring torque when spring returns (as well as the beginning torque of air pressure), turn the hand wheel clockwise as picture showing below, it is to add the torque of spring returns (as well as reduce the torque of beginning of air pressure); to turn the hand wheel anticlockwise, it is to reduce the torque of spring returns (as well as adding the torque of beginning of air pressure); by adjusting the balance of air pressure between hand wheel and cylinder, it can meet the reasonable torque when valve open or closed.



### 5. The running environment and maintenance

Air supply: clean pneumatic air supply

Temperature range: -20°C to +80°C (if there's special low temp. or high temp. needed, change the sealings.)

Lubrication: under normal working condition, there's no need to add the lubrication (if there's special low temp. or high temp. needed, change the sealings.)

Installation: available indoor and outdoor installation

Maintenance: daily maintenance, air supply need to keep dry and clean, and draw off the water and sewage of air filter, to ensure the working condition of solenoid valve and actuator. The actuator need to keep the clean surface, without dust dirt; as well as do not polluted by water vapor, water and oil.

The actuator sealing need to keep tight and intact. All parts of actuator and air lines need to be checked carefully. The air inlet/outlet connection and lines need to keep in good condition. Make sure the air pressure is performing within standard range and without any leakage.

## 6.Trouble Shooting

| Trouble Phenomena                      | Checking Item  | Solution   |
|--|--|--|
| Pneumatic Valve dose not Work          | (1) Solenoid fails, Coils burned, Blockage in spool valve            | (1) Replace Solenoid or Coil, Remove the impurity                    |
|  | (2) Actuator fails, piston or cover o-ring worn out, cylinder broken | (2) Replace the damaged o-ring or cylinder                           |
|  | (3) Blockage at valve disc.  | (4) Clean the impurity, replace the damaged parts                    |
|  | (5) The handle of gear operator is at the manual state.              | (4) Pull the handle to the pneumatic state.                          |
| Pneumatic Valve dose not Work Smoothly | (1) Air pressure is too low.   | (1) 0.4~0.7MPa)<br>Increase supply air pressure(Normally 0.4~0.7bar) |
|  | (2) Actuator output torque is too low.                               | (2) Replaced with a larger actuator or add springs                   |
|  | (3) Valve disc. or other parts is too tight.                         | (4) Readjust and reassemble  |
|  | (5) Blockage in air inlet/outlet lines by impurity                   | (4) Clean impurity in the lines                                      |
| No Signal from Limit Switch Box        | (1) Electric power line fails  | (1) Check the incoming voltage or power line                         |
|  | (2) Cam setting is wrong   | (3) Set cam again.   |
|  | (4) Micro switch damaged   | (2) Replace micro switch   |

## 7. Air consumption

| Double acting |                   |        |                     |                            |                         |                          |                          |                             |
|---------------|-------------------|--------|---------------------|----------------------------|-------------------------|--------------------------|--------------------------|-----------------------------|
| Size          | Cylinder diameter | Stroke | Piston rod diameter | Single stroke time(second) | Air consumption (L/min) | Open/air consumption (L) | Shut/air consumption (L) | A cycle/air consumption (L) |
| DFA16-300DA   | 300               | 179    | 32                  | 20                         | 155.6                   | 14.06                    | 11.22                    | 25.28                       |
| DFA16-350DA   | 359               | 179    | 32                  | 20                         | 222.8                   | 20.14                    | 16.71                    | 36.85                       |
| DFA25-350DA   | 359               | 214    | 38                  | 20                         | 266.4                   | 23.68                    | 19.65                    | 43.33                       |
| DFA25-400DA   | 410               | 214    | 38                  | 20                         | 347.5                   | 30.89                    | 26.25                    | 57.14                       |
| DFA25-450DA   | 450               | 214    | 38                  | 20                         | 418.6                   | 37.21                    | 32.11                    | 69.32                       |
| DFA30-450DA   | 450               | 262    | 45                  | 20                         | 512.5                   | 44.85                    | 38.69                    | 83.54                       |
| DFA30-500DA   | 500               | 262    | 45                  | 20                         | 632.7                   | 55.37                    | 48.5                     | 103.87                      |
| DFA30-550DA   | 540               | 262    | 45                  | 20                         | 738                     | 64.58                    | 57.15                    | 121.73                      |
| DFA35-550DA   | 540               | 342    | 55                  | 20                         | 963.4                   | 82.9                     | 73.37                    | 156.27                      |
| DFA35-600DA   | 600               | 342    | 55                  | 20                         | 1189.3                  | 102.35                   | 91.72                    | 194.07                      |
| DFA35-700DA   | 700               | 342    | 55                  | 20                         | 1618.8                  | 139.31                   | 126.86                   | 266.17                      |

| Spring return  |                   |        |                     |                            |                         |                          |                             |
|----------------|-------------------|--------|---------------------|----------------------------|-------------------------|--------------------------|-----------------------------|
| Size           | Cylinder diameter | Stroke | Piston rod diameter | Single stroke time(second) | Air consumption (L/min) | Open/air consumption (L) | A cycle/air consumption (L) |
| DFA16-350-S4/5 | 359               | 179    | 32                  | 20                         | 222.8                   | 16.71                    | 16.71                       |
| DFA25-400-S4/5 | 410               | 214    | 38                  | 20                         | 347.5                   | 26.25                    | 26.25                       |
| DFA30-550-S4/5 | 540               | 262    | 45                  | 20                         | 738                     | 57.15                    | 57.15                       |
| DFA35-600-S4/5 | 600               | 342    | 55                  | 20                         | 1189.3                  | 91.72                    | 91.72                       |
|                |                   |        |                     |                            |                         |                          |                             |
| DFA16-300-S6   | 300               | 174    | 32                  | 20                         | 151.2                   | 10.94                    | 10.94                       |
| DFA25-350-S5/6 | 359               | 214    | 38                  | 20                         | 266.4                   | 19.65                    | 19.65                       |
| DFA30-500-S5/6 | 500               | 262    | 45                  | 20                         | 632.7                   | 48.5                     | 48.5                        |
| DFA35-550-S5/6 | 540               | 342    | 55                  | 20                         | 963.4                   | 73.37                    | 73.37                       |