CAT. NO. 207E

ELECTRO-HYDRAULIC ACTUATOR

SEIRITSU ENGINEERING CO,.LTD.

General Description

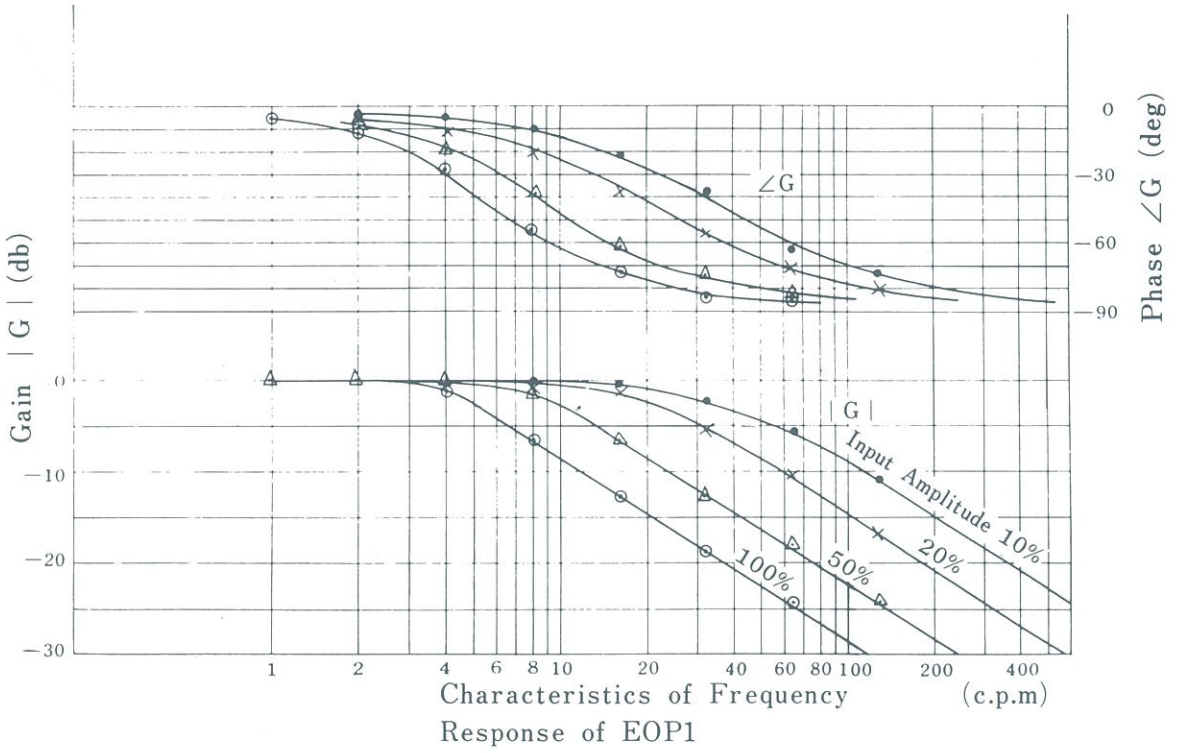
More than 50years have already passed since the hydraulic automatic control devices with oil jet pipe relay system were invented. The hydraulic automatic control device has various superior features as seen from the fact that it has been adopted widely for more than 50years.

We have been engaged in design and manufacture of various types of products with emphasis placed on the hydraulic device for more than 20 years. Due to the recent rapid progress of electronic technology, electronic controllers are being adopted more and more for instrumentation in various industrial processes.

As seen from this catalogue, we have manufactured a series of electro-hydraulic actuators having features of the oil hydraulic type and they can be used by coupling them with various types of electronic controllers.

We export our products to South-east Asian countries, Middle and Near Easts, African countries, USSR, China and others. Many units have been adopted for operation of valves for such various plants as iron, non-ferrous metal, ceramic, sugar refining and boiler etc.

For marine use, they are adopted for boilers, turbines and pumps for tankers and freighters.



Outline of Electro-hydraulic Actuator EOP

Electro-hydraulic actuator TYPE EOP is one of series products called OP series.

OP series products have been developed by application of the principles of the oil jet pipe relay system having high reliability since many years ago. The oil jet pipe relay system, operating cylinder, oil supplier which are constitutional members of the actuator are incorporated in a standardized casing. All the units constituting them have been designed and manufactured for outdoor use.

By adding units with various functions according to the intended use, OP series products can be converted to the following TYPE EOP, COP, POP, DOP, MOP and SOP. With regard to the other OP than EOP, please refer to P. 13 and after.

	CODE	ARTICLE
FUNCTION	EOP	ELECTRO-HYDRAULIC ACTUATOR This is a hydraulic actuator which can be operated by a direct current signal from an electronic controller.
	COP	PACKAGED CONTROLLER This is a site installing type controller incorporating all the devices which constitute a hydraulic controller with oil jet pipe relay system.
	POP	PNEUMATIC HYDRAULIC ACTUATOR This is a hydraulic type actuator which is operated by a pneumatic signal from a pneumatic type controller.
	DOP	DIGITAL HYDRAULIC ACTUATOR This is a hydraulic type actuator which is operated by a pulsed signal from a computer.
	MOP	MAGNETIC HYDRAULIC ACTUATOR This is a 2-position type hydraulic actuator which is operated with an on-off electric signal.
	SOP	SERVO ACTUATOR This is an electrohydraulic actuator which is incorporoted with a servo amplifier. Refer to SERVO AMPLIFIER P. 15 to 17.
OPERATING TORQUE	1	Crank cylinder type Max. 50 kgf-m Min. 35kgf-m
	2	Crank cylinder type Max. 125 kgf-m Min. 91kgf-m
	22	Crank cylinder type Max. 174 kgf-m Min. 127kgf-m
	3	Crank cylinder type Max. 278 kgf-m Min. 171kgf-m (130K) Max. 609 kgf-m Min. 428kgf-m (160K) Max. 1038kgf-m Min. 712kgf-m (200K)
	4	Straight moving cylinder type Max. 500kgf (In the case of direct coupling) Max. 13 kgf-m (When rotary type yoke attached)

EOPZ 1

This is called "CYLINDER SEPARATING TYPE" that the cylinder has been removed from the casing. It is combined with another cylinder installed separately by pipeline at site.

In addition to its inherent functions, various functions such as manual operation, operation in emergency, remote opcration etc. can be added. Refer to Item "STANDARD ATTACHING DEVICES AND INSTRUMENT" for the details.

FEATURES

1. Most of the troubles on the hydraulic machines are attributable to entry of dust. Oil jet pipe which keeps dust out or away effectively has been adopted for OP series, resulting in elimination of trouble. Furthermore, maintenance and handling can be made easily.
2. All constitutional members are incorporated in the casing compactly and internal inspection can be made easily.
3. Installing work can be done easily at site.
4. The standard input signal level of the electro-hydraulic actuator is 4~20mA DC. Other signal levels are also available.
5. It has a large actuating force and responds more rapidly as compared with the pneumatic type actuator and motor type actuator.
6. Possible to adopt various explosion-proof constructions.

CONSTRUCTION AND OPERATING PRINCIPLES OF EOP

As shown in Photo 1, TYPE EOP 1, 2 and 22 have a built-in oil jet relay system, a feedback mechanism, an operating cylinder and a transfer cock and is equipped with an oil pump, a relief valve, and a strainer.

Their casings are made of cast iron and are equipped with bearings for supporting an operating shaft and hydraulic oil is filled therein.

TYPE EOP 3 has the same casing as TYPE EOP1 but a crank type cylinder, an auxiliary tank are installed on a common base with the actuator casing and the movement of the cylinder is conveyed to the actuator through a connecting link.

A pilot valve for amplifying oil quantity is attached to the oil jet pipe relay system of TYPE EOP3. A force coil unit receiving a current signal from an electronic type controller is attached to any of these types.

As shown in Photo 2, TYPE EOP 4 has a different casing from TYPE EOP1. An oil jet pipe relay system, a feedback mechanism, a cylinder, a force coil unit and an oil pump are incorporated inside the casing. Relief valve and a strainer are provided outside it.

Movement of the cylinder is conveyed to the operating shaft through the lever, resulting in moving up and down. There is a seal pipe (utility model registered) between the shaft and body and it has such a construction that no oil leaks to the outside when the shaft is moved.

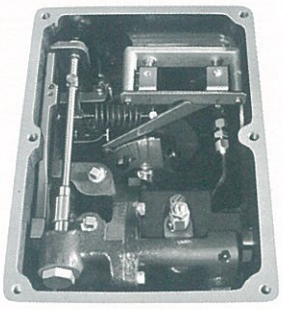


PHOTO 1

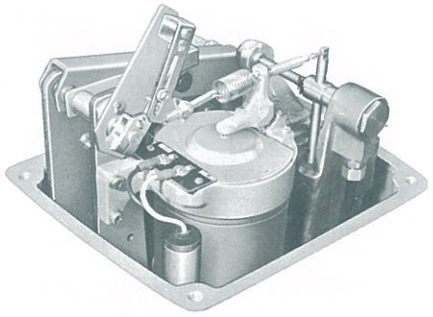


PHOTO 2

Figs. 1 and 2 show the operating principle of the electro-hydraulic actuator. When an output current signal of an electronic type controller flows into a force coil, a force in proportion to the current is generated in the moving coil.

The oil jet pipe is operated by this force and the oil jetted from the nozzle at tip end of the jet pipe is sent to the cylinder through diffuser, resulting in operation of the cylinder piston.

The movement of the piston is converted to a rotating movement by means of the crank mechanism, resulting in rotating the operating shaft with a specified torque.

The operating shaft is provided with a feedback cam and the movement of the cam is conveyed to the feedback spring through the magnification change lever and the contracting force of the feedback spring is transmitted to the jet pipe.

As explained hereabove, a mechanical feedback loop is formed at the inside of the actuator and an manipulation variable in proportion to the current signal can be obtained.

Operating direction can be selected freely according to the change in port position, fitting direction of the feedback cam and change in wiring of the force coil. Hydraulic oil from a gear pump driven by a motor is adjusted to a specified pressure and sent to an oil jet pipe.

In TYPE EOP4, the operation of the cylider piston is transmitted to the operation shaft which is move up and down, resulting in linear operation of the shaft. In the feedback mechanism of TYPE EOP4, no cam is used and it consists of the lever, link mechanism, feedback spring etc.

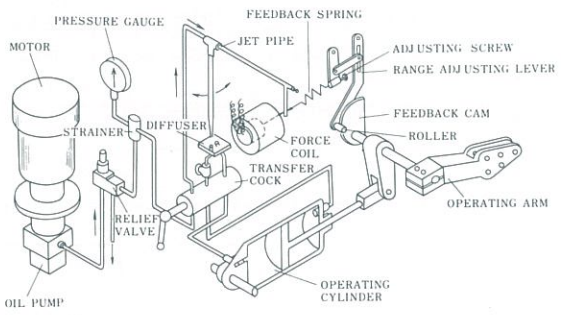


FIG. 1
OPERATING PLINCIPLE OF TYPE EOP 1

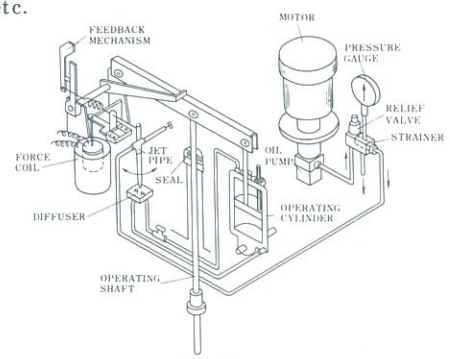


FIG.2
OPERATING PRINCIPLE OF TYPE EOP 4

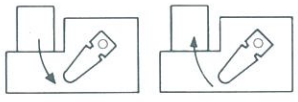
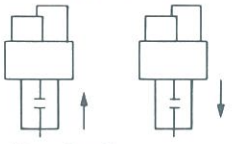
SPECIFICATION OF EOP

◆ Specifications according to type

Specifications \ Type			EOP 1	EOP 2	EOP 22	EOP 3 -130KD	EOP -160K	EOP 3 -200K	EOP 4
Operating force	Torque kgf-m	Max.	50	125	174	278	609	1038	13.5 (NOTE2)
		Min. (NOTE1)	35	91	127	171	428	712	13.0 (NOTE2)
	Thrust Kgf		—	—	—	—	—	—	500
Operating angle °Deg.			80 ±1.2	80 ±1.2	80 ±1.2	90 ±3	90 ±3	90 ±3	22 (NOTE3)
Lift of operating shaft mm			—	—	—	—	—	—	13～50
Required time for whole stroke at no-load SEC (NOTE 4)			Abt.10	Abt.14	Abt.19	Abt.12	Abt.26	Abt.45	Abt.10
Max. working oil pressure Kgf/cm²			15	15	15	15	15	15	13
Motor KW			0.4	0.75	0.75	1.5	1.5	1.5	0.2
Required oil quantity ℓ			20	24	24	52	68	72	8
Weight Kg			125	135	145	290	380	580	55

◆ General specifications

Input signal	4 ～ 20 mA DC	10 ～ 50 mA DC
Force coil resistance	430 ohm	300 ohm
Accuracy	Accuracy ±1.5% or less Precision 1.5% or less (at no load)	
Feedback mechanism	Link mechanism or cam mechanical type (Standard input/output characteristics are linear)	
Motor (NOTE5)	200V 50/60Hz, 220V 60Hz, 400V 50/60Hz, 440V 60Hz	
Hydraulic oil	0 ～ 40℃ JIS Additive turbine oil equivalent to ISO VG 32 40 ～ 80℃ JIS Additive turbine oil equivalent to ISO VG 68 −30 ～ 0℃ Hydraulic oil for aircraft Movil HFD or equivalent	

Operating direction (NOTE6)	When input signal is increased: TYPE EOP1, 2, 22, 3 (Standard)  TYPE EOP4 (Standard) 
Coating color	Silver (Standard)

(NOTE 1) The value of min. torque is the value at end of stroke of the piston.

(NOTES 2 & 3) The torque and operating angle when EOP 4 body is fitted with Y5 type yoke and converted to a rotory type are shown.

(NOTE 4) The value of required time is the value when operated at maximum working pressure.

(NOTE 5) The safety improved explosion-proof, and pressurized and explosion-proof type motor can be installed.

(NOTE 6) Selection of the operating direction can be made optionally according to the condition of such final control element as butterfly valve, globe valve etc. conbined with an actuator.

(NOTE 7) The electro hydraulic actuator can be so designed and manufactured to have an intrinsically safe explosionproof construction.

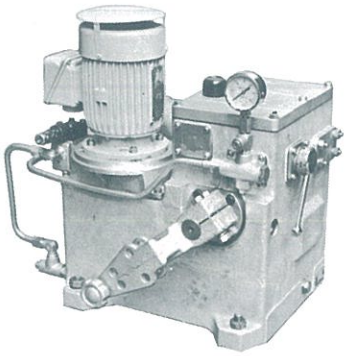


PHOTO 3 TYPE EOP 1

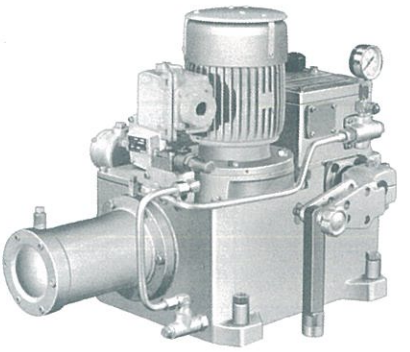


PHOTO 4 TYPE EOP 2

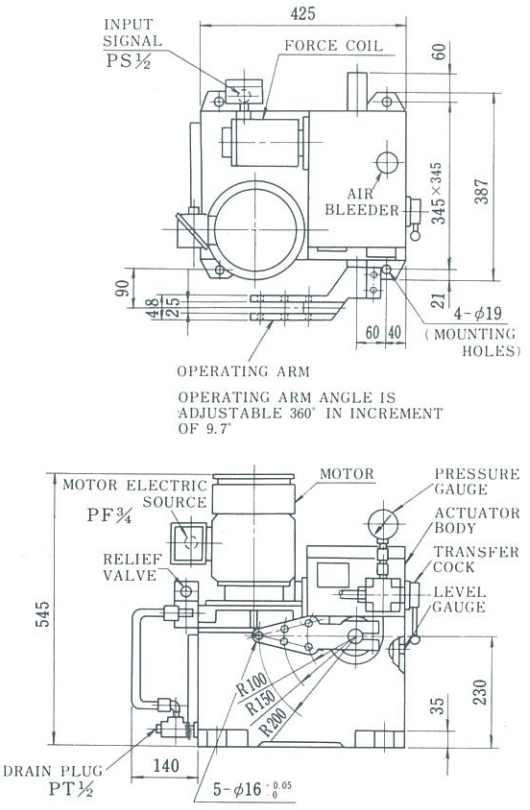


FIG. 3 TYPE EOP 1

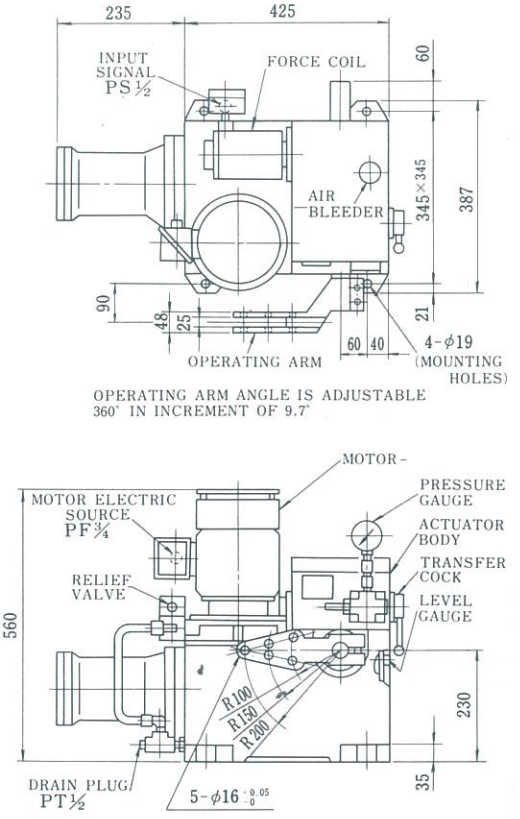


FIG. 5 TYPE EOP 2

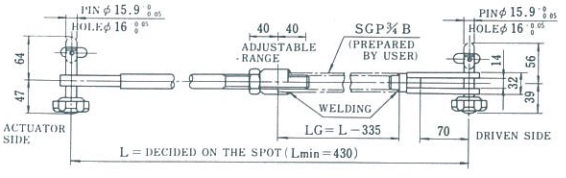


FIG. 4 CONNECTING LINK FOR TYPE EOP 1

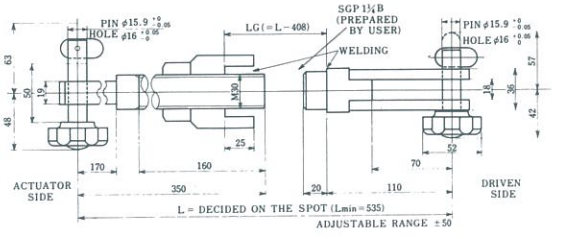


FIG. 6 CONNECTING LINK FOR TYPE EOP 2

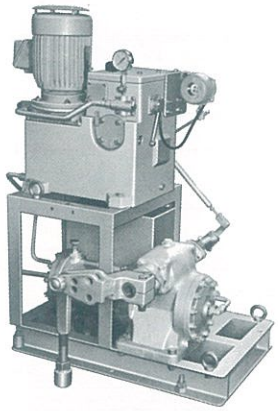


PHOTO 5 TYPE EOP 3–130KD

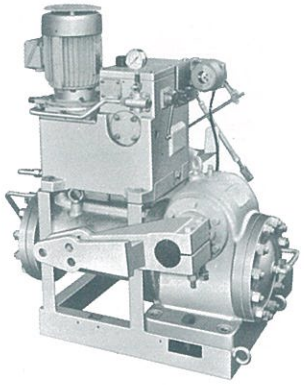


PHOTO 6 TYPE EOP 3–200 K

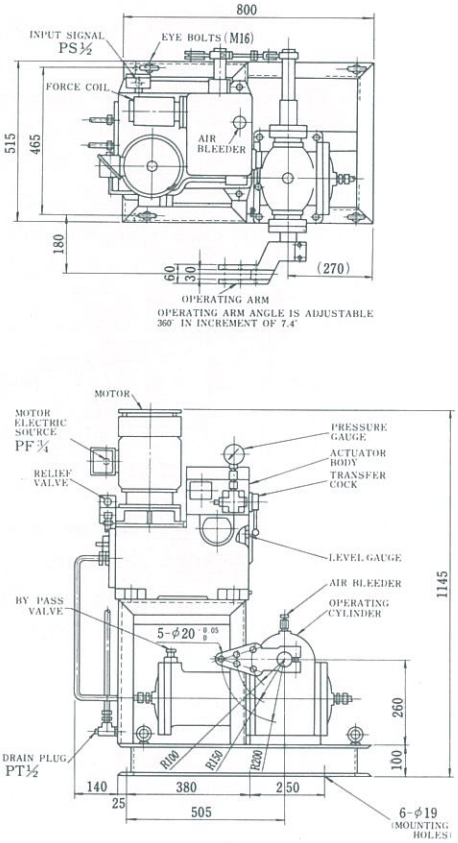


FIG. 7 TYPE EOP 3–130 KD

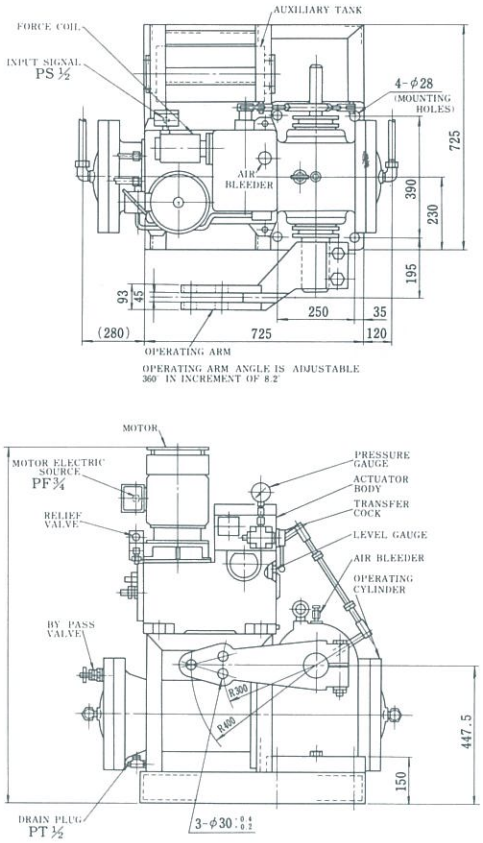


FIG. 9 TYPE EOP 3–200 K

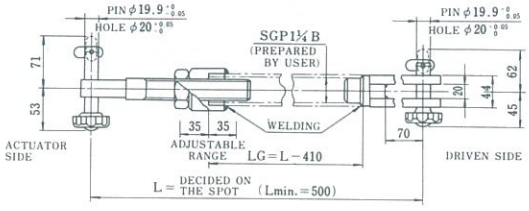


FIG. 8 CONNECTING LINK FOR TYPE EOP 3–130KD

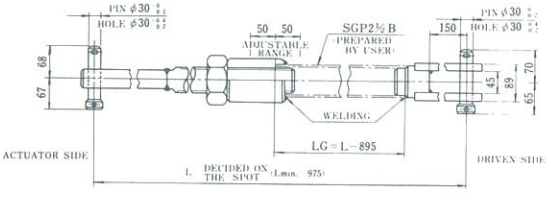


FIG. 10 CONNECTING LINK FOR TYPE EOP 3–200K

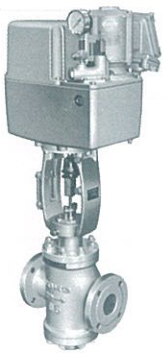


PHOTO 7 EOP4-Y2-V65

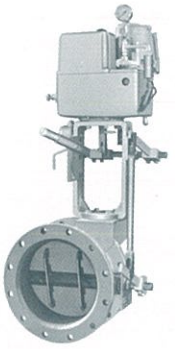


PHOTO 8 EOP4-Y52-BV200

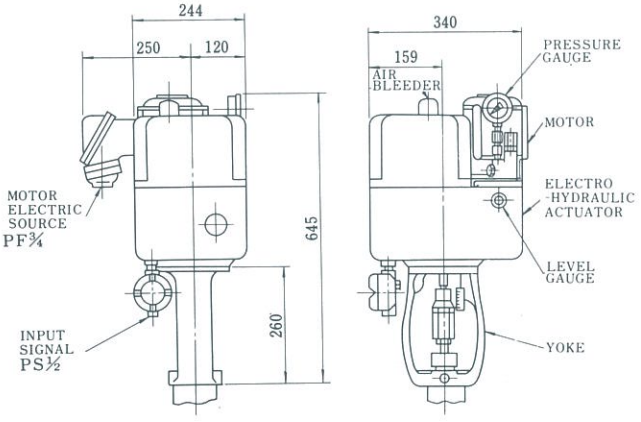


FIG. 11 TYPE EOP4-Y23

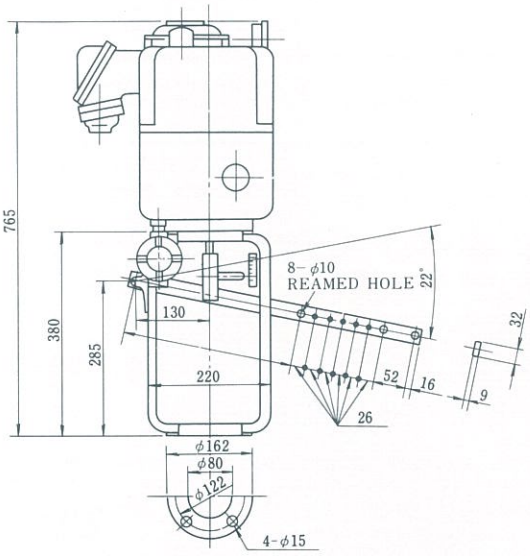


FIG. 12 TYPE EOP4-Y51

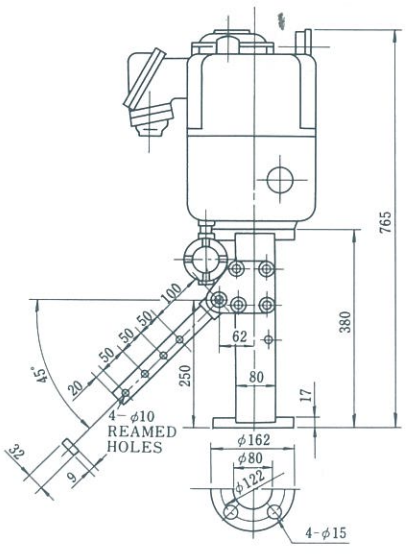


FIG. 13 TYPE EOP4-Y52

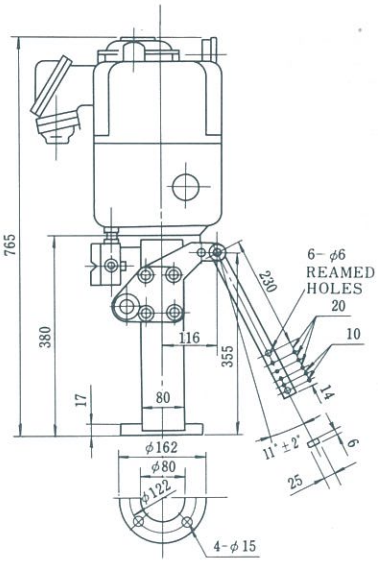


FIG. 14 TYPE EOP4-Y91

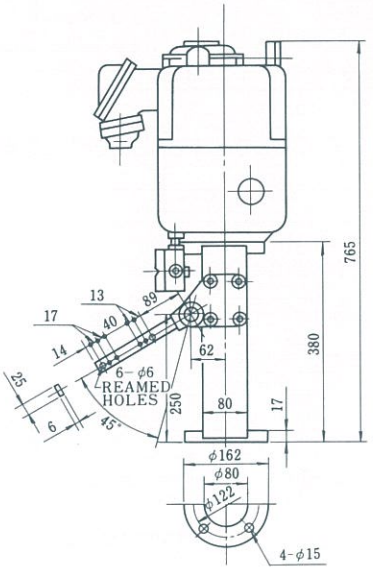


FIG. 15 TYPE EOP4-Y93

STANDARD ATTATCHING DEVICES AND INSTRUMENTS

In addition to the inherent function, the devices and instruments having the following functions can be added to the electro hydraulic actuator:

Type of Devices & Instruments	Transfer Cock	Manual Control Equipment	Emergency Power Equipment	Remote Transfer Valve	Emergency Shut off Valve	Pressure Switch	Displacement Trans-mitter	Limit Switch	Oil Jet Pipe Displacer	Solenoid Valve	Terminal Box
Code	6C	MC	EP	DCV	EV	PS	DIET	LS	MG	MGV	TB

◆ Transfer Cock 6C

Fitting it to the actuator casing, change-over can be effected from auto to manual or vice versa (OPEN, CLOSE and STOP). TYPE EOP1, 2, 22 and 3 are provided the transfer cock 6C as a standard unit.

No TYPE EOP 4 is provided with this cock.

By changing the combinations of rotary valve and operating handle, the oil hydraulic circuit can be changed to normal or reverse operation freely.

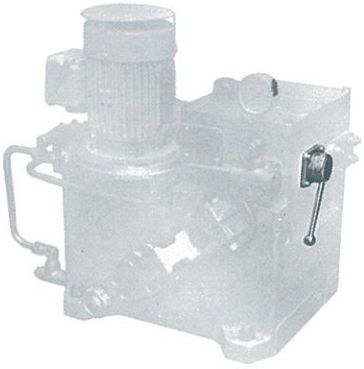


PHOTO 9 OP−6C

◆ Manual Manual Control Equipment MC

If the actuator is out of operation due to the trouble of oil pressure pump or power failure, this unit can be operated by handle or lever manually at site.

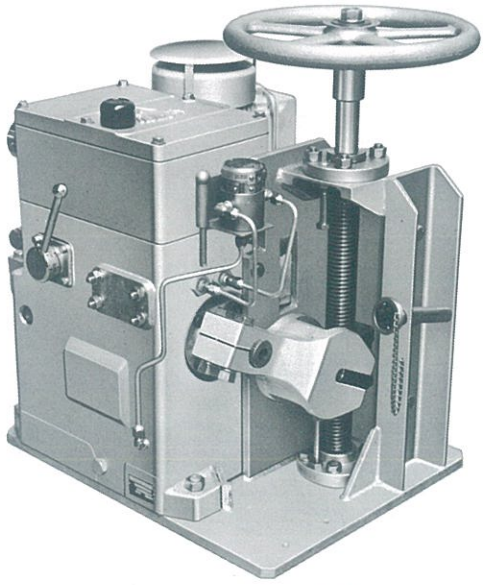


PHOTO 10 EOP1 MC

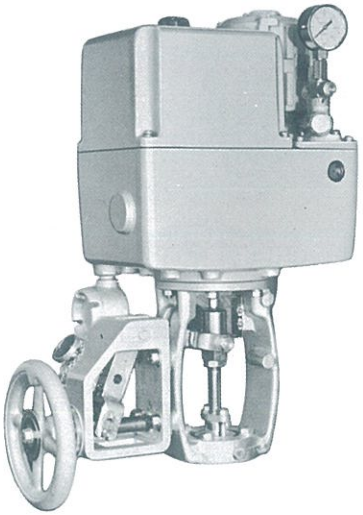


PHOTO 11 EOP 4−Y2−MC

◆ Emergency Power Equipment EP

If the actuator should stop its operation due to the trouble of the oil pressure pump or power failure, the oil pressure accumulated in the accumulator will close or open fully the valve throagh the actuator.

It is possible, if necessary, to move the actuator to full open-position or close-position by adding a solenoid valve which is operated by an external signal.

In the case of such as emergency shutting off, it can be operated in less than 10 seconds for full stroke.

Please instruct us about the required speed.

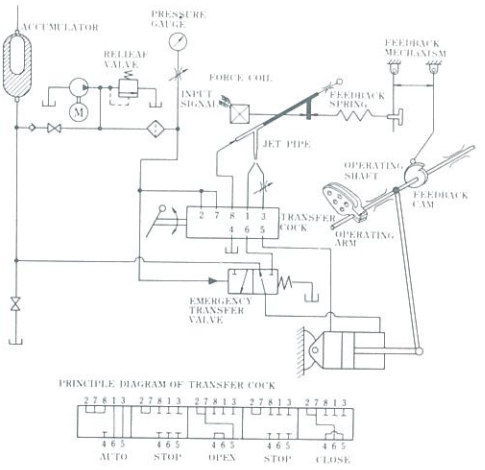


FIG. 16 OPERATING PRINCIPLE FOR EOP 1-EP

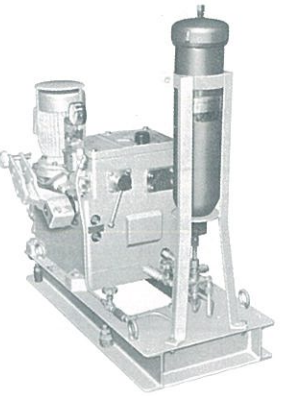


PHOTO 12 EOP 1-EP

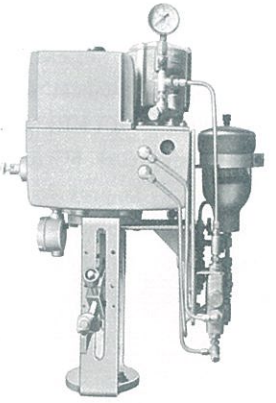


PHOTO 13 EOP4-Y2-EP

◆ Remote Transfer Valve DCV

By an electric signal from a remote place, the actuator can be freely changed over to AUTO or MANUAL by oil pressure (OPEN, CLOSE, STOP).

It is used in combination with a cam switch usually.

As an emergency stop valve is incorporated, the actuator is locked at that position when oil pressure drops.

When the transfer cock is combined, the operation of the transfer cock has priority over that of the remote transfer valve.

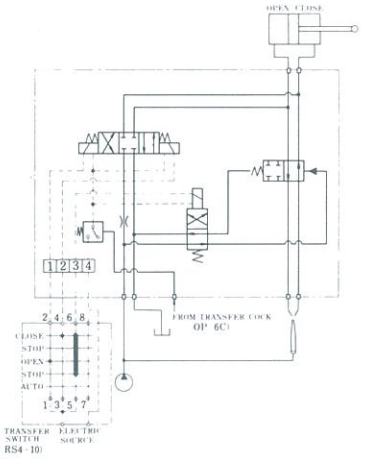
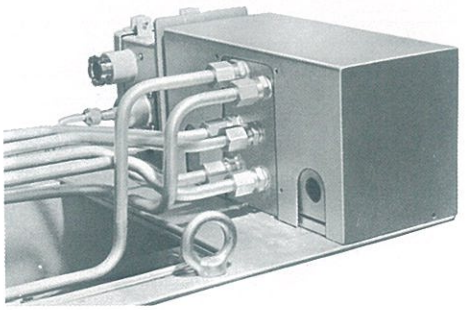


FIG. 17 OPERATING PRINCIPLE OF DCV



PTOTO 14 EOP1-DCV

◆ Emergency Shut off Valve EV

If oil pressure should drop due to power failure or oil pump trouble, the operating oil pressure circuit will be shut off, resulting in locking the operating arm at that position.

This apparatus is incorporated in the actuator casing.

When combined with the solenoid valve, it can be locked at that position by an external signal.

◆ Pressure Switch PS

Due to power failure or oil pressure pump trouble, if there is no oil pressure, the contact of pressure switch will be opened or closed, resulting in giving an electric signal for warning.

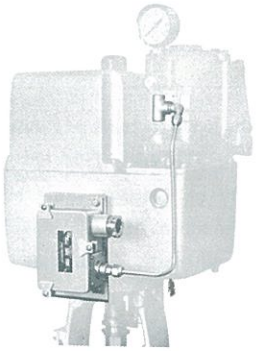


PHOTO 15 EOP4-PS

◆ Displacement Transmitter DIET (POSI-TRANS)

This unit transmits the opening of the actuator as an electric signal. It consists of a transmitter to be installed to the actuator casing and a receiver to be installed to the panel. The transmitter has a potentiometer and the receiver has a built in V/I amplifier and an opening scale (POSI-METER).

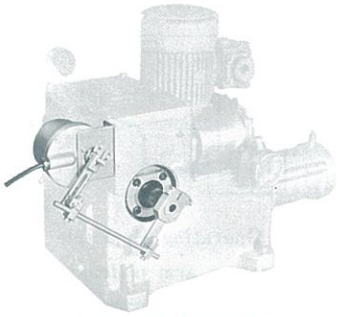


PHOTO 16 EOP2-DIET

◆ Limit Switch LS

This consists of a cam and a microswitch and can transmit a signal at an optional opening. A maximum of 2 pcs. of micro switches can be fitted.

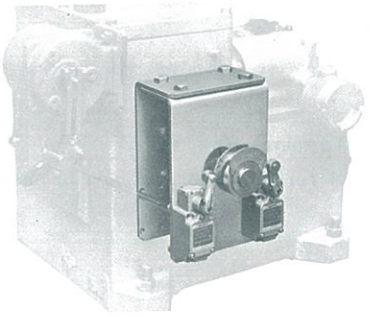


PHOTO 17 EOP1-LS

◆ Oil Jet Pipe Displacer MG

The oil jet pipe in the actuator is operated forcibly with AC solenoid, resulting in opening fully or closing fully the operation arm.

If the electric signal to be sent to the AC solenoid is turned off, the actuator will be reset to automatic condition. A maximum of 2 pcs. of AC solenoids can be installed.

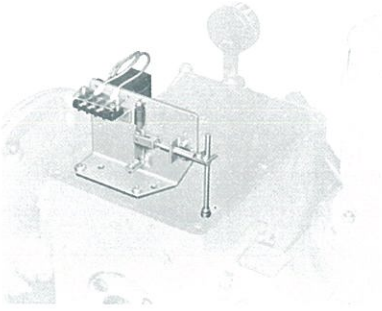


PHOTO 18 EOP1-MG

◆ Solenoid Valve MGV

It can be operated in various ways by inserting a solenoid valve in the midway to the oil pressure circuit of the actuator. The following FIG. "Operating Principle" shows a special function by combining the solenoid valve with emergency shut off valve or emergency power equipment.

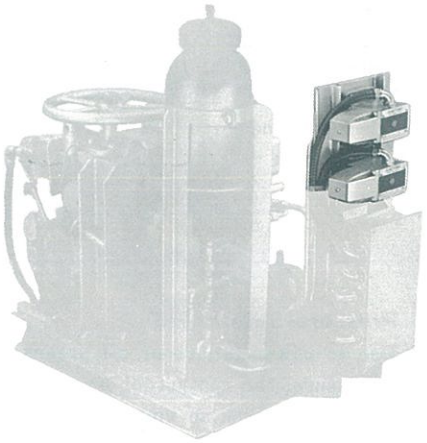


PHOTO 19

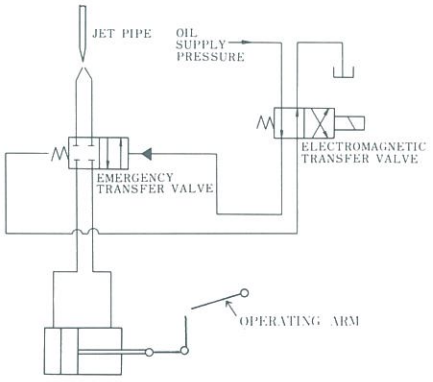


FIG. 18 : Operating Principle

The operating arm is locked at the last position when the solenoid valve combined with an electromagnetic transfer valve is energized.

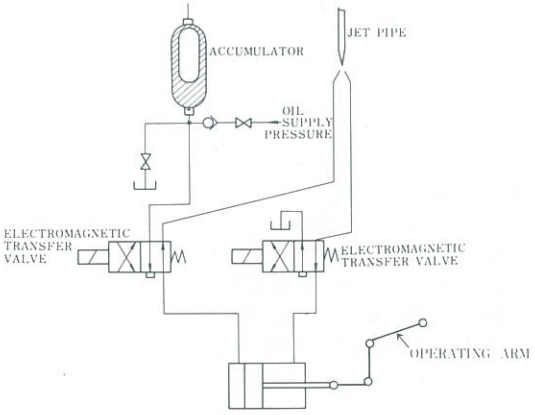


FIG. 19 Operating Principle

The operating arm is revolved to full open or full closed by energizing the solenoid valve combined with an electromagnetic transfer

◆ Terminal Box TB

All terminals for adding machines except motor terminal are contained therein.

The following combinations of each device shall not be made for the reasons of functional limitation or limitation by fitting position.

Emergency power equipment (EP) and Emergency shut off valve (EV)	The emergency power equipment is opened fully or closed fully at the time of emergency. On the other hand the emergency shut off valve is locked at just position at that time. Therefore, these can not be combined.
Remote transfer valve (DCV) and Emergency shut off valve (EV)	The remote transfer valve includes the function of emergency shut off valve and no independent emergency stop valve is required.
Remote transfer valve (DCV) and Oil jet pipe displacer (MG)	On operation of the remote transfer valve the final control element is changed over to OPEN, CLOSE, STOP, AUTOMATIC. By using the oil jet pipe displacer, the final control element is changed orver to OPEN, CLOSE, AUTOMATIC with an electric signal. Therefore, these two can not be combined because of contradiction.
Emergency shut off valve (EV) and Bypass valve (BYV)	The bypass valve applied to Type EOP 4 has been so designed to have a function of the emergency shut off valve also.

In addition to the above, when a solenoid valve (MGV) is added, a limitation will be placed on the combination sometimes functionally speaking. Please make an inquiry of us about the concrete specifications.

THE OTHER OP SERIES

Packaged Controller COP

This type of controller is completely equipped with such the necessary units for the local mounting type hydraulic controller that an input pressure senser, a setting unit, a hydraulic type control system, a hydraulic oil supply unit and a hydraulic actuating unit.

The controller is installed at the site and required only to the power supply wiring for motor and the piping connection between the input senser and the process to be controlled. Therefore, the construction is simple and handling and maintenance for it can be done easily.

For further detail, please refer to separate catalog No. 220.

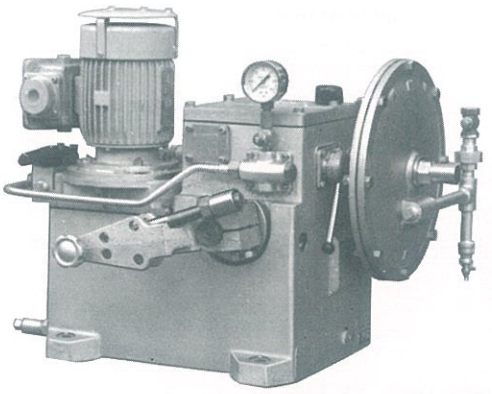


PHOTO 20 COP 1

Pneumatic-Hydraulic Actuator POP

This unit is an oil hydraulic type actuator which is operated with a pneumatic input signal from a pneumatic cotroller. In the pneumatic hydraulic actuator, a force coil unit which is an input receiving unit of an electro hydraulic actuator has been replaced with a bellows unit. Other constructions are the same as that of the electro hydraulic actuator.

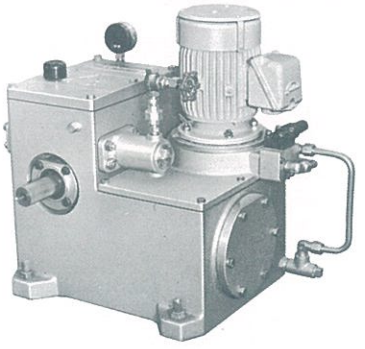


PHOTO 21 POP1－6C

The specification according to type is same as that of TYPE EOP. Standard attaching devices and instruments can be installed in the same way as TYPE EOP.

Digital Hydraulic Actuator DOP

This type is a hydraulic actuator whose input is an output pulse signal sent from the conputor and a pulse motor is employed as its input unit.

The pulse motor unit consists of a stepping motor and a spring, and a revolution of the motor is converted into a spring force through a screw mechanism and transmitted to an oil jet pipe system. Therefore, the manipulated variable (e. g. an actuating angle of the actuator arm) corressponds to the integral value of the input signal.

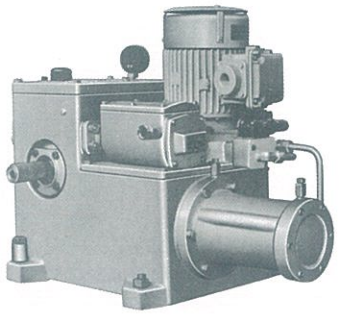


PHOTO 22 TYPE DOP 2

Magnetic Hydraulic Actuator MOP

The magnetic hydraulic actuator is a two-position type actuator and used for on-off operations.

In place of an oil jet pipe relay system for the electro hydraulic actator, a solenoid valve is incorporated therein.

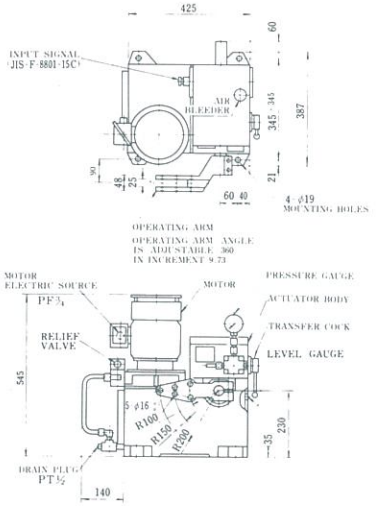


FIG. 20
External view of TYPE MOP 1

Servo Amplifier SA 1

The electronic servo amplifier is employed to the servo system which is formed by an electronic feed back the output of the electro-hydraulic actuator (a displacement of the cylinder stroke). This is used for such the servo system that a separated cylinder type as shown in Fig. 21 or that requires to very quick response.

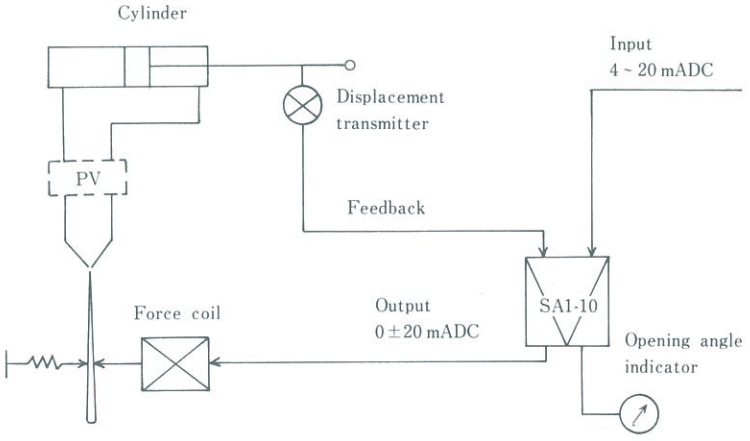


Fig. 21 Hydraulic Servo System

The servo system which is incorporated with this amplieier is able to cover whole loop gain of the system by the amplification of the amplifier, accordingly, it enables the mechanical gain (oil jet pipe gain) to lower and the spring system to intensify.

Therefore, the dynamic characteristic is imporved excessively and the optimum system characteritic can be obtained.

Advantages

1. This servo amplifier acts as PD control action.
   So, a phase advance element is incorporated into the servo system by emphasizing D action and the dynamic characteristic is improved.
2. This can be coped with various kinds of the inputs and feed back signals such as current, voltage, resistance change and so forth.
3. This has been designed so as to prevent the mutual interference during zero and span adjustments for opening output of the valve. So, the openning signal adjustment can easily be completed by only an adjustment carried out in order of ZERO and then SPAN adjustment.

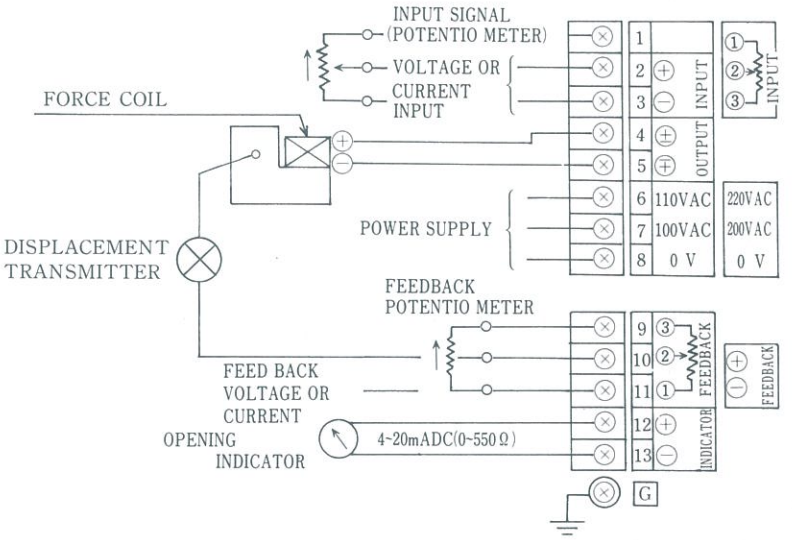
Specification

1. Input signal : Refor to code table
2. Output signal : Refor to code table

Code	Output signal	Applicable Standard
1	0 ± 20 mADC	Combination of standard separated cylinder type electrohydraulic actuator and R-type controller
2	0 ± 25 mADC	Fast frequency response hydraulic servo equipment
3	0 − 20 mADC	Intrinsically safe explosion-proof construction

3. Load resistance : 0 to 550 Ω (0 to 450 Ω When signal is 0±25 mA)
4. Feedback signal : Refer to code table
5. Opening signal : 4 to 20 mA DC, 0 to 550 Ω
6. Resert band : 5 to 50% (gain conversion K = 20 to 2)
7. Prop gain : (Differentiating time T_D = 0 to 0.2 sec)
8. Power supply : 100/110 VAC, 200/220 VAC ±10% 50/60 Hz
9. Ambient temperature : −10 to +50℃
10. Insulation resistance : 500 VDC 100 MΩ or greater
11. Insulation strength : 1000 VAC in 1 min.
12. Power consumption : 3 VA
13. Paint color : 5Y7/1
14. Mounting method : Rack or wall mounting
15. External dimensions : 70 (W) × 140 (H) × 127 (D) mm
16. Weight : Approx. 1.2 kg

CUSTOMER'S TERMINAL



TYPE & CODE TABLE

SA 1 − 10 − □□□ − □□