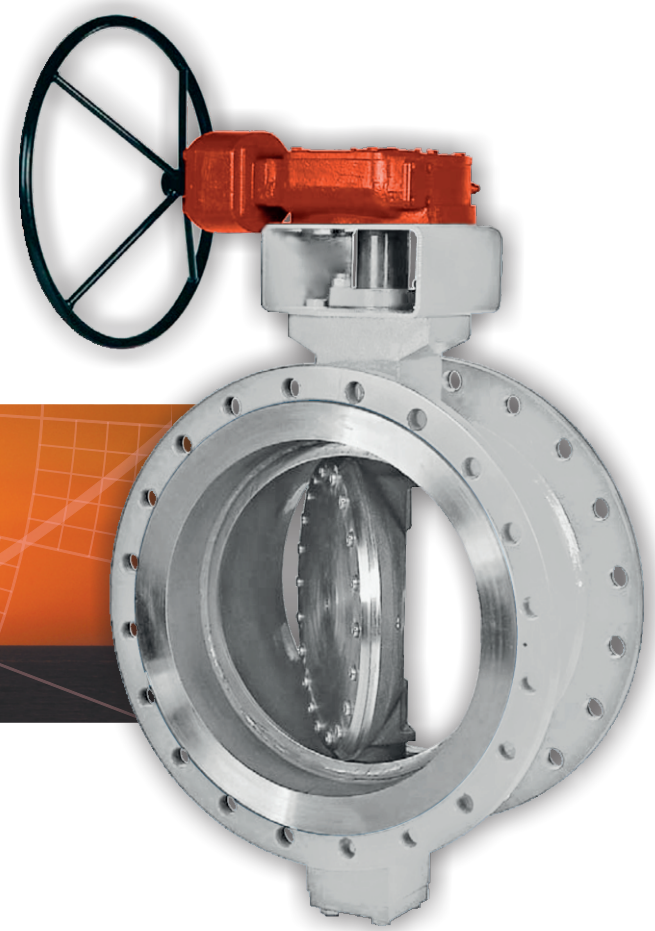

HLV FLOW MACHINERY

# MIR Series Wafer type Butterfly Valve

## The instruction for installment service and use

**Read the instruction carefully before installment and use**

With over 70 years of experience, we can offer you the best service.



TÜV SÜD ISO 9001

HLV FLOW MACHINERY

# Catalogues

## 1. General Rule

Thank you for purchasing and using HLV control valve products, please read the instruction carefully before using, and this booklet including the important content of installment, service and use of the HLV MIR wafer type butterfly valve, please preserve it and that you can refer in the future.

HLV MIR type wafer valve is a high performance butterfly valve design, and the rated value of the biggest closure pressure is decided by the material.

### 1. 1 Special Prompt

In order to understand easily and catch your attention, regarding the information of product safety and some important things, we will mention in this chapter or the other chapter through the following rank and special warning to you, those special warning is showed as follows.

Careful It means safety or other contents which must be paid Attention to.

Attention It means should pay attention to the mild danger.

Warning It means should pay attention to the moderate Danger.

Forbidden It shows the dangerous operation should be Forbidden.

In this chapter the security information which provided for you is not complete, in order to your security and benefit, we arrange security information of the partial products to the behind chapter of the manual depending on the need, no matter the security information is showed in any charter, you should read carefully.

At the meanwhile, except the special notice, you also should read the other contents of the manual carefully.

### 1.2 Important notice

1. 2. 1 Operator:

Attention Only the qualified or the experienced personnel can install, operate and maintain MIR type control valve.

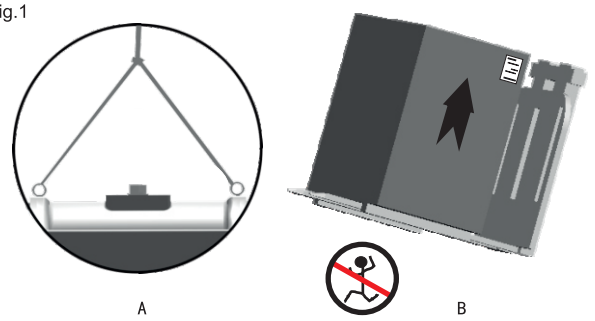
1. 2. 2 Move, Transport, Storage

Attention Attention: when store and transport the products, don't invert the packing case, when open the packing case please check the product whether is consistent to the order or not, if you have any question, please connect with the company immediately, If the product is unmistakable, please read all user's material which attached with the product carefully, and should understand the application method and notice of the product.

If you store and transport product after opening the packing case, please avoid being showed under the open-air environment, prevent rusting. When lifting, please pay attention to the bearing point of the product and lift a Ccording to the identification of the product.(Fig.1)

**Forbidden** please pay attention to the weight in the packing case, when storing and transporting, the carrying capacity of the machine which ransports must be bigger than the weight of the packing case certainly, and Please don't approach to the packing case, for avoiding personnel injury. (Fig.1 B)

Fig.1




### 1. 3 Open and inspect

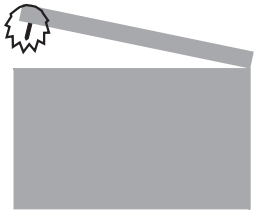
Attention

1. Open the case according to the instruction direction in the packing case.
2. Please check the product model whether is consistent to the order or not, if you have any question, please connect with the company immediately.
3. After checking up, please be sure to damage or missing with the Products and accessories.

Careful

Pay attention to the items that way cause injury, as nail, wood edge, Before opening the packing case.(Fig.2)

(Fig.2)



### 1.4 Packing parts

1. The main part of the products, the model which you need will be narrated in the following chapter.

**2. Accessory**

The flange, the bolt (provides flange by your specific request) offer user's instruction booklet, and product certificate. (Fig.3)

Attention The other accessories take the object product as actual, Because the product model is different.

Fig.3


### 1. 5 Warning

Safety first! Please clarify the following question before dismantling the valve from the pipeline and decomposing.

1. What's the medium in the pipeline?

   Make sure that what's medium in the pipeline. If has any questions, may clarify to the concerned manager.

2. Have you carried on the protection?

   In order to prevent injuring from special medium in pipeline, it usually requests to wear corresponding working clothes and the protection appliance.

3. Whether the pipeline has reduced pressure?

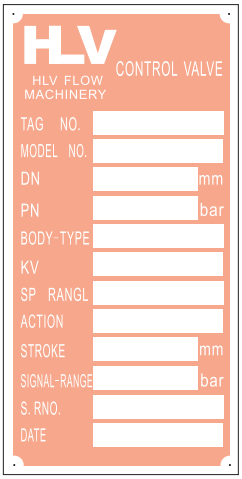
   Releases the pipeline pressure and removes the piping system medium. The eccentric shaft of wafer type butterfly valve form a bigger butterfly board area in an axis side, this meant that without handle or in the drive situation, when inlays a side bearing, the valve will open.

4. Whether the valve is closed?

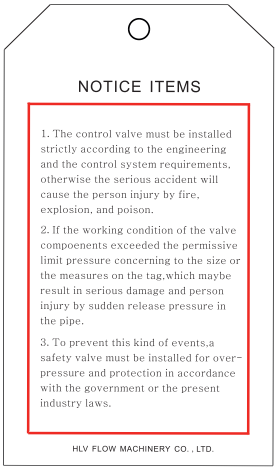
   Close the valve completely at first when installing or disassembling the valve from the pipeline, the wafer butterfly valve has to dismantle in the off-position from the pipeline. To prevent the seal edge of butterfly board damaging, the flat potential plane or the axis peak shape line has indicated the Butterfly board position. (Fig.4)

### 1. 6 Designation strip explanation

Designation strip explanation




Certificate explanation


## 1. 7 Operating instructions

You should understand the rated value in each valve product label. The valve's rated value in using can't surpass the value on the designation strip.

## Eccentric shaft design

The outstanding performance of the wafer butterfly valve is the eccentric shaft design,Manifests to clamps the type valve outstanding performance a design characteristic is the eccentric shaft design. Axis bias to two planes: (1) deviates in the butterfly board the core and (2) lags Yu Dieban to seal the plane (to see Figure 3) the eccentric shaft design to cause the rotation the butterfly board picture "the cam" equally to be separated from the valve seat to after, completely eliminates usually in the valve seat peak and the bottom end attrition spot, the butterfly board is separated from the valve Seat only to revolve along 90 eccentric arcs.

## Stop block

In order to prevent the butterfly board closure excessively to damage the valve seat (usually occurs at install handwheel or drive sets), the wafer type butterfly has design the “stopper”. The stopper may also use for adjustment the localization position of the drive set online. The stopper position see (Fig.4B)

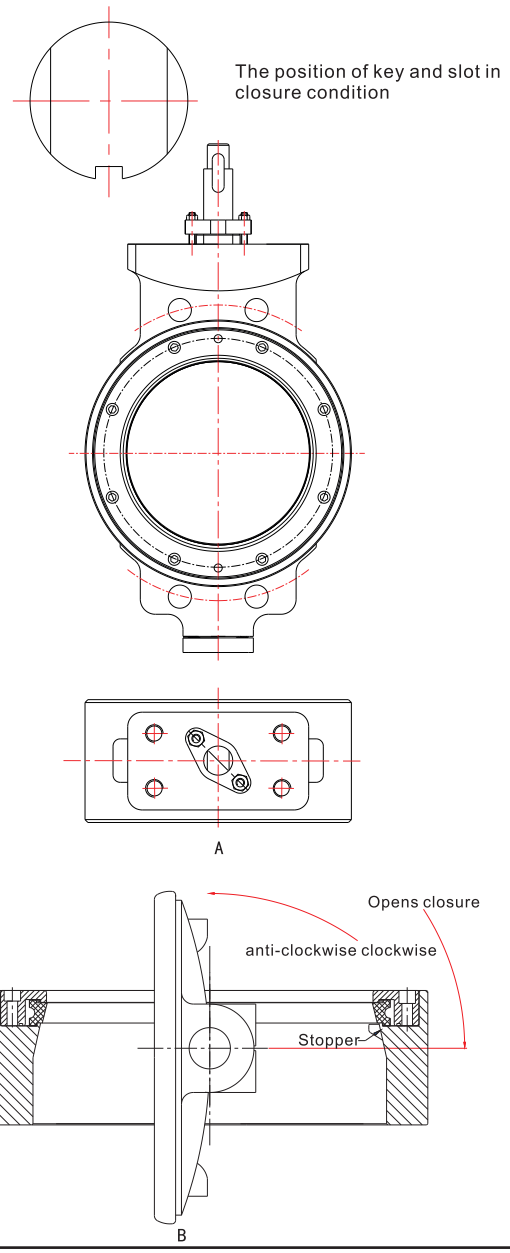
## Drive type

Handwheel, pneumatic actuator and electrical actuator, etc.

## Wafer type body design

The purpose of flange bolt hole or slot existing on some valve bodys with wafer constructions(chart 4A), is for fastening,and aligning correctly when fitting main pipes,the purpose of alignment hole/slot of wafer valve body is not for bearing the pressure from pipe,just for connecting pipe flange which Is by bolts connection totally.

Fig.4



## 2 Installment

### Attention

The control valve must be installed strictly according to the engineering and the control system requirements, otherwise the serious accident will cause the person injury by fire, explosion, and poison, if the working condition of the valve components exceeded the permissive limit pressure concerning to the size or the measures on the tag, which maybe result in serious damage and person injury by sudden release pressure in the pipe. To prevent this kind of events, a safety valve must be installed for over-pressure and protection in accordance with the government or the present industry laws.

### Attention

When ordering, the valve disposes various of structural material is according to the specific pressure, the temperature, the pressure and the control current capacity condition to choose, because certain valve bodies and the valve components combination material has the certain limit of the pressure and the temperature range aspect, therefore, please don't apply these valves to the other conditions before without consulting the opinion of the sale-officer or technical department of the HLV flow machinery corporation.

1. Before install the valve, inspects the valve and the correlate equipment, look whether damaged or any sundries, guarantee the valve interior cleanly and hasn't any sundries in the pipeline.

2. The control valve can be installed at any position, except there are some shockproof rules, but in general, it's usually installed the actuating mechanism vertically above the valve, because other positions may cause non-uniformity attrition and unsuitable operation to the plug and the valve cage. Regarding certain valves, it will need the strut supporting if the actuating mechanism isn't vertical (See Fig5). Please consult with the sale-office or technical department of the HLV Flow Machinery Corporation if you Want more detailed information about it.

3. When installing the valve in the pipeline, please adopt the recognized matching tube and the welding methods. During welding, the components of internal elastic may remain in the original position(Neither take them down nor move). If the process of the check-up and maintenance need successive operation, a pass-way tee valve is required to be installed Around the control valve.

4. To the structure of the leakage outside-vent type bonnet, taking the tube caulking down then connect it to the drainage pipeline. If the process of the check-up and maintenance need successive operation, a pass-way tee valve is required to be installed around the control valve.

5. Leakage of padding will lead to personnel injury. The valve padding must be fastened before leaving the factory, however, it needs readjust the padding, so as to satisfy the corresponding application conditions.

6. When install the control valve, it requires to consider about the possibility of site maintenance and daily disassemble-maintenance, well positioned, accessible. Simultaneously, it also requires to consider about the space, gap and convenience for maintaining the valve. Generally, $H_1=H_0+300mm, H_2=2H_0+200mm$ (Fig.5).

### Attention

The actuator should be avoided in the high temperature, when the temperature is above 62℃, the membrane, sealing parts, electrical parts such as positioner will be affected in accuracy.

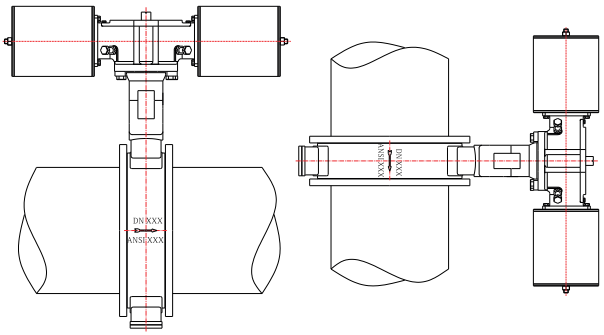
Under the condition of vibration, the pipe's vibration way resulted in the position deviation, so the flexibility must be ensured with the air pipe connecting to the actuating parts, the liquid pressure pipe and the electrical joints, but is less to the plastic pipe except for the loosen parts, meanwhile more necessary to the metal pipe that supposed to be fixed under vibrating Conditions, the electrical joints could be depend on the reality.

According to the material of the valves, it maybe need heat treatment after the process of welding. If so, that will cause the damage to the inner springs and plastic or inner mental units. The thermal accessories and screw joints also could be affected to looseness. Generally, you should move away the inner parts in the processing of the heat treatment after welding. Please contact the manufacturer for details.

Fig.5

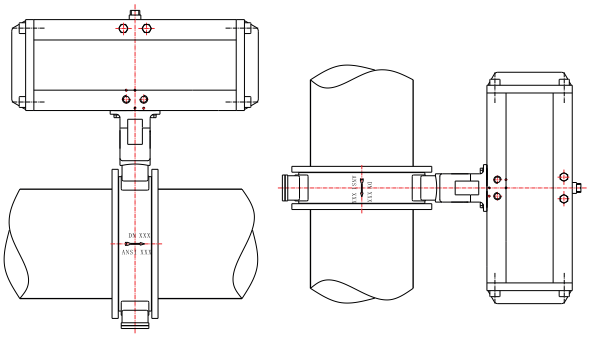
Correct installment position

Match AP type actuator



Level installment　　Vertical installment

Match GT type actuator



Level installment　　Vertical installment

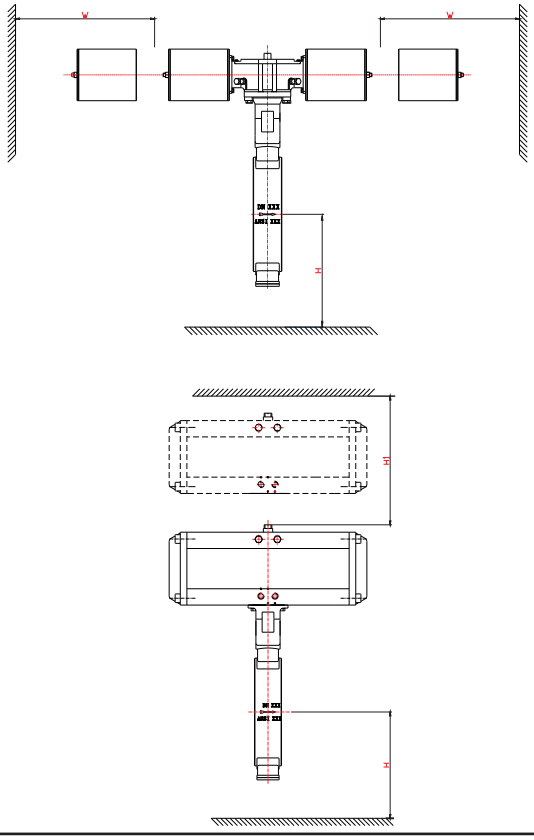
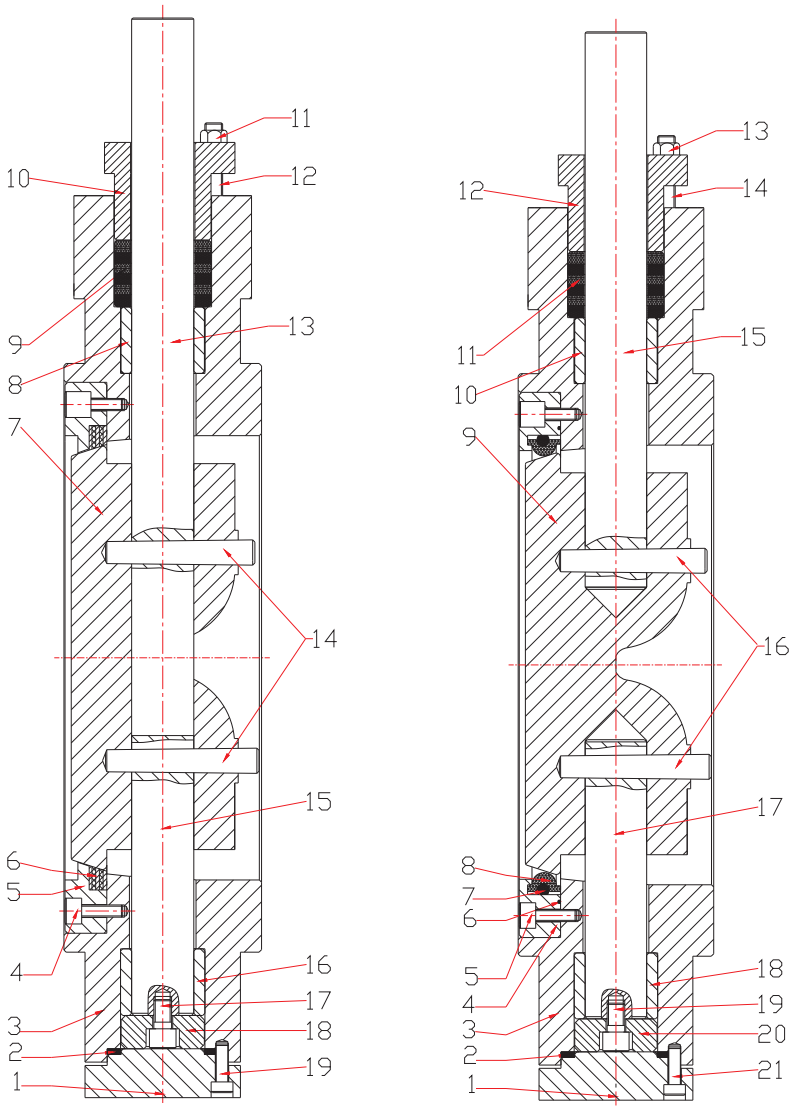
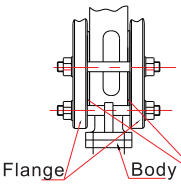


Fig.6

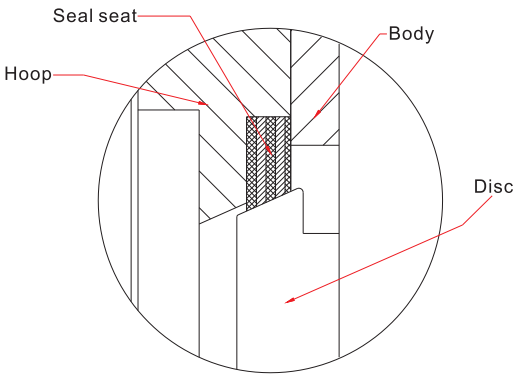
## Body section




| No. | Name |
|---|---|
| 1 | Bonnet |
| 2 | Seal gasket |
| 3 | Bady |
| 4 | Hoop |
| 5 | Socket hexagon bolt |
| 6 | Oring |
| 7 | Oring |
| 8 | Seat |
| 9 | Disc |
| 10 | Guided set |
| 11 | Packing |
| 12 | Gland |
| 13 | Hex nut |
| 14 | Double armed bolt |
| 15 | Axle |
| 16 | Cup head pin |
| 17 | back shaft |
| 18 | Guided set |
| 19 | Socket hexagon bolt |
| 20 | Located piece |
| 21 | Socket hexagon bolt |




Connection type: Wafer



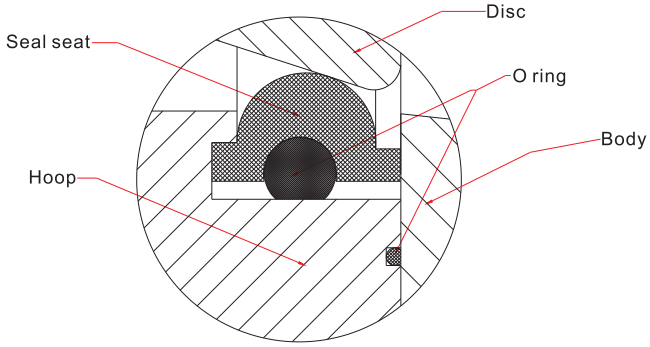
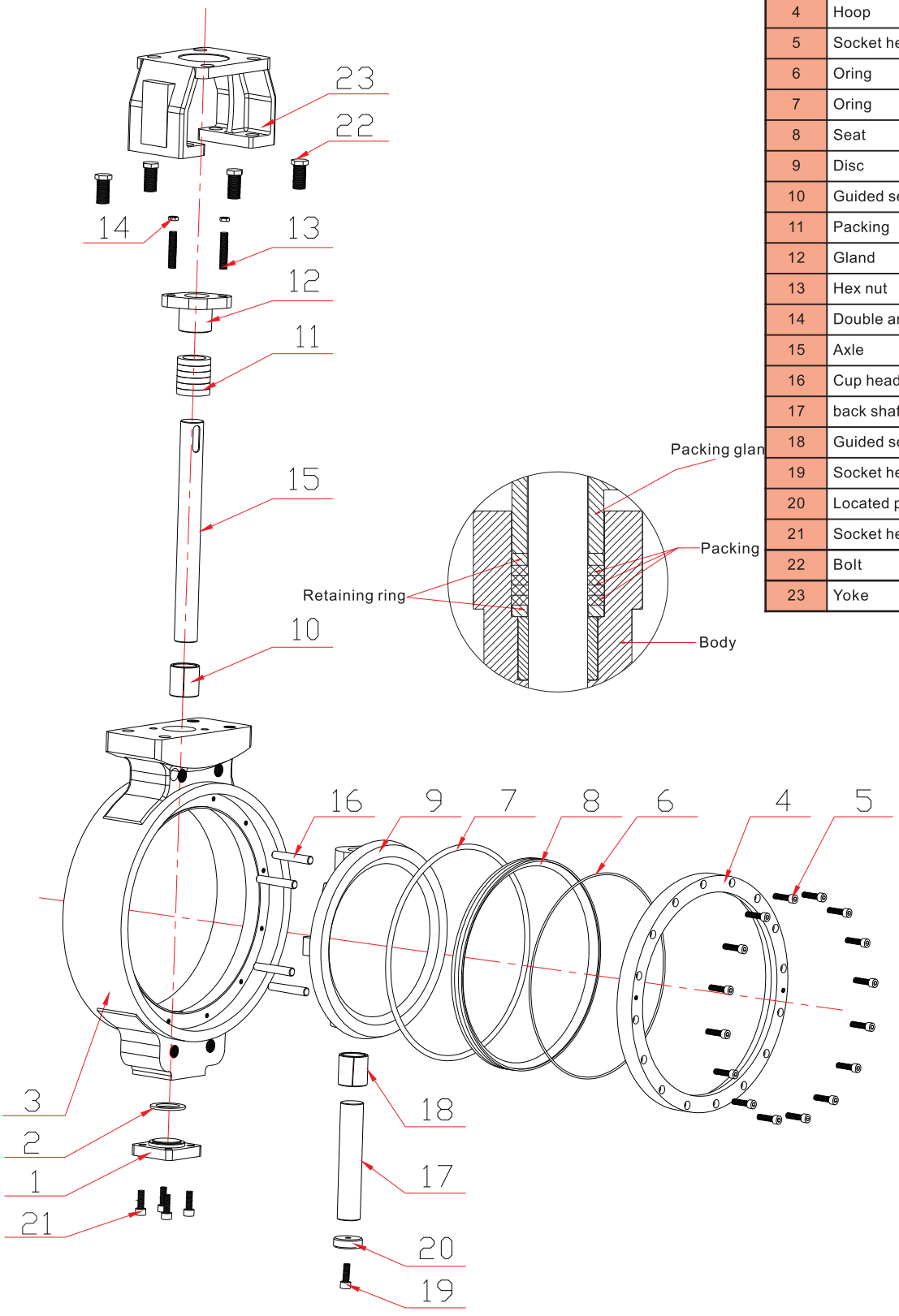



Fig.7

Valve section




| No. | Name |
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| 9 | Disc |
| 10 | Guided set |
| 11 | Packing |
| 12 | Gland |
| 13 | Hex nut |
| 14 | Double armed bolt |
| 15 | Axle |
| 16 | Cup head pin |
| 17 | back shaft |
| 18 | Guided set |
| 19 | Socket hexagon bolt |
| 20 | Located piece |
| 21 | Socket hexagon bolt |
| 22 | Bolt |
| 23 | Yoke |

In order to reduce the torque, the wafer type butterfly valve to be supposed to install the valve body in a high pressure side (axis to be In downriver).

1. Please read the warning ahead carefully.

2. Main point: You should use the positioning device of handwheel or drive set to lock the butterfly valve position, not use the baffle plate To limit the stroke.

3. When valve shutting down also the seat has compressed completely, inspect the disc position, the disc and the flange must Be parallel, and the error can't surpass 1,/32 inch (0.79 millimeter).

4. Before installing the valve to the pipeline, make sure that when rotate the handwheel and drive set at anti-clockwise direction(see from the upside), the valve is start to opening (see Fig.4A). Close the valve completely before installing.

5. Pipeline: To prevent the disc bumps into the pipeline to damage the disc or the axis, the butterfly valve should install in pipeline flange center. The flange and pipeline welding must carry on before the valve installment. If can't, place the safety mask or the protecting screen between the valve and welding area before welding. To prevent to damage the valve seat, not only needs to protect valve to guard against the welding dregs, but also had prevented overheat. The welding dregs, welding rod, fragment, tool and so on must be eliminated from the pipeline before the Valve installment or transportation.

6. Fixes the valve between the flanges, compresses the flange filling piece evenly, tights the fastener in turn.

   Main point: According to the corresponding pipeline standard, use suitable operating mode filling pieces and fixes the valve between the flanges by the fastener.

7. After the valve has installed, if the axis seal place has the leakage, the reason is the valve load on greater temperature change when transporting, in this situation, you only need adjust the packing to restore sealing property of the valve.

## 3 Maintenance

### 3. 1 Outline

The conventional maintenance work is tightening packing clamp regularly, compensates the attrition of axis seal. However, the clamp can't press downward to tight excessively, otherwise will shrink the life of axis seals. The more widespread scope maintenance work, including replaces the valve seat and packing that you can see Explanation as below.

### 3. 2 Disassemble valve

1. Please read the warning ahead **carefully**.

2. Dismount the valve from the pipeline, the valve must be closed completely.

3. Attention: If the valve drive set is spring to open (air to close), should separate the valve from the drive firstly, then close the valve. When disassemble the valve from the pipeline, the valve must be shutting down.

### 4. 3 Valve seat replacement

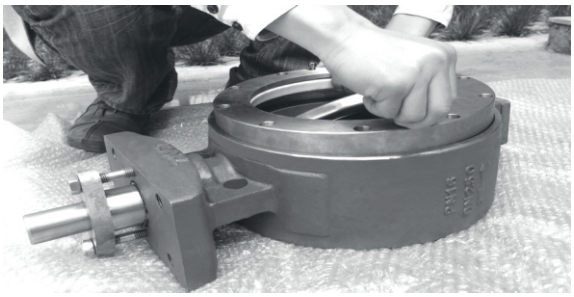
1. Dismount the valve from the pipeline, and put to the worktable, please pay attention not to damage the seal edge of the butterfly Board.

2. Dismount insert bolts, take the clamping ring from the valve. If the clamping ring is not easy to take out, uses the wooden stick or the plastic stick and the hammer knocks it from a valve doorpost side. The hammer cannot directly knock on the valve. (Bolt fixed clamping ring: Causes the valve to be in the off-position, replaces the clamping ring and the valve seat together through the operation valve seat bolt. Evenly screws tight the bolt. Opens the valve, screw tight the valve seat bolt once more. Please pay attention not to damage the seal edge of the butterfly board. Close the valve.)

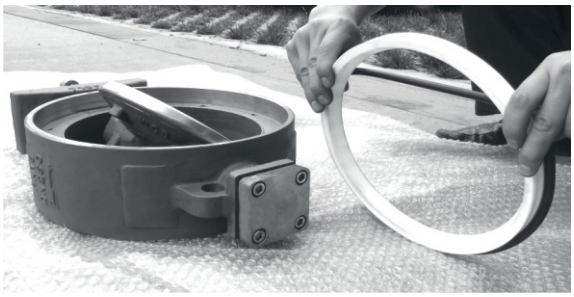
3. Dismantle the valve seat and abandon. Dismantle the valve body seal from the clamping ring and valve body.

4. Clean the contact gasket surface carefully with the suitable solvent, the surface should not have the scoop channel and the abrasion. If abrades deeply, should polish or must repair.

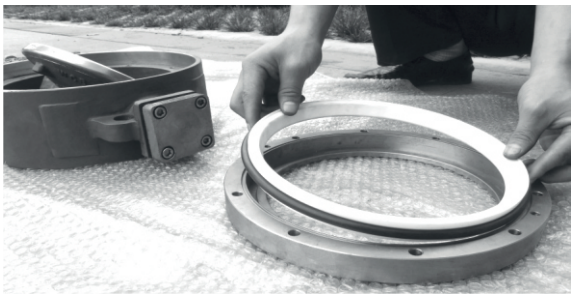
Unload the bolt on insert



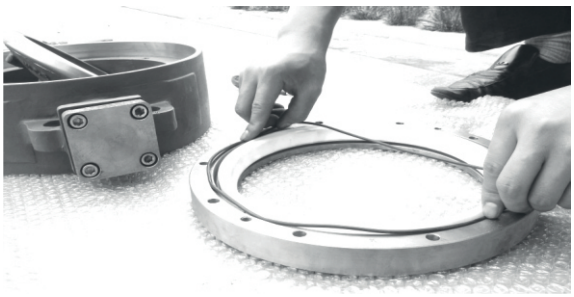
If unloads the clamping ring with the bolt, the seat will abandonment



Installs the new seat seal



Place the seal in the valve seat



Stick the packing ring to the valve seat with the glue water

5. Clean the valve, removes the burr on the clamping ring.

6. Scour the butterfly board seal surface and polishes carefully. The surface should not have the scoop channel and the abrasion.

7. If the butterfly board packing surface has the slight abrasion, grind the packing surface with crocus cloth, close grained burr or similar polishes, if abrades deeply, need replace the butterfly board or Return to plant to maintenance.

8. Drive the valve to close.

9. Install the valve body seal filling gasket between the valve seat terminal and the valve body, sees chart 7. This valve use graphite filling gasket, the install method as follows:

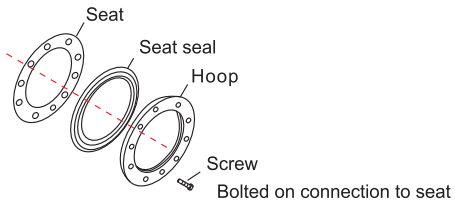
   A: The main point, pay attention not to damage the filling gasket, Otherwise can cause divulges.

   B: The bottom plane of the clamp should not have the impurity, clean carefully with the appropriate.

   C: Put the gasket into valve, if is lug type valve, please pay Attention to align the gasket hole and insert bolt.

10. Inspect the butterfly board whether in horizontal position. If is the horizontal position, installs the new clamping ring and the valve seat, see Figure 6 and 7, fixed inlays to the bolt, needs to install the clamping ring bolt, Please pay attention not to damage the seal edge of the butterfly board. Close the valve.

11. Adjust the drive localization according to the drive installment showing chapter. To replaces the valve seat, cannot install and screw tight the flange before the good drive localization and the entire closure. If the butterfly board position has not aimed, when screws tight the flange primary, may damage the new valve seat. Note: After installs the new Valve seat, some operating cycle torques may be bigger.




## 3. 4 Replace axis seal

Attention: **Please read the first page of prompt.**

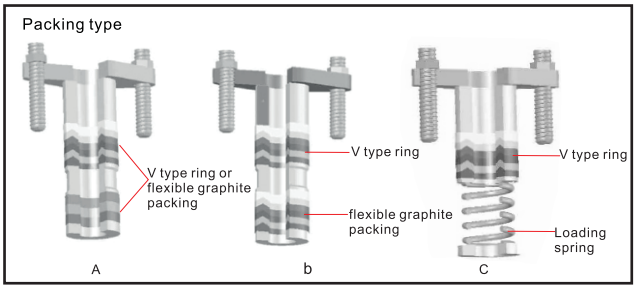
1. Dismantles the linkage of handwheel and drive set from the valve.

2. Dismantles the nuts for the gland, take down the clamp. Don't dismantle the bolt.

3. Takes down the old axis seal packing collar fragment, don't abrade the axis or the valve hole.

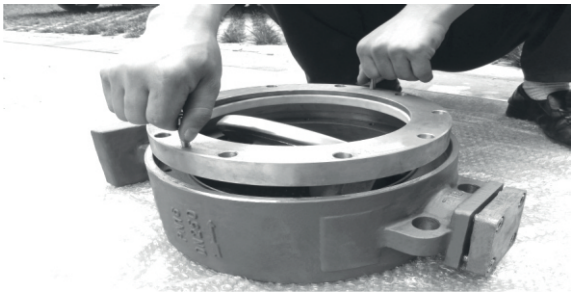
4. When replacing axis seal packing, don't dismantle the retainer.

5. Exchanges the new axis seal packing ring. Note: If the axis seal packing ring is a PTFE V type ring, keep the join together order when takes it out from the maintenance spare parts bag. Please pay attention to the direction on chart below, the direction is Suitable for the complete scope,including vacuum valve.



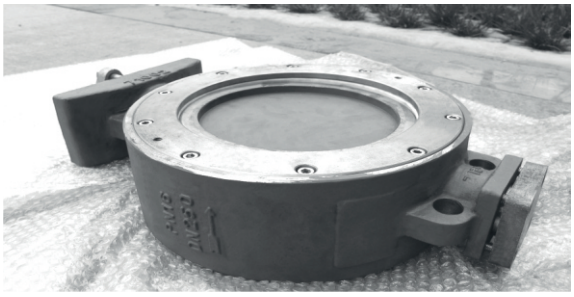

6. Reinstall the gland, the retaining ring, the clamp, the nut.

* If the initial point of clamping ring hypothesizes too high, can't install the retaining ring, that must compress the axis seal ring firstly, then install the clamp, screw tightly the nut, caused the axis seal packing ring closely, after that dismantle the clamp, install the elastic ring, then assemble completely again.



Put the hoop into valve with starting bolt.

Screw the valve seat tightly with hexagonal head wrench.



Replace the valve seat completely

Dismount the gland

Dismount disc rivet

7. Close valve.

8. Close valve, screw the nut on packing clamp tightly, then compress the packing completely to prevent divulging. Compress completely means that after two nuts have contacts the clamp, the wrench Need twist 1 half to 2 rings.

## 3. 5 Valve disassemble

Attention: If must disassemble the valve completely, you'd better replace the valve seat and all seal rings.

1. Put the valve on the work table or other appropriate working areas.
2. If must replace the valve seat, please according to "the valve seat replacement" in the chapter 2, 3, 4 and the axis and the valve body seal and the bearing .
3. Defers to "the replacement, the axis seal packing " in the chapter on 1-4 step disassemble axis seal packing. If dismantles the axis from the valve firstly, disassemble packing material will be easier.
4. Remove the welding on disk pin with the methods of grinding or machining. Take the pin out on installment reverse direction. (See Figure 5).
5. Take down the nuts, cover board and gasket.
6. Dismantle the axis, please pay attention to not damage the butterfly board seal surface when takes the axis out from the butterfly board.
7. Take down the butterfly board, dismantle the thrust shaft and the under thrust bearing.
8. Take axle sleeve above out from the valve or get the axle sleeve lower out of the valve channel.

## 3. 6 Valve assembly

1. Clean the valve parts complete.
2. Before assembling the valve, should inspect all parts whether has the damage, check the damage situation of butterfly board, the axis and the valve body seal area as well as the bearing region attrition situation.
3. Scour the butterfly board seal surface and polishes carefully. The surface should not have the scoop channel and the abrasion.
4. If the butterfly board packing surface has the slight abrasion, grind the packing surface with crocus cloth, close grained burr or similar polishes, if abrades deeply, need replace the butterfly board or Return to plant to maintenance.
5. Put the axle sleeve in the valve body axis hole.
6. In order to install the axis on the butterfly board easily, if necessary, may spread the lubricant on the axis and butterfly board hole, the lubricant nature should be suitable to the medium which transports in the valve.
7. The axis passed through the axle sleeve, then installs the stop bearing, install the butterfly board to the flow channel, the butterfly board two slightly holes faces the valve cover, then passed the axis through the axis hole of the butterfly board, simultaneously put the thrust bearing under the butterfly board, cause the axis to pass through and the wrap enters the axle sleeve. Please pay attention to not damage the bearing and butterfly board seal surface.
8. Insert the pin into the butterfly board and knock it in according to the direction of chart 7, the depth of two pins must be same, indent do not surpass 1/16 ' ' (1.56mm). If the pin install correctly, the drive shaft shows on like chart 1 and chart 2, Then welds the beginnings and ends of the pin, welds a small end firstly, put the valve body on the log, after the butterfly board has cooled, brushes cleanly with the steel wire brush holder welding place Attention: when using, please not smear the valve.
9. If has the bearing retainer, then install it, the bevel edge side should face the butterfly board, then installs the top roll seal, the clamping ring, the retainer ring. If the axis seal packing is V type structure, must defer to chart 5 to install.
10. If the stud has already take down from the valve, install them in the hole which show to (chart 7) again, on the stud spreads Letai or other backing-up reagent. To prevent loosen when vibration. The

Dismount axis

Take axis seal out with the screw knife. Abandon

Insert axis

Change new axis seal

Compress the gland, complete the seal replacement

should stretch out , the stud of 2 ' ' (50.8mm),10 ' ' and 12 ' ' (DN250 and 300) valve should stretch out 2-1/4 (57.15mm).

11. Installs the new gasket, fixes the cover board to valve body by the bolt. In order to guarantee the gasket load to be even, screws tight the bolt in turn.

12. If the handle localization toothed rack has already take down from the valve, install them which show to (chart 7) again, install the lock-packing ring and blot into the bonnet holes, after locate the handwheel position, screw tight the bolt. (See “handwheel locate position hypothesis” or drive installment explains” chapter).

13. Puts the clamp on the axis and the stud, then install the lock-nut, but don't screw tight.

14. Closes the valve completely, installs new valve seat and the body seals. The regulation sees "the valve seat replacement chapter".

15. Close valve, screw the nut on packing clamp tightly, then compress the packing completely to prevent divulging. Compress completely means that after two nuts have contacts the clamp, the wrench need twist 1 half to 2 rings.

16. According to “the setting handwheel locate position” chapter or "the drive installment explained" chapter, setting the handle or the drive locates position, then screws tight the bolt on the toothed Rack.

## 4 Valve experiment procedure

If need carry on valve divulge experiment before the valve installs on the pipeline, should according to the following step:

1. In the following experiment, between the valve joint face and the test equipment should have the corresponding filling piece.

2. Before the valve pressurizes, guarantees all drive fastener is screws tight, the drive maintains the valve at the off-position under pressure. When the test pressure exerts to a butterfly board side, t he valve biased design may be able to create it to revolve.

3. The valve should install between in the flanges or the test equipment, if uses the flange, refers to the 6th part of the chapter to install, if uses the test installment, the strength of the installment clamps must match with the valve flange bolt loaded.

4. Little open valve.confirm that no seal between seat with plate.avoid plate contact with testing jig,or else possible plate Breakage occurred.

5. Close the outlet of downstream,put pressure 100 Psi(6.9 bar) to valve.check shaft sealing and whether leakage occurredd from flange gasket.View bubble occurred or not after smear soapy Water to all the location of sealing connection.

The points of checking:please stop progress immediately if find leakage between valve with flange.to mark them on the leakage area. relieving valve pressure back till 0Psi(0bar),tighten flange bolts again.repress valve and check gasket.in case leakage there still,please disassemble valve and checking breakage.

6. In case the leakage occurred on the lacation of shaft sealing, please just tighten bonnect nuts.

7. Please relieving valve pressure continually,and close the valve when it's to 0Psi(0bar).

8. Connect tube or hose to downstream location of flange(which loated on the shaft side of valve).

9. Confirm that drive unit is with force/pressure.push pressure 100psi(6.9bar) on upstream flange(which located on insert side of valve)check whether leakage occurred from the dead end location Of ture/hose.

10.In case the leakage occurred,please relieving valve pressure to 0 Psi(0bar),and adjusting the close-stop of drive unit accords with related drive unit specification.

11.Repress valve and check leakage.in case leakage existing,please repeat the step 10 if leaking can't to be stop,adjust the position of Drive unit,reduce the leakage be least.

12.Might be small leakage occurred from the damaged plate of reassembled valve.put the dead end location of ture/hose into water, view bubble occurred or not in the case of it's n't other testing processing,check leakage after reached to stable condition,cause the operating valve vent air,so for more minutes leakage to be stable or stop.to the condition of reassembled soft seal butterfly valve or fire proof butterfly vlave,it's acceptable that one bubble occurred from body port (25.4mm) by min/inch.

## 5 Drives installment explanatio

### 5. 1 Warning

Before install valve and actuator,please first confirm the positon indicator above actuator indicate position of valve correctly,in case parts in wrong fitting,wrong indicate position of valve,possible Induce bodily injury and death.

Attention:When install connector or maintenance valve/driving parts,best to disassemble whole driving set from equipment.

Attention:The disassembled driving set should reassembled to valve,please readjusting open and close correctly for every reassembling driving set.

Attention:The designment purpose of connector is that support weight of actuator and related accessories of HLV flow machine company,not available for equipment, people or ladder etc.or else destroy connector,valve or actuator,and possible bodily injury Occurred.

Warning:Installing actuator,please first confirm valve and driving lever on same location,in case fitting the open driving set on close valve, possible induce valve stem breakage.

Remark:Install single acting spring return pneumatic set on wafer valve,only available by spring close(air open) mode.

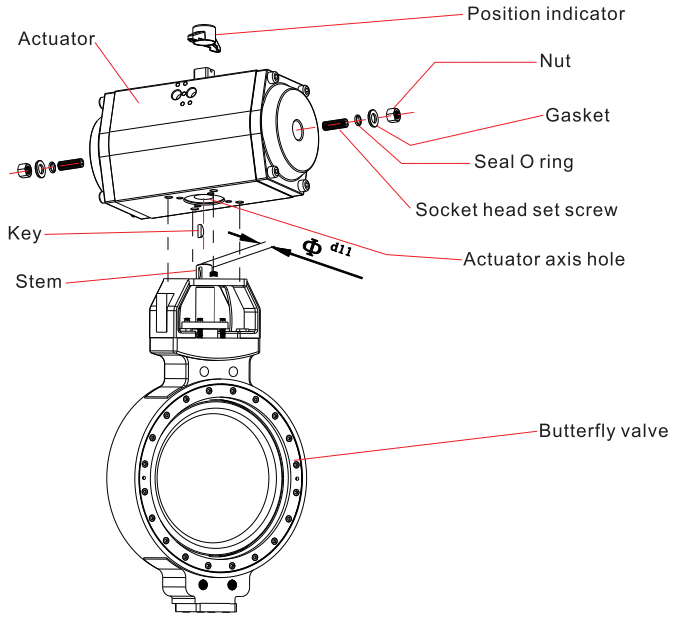
### 5. 2 Drive installment and adjustment

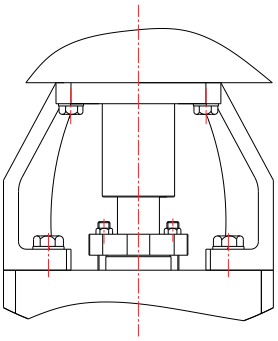
The setting precision of pneumatic actuator with valve,is much important to the actuator safe opearing and service life.for exact setting:putting the central axis of actuator absolute ganging with valve stem,testing the valve's torque to confirm it's working in the normative operating range before setting actuator to valve,after setting,to test pneumatic actuator with the valve simultaneously, exerting valve to reach the nominal sealing pressure value,for actuator,setting air pressure to be 0.4~0.7Mpa or by operating conditions.switching air supply between each of air inlets of actuator,to view valve's opening/closing situations,checking that shouldn't happened with dwell,stick-slip motion phenomena,and to repeat testing by several times.

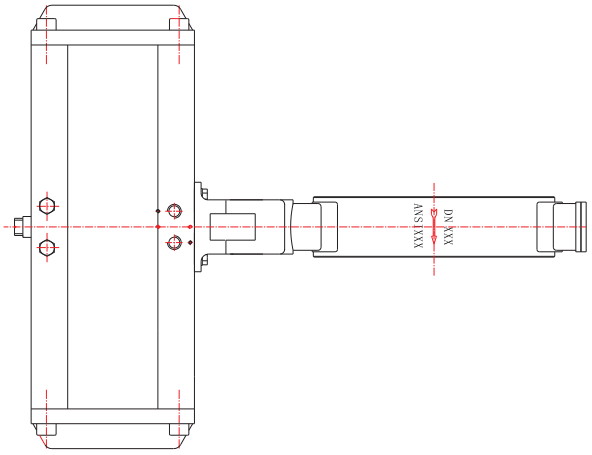
Two setting modes for actuator with butterfly valve,1.For rubber seal wafer butterfly valves with center line,the setting could to be finished by inserting into the shaft bore of pneumatic actuator. 2.For metal seal butterfly valves, which with different dimension stems producing by different manufacturers,the setting could to be finished by supports with connecting sleeve,attention to the axle housing shouldn't be higher than the depth of actuator's shaft bore to avoid top die happened working actuator out of action,the fitting accuracy between all the connectional parts should be enough of high,to avoid failed to open/close occurred leakage of valve, tolerance of fits which accords with the related standard,the fits tolerance of shaft bore with axle housing(stem), square hole with flat hole,and square head with f lat head accords with H11/d11 standard, the parallelism and symmetry accords with tolerance class 9 standard, the conventional flat key dimension and tolerance accords with GB/T1095-79 standard,the semicircular key dimension and tolerance accords with GB/T1098-79/GB/T1099-79 standard.

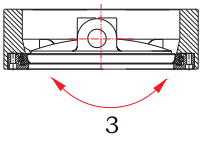
Adjusting and correcting the switch position after mounting by following the progress of sheet bellows,first of all,setting the position of butterfly valve to be close 3 and keeping the position of actuator piston in both side,then loose running fit the central nut of both sides cover of actuator, turn the tight screw to be adjusted enough(attention:it must keep safe by reliefing actuator or cutting air supply.):adjusting the position 3 by clockwise mounting if the position is over and by anticlockwise mounting if it's not reach,switching air supply between each of air inlets of actuator, to view the position 3 situation,confirm the position 3 is correct after adjusting,finally tighting and sealing each sides nuts.

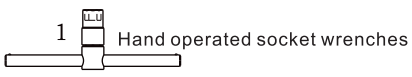
## Pneumatic actuator installation diagram







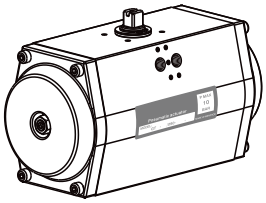




## 5. 3 Actuator type

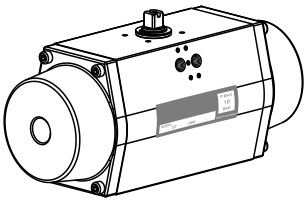
It's popular that GT series 90 degree rotary pneumatic actuator and AW series 90 rotary pneumatic actuator which service in fluid industry.

### 5. 3. 1 GT type serires 90 rotary pneumatic actuator

GT type series pneumatic actuator compressed air transferred to power,by mechanical transmission of pison gear rack and gear,drive torque by angle travel,with features small in volume, light weight,and long life service.it's modern version actuator,with two mode about double acting and single acting spring return.served for angle travel control valve(ball valve,butterfly valve) in open/close and control.



Double acting type



Single acting type

| Standard data | | Special data |
|---|---|---|
| Basis designment | Pneumatic piston operator<br>GTD type (doublte acting)<br>GTE type (single acting with spring return) | Two special piston at three locations of actuator |
| The feature of manufacturing | Ultra-width face of gear rack(piston) and pinion transmission technology.<br>The connection face for Piston,gear with housing produced by low-friction material<br>Sliding bush bearing,guided.<br>Single acting type security spring seat | |
| Adopted standard | Adopted standard<br>The connection of actuator with valve<br>Four or eight bolt holes accords with DIN/ISO 5211<br>Fitting hole of shaft accords with standard DIN 3337<br>The connection of actuator with control valve<br>Accords with standard NUMUR VDI/VDE 3845,<br>CTD/GTE040+090Connection by patch panel<br>Connection on actuator with signal box<br>AccordsVDI/VDE 3845 | Several type of dimensions choosable to fitting shaft hole |
| Material of parts | Body: aluminum alloy face anodize<br>End housing: aluminum alloy face powder coating<br>Piston/gear rack: aluminum alloy<br>O type sealing ring: buna-N rubber<br>Bearing ring/ guide bushing:plastic | Outside shell and end housing: powder coating<br>Special etch(ing) condition:optional stainless steel material<br>Please feel free to contact us<br>O type ring: fluorous rubber |
| Temperature of operating condition | —20~+90°c。 | —40~+160°c。 |
| Rotary angel | Double acting type=90°<br>Single acting type=90° | Adjust the angle of rotary shaft of Standard actuator by each side clockwise rotation or anti-clockwise rotation by real conditions 0-45-90°，-60-120°，-90-180°，-120-240°，Please feel free to contact us. |
| Driving torque | 3~10000Nm | |
| Air pressure | 2~8bar,Max10bar。 | |
| Accessories | solenoid valve、electric positioner、limited switch(mechanical, proximity type), triple parts for air supply processing(Filter reducing valve, filter-regulator,Oil atomizer), manual operator | Adjusting angle and ON/OFF cutting interlock device |

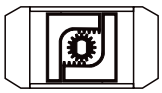
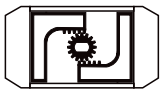
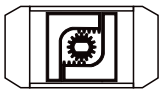
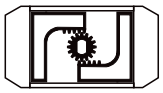
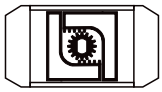
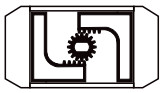
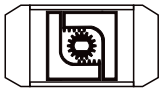
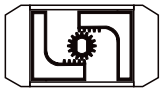
## Selection of actuator

After definition torque value, increasing more 25% safety value for steam or non-lubricant liquid medium: increasing more 40% safety value for non- lubricant slurry liquid medium; increasing more 60% safety value for non- lubricant dry gas medium; increasing more 100% safety value for non- lubricant entrained powder medium which by gas transmission: increasing more 20% safety value for clean,non-friction lubricant medium.( recommended by HLV company)

Selection of double acting actuator that basing on the operating pressure of air supply against double acting type torque's sheet.instance one condition:air pressure 5 bar,controlling ball valve with opering torque 200N.m,medium non-lubricant steam,for safety factor,increasing more 25% safety value,then the torque should to be 250 N.m,First please check in the sheet,then find the equal torque value or close torque value which is working on the condition of air pressure 5 bar,so torque value 272 N.m is selected,finally choose the type GTD125 which met with the air pressure and selected torque.

Selection of single acting actuator that basing on the condition that air pressure torque value which more than spring return torque value,after get the tip of spring react against double acting type torque's sheet. instance one condition:air pressure 4 bar,controlling ball valve with opering torque 100N.m,medium non-lubricant dry gas,for safety factor,increasing more 60% safety value,then the torque should to be 160 N.m,First please check in the sheet,then find the close torque value 166 N.m by spring react destination,according with this data,then checked found the destination torque value 196 N.m which is working on the condition of air pressure 4 bar,,and the air pressure torque is more than Spring react torque,finally choose the type GTE160 which met with the air pressure and selected torque.

## Fitting type

| Basic position<br>The position of rotation axis and piston by top perspective | The rotation direction of axis | The rotation direction of axis<br>The position of top slot by looking down | The position of switch<br>The position of rotation axis and piston by top perspective | Fitting shaft bore by bottom | sequence number |
|---|---|---|---|---|---|
|  | P |  |  | P | A |
| | D | | | D | B |
| | O | | | O | C |
|  | P |  |  | P | D |
| | D | | | D | E |
| | O | | | O | F |
|  | P |  |  | P | G |
| | D | | | D | H |
| | O | | | O | I |
|  | P |  |  | P | K |
| | D | | | D | L |
| | O | | | O | M |

Driving torque sheet of GTE double acting (unit)

| Type | Air pressure (bar) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| GTD40 | 3.7 | 5.6 | 7.4 | 9.3 | 11.2 | 13.0 | 14.9 |
| GTD52 | 7.9 | 11.8 | 15.7 | 19.6 | 23.6 | 27.5 | 31.4 |
| GTD65 | 14.7 | 22.1 | 29.5 | 36.8 | 44.2 | 51.5 | 58.9 |
| GTD80 | 26.0 | 39.0 | 52.0 | 65.1 | 78.1 | 91.1 | 104 |
| GTD90 | 37.6 | 56.5 | 75.3 | 94.1 | 112 | 131 | 150 |
| GTD100 | 58.0 | 87.0 | 116 | 145 | 174 | 203 | 232 |
| GTD115 | 84.5 | 126 | 169 | 211 | 253 | 295 | 338 |
| GTD125 | 108 | 163 | 217 | 272 | 326 | 381 | 435 |
| GTD145 | 159 | 239 | 318 | 398 | 478 | 557 | 637 |
| GTD160 | 223 | 334 | 446 | 557 | 669 | 780 | 892 |
| GTD190 | 367 | 550 | 734 | 917 | 1101 | 1284 | 1467 |
| GTD210 | 538 | 807 | 1075 | 1344 | 1613 | 1882 | 2151 |
| GTD255 | 1057 | 1586 | 2115 | 2644 | 3172 | 3701 | 4230 |
| GTD300 | 1656 | 2470 | 3293 | 4117 | 4940 | 5764 | 6587 |
| GTD350 | 2490 | 3735 | 4981 | 6226 | 7471 | 8717 | 9962 |

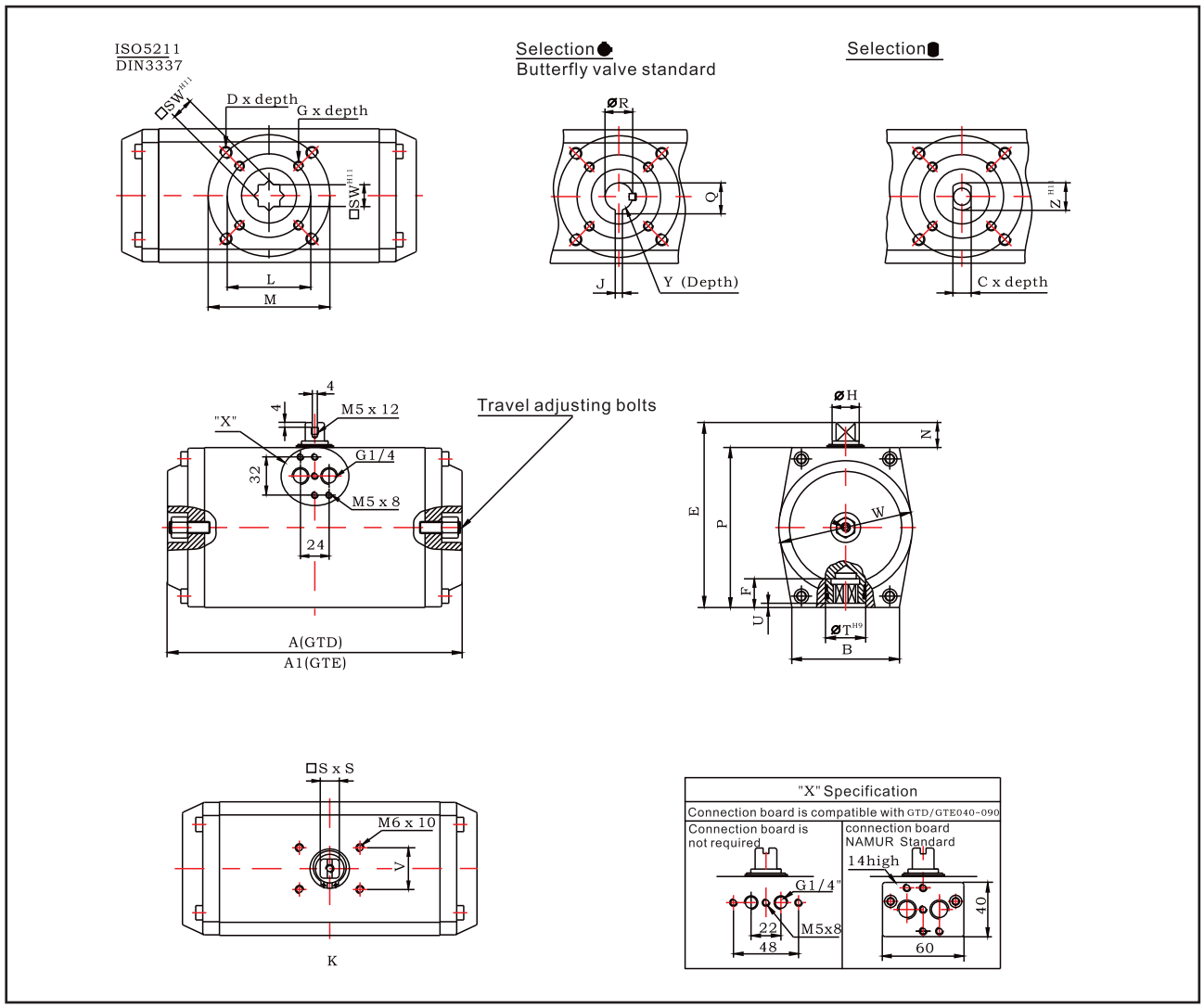
## Driving torque sheet of GTE double acting (unit) N. m

| Type | Quanitites of spring | Air pressure (bar) | | | | | | Spring return | |
|---|---|---|---|---|---|---|---|---|---|
| | | 3 | | 4 | | 5 | | | |
| | | Inception | Tip | Inception | Tip | Inception | Tip | Inception | Tip |
| GTE65 | 8 | 15.0 | 7.9 | 22.3 | 15.2 | | | 14.2 | 7.1 |
| | 10 | | | 20.6 | 11.7 | 27.9 | 19.1 | 17.8 | 8.9 |
| | 12 | | | 18.8 | 8.1 | 26.2 | 15.5 | 21.3 | 10.7 |
| GTE80 | 8 | 25.1 | 16.2 | 38.1 | 29.3 | | | 22.8 | 14.0 |
| | 10 | | | 34.6 | 23.6 | 47.6 | 36.6 | 28.5 | 17.5 |
| | 12 | | | 31.1 | 17.9 | 44.1 | 30.9 | 34.2 | 21.0 |
| GTE90 | 8 | 32.8 | 20.9 | 51.6 | 39.8 | | | 35.5 | 23.7 |
| | 10 | | | 45.7 | 30.9 | 64.5 | 49.7 | 44.4 | 29.6 |
| | 12 | | | 39.8 | 22.0 | 58.6 | 40.8 | 53.3 | 35.5 |
| GTE100 | 8 | 56.1 | 26.5 | 85.1 | 55.5 | | | 60.7 | 31.1 |
| | 10 | | | 77.3 | 40.3 | 106 | 69.4 | 75.9 | 38.9 |
| | 12 | | | 69.6 | 25.2 | 98.6 | 54.2 | 91.0 | 46.6 |
| GTE115 | 8 | 77.9 | 45.4 | 120 | 87.6 | | | 81.4 | 48.8 |
| | 10 | | | 108 | 67.3 | 150 | 109 | 101 | 61.1 |
| | 12 | | | 95.8 | 46.9 | 138 | 89.2 | 122 | 73.3 |
| GTE125 | 8 | 101 | 65.7 | 155 | 120 | | | 97.7 | 62.2 |
| | 10 | | | 140 | 95.7 | 194 | 150 | 122 | 77.7 |
| | 12 | | | 124 | 71.3 | 179 | 125 | 146 | 93.2 |
| GTE145 | 8 | 135 | 83.7 | 215 | 163 | | | 155 | 103 |
| | 10 | | | 189 | 124 | 269 | 204 | 194 | 129 |
| | 12 | | | 163 | 85.7 | 243 | 165 | 233 | 155 |
| GTE160 | 8 | 201 | 134 | 312 | 246 | | | 199 | 133 |
| | 10 | | | 279 | 196 | 391 | 307 | 249 | 166 |
| | 12 | | | 246 | 146 | 357 | 258 | 299 | 199 |
| GTE190 | 8 | 317 | 213 | 500 | 397 | | | 336 | 233 |
| | 10 | | | 442 | 313 | 626 | 496 | 420 | 291 |
| | 12 | | | 384 | 228 | 567 | 412 | 505 | 349 |
| GTE210 | 8 | 465 | 309 | 734 | 578 | | | 497 | 341 |
| | 10 | | | 648 | 454 | 917 | 723 | 621 | 427 |
| | 12 | | | 563 | 330 | 832 | 599 | 745 | 512 |
| GTE255 | 8 | 945 | 670 | 1474 | 1199 | | | 915 | 640 |
| | 10 | | | 1314 | 970 | 1843 | 1499 | 1144 | 800 |
| | 12 | | | 1154 | 741 | 1683 | 1270 | 1373 | 961 |
| GTE300 | 8 | 1491 | 838 | 2314 | 1662 | | | 1631 | 979 |
| | 10 | | | 2069 | 1254 | 2893 | 2077 | 2039 | 1223 |
| | 12 | | | 1825 | 846 | 2648 | 1669 | 2447 | 1468 |
| GTE350 | 8 | 2181 | 1404 | 3427 | 2650 | | | 2330 | 1554 |
| | 10 | | | 3038 | 2067 | 4284 | 3312 | 2913 | 1942 |
| | 12 | | | 2650 | 1484 | 3895 | 2730 | 3496 | 2331 |

## The weight,volume,and open/close time of actuator

| Double acting | Volume L | Weight K G | Single acting type | Volume L | Weight K G | Open or close time S |
|---|---|---|---|---|---|---|
| GTD40 | 0.12 | 0.7 | GTE40 | 0.06 | -- | ≤0.5 |
| GTD52 | 0.23 | 1.5 | GTE52 | 0.12 | -- | ≤0.5 |
| GTD65 | 0.46 | 2.0 | GTE65 | 0.22 | 3.6 | ≤0.5 |
| GTD80 | 0.80 | 3.0 | GTE80 | 0.38 | 5.5 | ≤1.0 |
| GTD90 | 1.10 | 4.5 | GTE90 | 0.50 | 8.0 | ≤1.0 |
| GTD100 | 1.60 | 6.0 | GTE100 | 0.79 | 10.5 | ≤1.0 |
| GTD115 | 2.33 | 8.0 | GTE115 | 1.14 | 13.6 | ≤2.0 |
| GTD125 | 3.03 | 9.5 | GTE125 | 1.46 | 16.2 | ≤2.0 |
| GTD145 | 5.40 | 14.0 | GTE145 | 2.34 | 23.1 | ≤2.5 |
| GTD160 | 6.10 | 18.0 | GTE160 | 3.00 | 30.0 | ≤4.0 |
| GTD190 | 11.0 | 26.0 | GTE190 | 4.80 | 41.6 | ≤5.0 |
| GTD210 | 15.4 | 33.0 | GTE210 | 7.10 | 52.8 | ≤7.0 |
| GTD255 | 31.1 | 72.0 | GTE255 | 14.1 | 112.0 | ≤10.0 |
| GTD300 | 45.9 | 102.0 | GTE300 | 21.3 | 153.0 | ≤10.0 |
| GTD350 | 68.5 | 153.0 | GTE350 | 32.7 | 222.0 | ≤10.0 |

## Appearance and connection dimension drawing

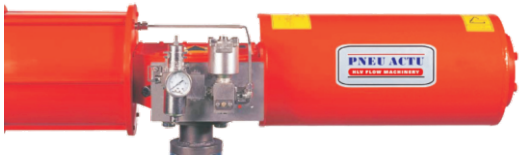


## Appearance and connection dimensions

| Actuator model | A | A1 | B | C x Depth | D x Depth | E | F | G x Depth | H | J | K | L | M | N | P | Q | $R^{H11}$ | □S x S | $□SW^{H11}$ | $T^{H9}$ | U | V | W | Y Depth | $Z^{h11}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTD/GTE040 | 104 | — | 45 | 8 x 12 | M6 x 10 | 82 | 14 | —— | 12 | | 50.8 | F04 Φ42 | —— | 22 | 60 | — | —— | 9 x 9 | 11 x 11 | 20 | 2.0 | 35 | 50 | | 12 |
| GTD/GTE052 | 140 | — | 50 | 8 x 12 | M6 x 10 | 96 | 14 | M5 x 8 | 16 | 3.0 | 50.8 | F03 Φ36 | F05 Φ50 | 22 | 74 | 14.2 | 12.7 | 10 x 10 | 11 x 11 | 23 | 2.0 | 35 | 62 | 32 | 12 |
| GTD/GTE065 | 164 | 178 | 62 | 10 x 13 | M8 x 13 | 102 | 16 | M6 x 10 | 18 | 3.0 | 50.8 | F05 Φ50 | F07 Φ70 | 22 | 90 | 14.2 | 12.7 | 13 x 13 | 14 x 14 | 29 | 2.0 | 35 | 75 | 32 | 16 |
| GTD/GTE080 | 190 | 214 | 65 | 10 x 15 | M8 x 13 | 130 | 18 | M6 x 10 | 18 | 5.0 | 50.8 | F05 Φ50 | F07 Φ70 | 22 | 108 | 18.4 | 15.88 | 13 x 13 | 17 x 17 | 33 | 2.0 | 35 | 91 | 32 | 16 |
| GTD/GTE090 | 210 | 246 | 74 | 10 x 15 | M8 x 13 | 140 | 18 | M6 x 10 | 18 | 5.0 | 50.8 | F05 Φ50 | F07 Φ70 | 22 | 118 | 18.4 | 15.88 | 13 x 13 | 17 x 17 | 38 | 2.5 | 35 | 101 | 32 | 16 |
| GTD/GTE100 | 247 | 295 | 90 | 14 x 22 | M10 x 16 | 156 | 25 | M8 x 13 | 24 | 5.0 | 50.8 | F07 Φ70 | F10 Φ102 | 22 | 134 | 21.6 | 19.05 | 16 x 16 | 22 x 22 | 46 | 2.5 | 35 | 112 | 45 | 22 |
| GTD/GTE115 | 276 | 340 | 94 | 14 x 22 | M10 x 16 | 177 | 25 | M8 x 13 | 24 | 5.0 | 50.8 | F07 Φ70 | F10 Φ102 | 25 | 149 | 21.6 | 19.05 | 16 x 16 | 22 x 22 | 52 | 3.0 | 35 | 127 | 45 | 22 |
| GTD/GTE125 | 308 | 398 | 103 | 20 x 24 | M10 x 16 | 182 | 25 | M8 x 13 | 30 | 5.0 | 50.8 | F07 Φ70 | F10 Φ102 | 25 | 160 | 24.8 | 22.23 | 22.3x22.3 | 22 x 22 | 55 | 3.0 | 35 | 139 | 45 | 30 |
| GTD/GTE140 | 348 | 438 | 110 | 20 x 24 | M12 x 16 | 216 | 29 | M10 x 16 | 38 | 8.0 | 70.8 | F10 Φ102 | F12 Φ125 | 35 | 181 | 32.1 | 28.58 | 28.6x28.6 | 27 x 27 | 65 | 3.5 | 35 | 159 | 45 | 30 |
| GTD/GTE160 | 378 | 478 | 110 | 28 x 30 | M12 x 16 | 233 | 29 | M10 x 16 | 38 | 8.0 | 70.8 | F10 Φ102 | F12 Φ125 | 35 | 198 | 32.1 | 28.58 | 28.6x28.6 | 27 x 27 | 70 | 3.5 | 35 | 176 | 45 | 42 |
| GTD/GTE190 | 432 | 562 | 128 | 28 x 30 | M12 x 16 | 282 | 29 | M10 x 16 | 50 | 8.0 | 70.8 | F10 Φ102 | F12 Φ125 | 50 | 232 | 32.1 | 31.75 | 36 x 36 | 36 x 36 | 80 | 4.0 | 35 | 206 | 45 | 42 |
| GTD/GTE210 | 524 | 724 | 135 | 32 x 34 | M16 x 24 | 305 | 40 | M16 x 24 | 50 | 8.0 | 150 | F14 Φ140 | 160 x 100 | 50 | 255 | 35.3 | 31.75 | 36 x 3 | 36 x 36 | 92 | 4.0 | 60 | 228 | 45 | 48 |
| GTD/GTE255 | 648 | 928 | 159 | 40 x 40 | M20 x 24 | 352 | 50 | M20 x 24 | 75 | 10 | 150 | F16 Φ165 | 200 x 120 | 50 | 302 | 37.4 | 33.34 | 46 x 46 | 46 x 46 | 125 | 4.0 | 60 | 275 | 50 | 60 |
| GTD/GTE300 | 715 | 1033 | 196 | 40 x 40 | M20 x 24 | 400 | 50 | M20 x 24 | 85 | 12 | 150 | F16 Φ165 | 200 x 140 | 50 | 350 | 45.3 | 41.28 | 46 x 46 | 46 x 46 | 135 | 4.5 | 60 | 324 | 65 | 80 |
| GTD/GTE350 | 795 | 1129 | 220 | 50 x 50 | M20 x 24 | 458 | 70 | M16 x 24 | 105 | 12 | 150 | 200 | 260 x 160 | 50 | 408 | 54.8 | 50.8 | 60 x 60 | 60 x 60 | 158 | 4.5 | 60 | 380 | 70 | 100 |

## 5. 3. 2 AP type series 90 degree (rotary) pneumatic actuactor

AP type series pneumatic actuator have double acting and single acting(spring return),two split body cylinder,double piston, shifting fork type actuating mechanism,suitable for big size cylinder body,large driving torque,fexible and stable action;perfect wear-resistance,oilless lubricating bearings and guide rings are fitting with valve parts exchange based on reducing coefficient of friction, extending service life.The AW pneumatic actuator's driving torque with U type curve characteristic,is much suitable for large body size valves's open/close,adjusting,and 90 degree rotary service.



Double acting type

Single acting type

### Standard data

| | |
|---|---|
| Basis designment | Pneumatic double cylinder,double piston,shifting fork type actuating mechanism<br>Model APxx=Double action type;<br>Model APxxs=Single action type(spring-return); |
| Rotary degree | Double action type =90°;<br>Single action type =90°;<br>Valves's degree could to be adjusted from each side-5° ~+5° . |
| Working | -20°C~90°C。 |
| Air supply | 0.2~0.8MPa (Max1.0MPa) 。 |

### Actuator's selection and installation

The points of selection AP pneumatic actuator: definition of valve's torque, medium, increasing more 25% safety value for steam or non-lubricant medium:increasing more 60% safety value for non- lubricant dry gas medium; increasing more 100% safety value for non- lubricant entrained powder medium which by gas transmission, increasing more 20% safety value for clean,non-friction lubricant medium,finally select actuator type that basing on the operating pressure of air supply against double acting or single acting type torque's sheet.

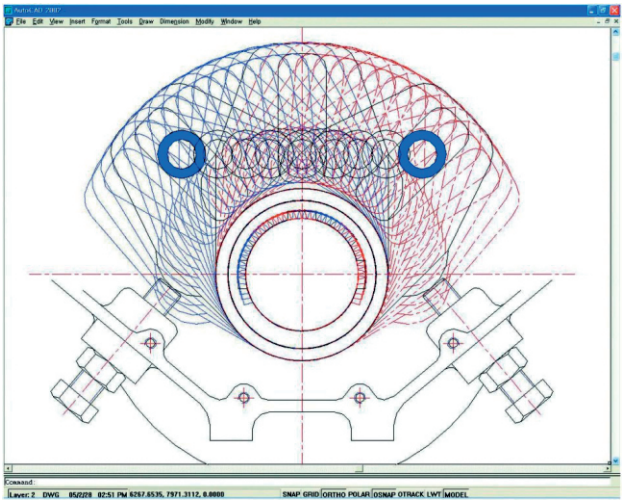
The setting precision of pneumatic actuator with valve,is much important to the actuator safe opearing and service life.for exact setting:putting the central axis of actuator absolute ganging with valve stem,testing the valve's torque to confirm it's working in the normative operating range before setting actuator to valve,after setting,to test pneumatic actuator with the valve simultaneously, exerting valve to reach the nominal sealing pressure value,for actuator,setting air pressure to be 0.4~0.7Mpa or by operating conditions.switching air supply between each of air inlets of actuator,to view valve's opening/closing situations,checking that shouldn't happened with dwell,stick-slip motion phenomena,and to repeat testing by several times.

### The feature and purpose of actuator

Double acting pneumatic actuator:ON/OFF control to valve's open/close

Spring return type:Automatic opening or closing valves sevicing to the situations when the circuit is cut or failled.

## Yoke Movement Simulation



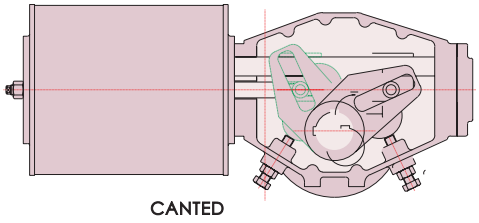
### Double action Output torque

| Model | Double action Output torque | | | | |
|---|---|---|---|---|---|
| | Air supply(Mpa) | | | | |
| | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 |
| AP A16 | 723 | 964 | 1205 | 1446 | 1687 |
| AP A20 | 1130 | 1507 | 1884 | 2260 | 2637 |
| AP B20 | 1695 | 2260 | 2826 | 3391 | 3956 |
| AP B25 | 2649 | 3532 | 4415 | 5298 | 6181 |
| AP B28 | 3323 | 4430 | 5538 | 6646 | 7753 |
| AP C28 | 4615 | 6154 | 7693 | 9231 | 10770 |
| AP C35 | 7212 | 9616 | 12020 | 14424 | 16828 |
| AP C40 | 9420 | 12560 | 15700 | 18840 | 21980 |
| AP C45 | 11922 | 15896 | 19870 | 23844 | 27818 |

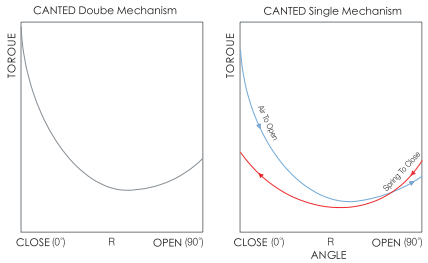
### Single action type Output torque

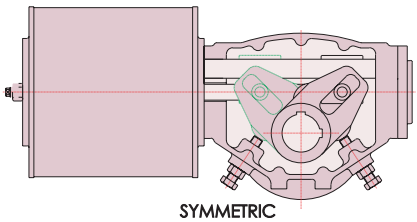
| Model | Spring torque | | Air supply (Mpa) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 0.4 | | 0.5 | | 0.6 | |
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| AP A25S | 106 | 1618 | 736 | 1148 | 1325 | 1734 | 1913 | 2325 |
| AP A28S | 1513 | 2031 | 922 | 1440 | 1661 | 2179 | 2399 | 2917 |
| AP B28S | 2270 | 3043 | 1387 | 2160 | 2492 | 3267 | 3603 | 4376 |
| AP B35S | 3547 | 4759 | 2164 | 3374 | 3895 | 5107 | 5625 | 6837 |
| AP C35S | 4928 | 6610 | 3006 | 4688 | 5409 | 7092 | 7814 | 9496 |
| AP C40S | 8146 | 10928 | 4968 | 7750 | 8941 | 11723 | 12916 | 15698 |
| AP C50S | 9812 | 13246 | 5594 | 9028 | 10304 | 13738 | 15014 | 18448 |

## Symmetrical & Canted Torqu

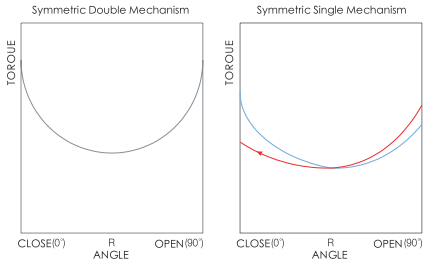


CANTED



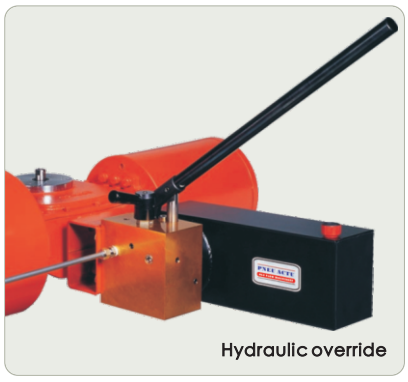



SYMMETRIC



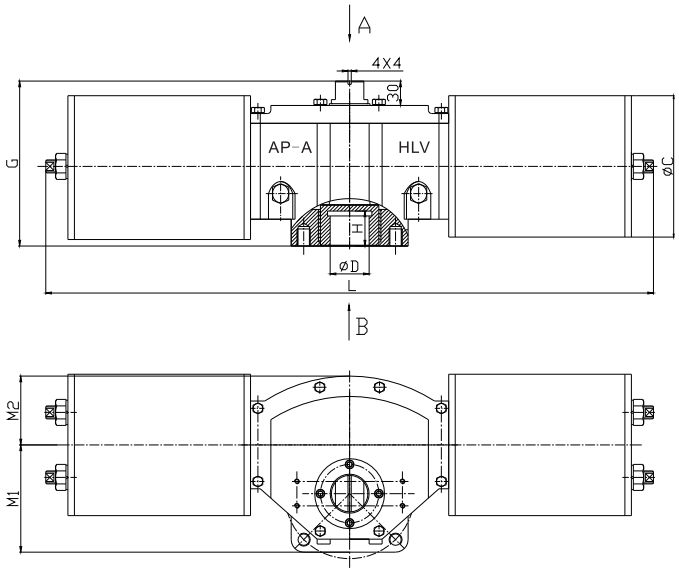

Jackscrew OVERRIDE

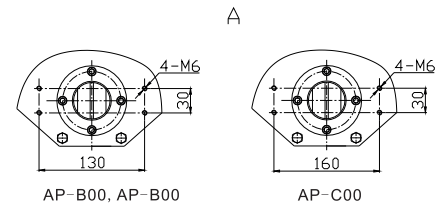
Gear override

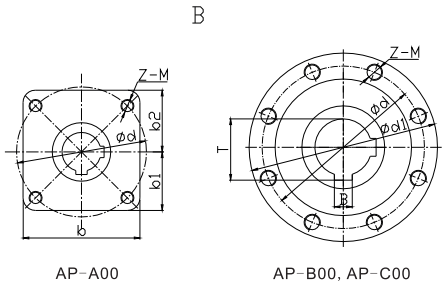


Hydraulic override

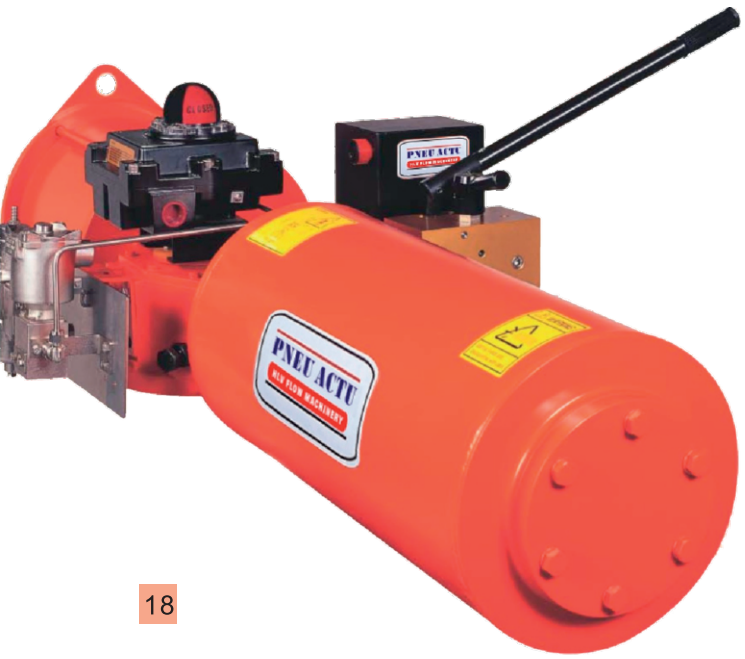
# Dimensions(Dual role)



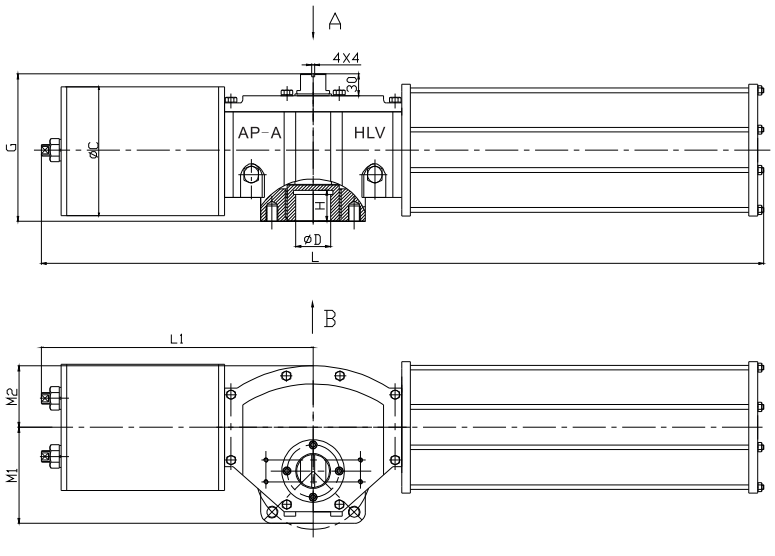



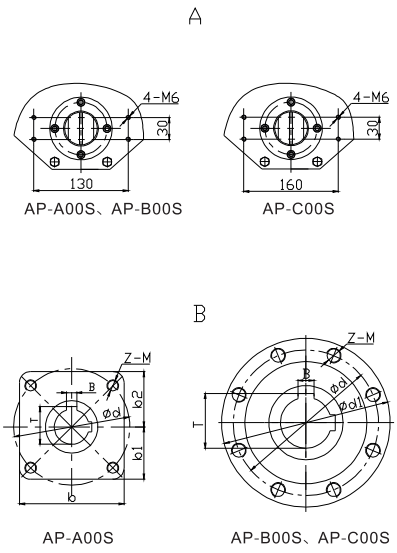




| External dimensions and connection dimensions | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Model | L | G | M1 | M2 | ΦC | ΦD | H | B | T | Φd | Φd1 | b | b1 | b2 | Z-M1 | Air connection |
| AP A16 | 786 | 206 | 85 | 132 | 174 | 45 | 42 | 14 | 48.8 | 140 | / | 144 | 72 | 76 | 4-M16 | G 1/4 |
| AP A20 | 786 | 203 | 85 | 132 | 214 | 45 | 42 | 14 | 48.8 | 140 | / | 144 | 72 | 76 | 4-M16 | G 1/4 |
| AP B20 | 1058 | 218 | 105 | 206 | 214 | 60 | 52 | 18 | 64.4 | 200 | 232 | / | / | / | 8-M16 | G 3/8 |
| AP B25 | 1058 | 218 | 105 | 206 | 266 | 60 | 52 | 18 | 64.4 | 200 | 232 | / | / | / | 8-M16 | G 3/8 |
| AP B28 | 1058 | 218 | 105 | 206 | 296 | 70 | 52 | 22 | 75.4 | 200 | 232 | / | / | / | 8-M16 | G 3/8 |
| AP C28 | 1360 | 260 | 140 | 300 | 296 | 100 | 106 | 28 | 106.4 | 300 | 350 | / | / | / | 8-M24 | G 1/2 |
| AP C35 | 1360 | 260 | 140 | 300 | 370 | 100 | 106 | 28 | 106.4 | 300 | 350 | / | / | / | 8-M24 | G 1/2 |
| AP C40 | 1360 | 260 | 140 | 300 | 420 | 100 | 106 | 28 | 106.4 | 300 | 350 | / | / | / | 8-M24 | G 1/2 |
| AP C45 | 1360 | 260 | 140 | 300 | 470 | 100 | 106 | 28 | 106.4 | 300 | 350 | / | / | / | 8-M24 | G 1/2 |

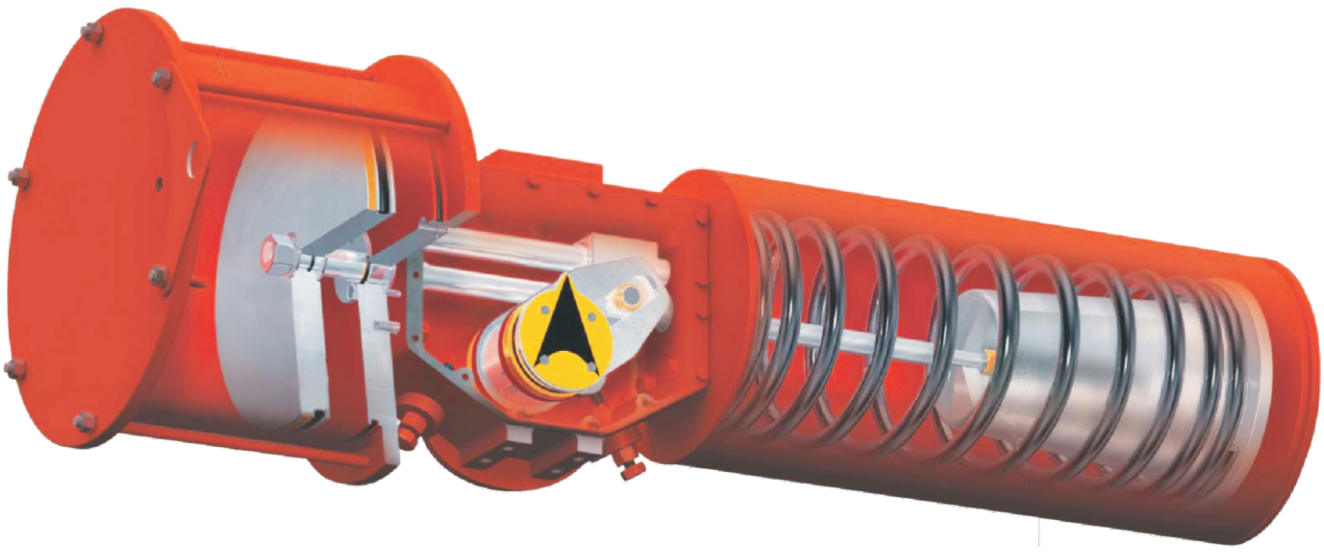


# Dimensions(Single)

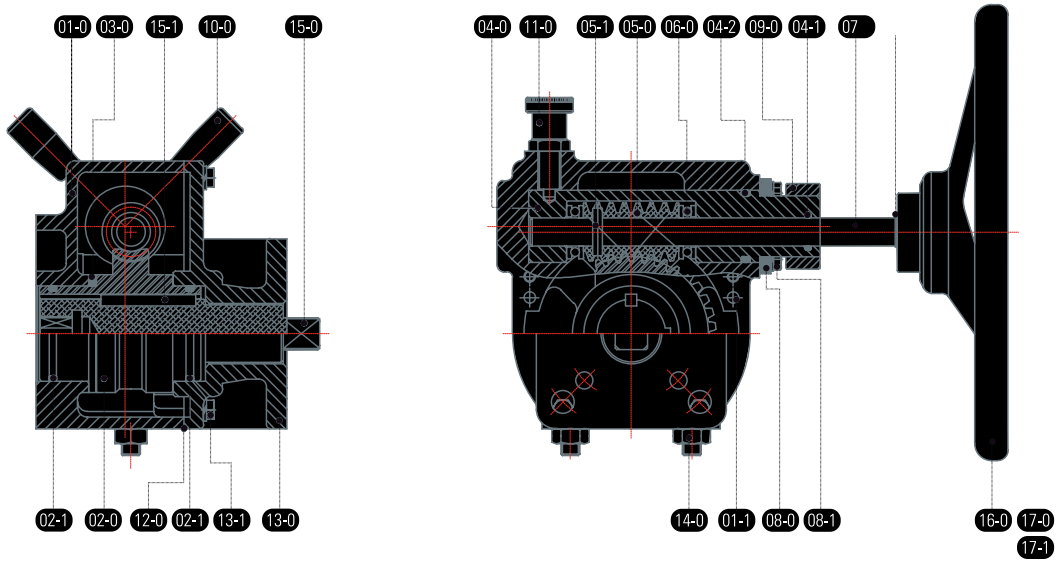



| External dimensions and connection dimensions | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Model | L | L1 | G | M1 | M2 | ΦC | ΦD | H | B | T | Φd | Φd1 | b | b1 | b2 | Z-M1 | Air connection |
| AP A25S | 1396 | 393 | 203 | 85 | 132 | 266 | 45 | 42 | 14 | 48.8 | 140 | / | 144 | 72 | 76 | 4-M16 | G 1/4 |
| AP A28S | 1396 | 393 | 203 | 85 | 132 | 296 | 45 | 42 | 14 | 48.8 | 140 | / | 144 | 72 | 76 | 4-M16 | G 1/4 |
| AP B28S | 1945 | 529 | 218 | 105 | 206 | 296 | 60 | 52 | 18 | 64.4 | 200 | 232 | / | / | / | 8-M16 | G 3/8 |
| AP B25 | 1945 | 529 | 218 | 105 | 206 | 370 | 60 | 52 | 18 | 64.4 | 200 | 232 | / | / | / | 8-M16 | G 3/8 |
| AP C35S | 2040 | 680 | 260 | 140 | 300 | 370 | 100 | 106 | 28 | 106 | 300 | 350 | / | / | / | 8-M24 | G 1/2 |
| AP C40S | 2040 | 680 | 260 | 140 | 300 | 420 | 100 | 106 | 28 | 106 | 300 | 350 | / | / | / | 8-M24 | G 1/2 |
| AP C45S | 2040 | 680 | 260 | 140 | 300 | 470 | 100 | 106 | 28 | 106 | 300 | 350 | / | / | / | 8-M24 | G 1/2 |
| AP C50S | 2040 | 680 | 260 | 140 | 300 | 520 | 100 | 106 | 28 | 106 | 300 | 350 | / | / | / | 8-M24 | G 1/2 |



## Materials of Construction



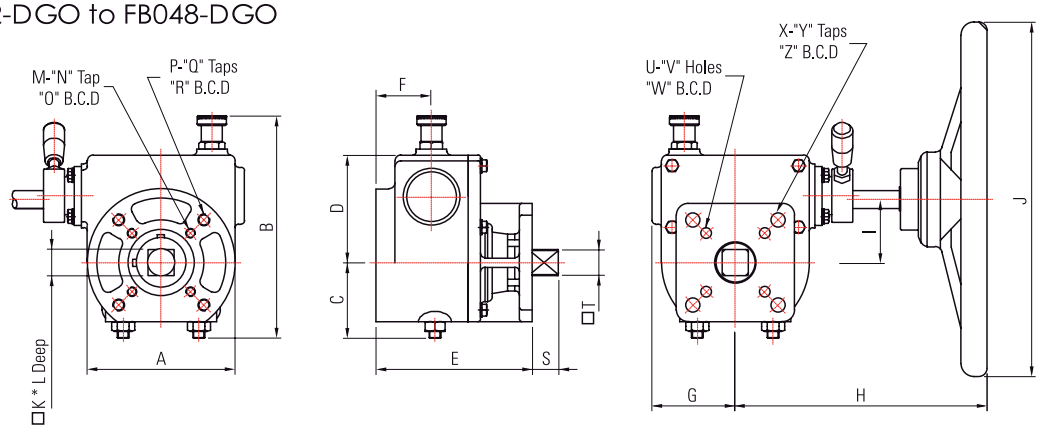

| Part No. | Q' ty | Description | Standard Material | Remark |
|---|---|---|---|---|
| 01-0 | 1 | Housing | Ductile Iron | |
| 01-1 | 2 | Housing Pin | Carbon Steel | |
| 02-0 | 1 | Worm Gear | Ductile Iron | |
| 02-1 | 2 | O-Ring | NBR | |
| 03-0 | 1 | Thrust Bearing | Aluminum Bronze | |
| 04-0 | 1 | Decl. Cam Bush | Brass | |
| 04-1 | 1 | O-Ring | NBR | |
| 04-2 | 1 | O-Ring | NBR | |
| 05-0 | 1 | Worm Wheel | Carbon Steel | |
| 05-1 | 2 | Pin | Carbon Steel | |
| 06-0 | 2 | Thrust Ball Bearing | Bearing Steel | |
| 07-0 | 1 | Shaft | Carbon Steel | |
| 07-1 | 1 | Snap Ring | Plated Carbon Steel | Fb048 above not applicable |
| 08-0 | 1 | Side Cover | Plated Carbon Steel | |
| 08-1 | 4 | Side Cover Bolt | Carbon Steel | |
| 09-0 | 1 | Position Adapter | Carbon Steel | |
| 10-0 | 1SET | Position Lever Assy | Stanless Steel & Plastic | |
| 11-0 | 1SET | Position Lock Assy | Carbon Steel & Plastic | |
| 12-0 | 1 | Gasket | Paper | |
| 13-0 | 1 | Cover | Ductile Iron | |
| 13-1 | 6 | Cover Bolt | Carbon Steel | FB032 (4) |
| 14-0 | 2SET | Adjustment Bolt & Nut | Carbon Steel | |
| 15-0 | 1 | Coupling | Carbon Steel | Plated |
| 15-1 | 1 | Key | Carbon Steel | |
| 16-0 | 1 | Handwheel | Ductile Iron / Carbon Steel | Powder Coating |
| 17-0 | 1 | Washer | Carbon Steel | Plated |
| 17-1 | 1 | Bolt | Stanless Steel | |

## Performance Data

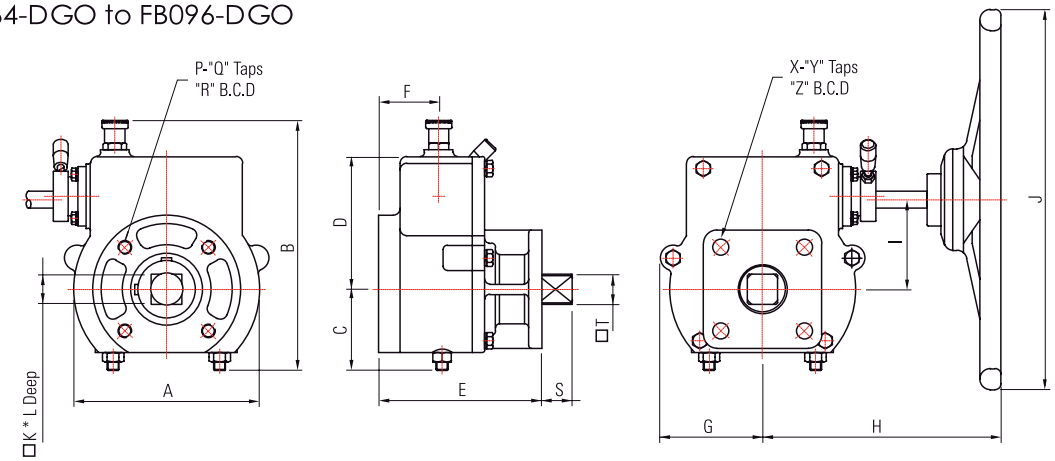
| Model | Gear Ratio | Mechanical Advantage | Weight | | Maximum input Torque | | Output Torque with 80Lbs | | Maximum output Torque | | Valve Mounting Size | Actuator Mounting Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | kgs | pounds | Nm | psig | Nm | psig | Nm | psig | | |
| FB032-DGO | 32 : 1 | 8 : 1 | 8 | 17 | 70 | 619 | 225 | 1991 | 294 | 2602 | F05 / F07 | F05 / F07 |
| FB036-DGO | 36 : 1 | 9 : 1 | 15 | 33 | 105 | 929 | 428 | 3788 | 558 | 4938 | F05 / F10 | F07 / F10 |
| FB048-DGO | 48 : 1 | 12 : 1 | 26 | 57 | 123 | 1088 | 740 | 6549 | 911 | 8063 | F10 / F12 | F10 / F12 |
| FB064-DGO | 64 : 1 | 16 : 1 | 46 | 101 | 158 | 1398 | 1397 | 12364 | 1675 | 14825 | F12 / F14 | F12 / F14 |
| FB080-DGO | 80 : 1 | 20 : 1 | 63 | 138 | 211 | 1867 | 2328 | 20604 | 2822 | 24976 | F14 / F16 | F14 / F16 |
| FB096-DGO | 96 : 1 | 24 : 1 | 118 | 249 | 282 | 2495 | 4064 | 35969 | 4860 | 43014 | F16 / F25 | F16 / F25 |

## Dimensions

### FB032-DGO to FB048-DGO




### FB064-DGO to FB096-DGO




## Dimensions

(Unit : mm)

| Model | A | B | C | D | E | F | G | H | I | J | □K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FB032-DGO | 98 | 167 | 55 | 76 | 104 | 38 | 55 | 185 | 43 | 200 | 17 |
| FB036-DGO | 125 | 194 | 69 | 91 | 132 | 47 | 71 | 213 | 53.5 | 300 | 22 |
| FB048-DGO | 160 | 243 | 79 | 123 | 156 | 54 | 84 | 247 | 74.5 | 350 | 27 |
| FB064-DGO | 220 | 296 | 96 | 157 | 193 | 71 | 121 | 282 | 106 | 450 | 36 |
| FB080-DGO | 267 | 362 | 120 | 197 | 225 | 86 | 148 | 330 | 133.5 | 600 | 46 |
| FB096-DGO | 340 | 458 | 170 | 244 | 254 | 92 | 192 | 413 | 172.5 | 800 | 55 |

| Model | L | M-N | O | P-Q | R | S | □T | U-V | W | X-Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FB032-DGO | 22 | 4-M6X10 | 50 | 4-M8X12 | 70 | 17 | 17 | 4-ø7 | 50 | 4-ø9 | 70 |
| FB036-DGO | 27 | 4-M8X12 | 70 | 4-M10X15 | 102 | 22 | 22 | 4-ø9 | 70 | 4-ø12 | 102 |
| FB048-DGO | 32 | N/A | N/A | 4-M12X18 | 125 | 27 | 27 | N/A | N/A | 4-ø14 | 125 |
| FB064-DGO | 42 | N/A | N/A | 4-M16X24 | 140 | 36 | 36 | N/A | N/A | 4-ø19 | 140 |
| FB080-DGO | 53 | N/A | N/A | 4-M20X30 | 165 | 46 | 46 | N/A | N/A | 4-ø23 | 165 |
| FB096-DGO | 60 | N/A | N/A | 8-M16X24 | 254 | 55 | 55 | N/A | N/A | 8-ø19 | 254 |

# Instruction of MIR series installment, service and use

HLV FLOW MACHINERY

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Http://www.hlvflow.com

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Calgary,Alberta Canada T3A2E4
TEL: (403)390-3406
FAX: (403)286-8868