INSTRUCTION MANUAL for BY HYDECK

MANUAL HYDRAULIC REMOTE CONTROL OPERATOR FOR VALVES (HYDECK)

CONTENTS

BY CONTROLS, INC

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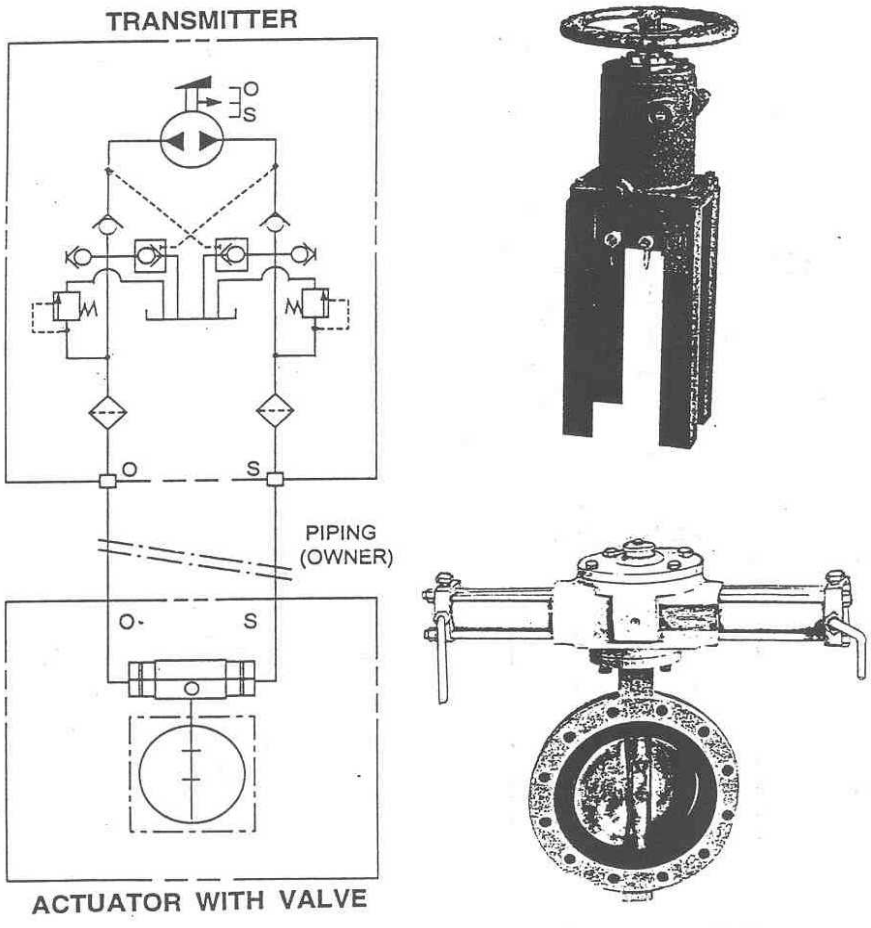
A. OUTLINE

Manual hydraulic remote control operator for valves (HYDECK) is basically composed of two components – transmitter and actuator. Normally the transmitter is installed at any convenient place for easy operation, whereas the actuator is installed on top of the valve body. The transmitter and the actuator are connected by a pair of small tubings which are used for transmitting the hydraulic pressure from the transmitter to the actuator to open or close the valve. One tubing is used for opening the valve, and the other is for closing.



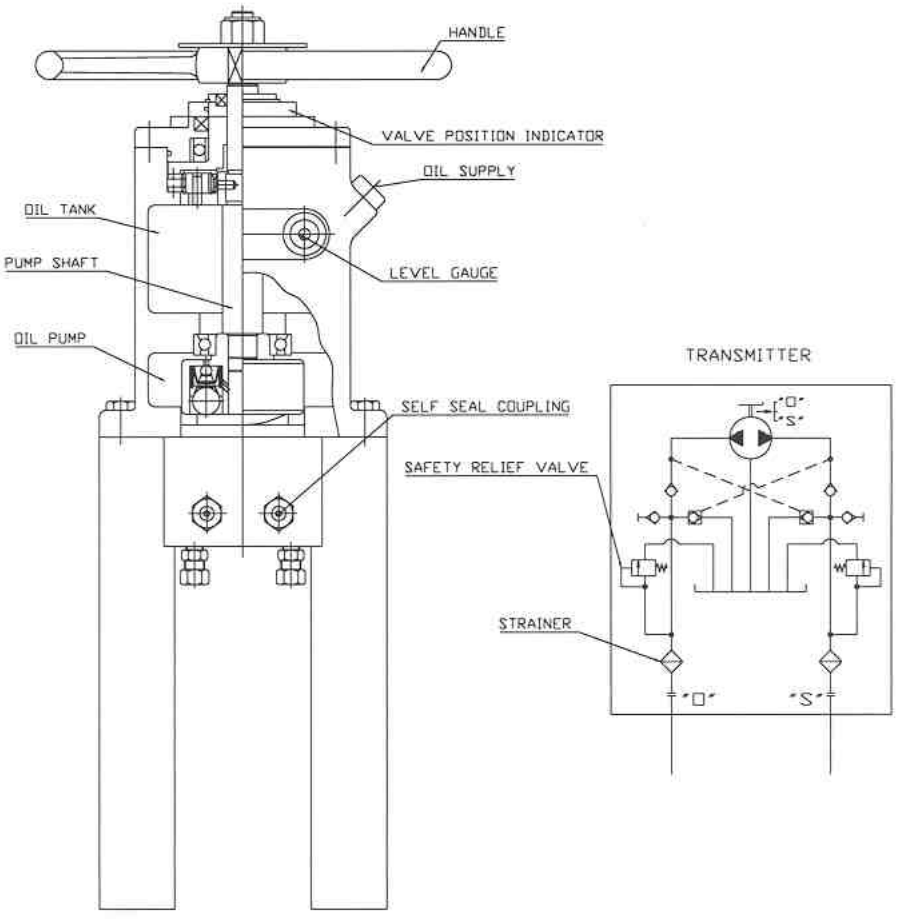
[Fig.1] Hydeck Piping Diagram

B. MAJOR COMPONENTS

B.1 TRANSMITTER

B.1.1 SPECIFICATION

Size	T12	T20	T24	T26
Oil pumping Rate’ cc/rev.	12	24	48	67
Movement of Indicator,° /rev. (Valve Size)	12.8 (50-600A)			6.3 (650-800A) 4.2 (above 850A)
Hyd. Oil Spec.	Mineral oil, ISO VG 22~32			
Oil temp., ℃	-25 ~ 90			
Test press., kg/㎠	150			
Working Press., Kg/㎠ (*)	90 for opening 80 for closing	(*): Set Pressure of the Safety Relief Valve		
Nor. oil vol. / Oil tank vol., ℓ	1.2 / 1.6			
Movement of Handwheel	Bi-directional (*clockwise* for closing, *counterclockwise* for opening)			



[Fig.2] Transmitter Schematic Diagram

B.1.2 GENERAL DESCRIPTION

Oil Pump

A ball piston type *oil pump* is directly connected to the shaft of rotating handwheel. When activated by turning the handwheel clockwise this pump starts to supply the hydraulic oil and pressurizes the closing-side tubing to close the valve. When the handwheel is turned counterclockwise, then the opening-side tubing is pressurized to open the valve. During this operation the return oil flows back to the oil tank of the transmitter through the other side of the tubing.

Lock Valve

In case the tubings connecting the transmitter and the actuator are damaged for a certain reason loss of hydraulic oil out of the system takes place causing the valve to move from the original position. *Lock valve* is a safety device to prevent the valve from being opened or closed even in the abnormal case as above. By adding this *lock valve* to the actuator the hydraulic pressure in the actuator could be maintained at a constant level maintaining the valve position unchanged until the damaged part has been recovered.

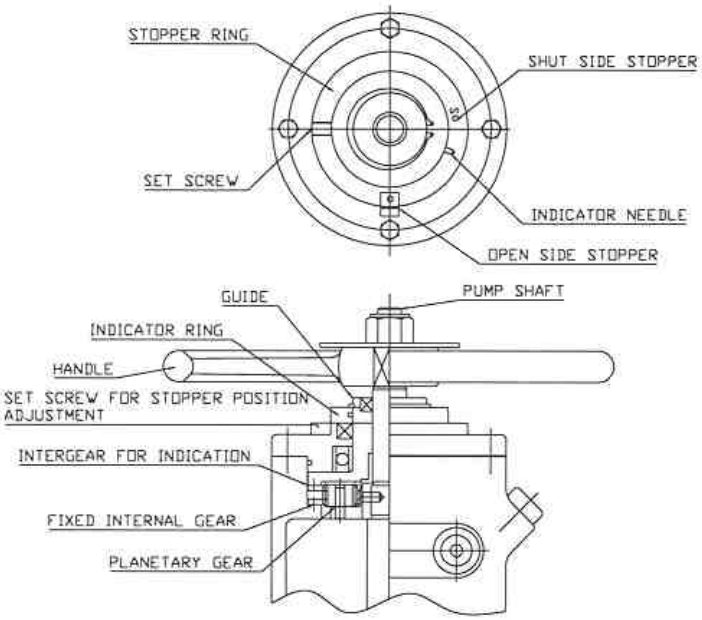
Safety Relief Valve

The purpose of the *safety relief valve* is to protect the system from being ruptured due to excessive pressure. Typically this device is being activated when the pump discharge pressure rises as high as the design set pressure, or when the ambient temperature rises too high to cause the isolated system pressure excessively high due to thermal expansion.

If the transmitter handwheel is continuously turned to open or close the valve, a moment is met when the *safety relief valve* start to operate. This can be easily recognized by heavy feeling on the hands as the operator continues to rotate the handwheel. This sign means that the valve has already been closed, and this can be counter-confirmed by checking the location of valve position needle. As long as this safety relief valve functions normally the handwheel can be rotated infinitely without causing any adverse effects to or damaging the system.

Self-Seal Coupling

The purpose of the *self-seal coupling* is to provide the transmitter system with additional emergency means for supplying the hydraulic oil using external hand pump. This emergency case is supposed to happen when the handwheel of the transmitter gets



[Fig.3] Valve Position Indicating System

loose or broken disabling its original function. When required, the rubber hoses of the external hand pump are to be connected to the *self-seal couplings* correctly for proper use.

Valve Position Indication Mechanism

This mechanism is composed of one piece of vertical planetary gear, one pair of horizontal internal gears (rotating upper gear and stationary lower gear), guide, O-ring, indication ring, indicator and stoppers (see FIG.3).

The rotating upper gear and the stationary lower gear are of the same diameter with different number of cogs (*). The upper internal gear and the guide are mechanically jointed by fixing screws letting these two parts always move together in one body.
In contrast to this, O-ring inserted between the indication ring and the guide is used as the mechanical binding medium for these two parts. Since the O-ring provides sufficient amount of friction on the contact surfaces between these two parts the indicator continues to move until it touches the stopper, which forces the indication ring to stop leaving the guide to skid over while the handwheel is kept moving.

(*) Three cases of combination (58/56, 58/57 and 87/86) are available in accordance with the size of the transmitter.

When the valve handle is rotated to open or close the valve, the planetary gear rotates by itself on its own axis against the internal gears while moving round the internal gear at the same speed of the handwheel, causing the upper internal gear to move forward in the rotating direction at a speed proportional to the difference of the cogs between the upper and lower gears. The movement of the indicator equivalent to one turn of the valve handle is approx. 12.8 deg (*) for the internal gears of 58/56 cog combination. (*): (360)(2/56) = 12.8°

INDICATOR SETTING:

1. Fully open the valve and put the indicator at the " O" side stopper.
2. Fully close the valve, move the " S" side stopper to touch the indicator, and tighten the set screw to fix the stopper.
3. In case the actual position of the valve does not match with the indication of the indicator, loosen the set screw and repeat the above procedure to correct the setting of the stopper.

[NOTE]

The calculated movement angle of the indicator (θ) might slightly differ from the actual set value of the stopper due to the possibility of remaining air in the tubings which would have adverse effects on the performance of the transmitter system.

Example calculation of movement span of indicator (θ)

- Size of transmitter: T12
  Discharge capacity: 12 cc/rev
  Angle of indicator: 12.8° /rev
  Oil quantity per one stroke: 49 cc (for 125A B/V)
- The numbers of handwheel revolution: N = 49 cc/12 cc/rev = 4.08 rev
- Angle span of indication needle: θ = (12.8° /rev)(4.08 rev) = 52.2°

B.2 ACTUATOR

B.2.1 SPECIFICATION

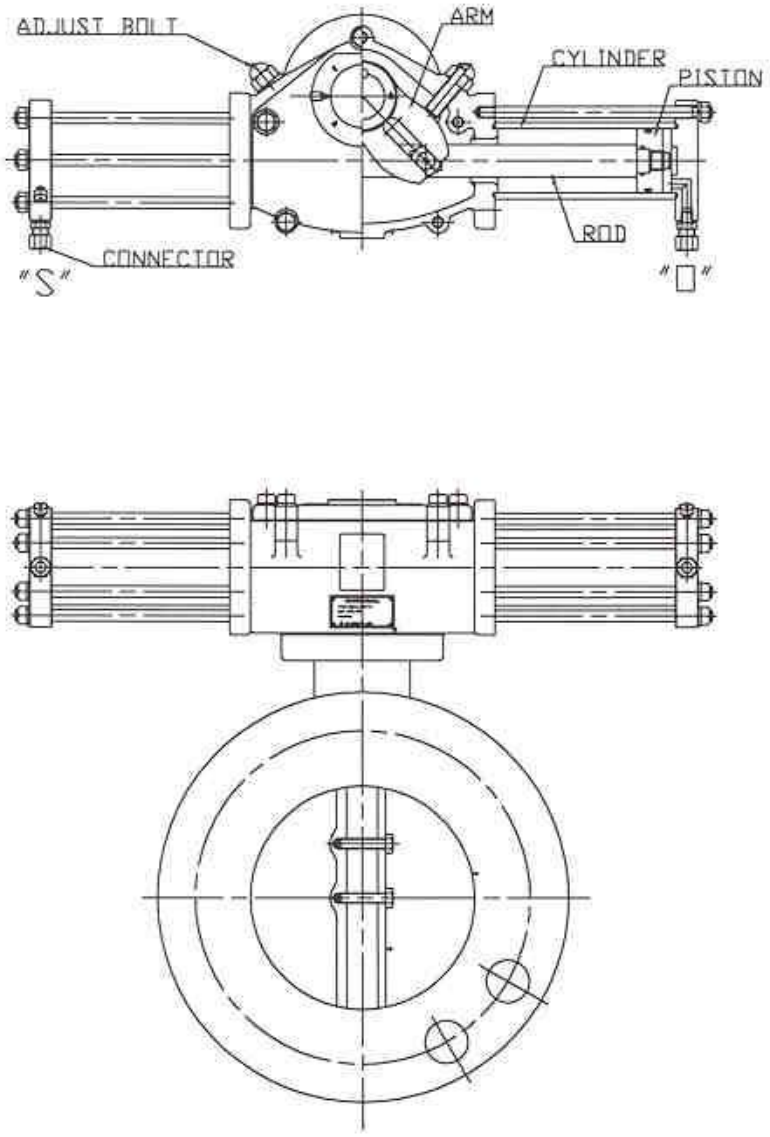
Type		ROTARY	LINEAR
Features	Cylinder type	Double acting	Double acting
	Installation	Horizontal / Vertical	Vertical
	No. of Piston	2	1
Pressure, Kg/cm	Test	150	
	Working (*)	90 (for opening) (*): Set Value of Relief Valve 80 (for closing)	
Hyd. Oil Spec.		Mineral oil, ISO VG 22~32	
Oil vol., cc		65~3200	55~3100
Application		Butterfly Valve, Ball Valve	Globe Valve, Angle Valve, Gate Valve, Surface Valve

B.2.2 ROTARY ACTUATOR

B.2.2.1 GENERAL DESCRIPTION

This type actuator is designed for the valves which have rotating disk such as butterfly and rotary ball valves. As the handwheel of the transmitter is turned, the hydraulic oil is pumped and delivered to the cylinder chamber of the actuator through the oil tubings. The hydraulic oil under pressure thus introduced into the cylinder chamber push the piston to move back and forth as needed. The reciprocating movement of the piston rod is changed into rotary torque by a device called *ARM* which is connected to the stem of the valve thus enabling the disk to rotate in either open or close direction.

The angle between full open and close position is 90 degree, and it can be adjusted using " adjust bolt." Stainless tubings are normally used for connecting the the actuator and the transmitter.



[Fig.4] Rotary Type Actuator

B.2.2.2 AIR PURGING

① Open the air vent plug located at " S" side of the actuator.

② Fill the oil tank on the transmitter.

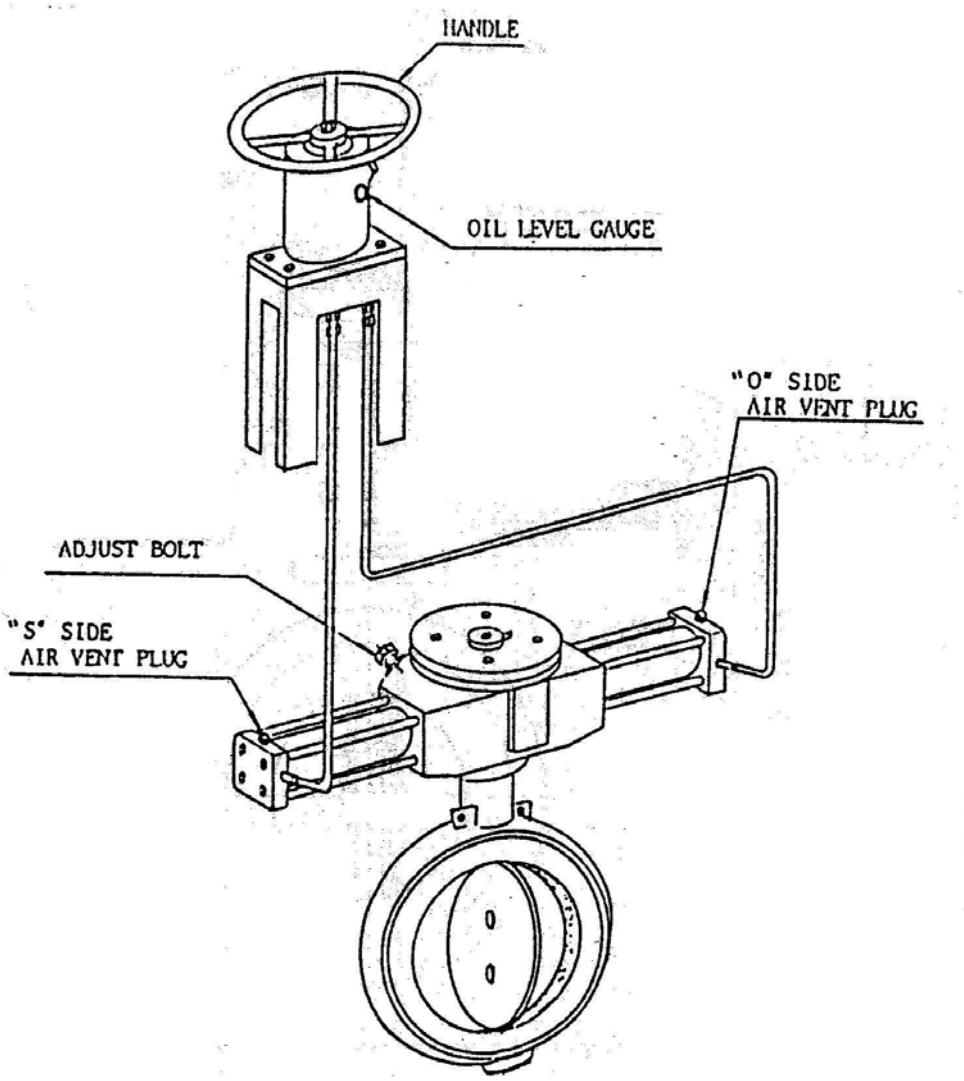
③ Turn transmitter handwheel clockwise to bleed the air out of the " S" side system. Continue this until the air bleeding is being finished and oil drop is just to come out of the vent plug hole.

[CAUTION]

Do not stop transmitter handwheel until the air purging process is completely finished.

④ Proceed air purging on " O" side actuator following the same procedure as above for the " S" side actuator.

⑤ After completely finishing the air purging, fill the oil tank up to the normal level (mid-level by the level gauge).



[Fig.5] Reference Diagram for Air Purging

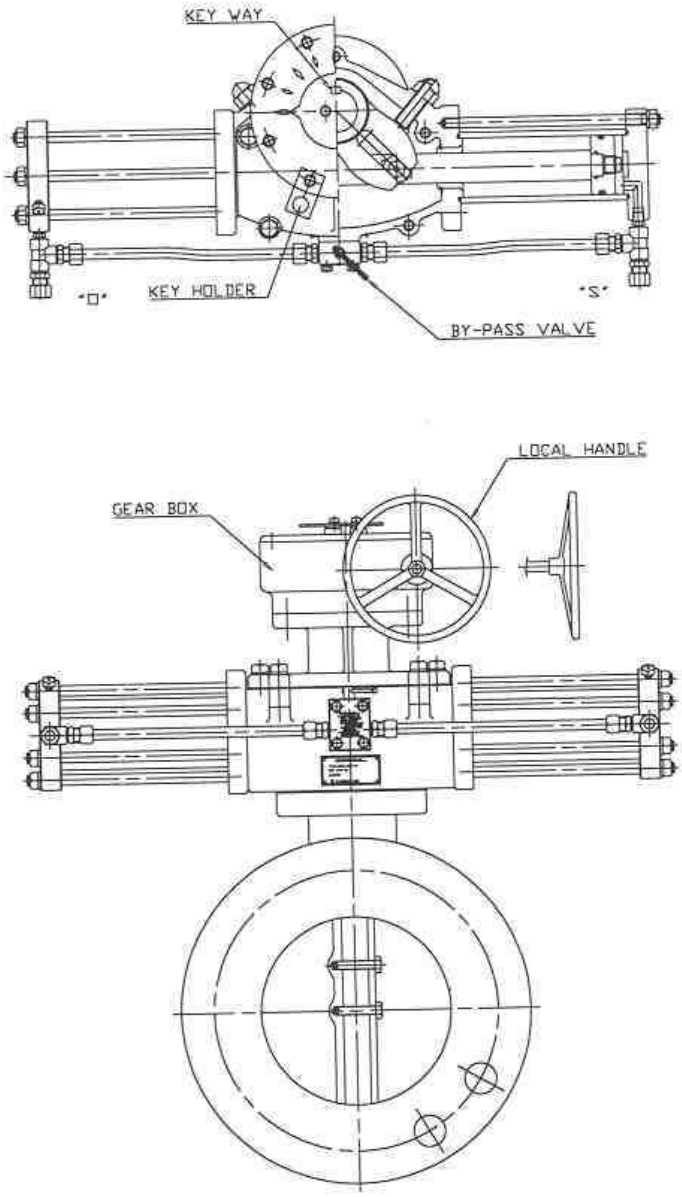
B.2.2.3 EMERGENCY OPERATION

① Open the by-pass valve.

② Insert key into the keyway so that the valve shaft can be mechanically jointed with the gear box.

③ Turn the local handwheel as needed to open or close the valve.

④ When the local operation is completed, close the by-pass valve and remove the key out of the keyway.

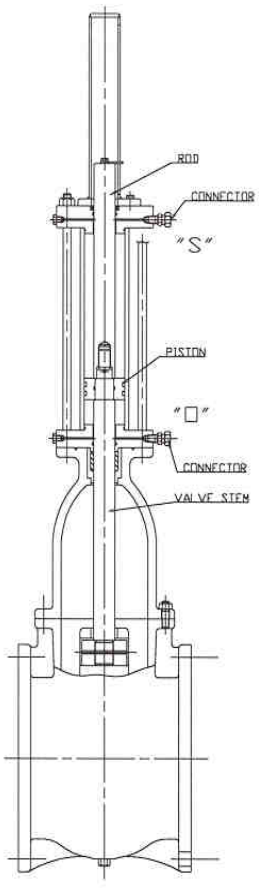


[Fig.6] Reference Diagram for Hand Pump Operation

B.2.3 LINEAR ACTUATOR

B.2.3.1 GENERAL DESCRIPTION

The actuator of this type is designed for the valves such as gate valve, globe valve, angle valve, surface valve and etc. which have disks moving linearly in line with the linear movement of valve stem. In order to make the turning number of the transmitter handwheel the same for both opening and closing operation cases, an extension rod of the same diameter as that of the existing stem is additionally installed on top of the existing stem which is utilized as actuator piston rod. The set pressure of safety relief valve on the transmitter (Fig.2) is to be set at 80 kg/㎠ for opening side and 90 kg/㎠ for closing side. The reason for higher pressure in the opening side is to overcome any possibilities of sticking between the disk and the seat of the valve.



[Fig.7] Piston Type Actuator

B.2.3.2 AIR PURGING OPERATION

① Supply oil to the oil tank on the transmitter.

② Loosen the air vent plug at " O" side after confirming that the valve is located at close position.

③ Turn the transmitter handwheel slowly in the opening (counter-clockwise) direction and bleed the air out of the " O" side tubing completely until there is a sign of oil overflowing through the vent hole.

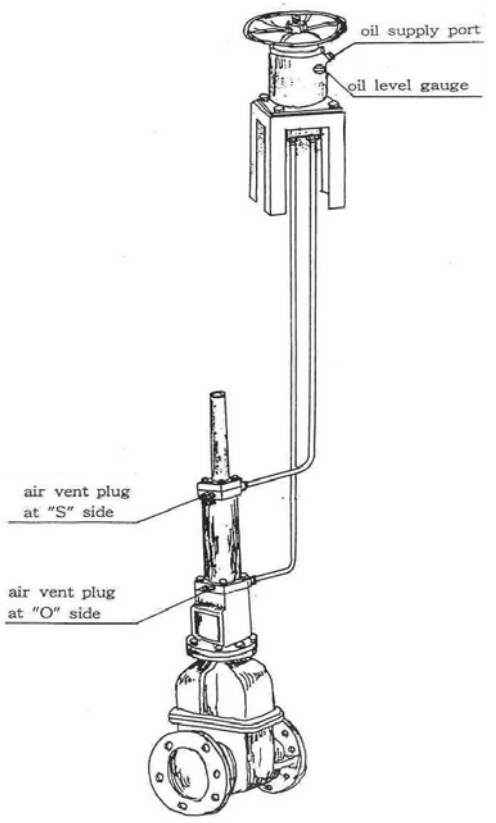
④ Tighten the air vent plug at " O" side and open the valve completely by continuously turning the transmitter handwheel in the opening direction.

⑤ Loosen the air vent plug at " S" side

⑥ Turn the transmitter handwheel slowly in the closing (clockwise) direction and bleed the air out of the " S" side tubing completely until there is a sign of oil overflowing through the vent hole.

⑦ Tighten the air vent plug at " S" side.

⑧ After completely finishing the air purging, fill the oil tank up to the normal level (mid-level by the level gauge).



[Fig.8]Reference Diagram for System Air Purging

C. TROUBLESHOOTING

Problems	Possible Reasons	Remedies
Unable to open the valve using the transmitter handwheel.	(1) Lack of oil due to insufficient initial charge or external leakage. (2) Internal leakage through check valve, relief valve or bypass valve.	(1) Fill the oil tank up to normal level. (2) Check the tubings for any damage or loose connection. Repair as needed. (3) Check the check and/or relief valve for cleanliness or any damage. Clean or replace as needed. Check if the by-pass valve is leaky. Tightly close or replace as needed.
Loose indicator	(1) Failure of internal gear mechanism.	(1) Contact the manufacturer for replacement of the parts.
Open/close position of indicator is not constant.	(1) Insufficient removal of air out of the system. (2) External leakage of hydraulic oil.	(1) Repeat air bleeding referring to the procedure in this manual. (2) Check the tubings for any leakage. Fix as needed.
Unable to tightly close or fully open the valve.	(1) Insufficient oil pressure. (2) Abnormality at the valve seat	(1) Check the relief valve for proper functioning. Repair or replace as needed. (2) Check the valve seat for any damage or cleanliness. Repair or clean as needed.

D. HYDRAULIC OIL – RECOMMENDED BRANDS AND TYPES

BRAND	TYPE	VISCOSITY GRADE
BP	BARTRAN HV 22 BARTRAN HV 32	ISO VG 22 ISO VG 32
CALTEX	RANDO HD Z 22 RANDO HD Z 32 RANDO HD AZ	ISO VG 22 ISO VG 32 ISO VG 32

CASTROL	HYSPIN AWS 22	ISO VG 22
	HYSPIN AWS 32	ISO VG 32
	HYSPIN AWH 32	ISO VG 32
CHEVRON	CHEVRON AW	ISO VG 32
	EP HYD.OIL 32 HV	ISO VG 32
ELF	VISGA 22	ISO VG 22
	VISGA 32	ISO VG 32
	HYDRELF DS 22	ISO VG 22
	HYDRELF DS 32	ISO VG 32
ESSO	UNIPOWER XL 22	ISO VG 22
	UNIPOWER XL 32	ISO VG 32
SK	ZIC SUPERVIS AW32	ISO VG 32
	ZIC SUPERVIS X32	ISO VG 32
GULF	HARMONY AW 32	ISO VG 32
	HARMONY HVI AW 26	ISO VG 22
S-OIL	SHF 32	ISO VG 32
	FLUID 32	ISO VG 32
MOBIL	DTE 13 M	ISO VG 32
SHELL	TELLUS OIL 22	ISO VG 22
	TELLUS OIL 32	ISO VG 32
	TULLUS OIL T 37	ISO VG 32
SUN	SUNVIS 822-WR	ISO VG 22
	SYBVIS 832-WR	ISO VG 32

*** NOTE**: Viscosity range should be 15~200 cSt at working temperature.