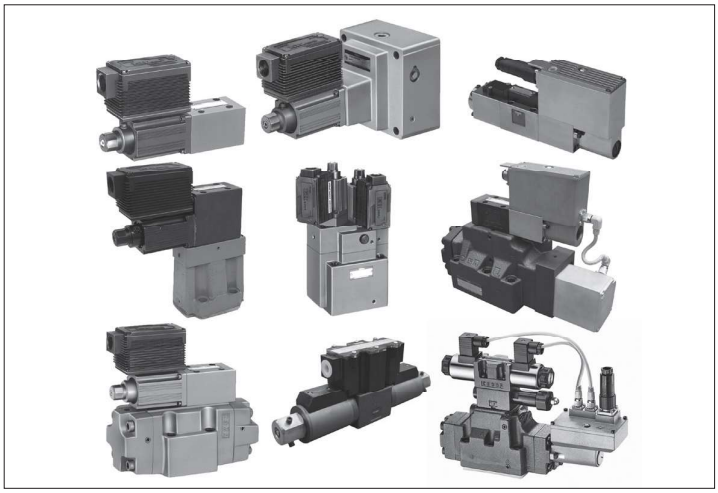
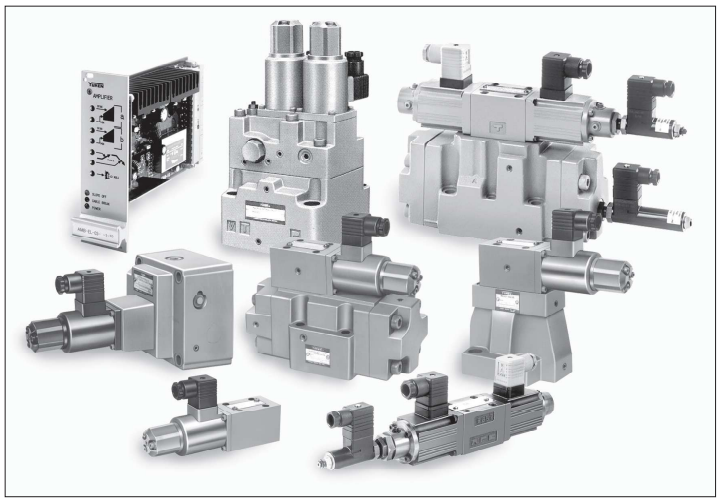
# PROPORTIONAL ELECTRO-HYDRAULIC CONTOROLS

■ **EH Series-Hybrid Components** ..... Page H-3
Proportional Electro-Hydraulic Control Valves



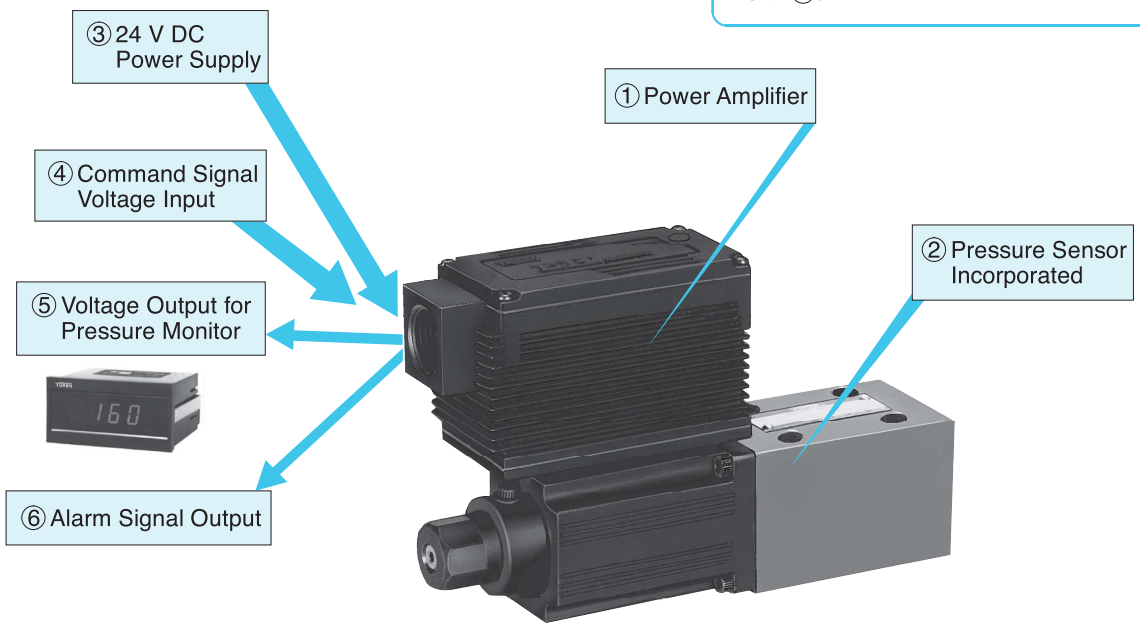
■ **E Series** ..... Page H-89
Proportional Electro-Hydraulic Controls



# High-accuracy, simple, convenient
# EH Series realizes your dreams.

## Why simple ?

Highly accurate hydraulic control can be obtained only by supplying 24 V DC power ③[★3] and inputting a command signal voltage of 0 to 5 V ④.[★4]




Details of Proportional Electro-Hydraulic Relief Valve

## Why high-accuracy ?

The power amplifier ① and pressure sensor ②[★1] are integrated in the control valve.
Furthermore, the closed-loop control [★2] design greatly improves the linearity, hysteresis and stability in control pressure.

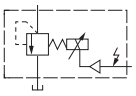
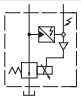
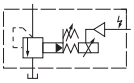
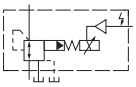
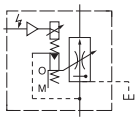
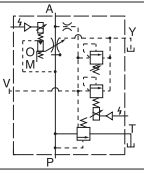
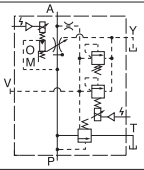
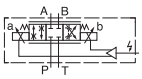
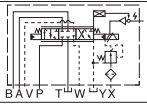
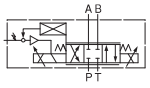
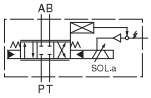
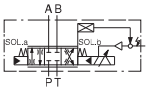
## Why convenient ?

Analog voltages can be output by using the incorporated sensor for monitoring pressure, etc. ⑤[★5].
Pressure can be displayed remotely with the indicators obtainable in the market and also can be transmitted into a computer.

If any trouble arises in the system and the command signal does not match to the output, the alarm signal ⑥ is dispatched.
The trouble, if arises, can be easily detected by monitoring the dispatch of the alarm signal with sequence controller or computer.

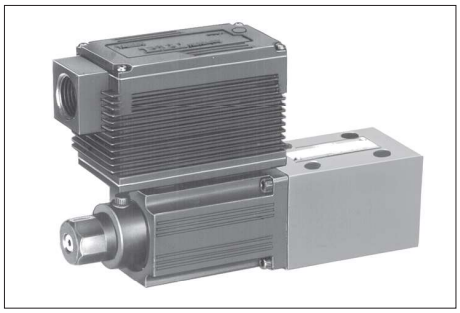
★1. Pressure sensors are incorporated only in pressure control valves. Directional and flow control valves (EHDFG-04,06) use a spool position sensor. However, some types of pressure control valves and directional/ flow control valves do not incorporate a sensor.
★2. Open-loop types are also available.
★3. EHDFG-04 and 06: ±24 V DC power supply is needed.
★4. The following products have the following command signal voltages and currents.
EHDFG-01, 03, 04, 06:0−±5 V
ELDFG-01EH, 03EH:0−±10 V, 4−20 mA, 0−±10 mA
ELDFHG-03EH, 04EH, 06EH, 10EH, ECDFHG-04EH, 06EH:
0−±10 V, 4−20 mA, 0−±10 mA
★5. Spool displacement for the following products is shown in %.
EHDFG-04, 06
ELDFG-01EH, 03EH
ELDFHG-03EH, 04EH, 06EH, 10EH
ECDFHG-04EH, 06EH

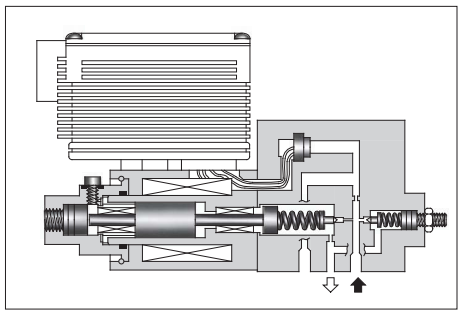
# EH Series-Hybrid Components
# Proportional Electro-Hydraulic Controls

| Type | Graphic Symbol | Max. Operating Pressure MPa | Maximum Flow L/min (1 2 3 5 10 20 30 50 100 200 300 500 1000 1500) | Page |
|---|---|---|---|---|
| Pilot Relief Valves |  | 24.5 | EHDG 01 | H-4 |
| Pressure Control Valves |  | SB1110: 24.5 SB1190: 7.0 | SB1110 / SB1190 | H-11 |
| Relief Valves |  | 24.5 | EHBG 03 / 06 / 10 | H-15 |
| Relieving and Reducing Valves |  | 24.5 | EHRBG 06 / 10 | H-23 |
| Flow Control (and Check) Valves |  | 03: 20.6 06: 24.5 | EHFG EHFCG 03 / 06 | H-29 |
| Flow Control and Relief Valves |  | 24.5 | EHFBG 03 / 06 / 10 | H-36 |
| High Flow Series Flow Control and Relief Valves |  | 24.5 | EHFBG 03 / 06 | H-45 |
| Directional and Flow Control Valves |  | 25 | EHDFG 01 / 03 | H-51 |
| High Response Type Directional and Flow Control Valves |  | 15.7 | EHDFG 04 / 06 | H-57 |
| Direct Operated and High Response Type Directional and Flow Control Valves |  | 35 | ELDFG 01EH / 03EH | H-62 |
| Two Stage Type High Response Type Directional and Flow Control Valves |  | 04EH 06EH350:35 10EH 03EH 06EH500:31.5 | ELDFHG 03EH / 04EH / 06EH / 10EH | H-68 |
| Directional and Flow Control Valves (with Main Valve Feedback Control) |  | 04EH:35 06EH:31.5 | ECDFHG 04EH / 06EH | H-80 |

# Proportional Electro-Hydraulic Pilot Relief Valves

The valve can be used as a pilot valve of the proportional electro-hydraulic control valves.
The valve can also be used as a relief valve for the hydraulic system where a small flow rate and continuous pressure control are required.



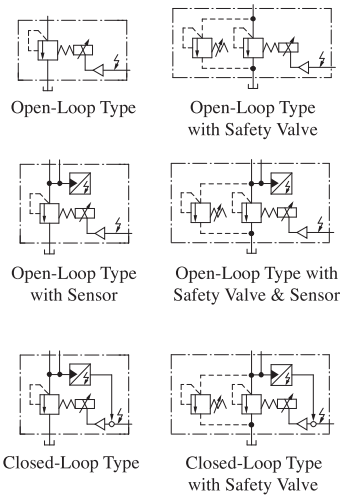


## Specifications

| Descriptions \ Model Numbers | EHDG-01∗ |
|---|---|
| Max. Operating Pres. MPa | 24.5 |
| Max. Flow L/min | 2 |
| Min. Flow L/min | 0.3 |
| Pressure Adjustment Range | Refer to Model Number Designation |
| Coil Resistance | 10 Ω |
| Hysteresis | 3% (1%)★1 or less |
| Repeatability | 1%★2 or less |
| Frequency Response | B : 10 (27) Hz ★1<br>C : 10 (27) Hz ★1 (-90 degree)<br>H : 12 (27) Hz ★1 |
| Supply Electric Power | 24 V DC<br>(21 to 28 V DC Included Ripple) |
| Power Input (Max.) | 28 W |
| Input Signal Voltage | B : 6.9 MPa / 5 V DC<br>C : 15.7 MPa / 5 V DC<br>H : 24.5 MPa / 5 V DC |
| Input Impedance | 10 kΩ |
| Alarm Signal Output (Open Collector) | Voltage: Max. 30 V DC<br>Current: Max. 40 mA |
| Pressure Signal Output | B : 5 V DC / 6.9 MPa<br>C : 5 V DC / 15.7 MPa<br>H : 5 V DC / 24.5 MPa |
| Ambient Temperature | 0 - 50°C<br>(With Circulated Air) |
| Mass | Refer to Page H-6 |

★1. The value in parentheses is for the closed-loop type.
★2. The repeatability of the valve is obtained by having it tested independently on the conditions similar to its original testing.

### Graphic Symbols




## Model Number Designation

| EHD | G | -01 | V | -B | -S | -1 | -PN | T15 | M10 | -50 |
|---|---|---|---|---|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Applicable Control | Pres. Adj. Range MPa (PSI) | Control Type | Safety Valve | P-Line Orifice | T-Line Orifice | P-B Line Orifice | Design Number |
| **EHD**: Proportional Electro-Hydraulic Pilot Relief Valve | **G**: Sub-Plate Mounting | **01** | **None**: For general use<br>**V**: Vent Control of Relief Valve (Omit if not required) | **B**: 0.5 - 6.9<br>**C**: 1 - 15.7<br>**H**: 1.2 - 24.5 | **None**: Open-Loop<br>**S**: Open-Loop with Sensor<br>**L**: Closed-Loop★1 | **None**: Without Safety Valve<br>**1**: With Safety Valve | **PN**: Without Orifice (Standard) | **T15**<br>**T13**<br>**T11**<br>★2 | —<br>**M10**: Standard Orifice | **50** |

★1. For closed-loop models, specify applicable control code "V" even though the valve may not be used as vent control of relief valve.
★2. Standard of T-line Orifice.
Pres. Adj. Range B:T15, C:T13, H:T11.
★3. Phosphate ester type fluids are also supported. When phosphate ester type fluids are used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

## Accessories

### Mounting Bolts

| Model Numbers | Socket Head Cap Screw |
|---|---|
| EHDG-01＊-＊-＊-PNT＊ | M5 × 45 L·····4 Pcs. |
| EHDG-01＊-＊-S＊-＊-PNT＊M10 | M5 × 75 L·····4 Pcs. |
| EHDG-01V-＊-L＊-＊-PNT＊M10 | |

## Sub-Plate

| Sub-Plate Model Numbers | Thread Size Rc | Mass kg |
|---|---|---|
| DSGM-01-31 | 1/8 | 0.8 |
| DSGM-01X-31 | 1/4 | |
| DSGM-01Y-31 | 3/8 | |

●Sub-plates are available. Specify sub-plate model from the table left. When sub-plates are not used, the mounting surface should have a good machined finish. (▽6.3)

## Instructions

### Piping to the Reservoir

The tank port should be connected directly to the reservoir with a back pressure of not more than 0.2 MPa. Be sure the end of pipe is dipped into the oil in the reservoir.

### Vent Control

When this valve is to be used as a relief valve or for other valve vent control purposes, use 6 mm ID, 300 mm or less long pipes for piping connections.

If pressure instability is encountered, provide a 1 - 1.5 mm diameter orifice for the relief or other valve vent port.

### Circuit Pressure Control

When circuit pressure is directly controlled by this valve, make sure that the trapped oil volume is exceeding 40 $cm^3$.

### Low Flow Rates

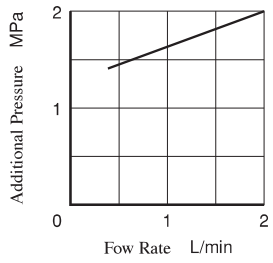
The preselected pressure may become instable. To avoid such pressure instability, the flow rate should not be lower than 0.3 L/min.

### Safety Valve Pressure Setting

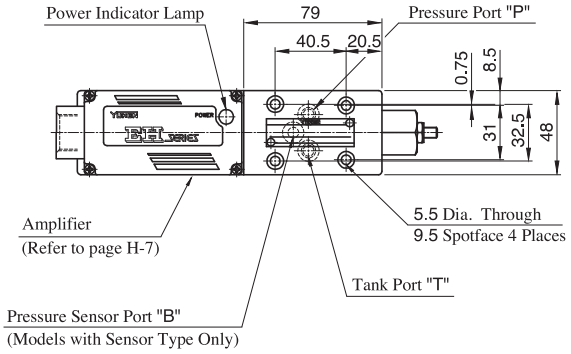
The safety valve pressure setting at the maximum flow rate is preset to a level that is 2 MPa higher than the pressure adjustment range upper limit. If the operating pressure upper limit is low or a different flow rate upper limit is used, make adjustment after calculating the safety valve pressure setting from the following equation:

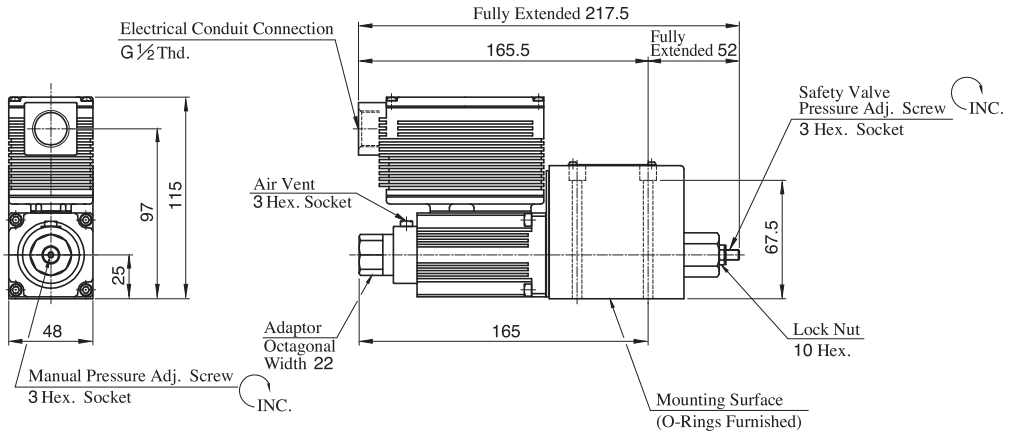
Pressure setting = (Operating pressure upper limit) + (Additional pressure indicated below)

To lower the pressure setting, turn the safety valve pressure adjustment screw anti-clockwise. After adjustment, be sure to tighten the lock nut.



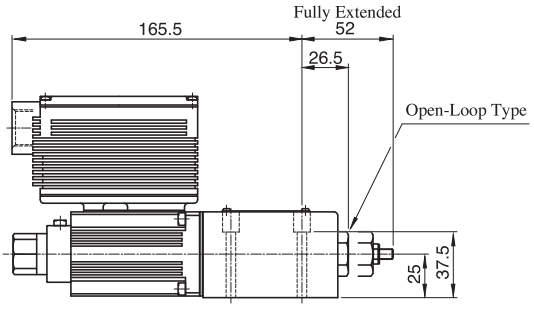
## EHDG-01＊-＊-S-1-PNT＊M10-50：Open-Loop Type with Sensor and Safety Valve
## EHDG-01＊-＊-L-1-PNT＊M10-50：Closed-Loop Type with Safety Valve



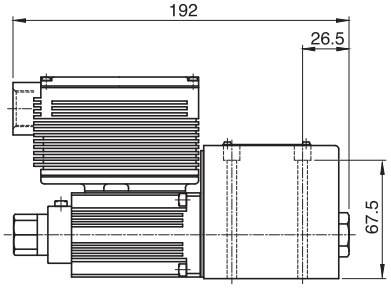

Mass·····2.9 kg

## EHDG-01＊-＊-PNT＊-50：
## Open-Loop Type
## EHDG-01＊-＊-1-PNT＊-50：
## Open-Loop Type with Safety Valve




Mass·····2.2 kg

## EHDG-01＊-＊-S-PNT＊M10-50：
## Open-Loop Type with Sensor
## EHDG-01＊-＊-L-PNT＊M10-50：
## Closed-Loop Type

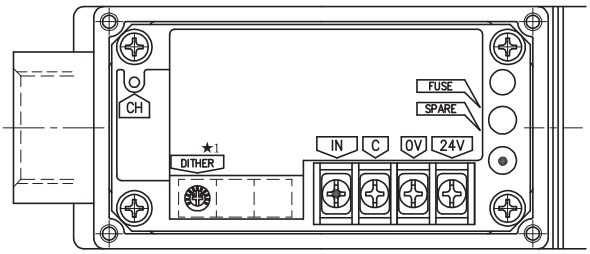



Mass·····2.9 kg

## Detail of Amplifier

### Connectiing Terminal

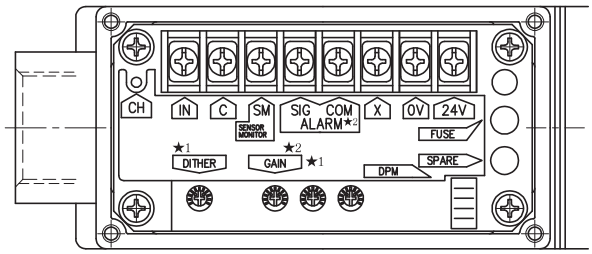
● Open-Loop Type




| Terminal | Name |
|---|---|
| IN | Input Signal (+) |
| C | Input Signal (COM) |
| 0 V | Power Supply |
| 24V | |
| CH | Output Current Check (to C) |

★1. DITHER/GAIN
Use as they are since they are factory-preset to the optimum position.
(Do not touch them in normal condition.)

● Closed-Loop Type
● Open-Loop Type with Sensor

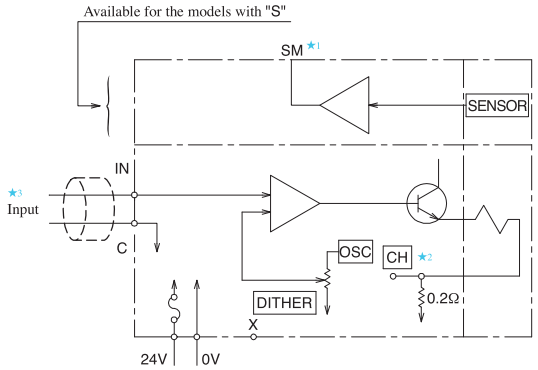



| Terminal | | Name |
|---|---|---|
| IN | | Input Signal (+) |
| C | | Input Signal (COM) |
| SM | | Sensor Monitor (to C) |
| ALARM | SIG | Alarm Output★2 |
| | COM | |
| X | | (Open) |
| 0 V | | Power Supply |
| 24V | | |
| CH | | Output Current Check (to C) |

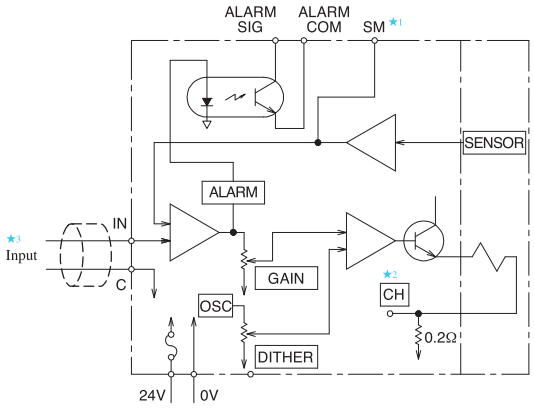
★2. GAIN/ALARM
GAIN adjusting volume is not available for open-loop type with sensor.

### Circuit Schematic

● Open-Loop Type
● Open-Loop Type with Sensor

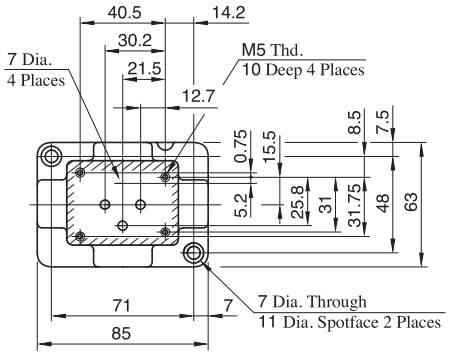


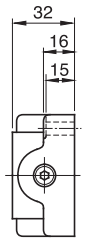

● Closed-Loop Type

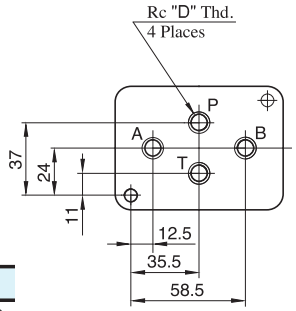



★1. For "SM" terminal, external instruments should have input impedance of more than 10 kΩ.
★2. For "CH" terminal, external instruments should have input impedance of more than 10 kΩ.
★3. Use shielded cable for "Input" connection. The ground of the shielded cable must be connected to input signal side.

## Sub-Plates : DSGM-01, 01X, 01Y



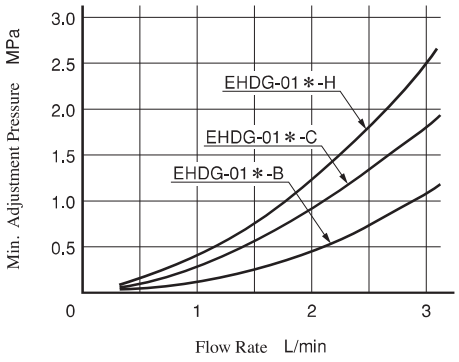




| Sub-Plate Model No. | D |
|---|---|
| DSGM-01-31 | 1/8 |
| DSGM-01X-31 | 1/4 |
| DSGM-01Y-31 | 3/8 |

## Min. Adjustment Pressure

B
EHDG-01∗-C
H

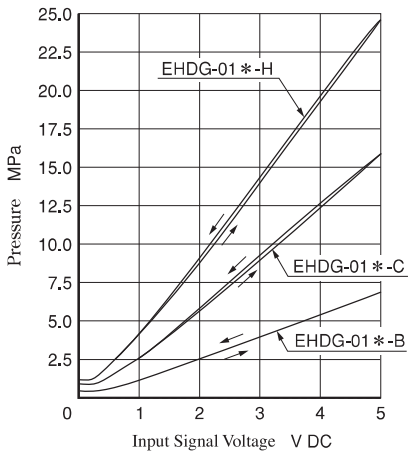
Viscosity: 30 mm²/s



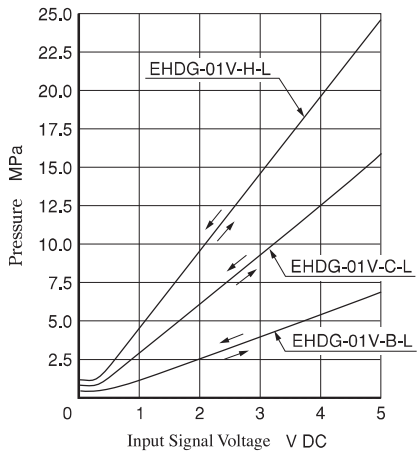

## Input Signal Voltage vs. Pressure

Flow Rate : 2 L/min
Viscosity : 30 mm²/s

**Open-Loop Type**



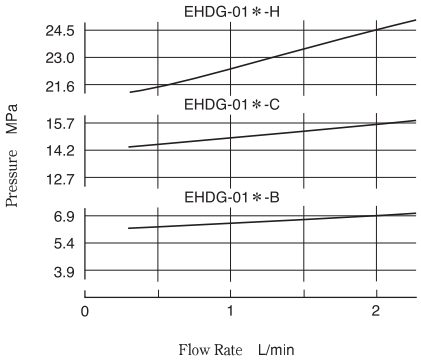

**Closed-Loop Type**



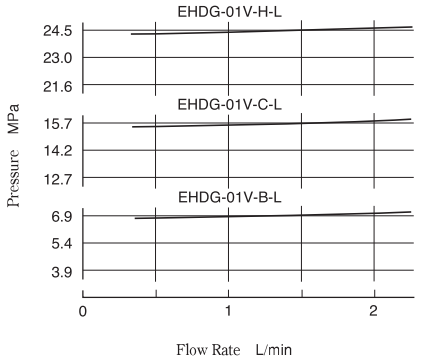
## Flow Rate vs. Pressure

Viscosity : 30 mm²/s

**Open-Loop Type**
**EHDG-01∗-∗**



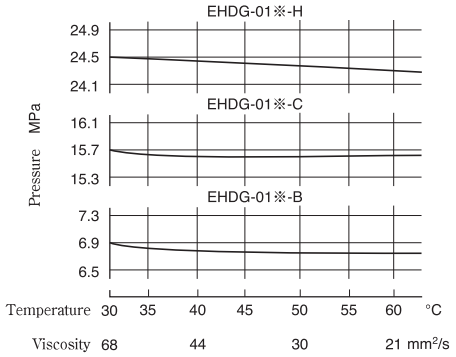

**Closed-Loop Type**
**EHDG-01V-∗-L**



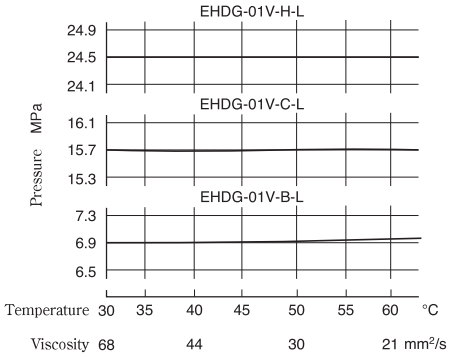

## Viscosity vs. Pressure

Flow Rate : 2 L/min
Oil : ISO VG 46 Oil

**Open-Loop Type**
**EHDG-01∗-∗**

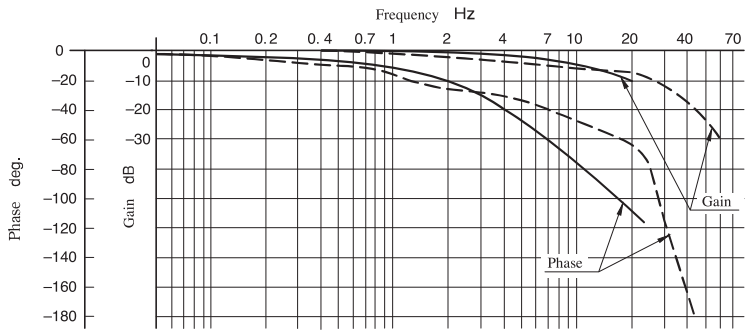



**Closed-Loop Type**
**EHDG-01V-∗-L**




## Frequency Response

Flow Rate : 2 L/min
Pressure : 7.8 ± 1.6 MPa
Trapped Oil Volume : 40 cm³
Viscosity : 30 mm²/s



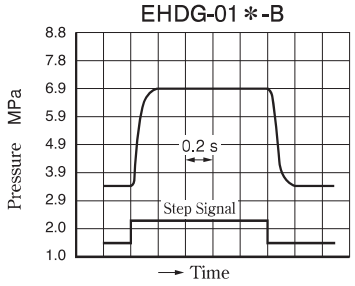
## Step Response (Example)

The step responses below are those obtained when the valve itself is tested independently.
The step responses may differ from them when the valve is used in combinations with other control valves.

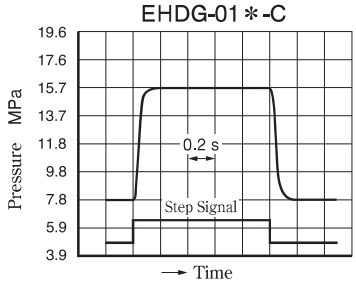
Flow Rate : 2 L/min
Trapped Oil Volume : 40 $cm^3$
Viscosity : 30 $mm^2/s$

### Open-Loop Type

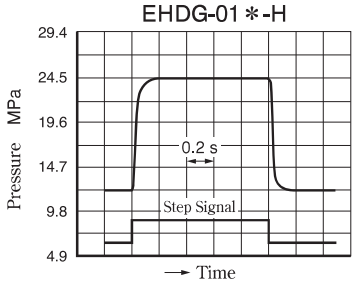
EHDG-01∗-B




EHDG-01∗-C

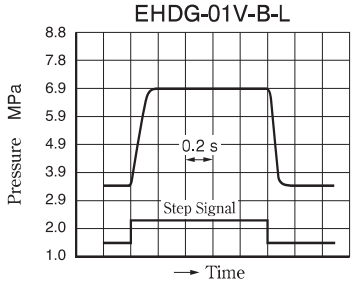



EHDG-01∗-H

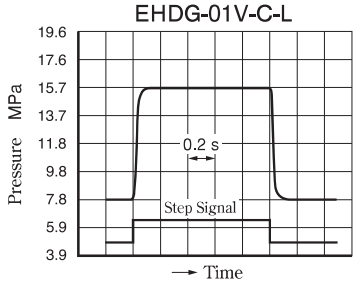



### Closed-Loop Type

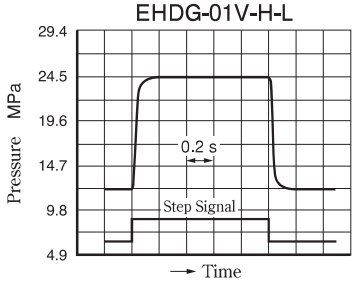
EHDG-01V-B-L




EHDG-01V-C-L

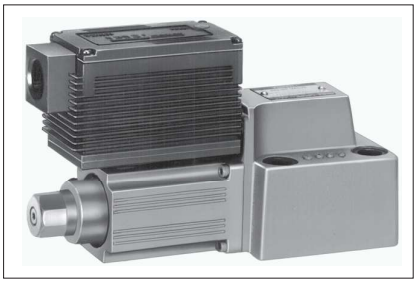


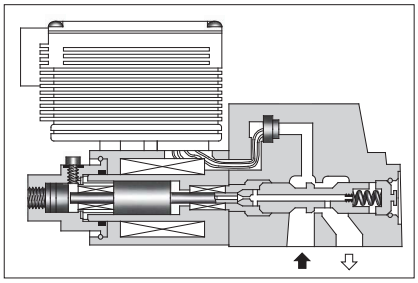

EHDG-01V-H-L



# Proportional Electro-Hydraulic Pressure Control Valves

These are closed-loop type pressure control valves controlling the system pressure from low to high in proportion to the input voltage. The stable pressure control is possible even in a small flow rate.



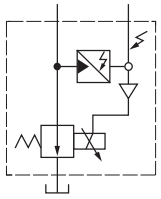


## Specifications

| Descriptions \ Model Numbers | SB1110 | SB1190 |
|---|---|---|
| Max. Operating Pres. MPa | B: 6.9<br>H: 24.5 | 7.0 |
| Max. Flow L/min | 30 | 70 |
| Min. Flow L/min | B: 0.5<br>H: 0.5<br>(at 0.2 - 6.9 MPa)<br>1.5<br>(at 6.9 - 15.7 MPa)<br>3.0<br>(at 15.7 - 24.5 MPa) | 1 |
| Pressure Adjustment Range | Refer to Model Number Designation | |
| Coil Resistance | 10 Ω | |
| Hysteresis | 1 % or less | 1.5 % or less |
| Repeatability | 1 %★1 or less | |
| Supply Electric Power | 24 V DC (21 to 28 V DC Included Ripple) | |
| Power Input (Max.) | 28 W | |
| Input Signal Voltage | B: 6.9 MPa / 5 V DC<br>H: 24.5 MPa / 5 V DC | 7.0 MPa / 5 V DC |
| Input Impedance | 10 kΩ | |
| Alarm Signal Output (Open Collector) | Voltage: Max. 30 V DC<br>Current: Max. 40 mA | |
| Pressure Signal Output | B: 5 V DC / 6.9 MPa<br>H: 5 V DC / 24.5 MPa | 5 V DC / 7.0 MPa |
| Ambient Temperature | 0 - 50°C (With Circulated Air) | |
| Mass | 3.3 kg | 10.2 kg |

★1. The repeatability of the valve is obtained by having it tested independently on the conditions similar to its original testing.

Graphic Symbol



## Model Number Designation

| SB1110 | -B | -20 |
|---|---|---|
| Series Number | Pres. Adj. Range MPa | Design Number |
| **SB1110**:<br>Proportional Electro-Hydraulic Pressure Control Valve (3/8, Sub-Plate Mounting) | **B**: 0.2★- 6.9<br>**H**: 0.2★- 24.5 | **20** |
| **SB1190**:<br>Proportional Electro-Hydraulic Pressure Control Valve (3/4, Sub-Plate Mounting) | **B**: 0.2★ - 7.0 | **10** |

★1. The minimum adjustable pressure is the value obtained at Max. Flow.

★2. Phosphate ester type fluids are also supported. When phosphate ester type fluids are used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

## Sub-Plate

| Valve Model Numbers | Sub-Plate Model Numbers | Thread Size Rc | Mass kg |
|---|---|---|---|
| SB1110 | BGM-03-20 | 3/8 | 2.4 |
| | BGM-03X-20 | 1/2 | 3.1 |
| SB1190 | BGM-06-20 | 3/4 | 4.7 |
| | BGM-06X-20 | 1 | 5.7 |

- Sub-plates are available. Specify sub-plate model from the table above.
  When sub-plates are not used, the mounting surface should have a good machined finish.
  (▽)

## Accessories

### Mounting Bolts

| Model Numbers | Socket Head Cap Screw |
|---|---|
| SB1110 | M12 × 65 L·····4 Pcs. |
| SB1190 | M16 × 100 L·····4 Pcs. |

## Instructions

### Safety Valve

As the function of safety valve has not been included in the valve itself, provide safety valve in the hydraulic circuit if required.

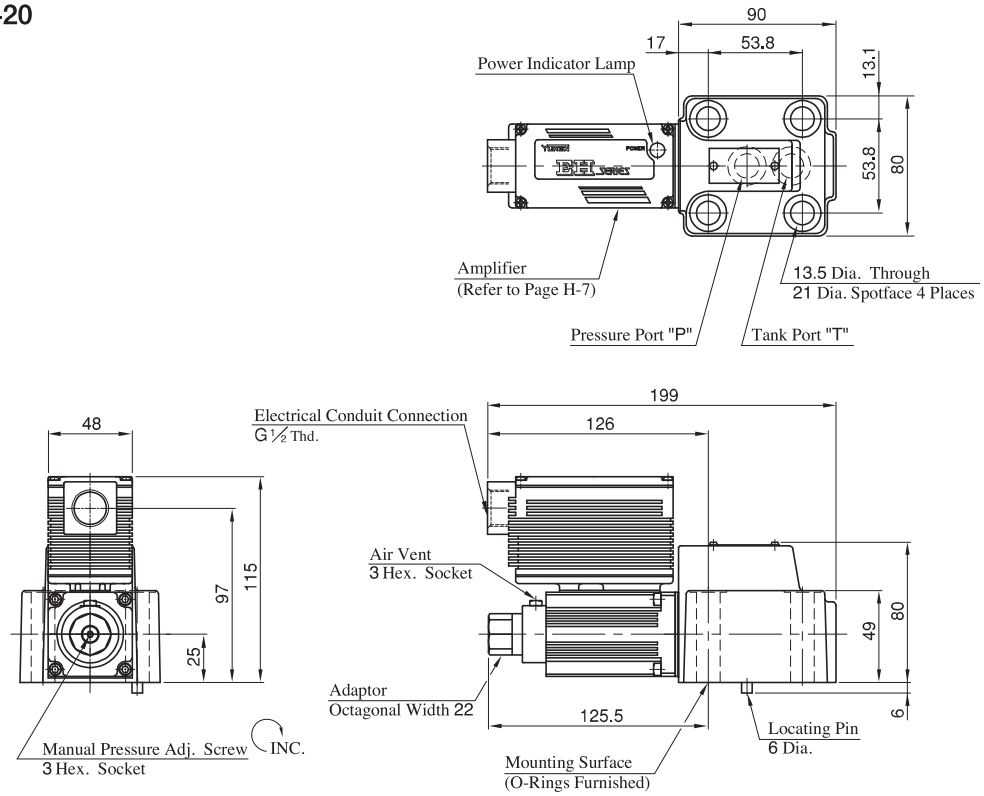
### Piping to the Reservoir

The tank port should be connected directly to the reservoir. Be sure the end of pipe is dipped into the oil in the reservoir.

### Low Flow Rates

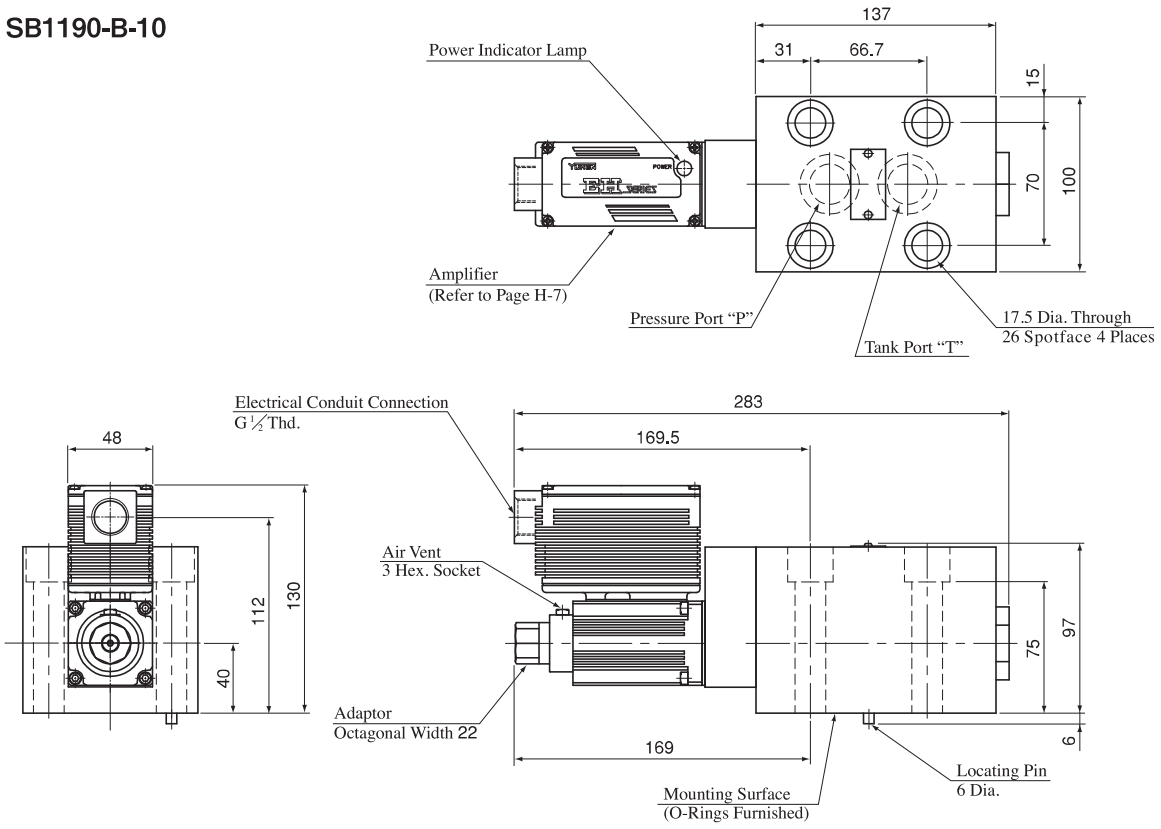
The preselected pressure may become instable. To aboid such pressure instability, the flow rate should not be lower than minimum flow.

### SB1110-*-20



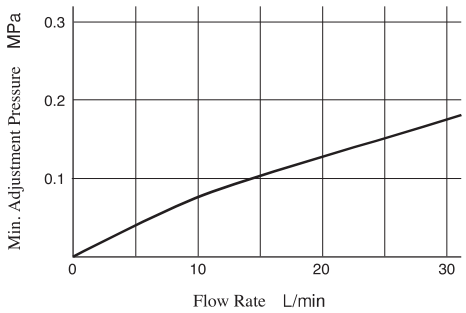

- Sub-plate is common to that of EBG-03. Refer to page H-18 for the dimensions of mounting surface.

## SB1190-B-10

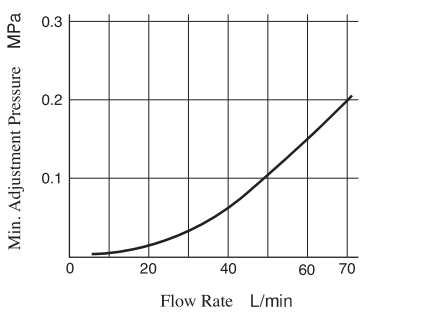



## Min. Adjustment Pressure

SB1110 Viscosity : 30 mm²/s

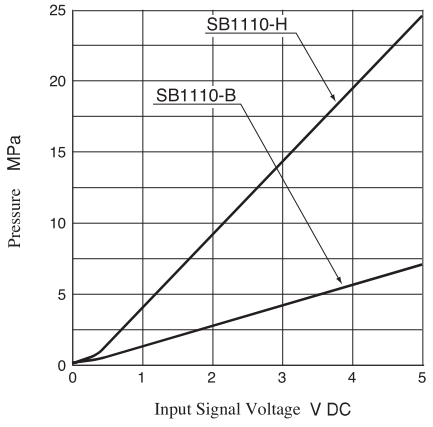



SB1190 Viscosity : 30 mm²/s

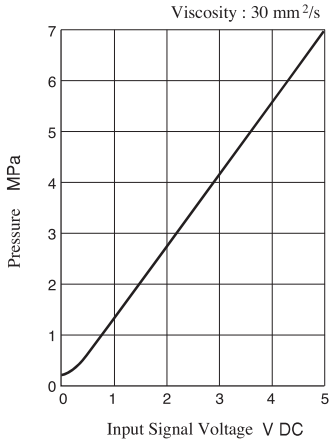



## Input Signal Voltage vs. Pressure

SB1110 Flow Rate : 30 L/min
Viscosity : 30 mm²/s

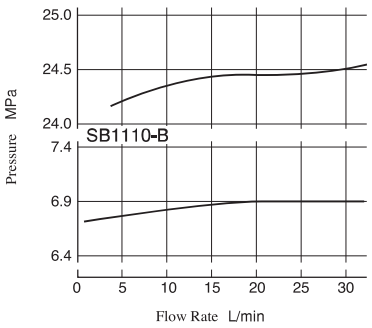



SB1190 Flow Rate : 70 L/min
Viscosity : 30 mm²/s

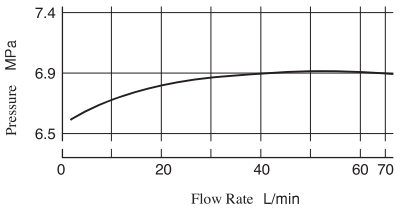


## Flow Rate vs. Pressure

SB1110-H Viscosity : 30 mm²/s

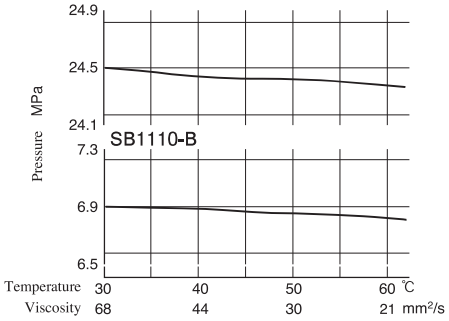



SB1119 Viscosity : 30 mm²/s

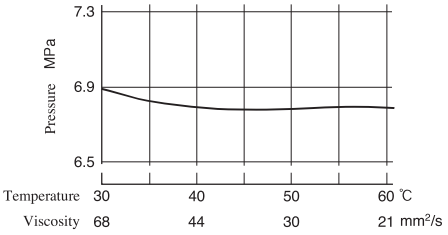



## Viscosity vs. Pressure

SB1110-H Flow Rate : 30 L/min
Oil : ISO VG46

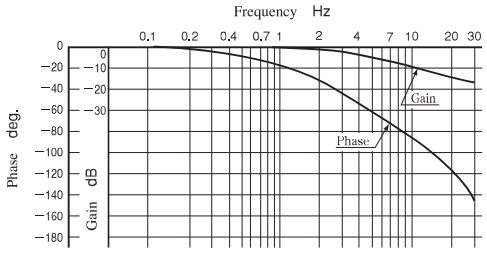



SB1119 Flow Rate : 70 L/min
Oil : ISO VG46

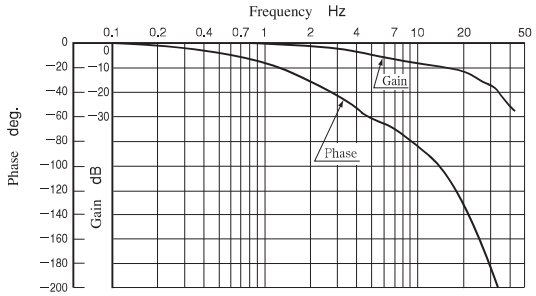



## Frequency Response

Flow Rate : 30 L/min
Pressure : 7.8 ± 1.6 MPa
Trapped Oil Volume : 500 cm³
Viscosity : 30 mm²/s




Flow Rate : 70 L/min
Pressure : 3.4 ± 0.7 MPa
Trapped Oil Volume : 1035 cm³
Viscosity : 30 mm²/s

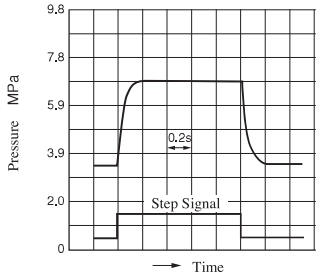



## Step Response (Example)

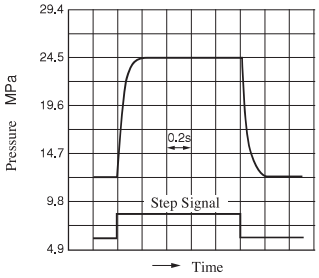
The step responses below are those obtained when the valve itself is tested independently.
The step responses may differ from them when the valve is used in combination with other control valves.

Flow Rate : 30 L/min
Trapped Oil Volume : 500 cm³
Viscosity : 30 mm²/s

SB1110-B

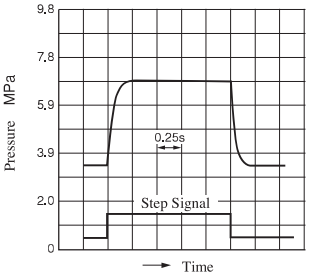



SB1110-H




Flow Rate : 70 L/min
Trapped Oil Volume : 1035 cm³
Viscosity : 30 mm²/s

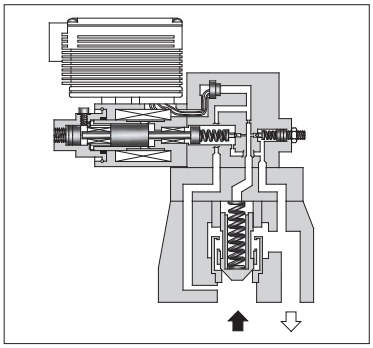
SB1190-B



# Proportional Electro-Hydraulic Relief Valves

These valves, consist of a small size but high performance EH series electro-hydraulic proportional pilot relief valve and a low noise type relief valve. The valves control the system pressure proportionally through a controlled input voltage.



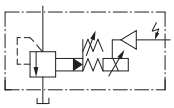


## Specifications

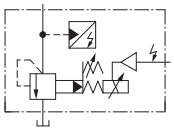
| Descriptions \ Model Numbers | EHBG-03 | EHBG-06 | EHBG-10 |
|---|---|---|---|
| Max. Operating Pres. | 24.5 MPa | | |
| Max. Flow | 100 L/min | 200 L/min | 400 L/min |
| Min. Flow | 3 L/min | 3 L/min | 3 L/min |
| Pressure Adjustment Range | Refer to Model Number Designation | | |
| Coil Resistance | 10 Ω | | |
| Hysteresis | 2% (1%) ★1 or less | | |
| Repeatability | 1% ★2 or less | | |
| Frequency Response | C : 10 (22) Hz ★1<br>H : 10 (25) Hz ★1<br>(-90 degree) | C : 11 (22) Hz ★1<br>H : 13 (24.5) Hz ★1<br>(-90 degree) | C : 7 (10.5) Hz ★1<br>H : 6 (14) Hz ★1<br>(-90 degree) |
| Supply Electric Power | 24 V DC<br>(21 to 28 V DC Included Ripple) | | |
| Power Input (Max.) | 28 W | | |
| Input Signal Voltage | C : 15.7 MPa / 5 V DC<br>H : 24.5 MPa / 5 V DC (At Max. Flow) | | |
| Input Impedance | 10 kΩ | | |
| Alarm Signal Output (Open Collector) | Voltage: Max. 30 V DC<br>Current: Max. 40 mA | | |
| Pressure Signal Output | C : 5 V DC / 15.7 MPa<br>H : 5 V DC / 24.5 MPa | | |
| Ambient Temperature | 0 - 50°C<br>(With Circulated Air) | | |
| Mass | Refer to Page H-17 | | |

★1. The value in parentheses is for the closed-loop type.
★2. The repeatability of the valve is obtained by having it tested independently on the conditions similar to its original testing.

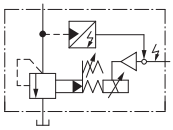
### Graphic Symbols



Open-Loop Type



Open-Loop Type with Sensor



Closed-Loop Type

## Model Number Designation

| EHB | G | -03 | -C | -S | -50 |
|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Pres. Adj. Range MPa | Control Type | Design Number |
| **EHB**: Proportional Electro-Hydraulic Relief Valve | **G**: Sub-Plate Mounting | **03** | **C** : ★-15.7<br>**H** : ★-24.5 | **None**: Open-Loop | **50** |
| | | **06** | | **S**: Open-Loop with Sensor | **50** |
| | | **10** | | **L** : Closed-Loop | **50** |

Note1: For the lower limits of the adjustable pressure shown with an asterisk (★), see the minimum adjustable pressure characteristics on page H-19.
Note2: Phosphate ester type fluids are also supported. When phosphate ester type fluids are used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

## Accessories

### Mounting Bolts

| Model Numbers | Socket Head Cap Screw |
|---|---|
| EHBG-03 | M12 × 40 L·····4 Pcs. |
| EHBG-06 | M16 × 50 L·····4 Pcs. |
| EHBG-10 | M20 × 60 L·····4 Pcs. |

## Sub-Plate

| Valve Model Numbers | Sub-Plate Model Numbers | Thread Size Rc | Mass kg |
|---|---|---|---|
| EHBG-03 | BGM-03-20 | 3/8 | 2.4 |
| | BGM-03X-20 | 1/2 | 3.1 |
| EHBG-06 | BGM-06-20 | 3/4 | 4.7 |
| | BGM-06X-20 | 1 | 5.7 |
| EHBG-10 | BGM-10-20 | 1 1/4 | 8.4 |
| | BGM-10X-20 | 1 1/2 | 10.3 |

● Sub-plates are available. Specify sub-plate model from the table left. When sub-plates are not used, the mounting surface should have a good machined finish. (▽)

## Instructions

### Piping to the Reservoir

The tank port should be connected directly to the reservoir. Be sure the end of pipe is dipped into the oil in the reservoir.

### Low Flow Rates

A flow rate of 3 L/min or higher should be used to avoid preselected pressure instability.

### Safety Valve

At shipment, the pressure of safety valves is set to the upper limits of the adjustable pressure ranges plus the extra as shown below.

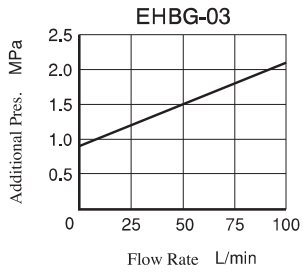
**Additional Pressures for Safety Valves at Shipment**

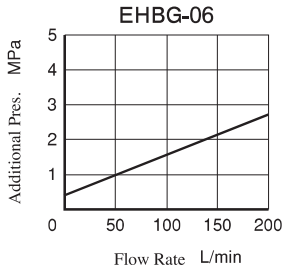
| Model No. | Additional Pressures at Shipment MPa | |
|---|---|---|
| EHBG-03 | 1.5 | (at 50 L/min) |
| EHBG-06 | 1.5 | (at 100 L/min) |
| EHBG-10 | 2.5 | (at 200 L/min) |

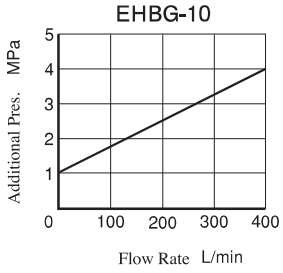
If the operating pressure upper limit is low or a different flow rate upper limit is used, make adjustment after calculating the safety valve pressure setting from the following equation;

Pressure Setting = ( Operating Pressure Upper Limit ) + ( Additional Pressure Indicated Below )

To lower the pressure setting, turn the safety valve pressure adjustment screw anti-clockwise. After adjustment, be sure to tighten the lock nut.

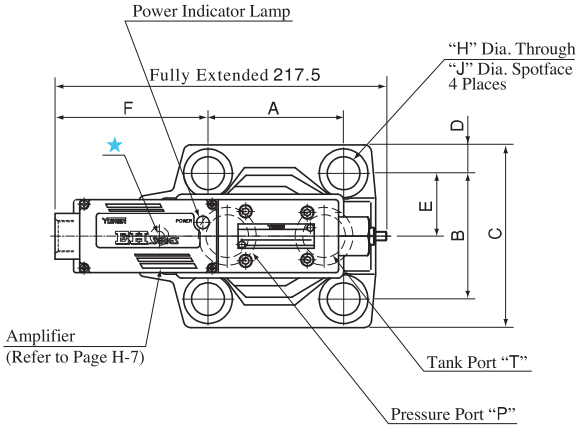


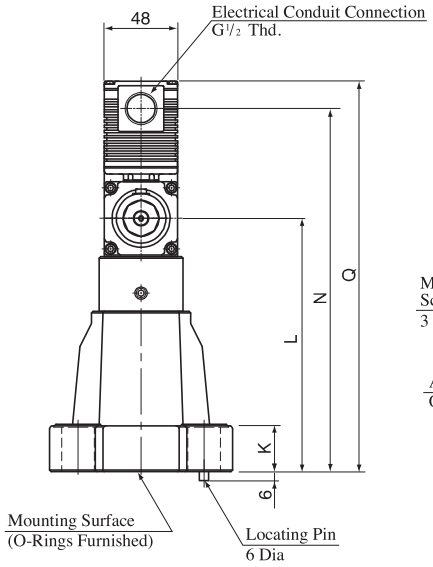



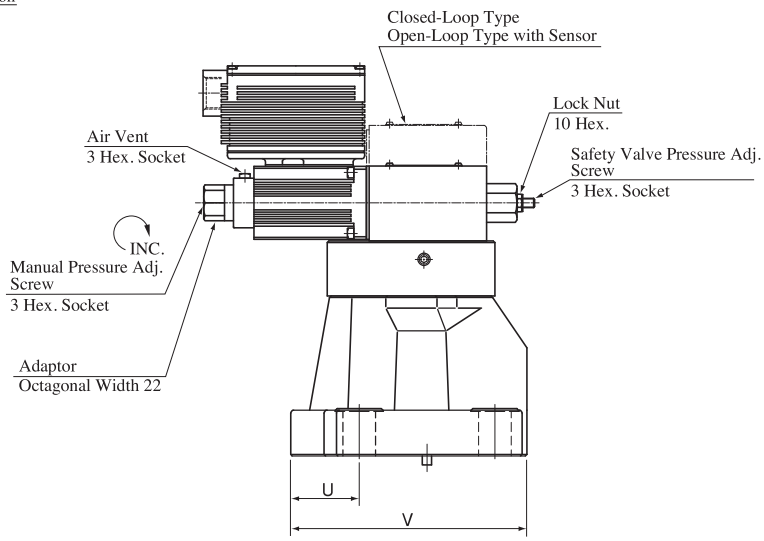



●EHBG-03/06/10-＊-50：Open-Loop Type
●EHBG-03/06/10-＊-S-50：Open-Loop Type with Sensor
●EHBG-03/06/10-＊-L-50：Closed-Loop Type

| Model Numbers | Mass kg | |
|---|---|---|
| | Open-Loop Type | Open-Loop Type with Sensor Closed-Loop Type |
| EHBG-03 | 5.6 | 6.3 |
| EHBG-06 | 6.8 | 7.5 |
| EHBG-10 | 10.5 | 11.2 |



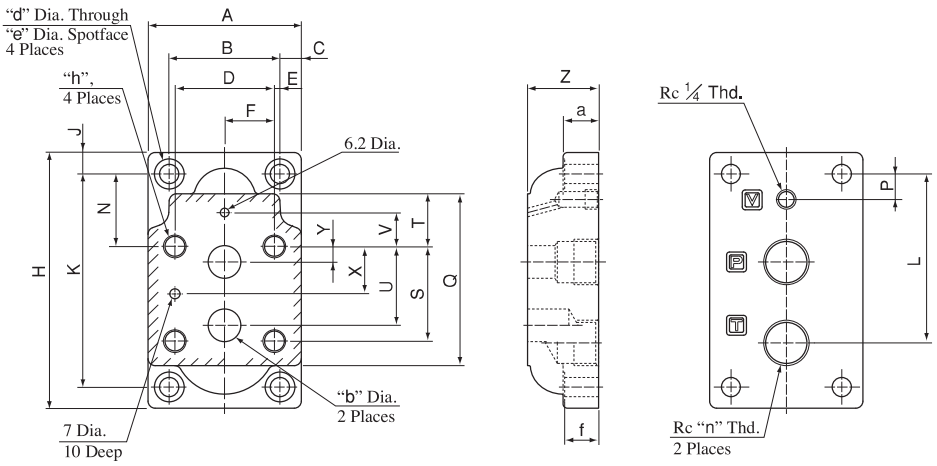

★ This port connection is not used.

| Model No. | A | B | C | D | E | F | H | J | K |
|---|---|---|---|---|---|---|---|---|---|
| EHBG-03 | 53.8 | 53.8 | 76 | 11.1 | 26.9 | 119.1 | 13.5 | 21 | 21.5 |
| EHBG-06 | 66.7 | 70 | 98 | 14 | 35 | 121 | 17.5 | 26 | 26 |
| EHBG-10 | 88.9 | 82.6 | 120 | 18.7 | 41.3 | 102.5 | 21.5 | 32 | 33.5 |

| Model No. | L | N | Q | U | V | Mounting Surface |
|---|---|---|---|---|---|---|
| EHBG-03 | 130 | 202 | 220 | 26.1 | 106 | ISO 6264-AR-06-2-A |
| EHBG-06 | 130 | 202 | 220 | 36 | 122 | ISO 6264-AS-08-2-A |
| EHBG-10 | 166 | 238 | 256 | 45 | 155 | ISO 6264-AT-10-2-A |

## Sub-Plates

BGM-03, 03X
06, 06X
10, 10X




| Model No. | A | B | C | D | E | F | H | J | K | L | N | P | Q | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BGM-03 | 86 | 60 | 13 | 53.8 | 3.1 | 26.9 | 149 | 13 | 123 | 86 | 32 | 26 | 97 | 53.8 |
| BGM-03X | | | | | | | | | | 95 | | 21 | | |
| BGM-06 | 108 | 78 | 15 | 70 | 4 | 35 | 180 | 15 | 150 | 106.5 | 51 | 27.2 | 121 | 66.7 |
| BGM-06X | | | | | | | | | | 119 | | 18 | | |
| BGM-10 | 126 | 94 | 16 | 82.6 | 5.7 | 41.3 | 227 | 16 | 195 | 138.2 | 62 | 30.2 | 154 | 88.9 |
| BGM-10X | | | | | | | | | | 158 | | 17 | | |

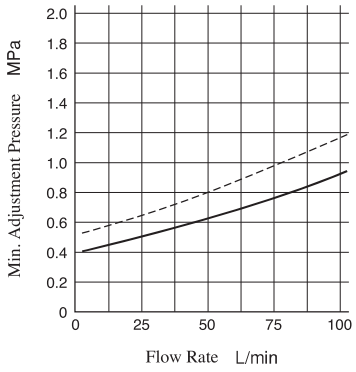
| Model No. | T | U | V | X | Y | Z | a | b | d | e | f | h | n |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BGM-03 | 19 | 47.4 | 0 | 22 | 22 | 32 | 20 | 14.5 | 11 | 17.5 | 19 | M12 Thd. 20 Deep | 3/8 |
| BGM-03X | | | | | | 40 | | | | | | | 1/2 |
| BGM-06 | 37 | 55.5 | 23.8 | 33.4 | 11 | 40 | 25 | 23 | 13.5 | 21 | 24 | M16 Thd. 25 Deep | 3/4 |
| BGM-06X | | | | | | 50 | | | | | | | 1 |
| BGM-10 | 42 | 76.2 | 31.8 | 44.5 | 12.7 | 50 | 32 | 28 | 17.5 | 26 | 31 | M20 Thd. 28 Deep | 1 1/4 |
| BGM-10X | | | | | | 63 | | | | | | | 1 1/2 |

## Min. Adjustment Pressure

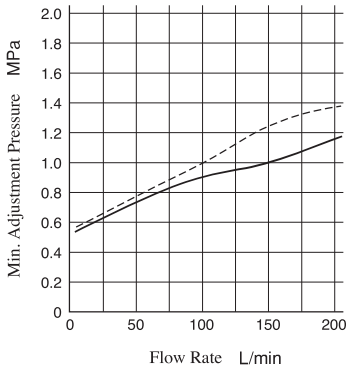
Open-Loop Type
Closed-Loop Type

Viscosity : 30 mm²/s

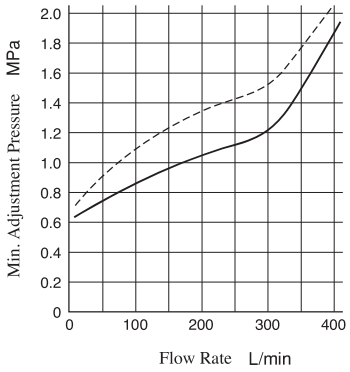
EHBG-03




EHBG-06




EHBG-10

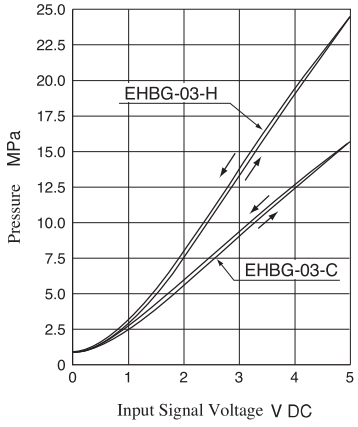



## Input Signal Voltage vs. Pressure

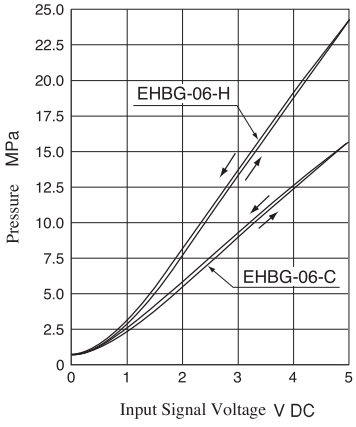
### Open-Loop Type

Viscosity : 30 mm²/s

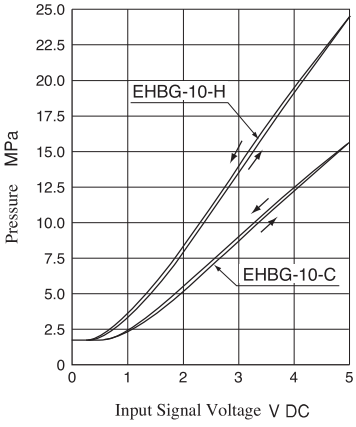
EHBG-03-*
Flow Rate : 100 L/min




EHBG-06-*
Flow Rate : 200 L/min

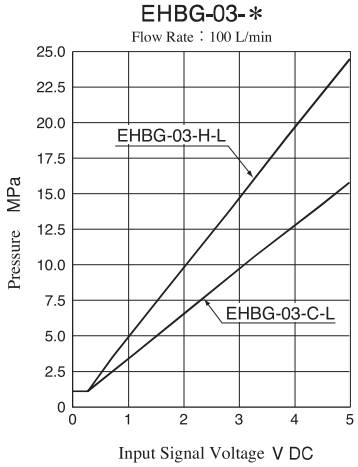



EHBG-10-*
Flow Rate : 400 L/min

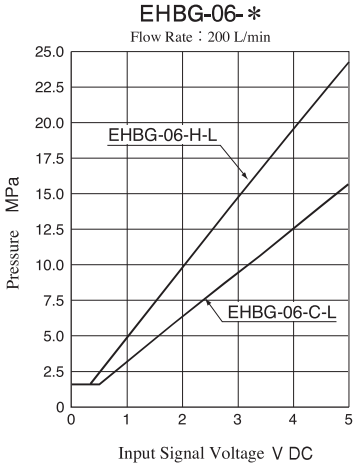



### Closed-Loop Type

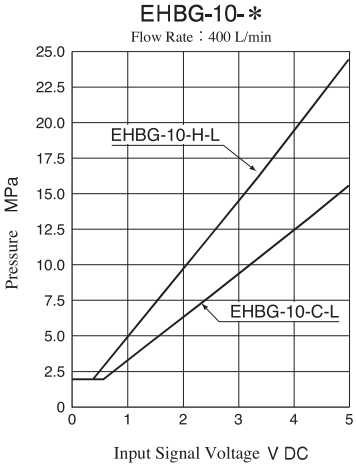
EHBG-03-*
Flow Rate : 100 L/min




EHBG-06-*
Flow Rate : 200 L/min



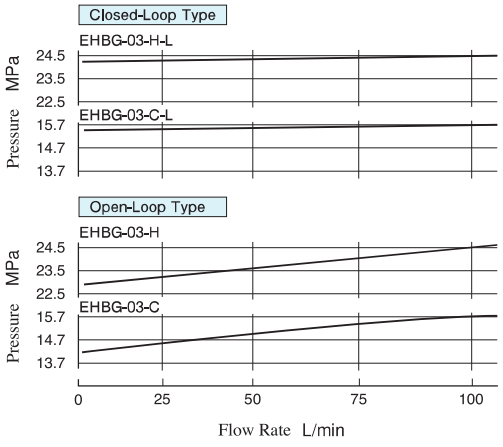

EHBG-10-*
Flow Rate : 400 L/min



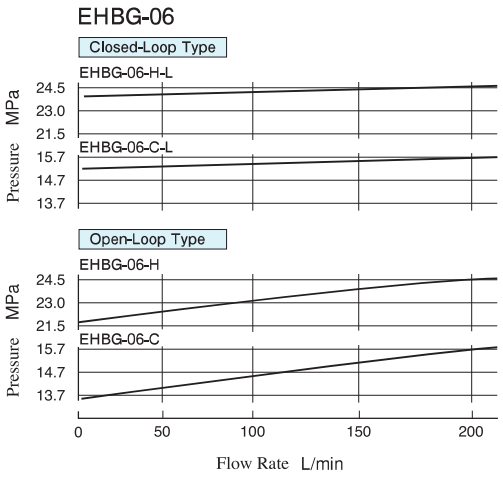
## Flow Rate vs. Pressure

Viscosity : 30 mm²/s

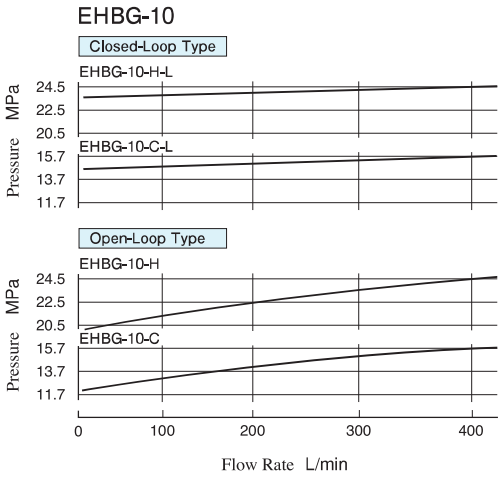
### EHBG-03




### EHBG-06



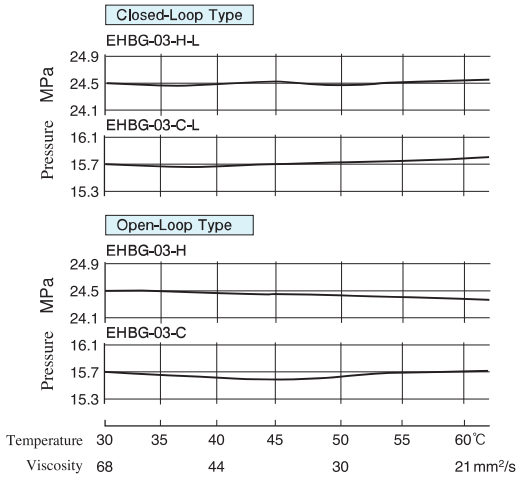

### EHBG-10



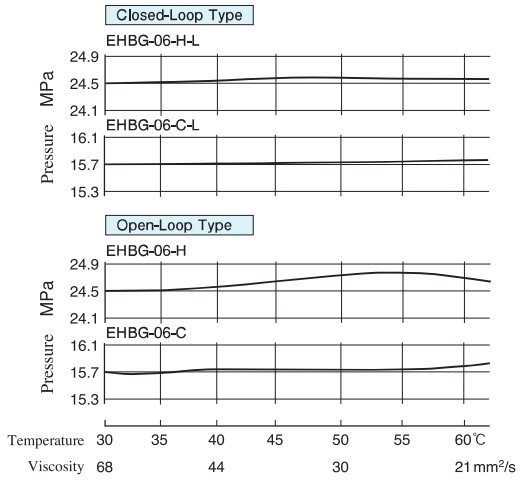

## Viscosity vs. Pressure

Oil : ISO VG46 Oil

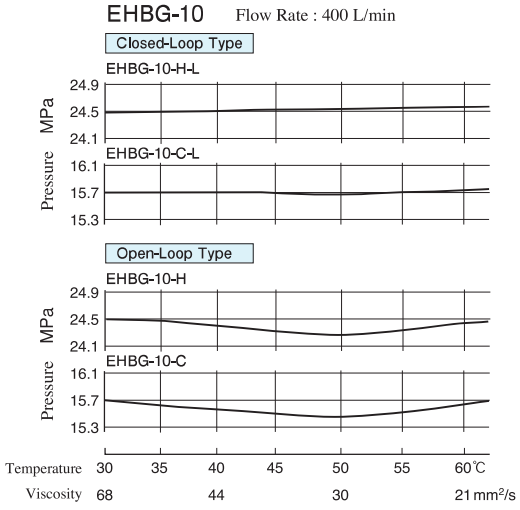
### EHBG-03 Flow Rate : 100 L/min




### EHBG-06 Flow Rate : 200 L/min




### EHBG-10 Flow Rate : 400 L/min



## Step Response (Example)

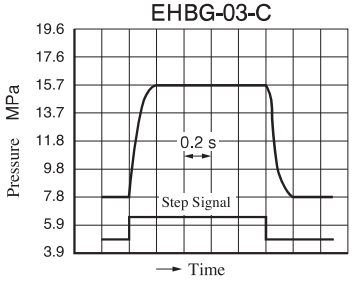
The step responses below are those obtained when the valve itself is tested independently.
The step responses may differ from them when the valve is used in combinations with other control valves.

Trapped Oil Volume : 1 L
Viscosity : 30 mm²/s

### Open-Loop Type

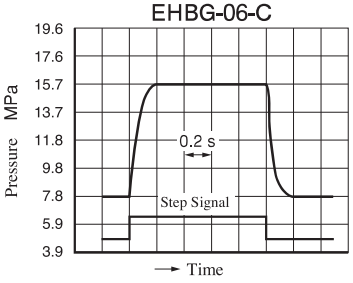
Flow Rate : 100 L/min

EHBG-03-C



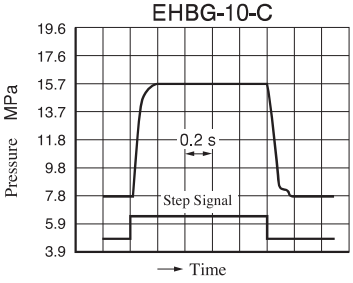

Flow Rate : 200 L/min

EHBG-06-C

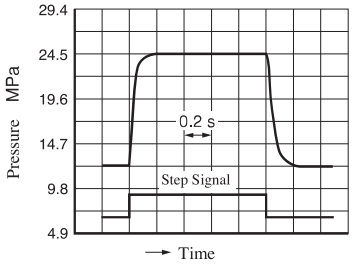



Flow Rate : 400 L/min

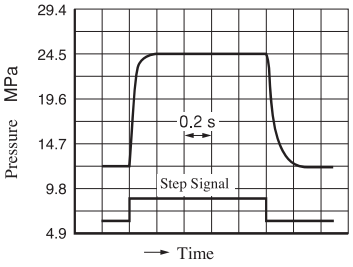
EHBG-10-C



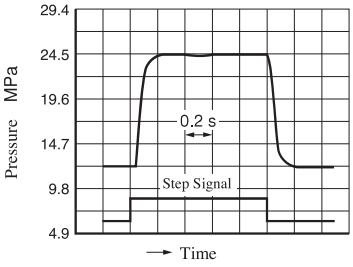

EHBG-03-H




EHBG-06-H



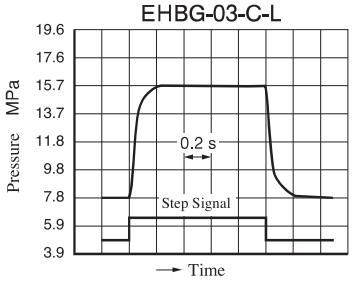

EHBG-10-H




### Closed-Loop Type

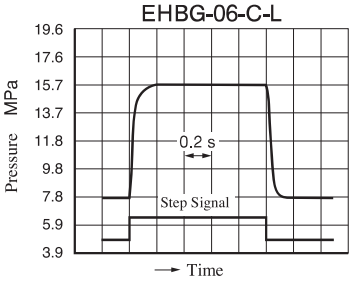
Flow Rate : 100 L/min

EHBG-03-C-L



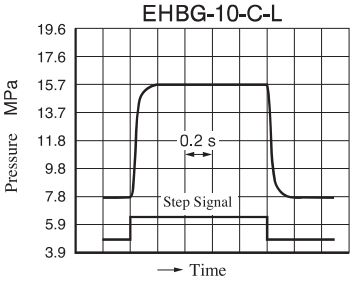

Flow Rate : 200 L/min

EHBG-06-C-L

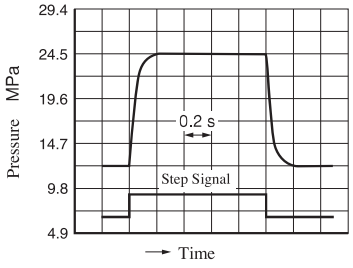



Flow Rate : 400 L/min

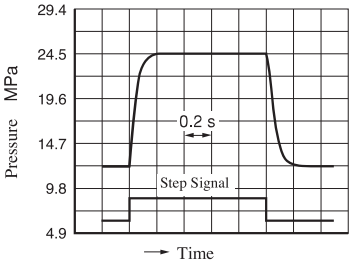
EHBG-10-C-L



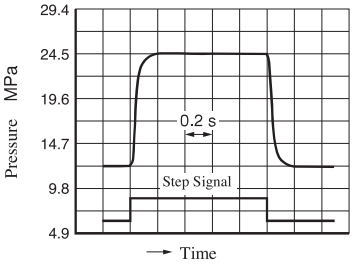

EHBG-03-H-L




EHBG-06-H-L




EHBG-10-H-L

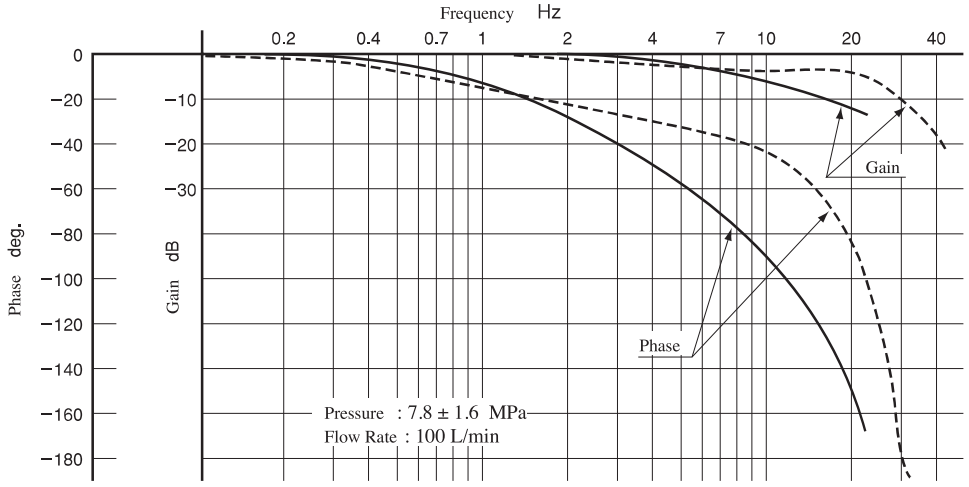


## Frequency Response

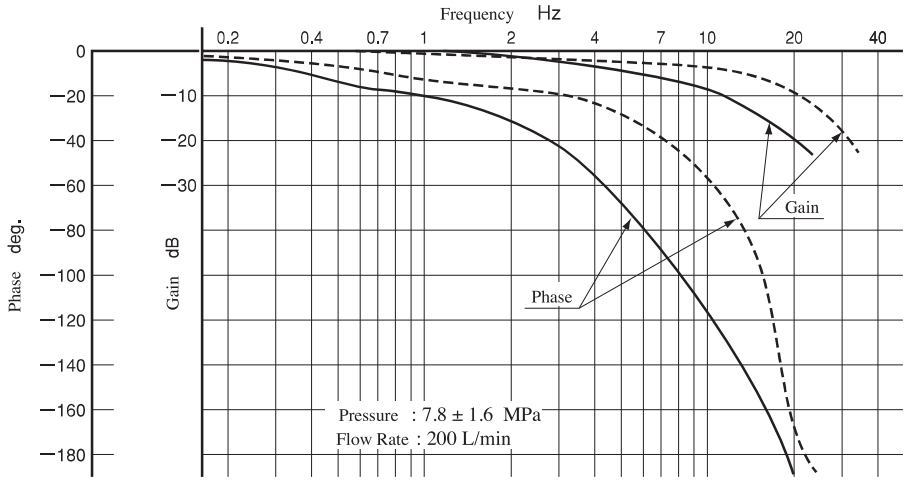
Open-Loop Type
Closed-Loop Type

Trapped Oil Volume : 1 L
Viscosity : 30 mm²/s

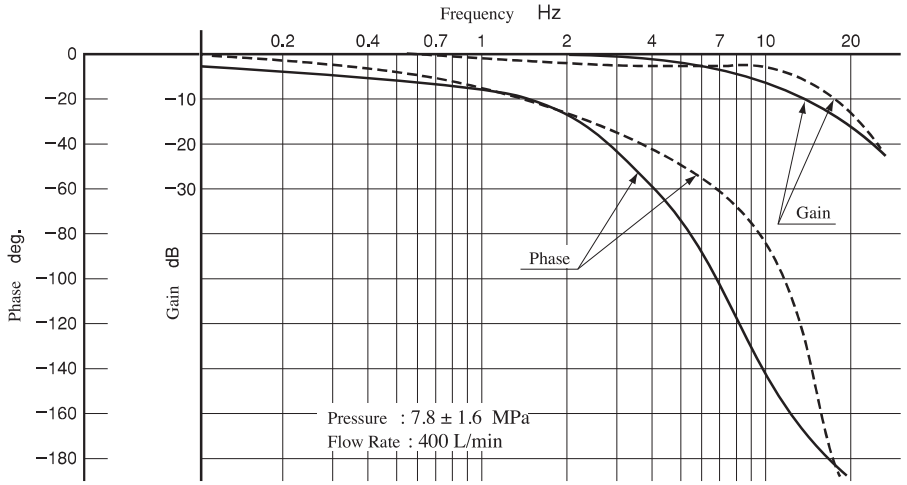
### EHBG-03




### EHBG-06

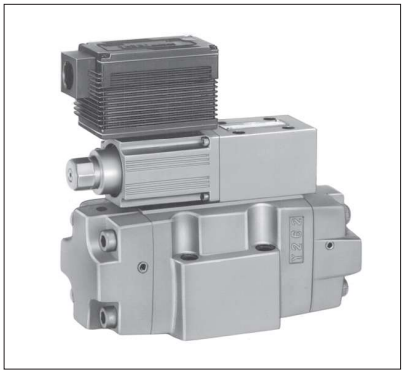


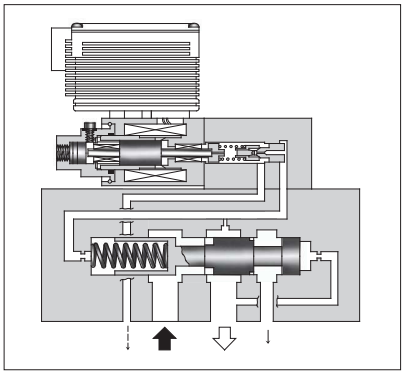

### EHBG-10



# Proportional Electro-Hydraulic Relieving and Reducing Valves

These valves consist of a small size but high performance electro-hydraulic proportional pilot relief valve and reducing valve with relief function. The valves control the system pressure proportionally through a controlled input voltage. Moreover, a good response speed in reducing the pressure even at a large load capacity can be obtained with the relief function of the valves.





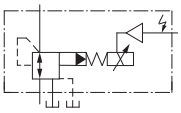
## Specifications

| Descriptions \ Model Numbers | EHRBG-06 | EHRBG-10 |
|---|---|---|
| Max. Operating Pres. MPa | 24.5 | |
| Max. Flow L/min | 100 | 250 |
| Max. Relieving Flow L/min | 35★1 | 15★1 |
| Pressure Adjustment Range | Refer to Model Number Designation | |
| Coil Resistance | 10 Ω | |
| Hysteresis | 3% or less | |
| Repeatability | 1%★2 or less | |
| Frequency Response | B : 4 Hz<br>C : 3 Hz (-90 degree)<br>H : 3 Hz | |
| Supply Electric Power | 24 V DC<br>(21 to 28 V DC Included Ripple) | |
| Power Input (Max.) | 28 W | |
| Input Signal Voltage | B : 6.9 MPa / 5 V DC<br>C : 13.7 MPa / 5 V DC<br>H : 20.6 MPa / 5 V DC<br>(at Flow Rate Zero) | |
| Input Impedance | 10 kΩ | |
| Pressure Signal Output | B : 5 V DC / 6.9 MPa<br>C : 5 V DC / 13.7 MPa<br>H : 5 V DC / 20.6 MPa | |
| Ambient Temperature | 0 - 50˚C<br>(With Circulated Air) | |
| Mass | Refer to Pages H-24 & H-25 | |

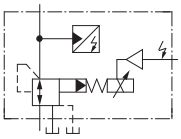
★1. The figures shown are those obtained where the differential pressure between the secondary pressure port and tank port is 13.7 MPa.

★2. The repeatability of the valve is obtained by having it tested independently on the conditions similar to its original testing.

### Graphic Symbols



Open-Loop Type



Open-Loop Type with Sensor

## Model Number Designation

| EHRB | G | -06 | -C | -S | -50 |
|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Pres. Adj. Range MPa | Control Type | Design Number |
| EHRB: Proportional Electro-Hydraulic Relieving & Reducing Valve | G: Sub-Plate Mounting | 06 | B: 0.8 - 6.9<br>C: 1.2 - 13.7<br>H: 1.5 - 20.6 | None: Open-Loop | 50 |
| | | 10 | B: 0.9 - 6.9<br>C: 1.2 - 13.7<br>H: 1.5 - 20.6 | S: Open-Loop with Sensor | |

★ Phosphate ester type fluids are also supported. When phosphate ester type fluids are used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

## Sub-Plate

| Valve Model No. | Sub-Plate Model No. | Thread Size Rc | Mass kg |
|---|---|---|---|
| EHRBG-06 | ERBGM-06-20 | 3/4 | 3.0 |
| EHRBG-10 | ERBGM-10-10 | 1 1/4 | 6.5 |

●Sub-plates are available. Specify sub-plates model from the table above. When sub-plates are not used, the mounting surface should have a good machined finish. (▽6)

## Accessories

### Mounting Bolts

| Model No. | Socket Head Cap Screw |
|---|---|
| EHRBG-06 | M10 × 70 L·····4 Pcs. |
| EHRBG-10 | M10 × 70 L·····6 Pcs. |

## Instructions

### Pressure at the Primary Pressure Port

The necessary pressure at the primary pressure port should be equal to the set pressure plus 1 MPa.

### Drain Port

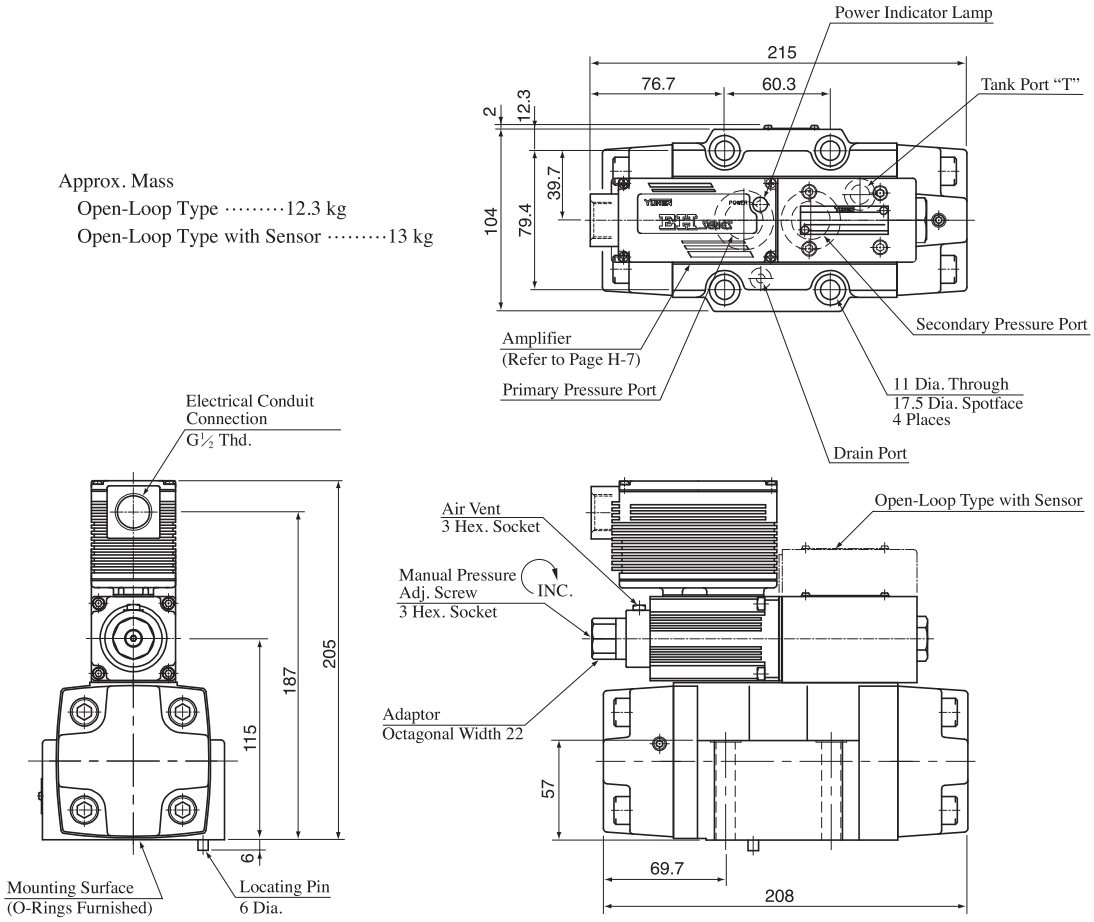
The back pressure at the drain port should be less than 0.2 MPa. The pipe from the drain port should be connected to the reservoir directly and the end of the pipe must always be in the oil.

### Load Capacity

The use of the valves at the load capacity of about 20 L is recommended. Even at the lowest, a load capacity of more than 1.4 L is required.

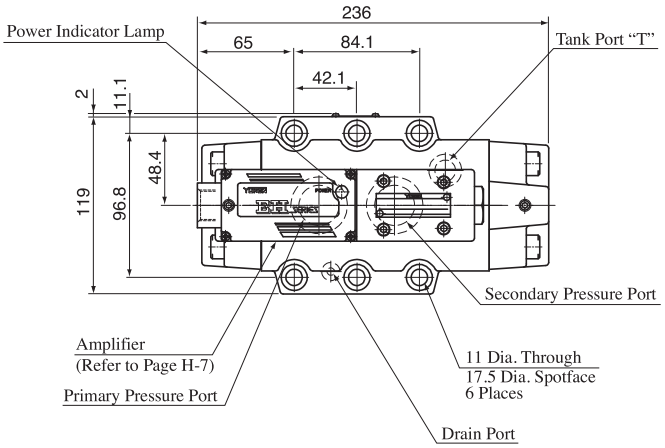
## ●EHRBG-06-＊-50：Open-Loop Type
## ●EHRBG-06-＊-S-50：Open-Loop Type with Sensor

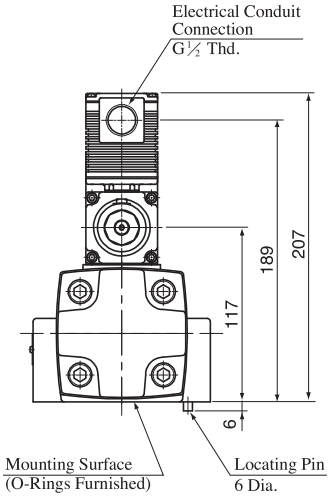
Approx. Mass
Open-Loop Type ·····12.3 kg
Open-Loop Type with Sensor ·····13 kg

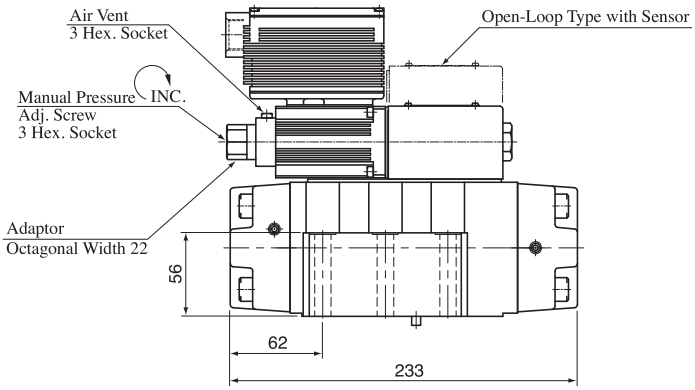


## ●EHRBG-10-＊-50：Open-Loop Type
## ●EHRBG-10-＊-S-50：Open-Loop Type with Sensor

Approx. Mass
Open-Loop Type ·····13.8 kg
Open-Loop Type with Sensor ·····14.5 kg

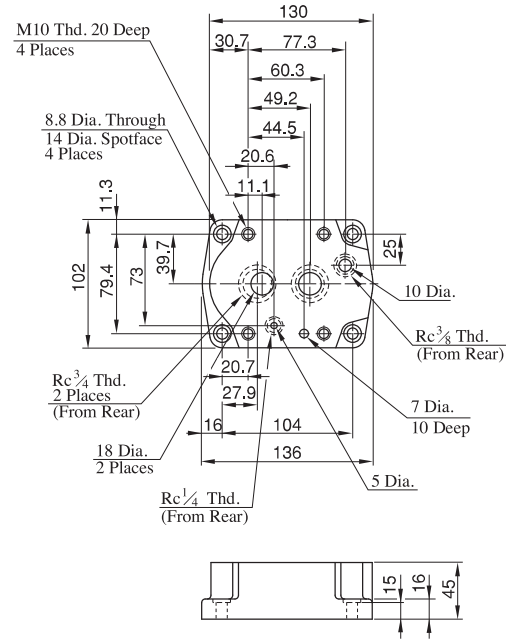


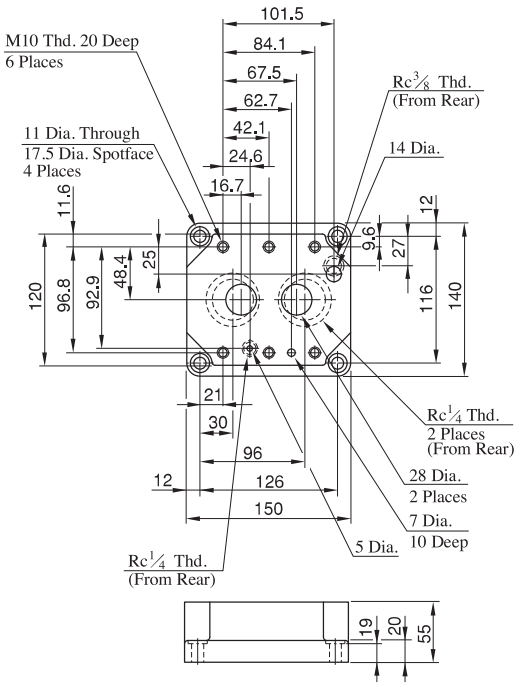




## Sub-Plates

### ERBGM-06



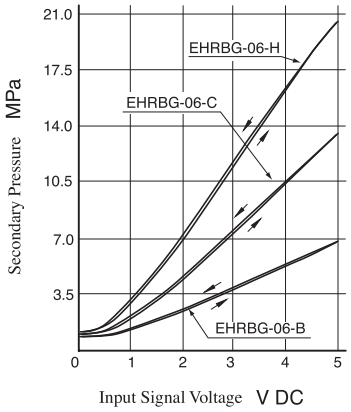

### ERBGM-10



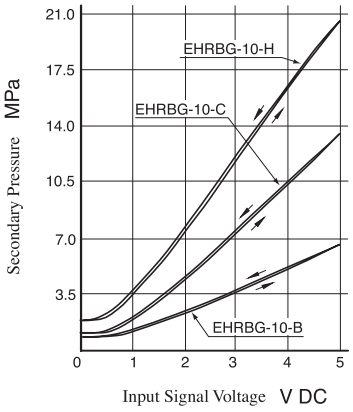
## Input Signal Voltage vs. Secondary Pressure

Primary Pressure : 24.5 MPa
Viscosity : 30 mm²/s

EHRBG-06

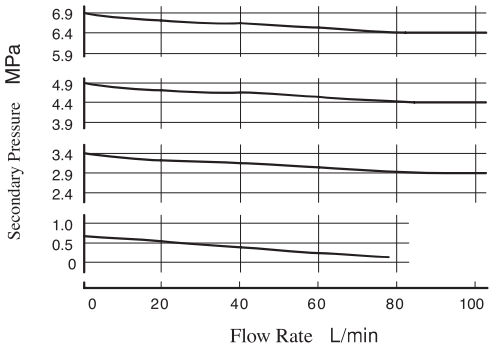



EHRBG-10

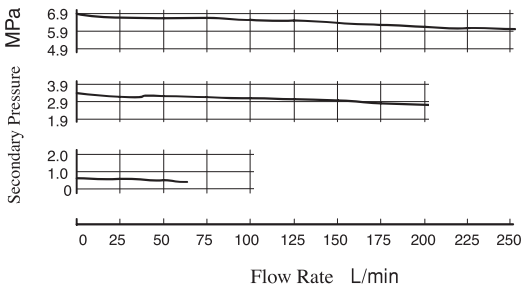



## Flow vs. Secondary Pressure

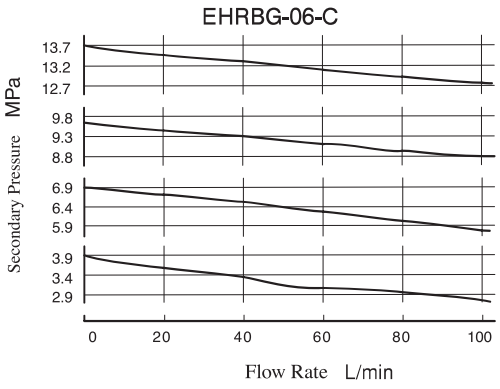
EHRBG-06-B



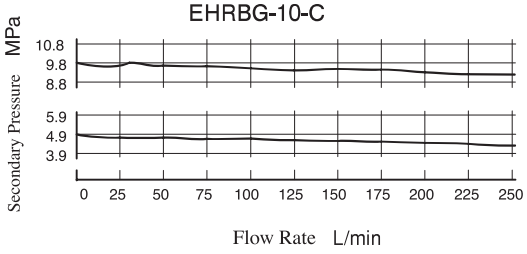

EHRBG-10-B



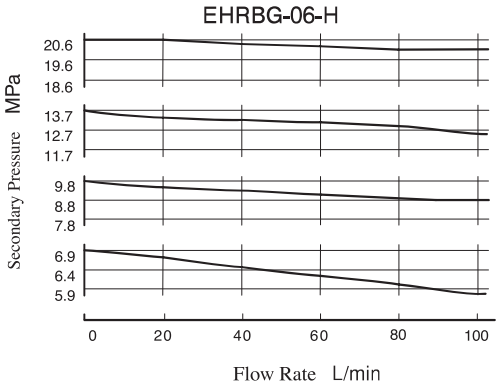

EHRBG-06-C



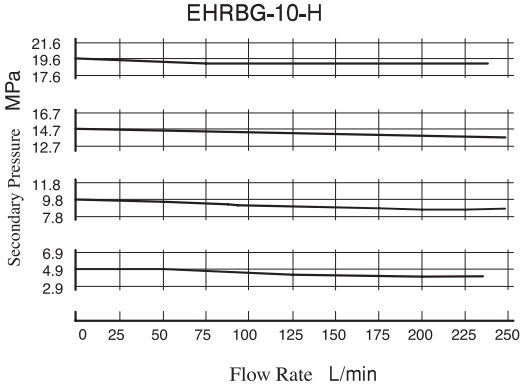

EHRBG-10-C




EHRBG-06-H



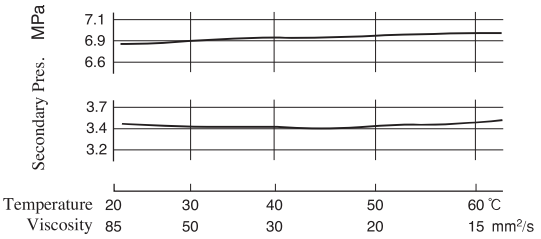

EHRBG-10-H



## Viscosity vs. Secondary Pressure

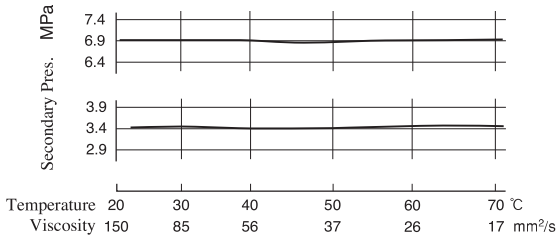
### EHRBG-06-B

Oil : ISO VG 32 Oil



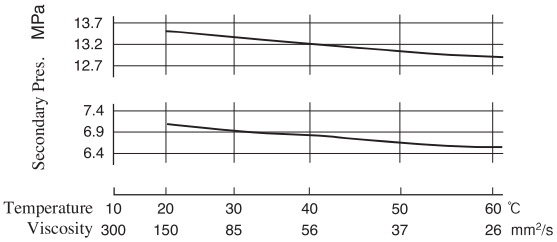

### EHRBG-10-B

Oil : ISO VG 56 Oil



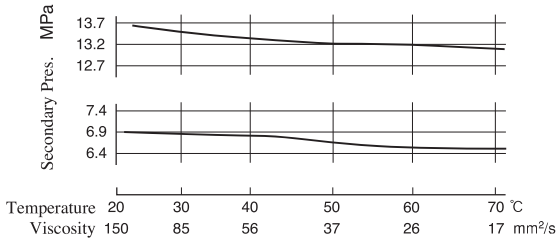

### EHRBG-06-C

Oil : ISO VG 56 Oil



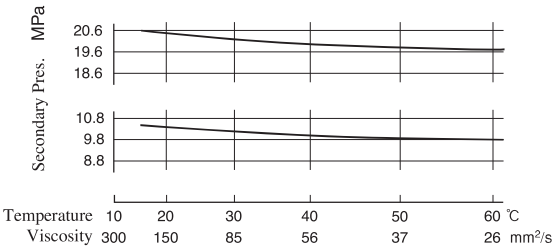

### EHRBG-10-C

Oil : ISO VG 56 Oil



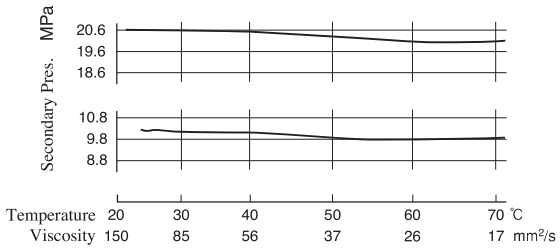

### EHRBG-06-H

Oil : ISO VG 56 Oil




### EHRBG-10-H

Oil : ISO VG 56 Oil

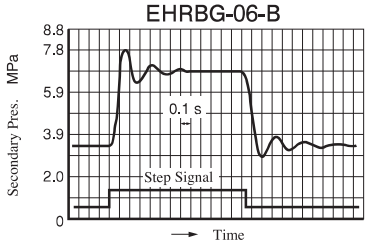



## Step Response (Example)

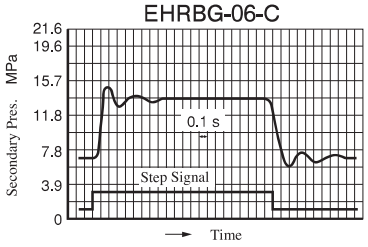
The following step response measurements are taken when the trapped oil volume is 20 L. The step response varies by trapped oil volume.

Primary Pressure : 24.5 MPa
Trapped Oil Volume : 20 L
Viscosity : 30 mm²/s

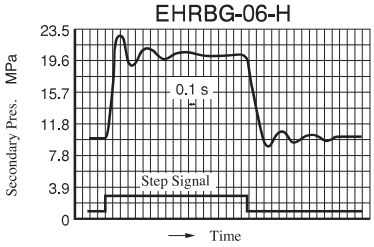
### EHRBG-06-B



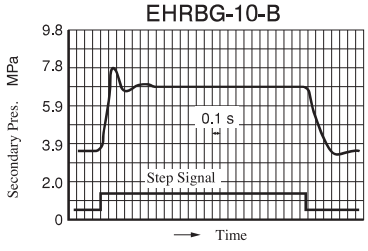

### EHRBG-06-C



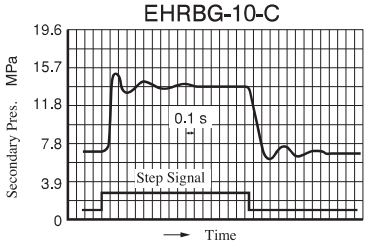

### EHRBG-06-H



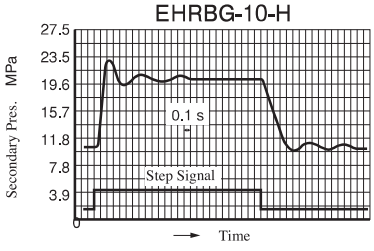

### EHRBG-10-B




### EHRBG-10-C



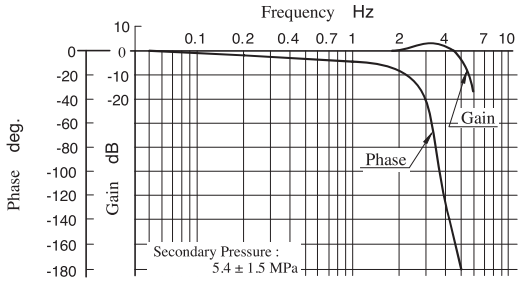

### EHRBG-10-H



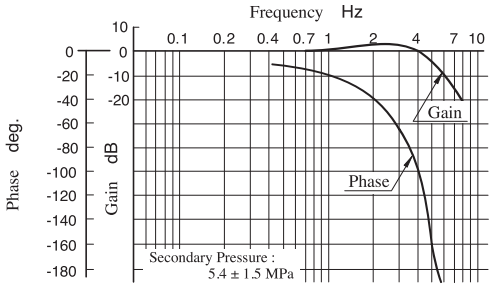
## Frequency Response

Primary Pressure : 24.5 MPa
Trapped Oil Volume : 20 L
Viscosity : 30 mm²/s

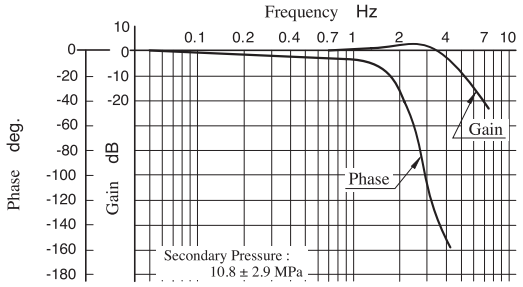
EHRBG-06-B



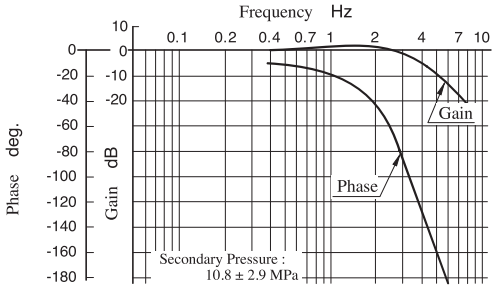

EHRBG-10-B



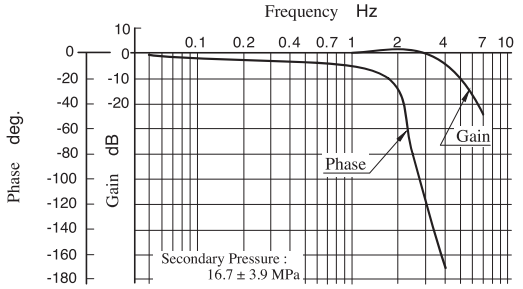

EHRBG-06-C



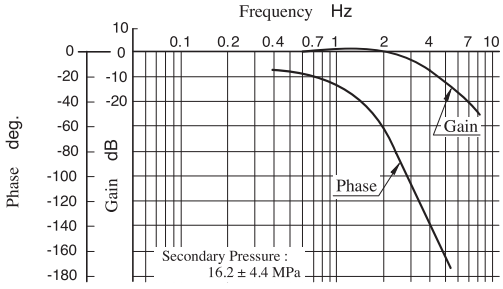

EHRBG-10-C




EHRBG-06-H

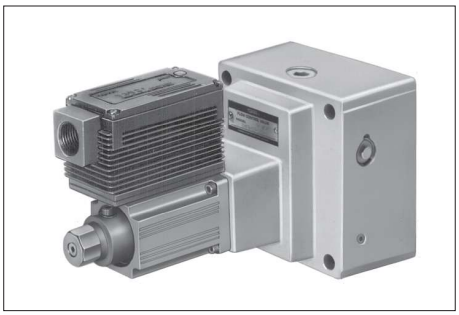


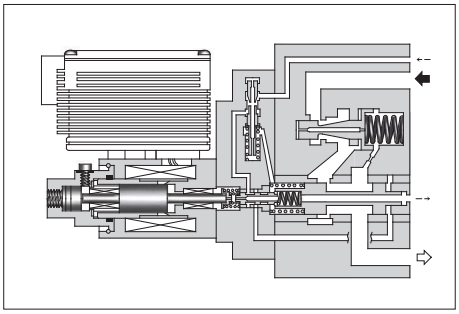

EHRBG-10-H



# Proportional Electro-Hydraulic Flow Control (and Check) Valves

The system flow rate can be controlled remotely as desired by regulating input voltage. Further, since pressure and temperature compensation functions are provided, the preselected flow rate is not be affected by pressure (load) or temperature (fluid viscosity).





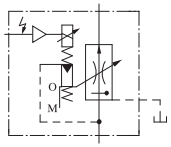
## Specifications

| Descriptions \ Model Numbers | | EHF*G-03-60/125 | EHF*G-06-250 |
|---|---|---|---|
| Max. Operating Pres. MPa | | 20.6 | 24.5 |
| Max. Metered Flow L/min | | 60: 60<br>125: 125 | 250 |
| Min. Metered Flow L/min | | 1 | 2.5 |
| Min. Differential Pressure ★1 MPa | | 1.0 | 1.0 |
| Free Flow (Only with Check Valve) L/min | | 130 | 280 |
| Pilot Flow L/min | at Normal | 0.5 | 1 |
| | at Transition | 2.6 | 4 |
| Min. Pilot Pressure MPa | | 1.0 | 1.5 |
| Frequency Response | | 12 Hz (-90 degree) | |
| Hysteresis | | 3% or less | |
| Repeatability | | 1% ★2 or less | |
| Coil Resistance | | 10 Ω | |
| Supply Electric Power | | 24 V DC<br>(21 to 28 V DC Included Ripple) | |
| Power Input (Max.) | | 28 W | |
| Input Signal Voltage | | Max. Metered Flow / 5V DC | |
| Input Impedance | | 10 kΩ | |
| Ambient Temperature | | 0 - 50°C<br>(With Circulated Air) | |
| Mass | | 10 kg | 25 kg |

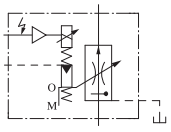
★1. Minimum differential pressure means fine pressure compensation at inlet and outlet port.
★2. The repeatability of the valve is obtained by having it tested independently on the conditions similar to its original testing.

### Graphic Symbols

**EHFG**

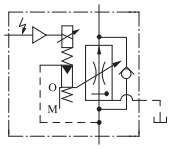


Internal Pilot

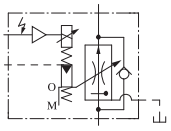


External Pilot

**EHFCG**



Internal Pilot



External Pilot

## Model Number Designation

| EHF | G | -03 | -60 | -E | -50 |
|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Max. Metered Flow L/min | Pilot Connection | Design Number |
| **EHF**: Proportional Electro-Hydraulic Flow Control Valve<br>**EHFC**: Proportional Electro-Hydraulic Flow Control and Check Valve | **G**: Sub-Plate Mounting | **03** | **60**: 60<br>**125**: 125 | **None**: Internal Pilot | **50** |
| | | **06** | **250**: 250 | **E**: External Pilot | **50** |

★ Phosphate ester type fluids are also supported. When phosphate ester type fluids are used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

## Accessories

### Mounting Bolts

| Model Numbers | Socket Head Cap Screw |
|---|---|
| EHFG<br>EHFCG -03 | M10 × 80 L……4 Pcs. |
| EHFG<br>EHFCG -06 | M16 × 130 L……4 Pcs. |

## Sub-Plate

| Valve Model Numbers | Sub-Plate Model Numbers | Thread Size Rc | Mass kg |
|---|---|---|---|
| EHFG<br>EHFCG -03 | EFGM-03Y-30 | 3/4 | 5.7 |
| | EFGM-03Z-30 | 1 | 5.6 |
| EHFG<br>EHFCG -06 | EFGM-06X-30 | 1 | 12.5 |
| | EFGM-06Y-30 | 1 1/4 | 16.0 |

●Sub-plates are available. Specify sub-plate model from the table left. When sub-plates are not used, the mounting surface should have a good machined finish. (▽)

## Instructions

### Drain Back Pressure

Check that the drain back pressure dose not exceed 0.2 MPa.

### Pilot Type Selection

This valve is constructed so as to operate at a predetermined pilot pressure. For the 03, a pilot pressure of 1 MPa or higher is required. For the 06, the required pilot pressure is 1.5 MPa or higher.

To obtain such a required pilot pressure, select the pilot type according to the circuit examples on the right.

①/②

Use the external pilot type (type symbol: E) whether a meter-in or meter-out circuit is employed.

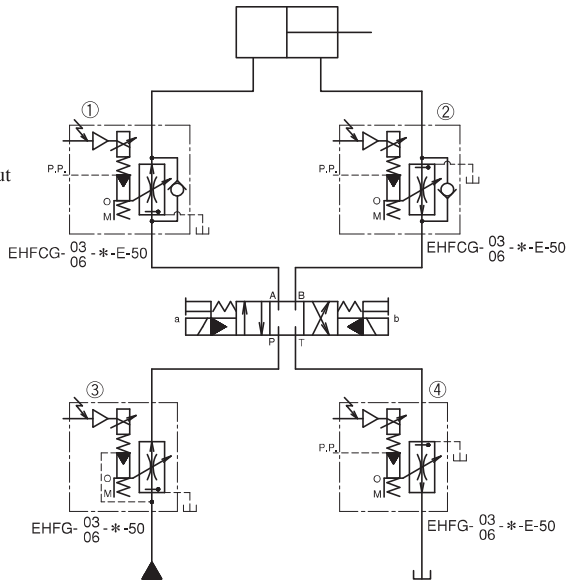
③

Use the internal pillot type (type symbol: None).

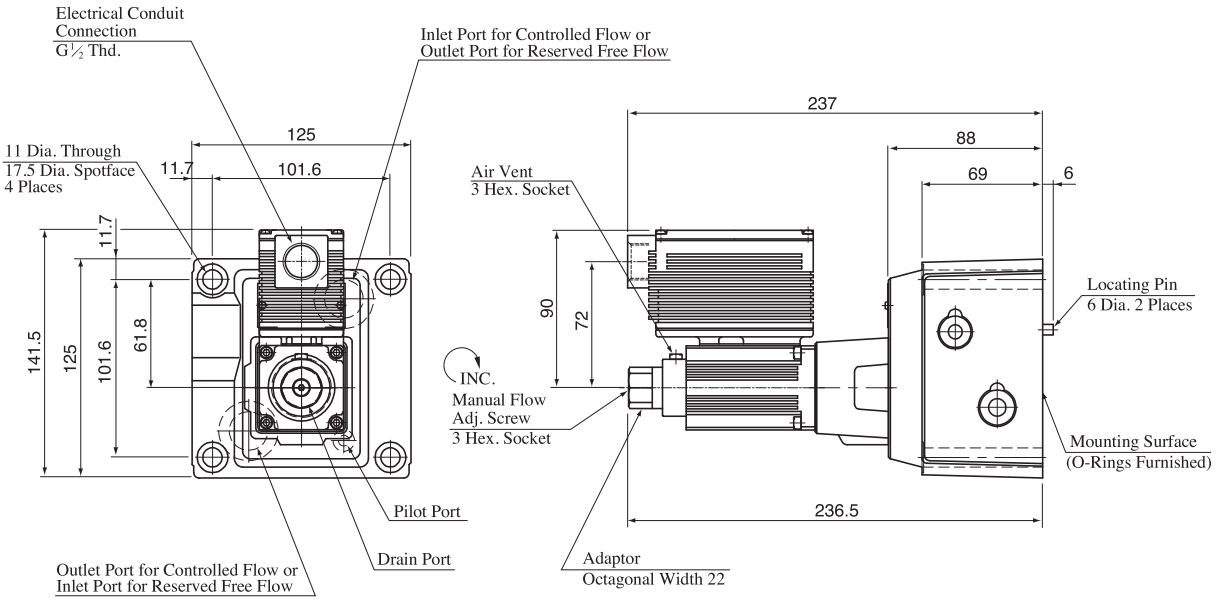
④

Use the external pilot type (type symbol: E).

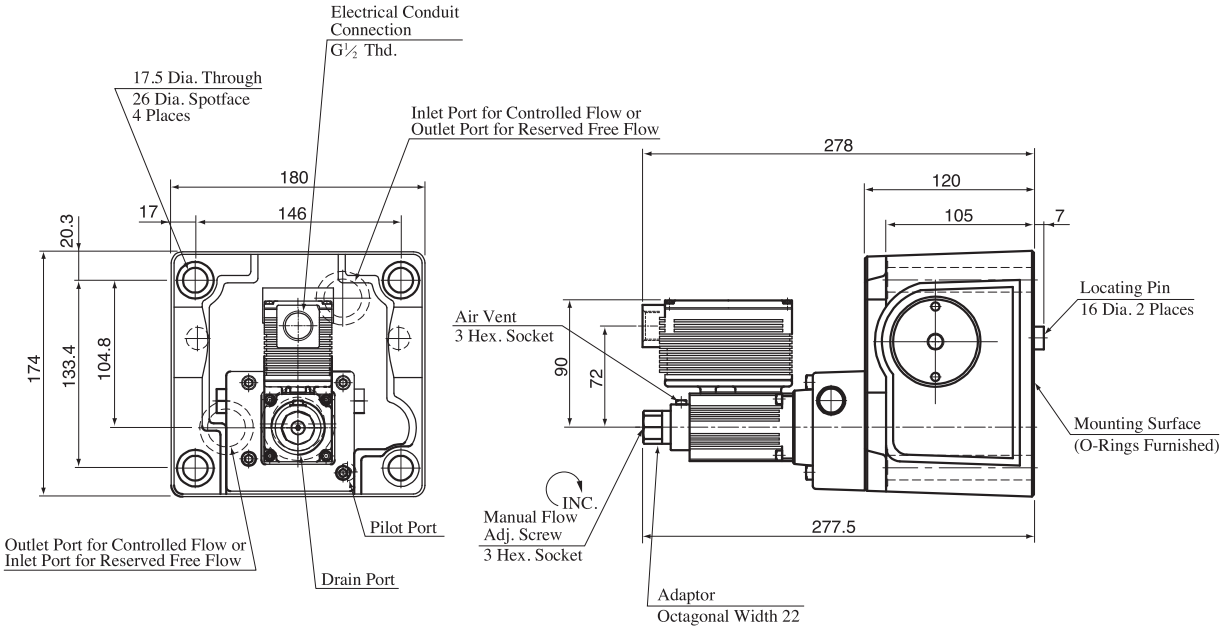
【Example of Circuit】



## EHFG EHFCG-03

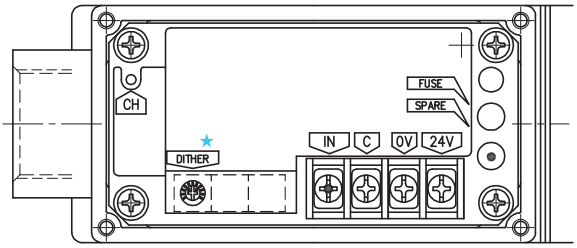



## EHFG EHFCG-06



## Detail of Amplifier

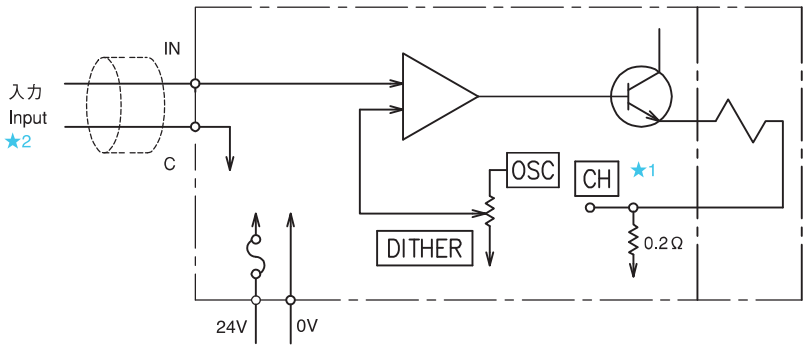
### Connecting Terminals




★DITHER
Use as it is since they are factory preset to the optimum position.
(Do not touch as it is in normal condition.)

| Terminal | Name |
|---|---|
| IN | Input Signal (+) |
| C | Input Signal (COM) |
| 0 V | Power Supply |
| 24 V | |
| CH | Output Current Check (to C) |

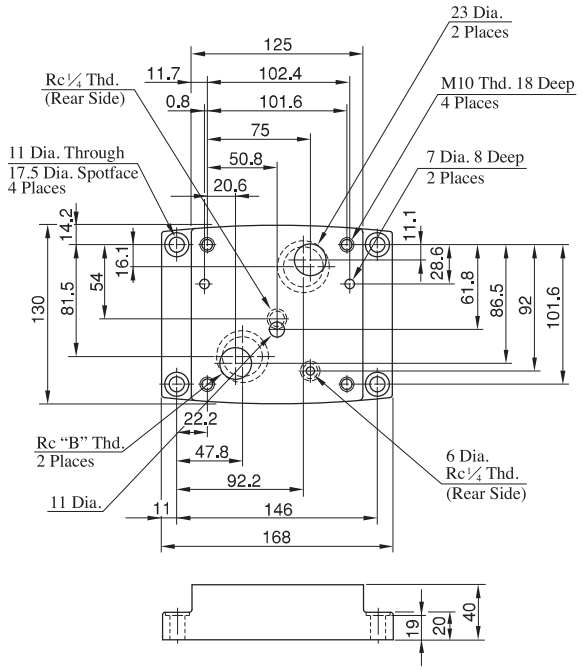
### Circuit Schematic



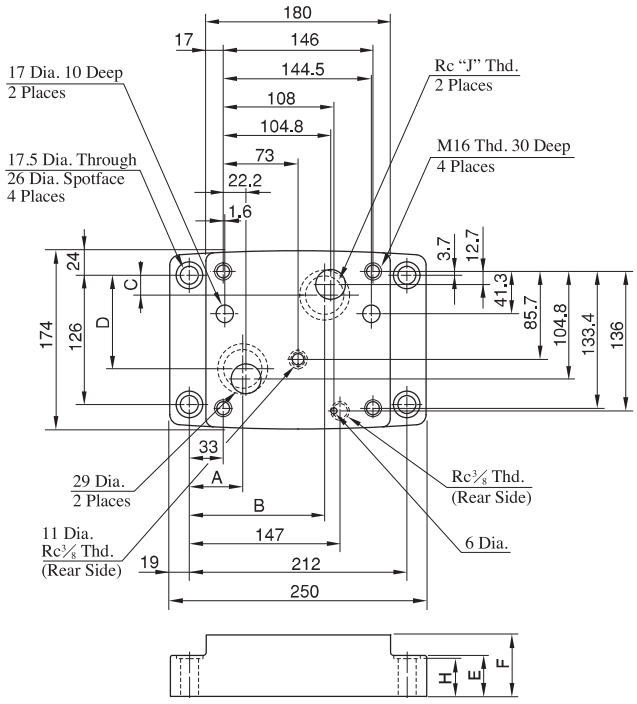

★1. For "CH" terminal, external instruments should have input impedance of more than 10 kΩ.
★2. Use shielded cable for "Input" connection. The ground of the shielded cable must be connected to input signal side.

## Sub-Plates

### EFGM-03Y, 03Z




### EFGM-06X, 06Y

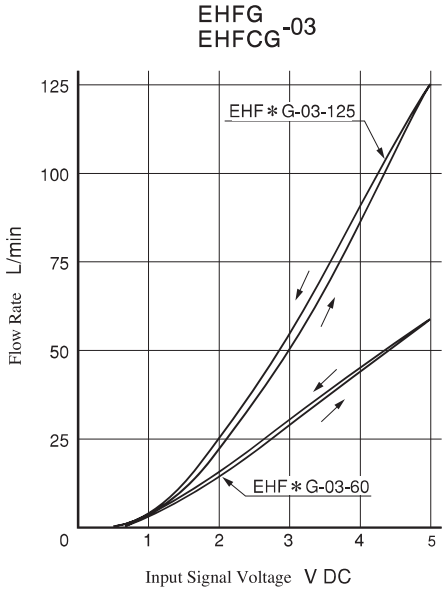


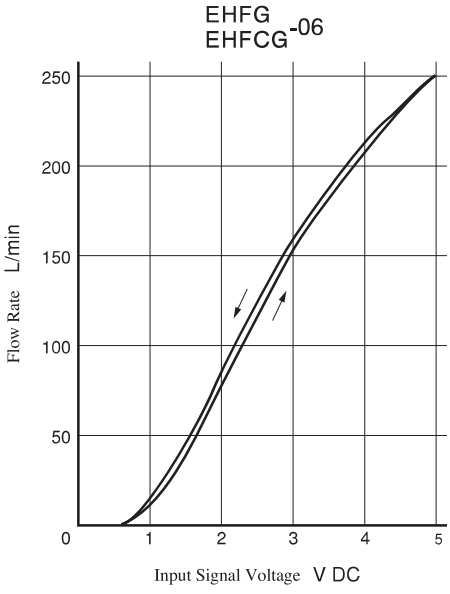

| Sub-Plate Model Numbers | B |
|---|---|
| EFGM-03Y-30 | 3/4 |
| EFGM-03Z-30 | 1 |

| Sub-Plate Model Numbers | A | B | C | D | E | F | H | J |
|---|---|---|---|---|---|---|---|---|
| EFGM-06X-30 | 55.2 | 137.8 | 14.3 | 101.1 | 35 | 45 | 34 | 1 |
| EFGM-06Y-30 | 52 | 132 | 19.3 | 91.3 | 40 | 60 | 39 | 1 1/4 |

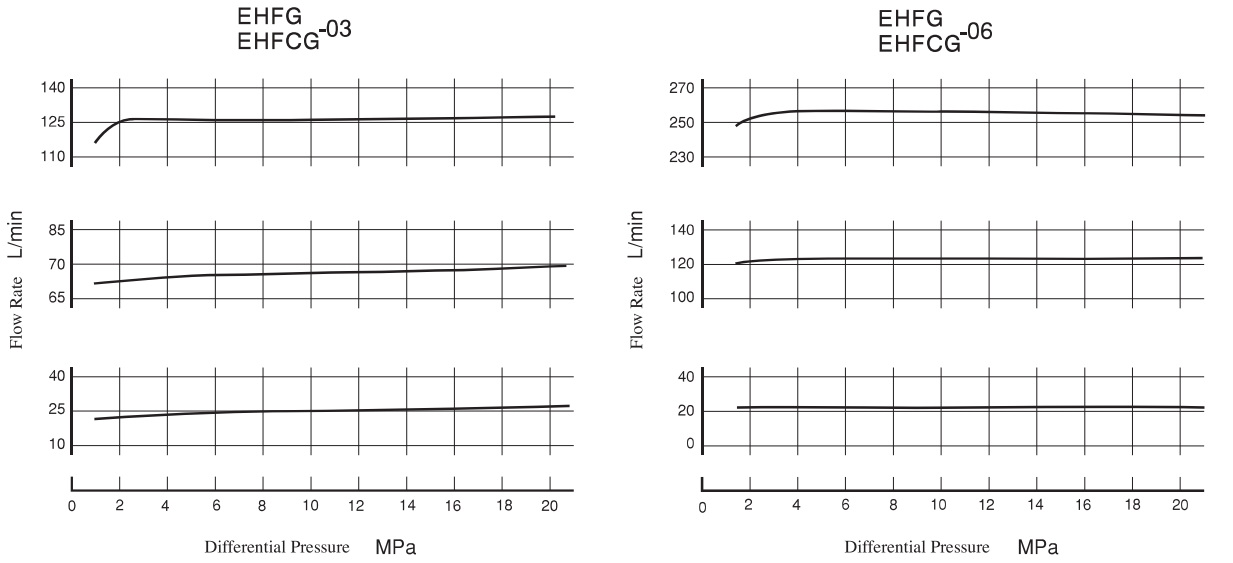
## Input Signal Voltage vs. Flow Rate

Viscosity : 30 mm²/s



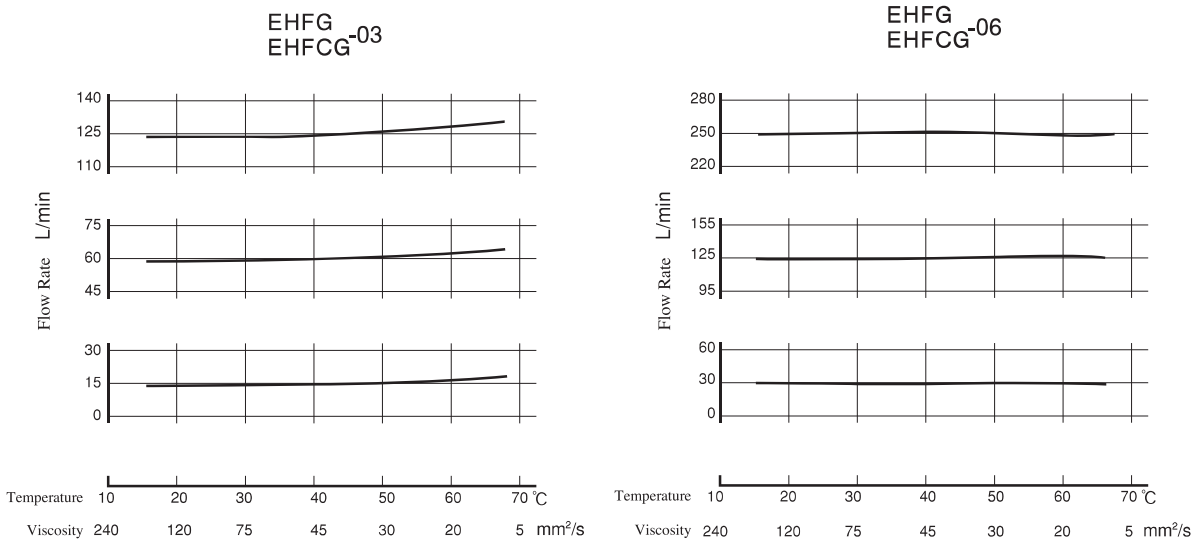



## Differential Pressure vs. Flow Rate




## Viscosity vs. Flow Rate

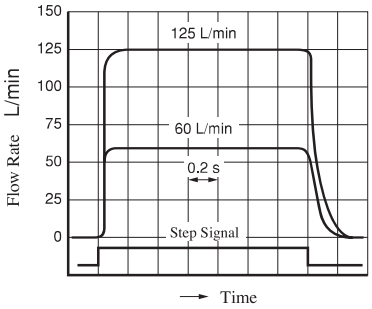
Oil : ISO VG 46 Oil



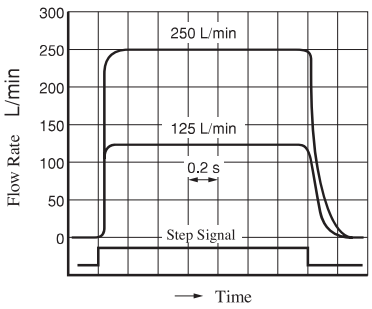
## Step Response (Example)

The step responses right are those obtained when the valve itself is tested independently. The step responses may differ from them when the valve is used in combination with other control valves.

EHFG EHFCG-03



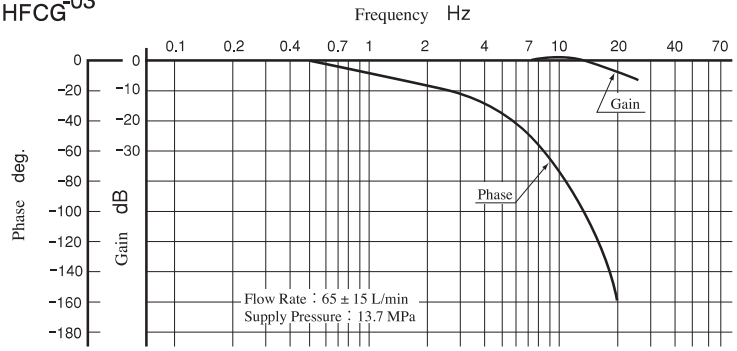

EHFG EHFCG-06



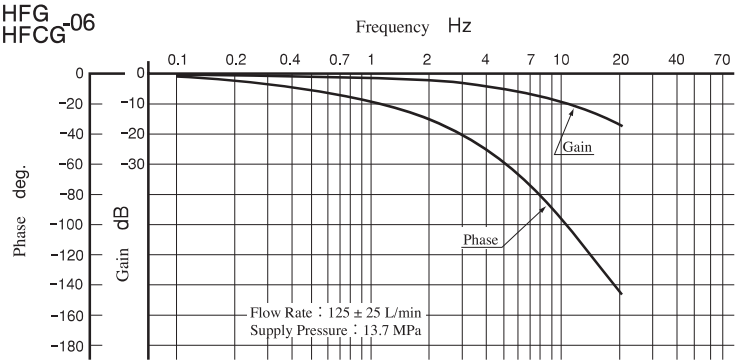

## Frequency Response

Trapped Oil Volume : 1 L
Viscosity : 30 mm $^2$/s

EHFG EHFCG-03

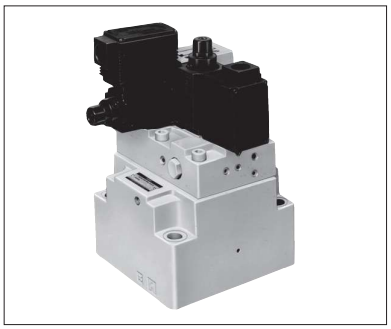


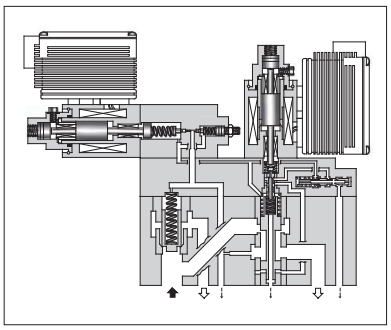

EHFG EHFCG-06



# Proportional Electro-Hydraulic Flow Control and Relief Valves

These are proportional electro-hydraulic flow control valves having functions for controlling the direct electric current of meter-in type and for pressure control.
They are energy-saving valves for supplying the minimum pressure and flow required to operate actuators.



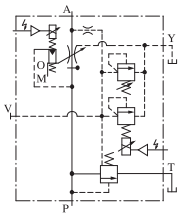


## Specifications

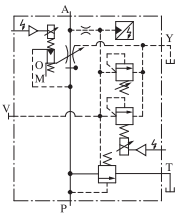
| Descriptions \ Model Numbers | | | EHFBG-03-* | EHFBG-06-250 | EHFBG-10-500 |
|---|---|---|---|---|---|
| Max. Operating Pressure MPa | | | 24.5 | 24.5 | 24.5 |
| Max. Flow L/min | | | 60 : 60<br>125 : 125 | 250 | 500 |
| Metered Flow Capacity L/min | | | 60 : 1-60<br>125 : 1-125 | 2.5-250 | 5-500 |
| Min. Pilot Pressure MPa | | | 1.5 | 1.5 | 1.5 |
| Pilot Flow L/min | | at Normal | 1 | 1 | 1 |
| | | at Transition | 3 | 4 | 6 |
| Differential Pressure MPa | | | 0.6 | 0.7 | 0.9 |
| Flow Controls | Hysteresis | | 3% or less | | |
| | Repeatability | | 1%★ or less | | |
| | Input Signal Voltage | | Max. Flow / 5 V DC | | |
| | Coil Resistance | | 10 Ω | | |
| | Supply Electric Power | | 24 V DC (21 to 28 V DC Included Ripple) | | |
| | Input Impedance | | 10 kΩ | | |
| | Power Input (Max.) | | 28 W | | |
| Pressure Controls | Pres. Adj. Range MPa | Adj. Range:C | 1.2-15.7 | 1.4-15.7 | 1.5-15.7 |
| | | Adj. Range:H | 1.4-24.5 | 1.4-24.5 | 1.5-24.5 |
| | Hysteresis | | 2% or less | | |
| | Repeatability | | 1%★ or less | | |
| | Coil Resistance | | 10 Ω | | |
| | Input Signal Voltage | | Max. Adj. Pres. / 5 V DC | | |
| | Supply Electric Power | | 24 V DC (21 to 28 V DC Included Ripple) | | |
| | Input Impedance | | 10 kΩ | | |
| | Power Input (Max.) | | 28 W | | |
| Output Signal (Sensor Monitor) | | | C : 5 V DC / 15.7 MPa<br>H : 5 V DC / 24.5 MPa | | |
| Ambient Temperature | | | 0 - 50°C<br>(With Circulated Air) | | |
| Mass | | | Refer to Pages H-38 to H-40 | | |

★1. The repeatability of the valves is obtained by having it tested independently on the conditions similar to its original testing.
★2. The specifications for pressure controls is applied to models with pilot relief valve. (Ex. EHFBG-03-125-C-*-50)
★3. Pressure adjustment range of the valves without pilot relief valves (Ex. EHFBG-03-125-*-50) is from a minimum adjustable pressure to 25 MPa.

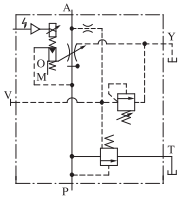
### Graphic Symbols



Models with Proportional Pilot Relief Valve



Models with Proportional Pilot Relief Valve and Sensor



Models without Proportional Pilot Relief Valve



External Pilot Pres. Connection

## Model Number Designation

| EHFB | G | -03 | -60 | -C | -E | -S | -50 |
|---|---|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Max. Metered Flow L/min | Pilot Relief Valve Pres. Adj. Range | Pilot Connection of Flow Control | Pressure Controls | Design Number |
| **EHFB**: Proportional Electro-Hydraulic Flow Control and Relief Valve | **G**: Sub-Plate Mounting | **03** | **60**<br>**125** | **None**: Without Proportional Pilot Relief Valve<br>**C, H**: See Specifications | **None**: Internal Pilot<br>**E**: External Pilot | **None**: Open-Loop<br>**S**: Open-Loop with Sensor | **50** |
| | | **06** | **250** | | | | **50** |
| | | **10** | **500** | | | | **50** |

★Phosphate ester type fluids are also supported. When phosphate ester type fluids are used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

## Accessories

### Mounting Bolts

| Model Numbers | Socket Head Cap Screw |
|---|---|
| EHFBG-03-60/125 | M10 × 65 L ····· 4 Pcs. |
| EHFBG-06-250 | M16 × 100 L ····· 4 Pcs. |
| EHFBG-10-500 | M20 × 130 L ····· 4 Pcs. |

## Sub-Plate

| Valve Model Numbers | Sub-Plate Model Numbers | Thread Size Rc | Mass kg |
|---|---|---|---|
| EHFBG-03 | EFBGM-03Y-20 | $^{3}/_{4}$ | 6 |
| | EFBGM-03Z-20 | 1 | 6 |
| EHFBG-06 | EFBGM-06X-20 | 1 | 12.5 |
| | EFBGM-06Y-20 | $1^{1}/_{4}$ | 16 |
| EHFBG-10 | EFBGM-10Y-20 | $1^{1}/_{2}$, 2Pipe Flange Mtg. | 37 |

- Sub-plates are available. Specify sub-plate model from the table left. When sub-plates are not used, the mounting surface should have a good machined finish. ($\sqrt{}$)
- EFBGM-10Y is special type sub-plate to be used with pipe flange. When ordering EFBGM-10Y specify pipe flange in addition to EFBGM-10Y. Refer to Engineering Information Catalogue.

## Instructions

### Drain Back Pressure

Check that the drain back pressure does not exceed 0.2 MPa.

### When Relief Valve Passing Flow Rate is Low in Pressure Control State

To avoid preselected pressure instability, use a passing flow rate of 15 L/min or higher.

Further, check that the tank-side back pressure does not exceed 0.5 MPa.

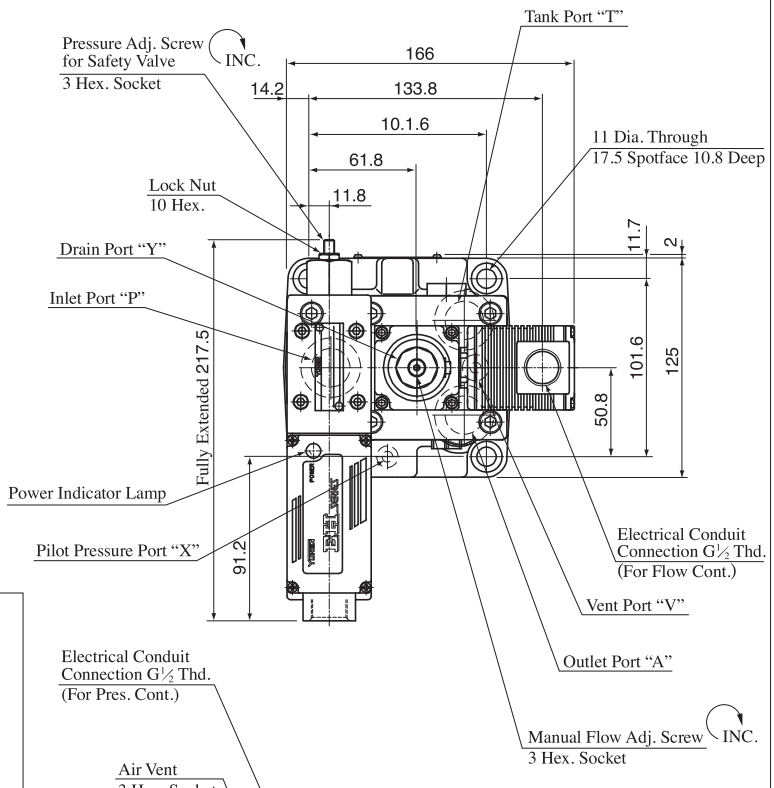
### Safety Valve Pressure Setting

The safety valve is preset to a pressure that is 2 MPa higher than the maximum adjustment pressure.

Therefore, adjust this pressure setting as needed to suit the pressure used.

To lower the pressure setting, turn the safety valve pressure adjustment screw anti-clockwise. After adjustment, be sure to tighten the lock nut.

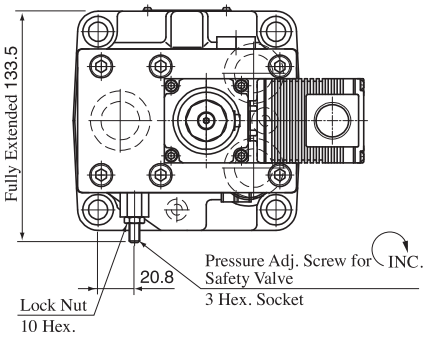
## EHFBG-03-$\frac{60}{125}$-$\frac{C}{H}$(-E)-＊-50

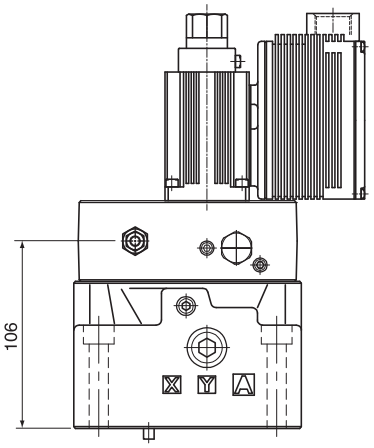



Mass ····· 17 kg

(Models with Sensor····· 17.7 kg)

## EHFBG-03-$\frac{60}{125}$(-E)-50

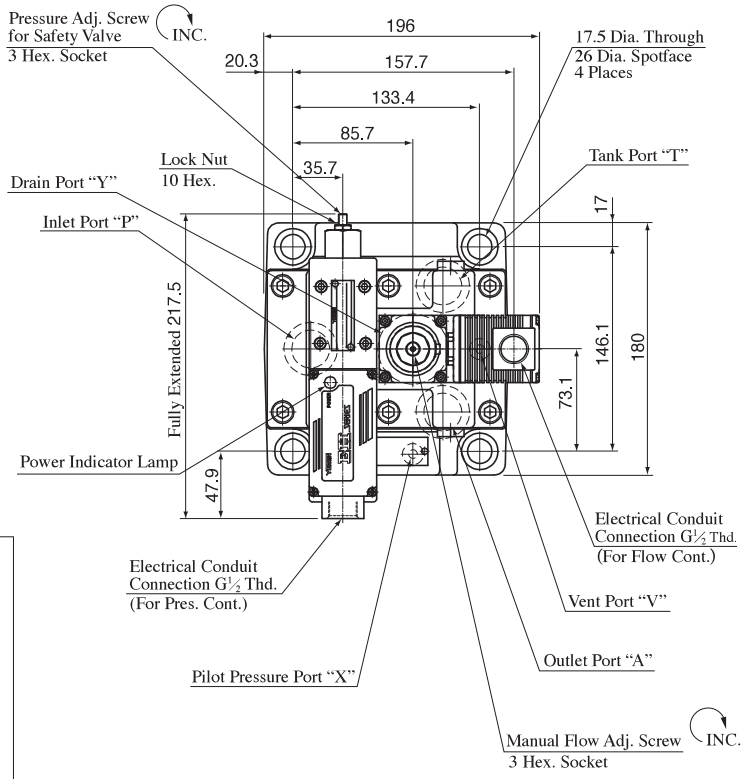


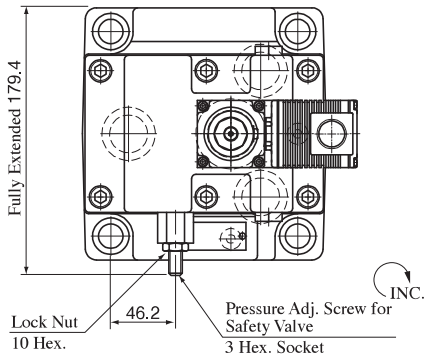

For other dimensions, refer to right drawing.

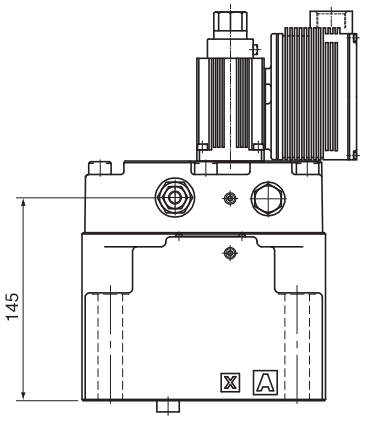
Mass ····· 14.8 kg

## EHFBG-06-250-$\frac{C}{H}$(-E)-＊-50



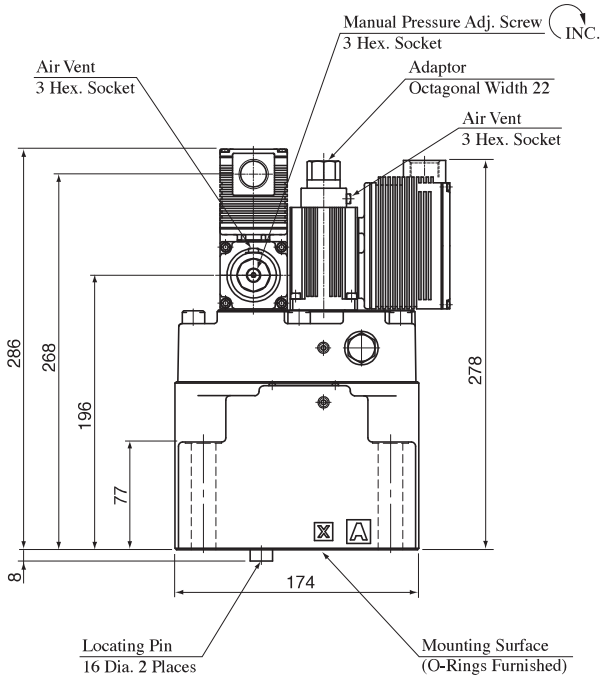

## EHFBG-06-250(-E)-50




For other dimensions, refer to right drawing.

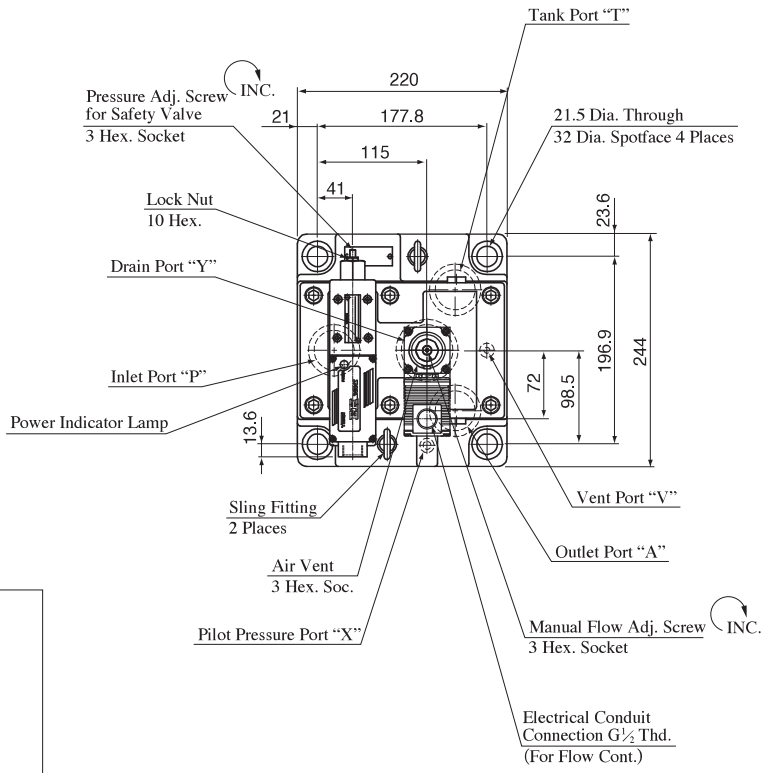
Mass …… 21.8 kg



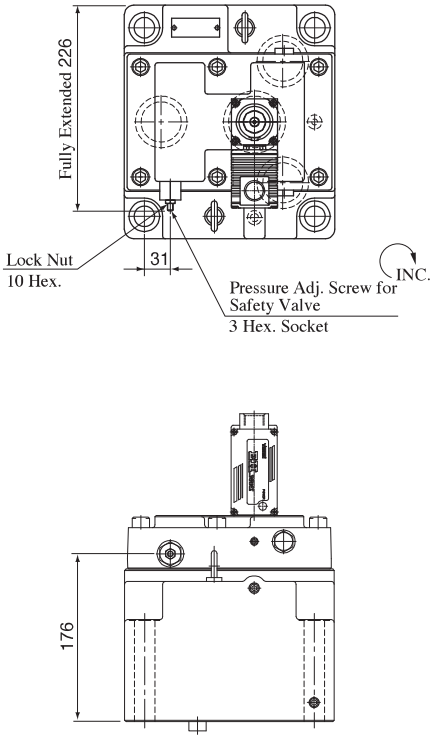

Mass …… 24 kg

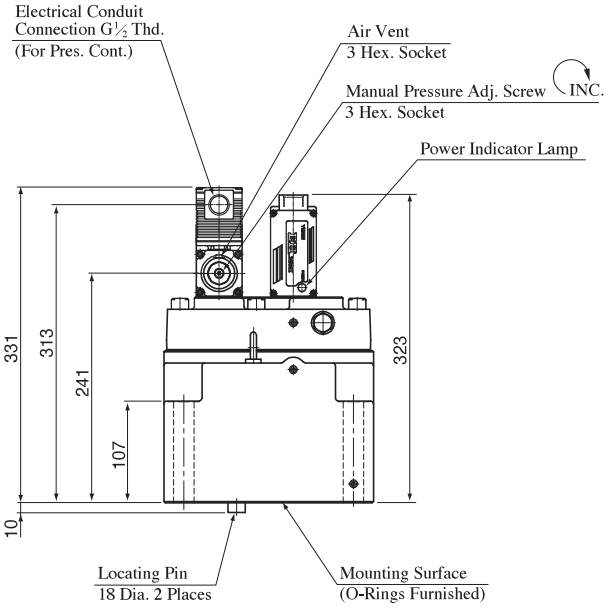
(Models with Sensor…… 24.7 kg)

## EHFBG-10-500-$\frac{C}{H}$(-E)-＊-50




## EHFBG-10-500(-E)-50




For other dimensions, refer to right drawing.

Mass ····· 61.8 kg

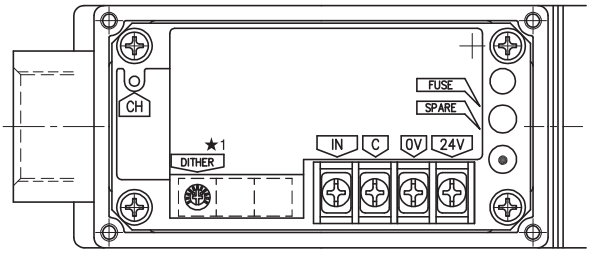
Mass····· 64 kg

(Models with Sensor····· 64.7 kg)

## Detail of Amplifier

### Connecting Terminal

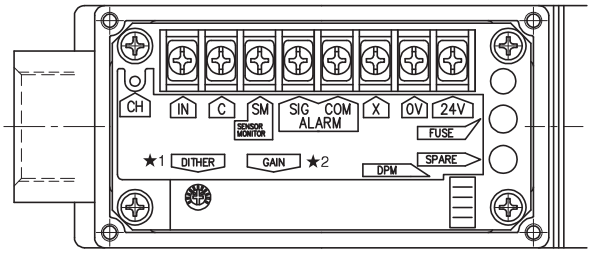
- Flow Control
- Pressure Controls···Open-Loop Type




| Terminal | Name |
|---|---|
| IN | Input Signal (+) |
| C | Input Signal (COM) |
| 0 V | Power Supply |
| 24 V | |
| CH | Output Current Check (to C) |

★1. DITHER
Use as they are since they are factory-preset to the optimum position. (Do not touch them in normal condition.)
★2. GAIN
GAIN adjusting volume is not available.

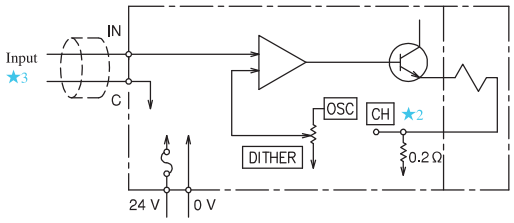
- Pressure Controls···Open-Loop Type with Sensor



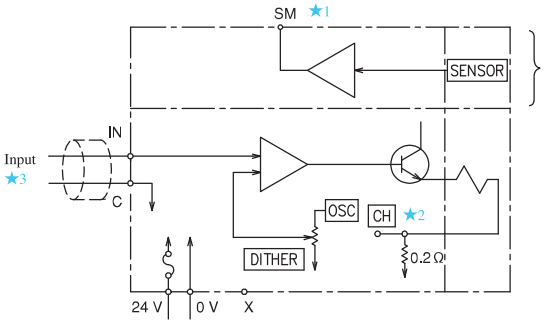

| Terminal | | Name |
|---|---|---|
| IN | | Input Signal (+) |
| C | | Input Signal (COM) |
| SM | | Sensor Monitor (to C) |
| ALARM | SIG | (Open) |
| | COM | |
| X | | (Open) |
| 0 V | | Power Supply |
| 24 V | | |
| CH | | Output Current Check (to C) |

### Circuit Schematic

- Flow Controls




- Pressure Controls

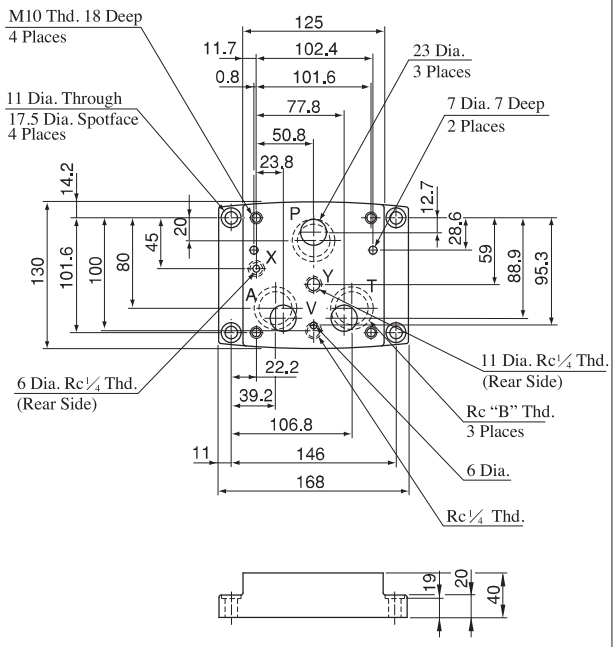



Available for the models with pres. controls " S"

★1. For "SM" terminal, external instruments should have input impedance of more than 10 kΩ.
★2. For "CH" terminal, external instruments should have input impedance of more than 10 kΩ.
★3. Use shielded cable for "Input" connection. The ground of the shielded cable must be connected to input signal side.

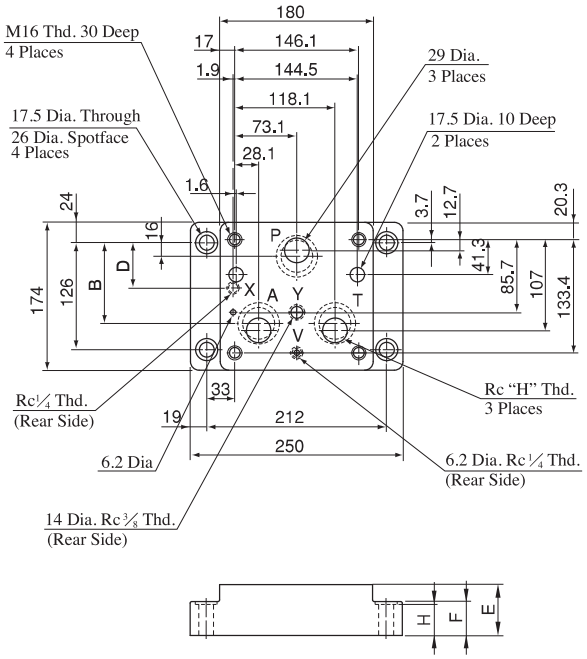
## Sub-Plate

### EFBGM-03Y -20 / 03Z -20



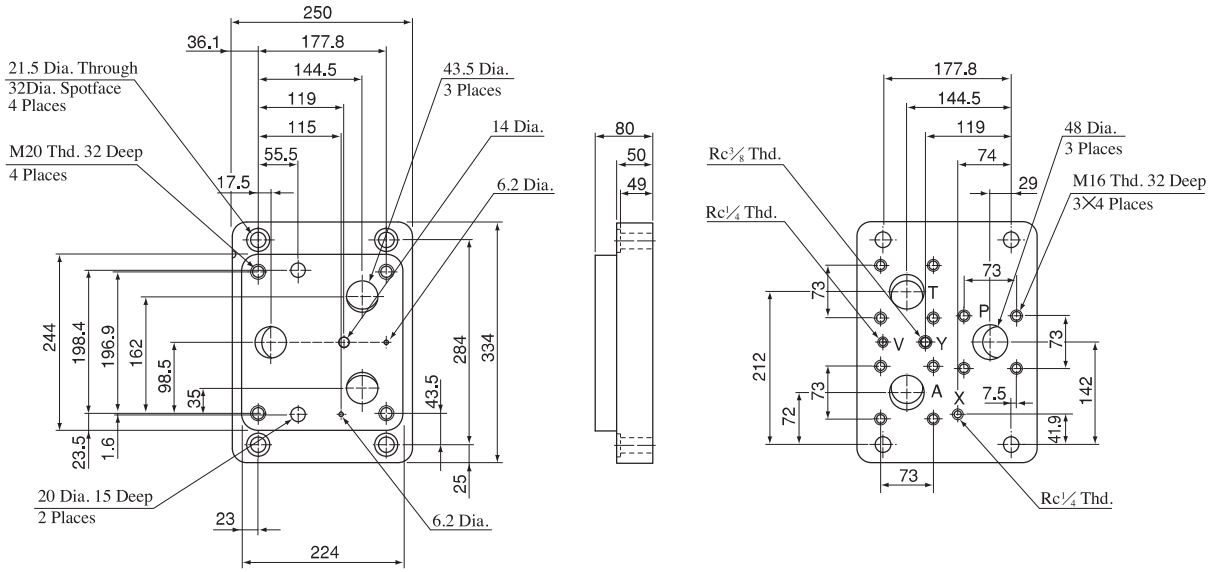

| Sub-Plate Model Numbers | B |
|---|---|
| EFBGM-03Y-20 | 3/4 |
| EFBGM-03Z-20 | 1 |

### EFBGM-06X -20 / 06Y -20




| Sub-Plate Model Numbers | B | D | E | F | H |
|---|---|---|---|---|---|
| EFBGM-06X-20 | 107 | 67 | 45 | 35 | 1 |
| EFBGM-06Y-20 | 95 | 57 | 60 | 40 | 1 1/4 |

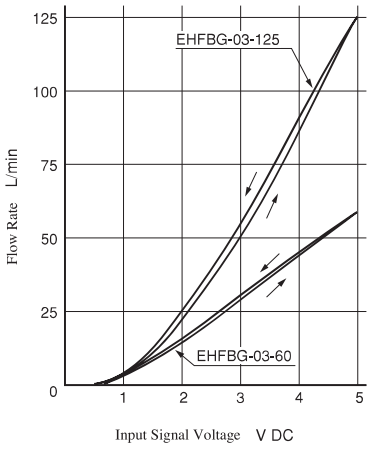
### EFBGM-10Y-20



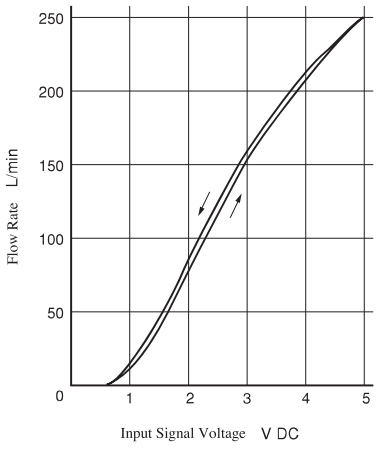
## Input Signal Voltage vs. Flow

Viscosity : 30 mm²/s

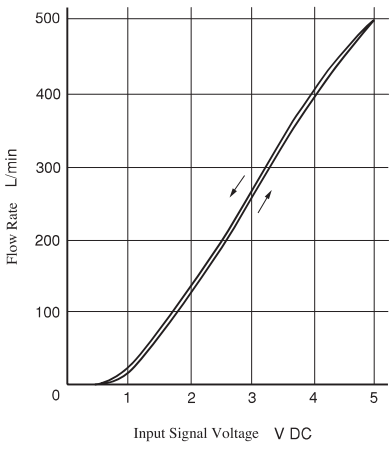
EHFBG-03




EHFBG-06




EHFBG-10

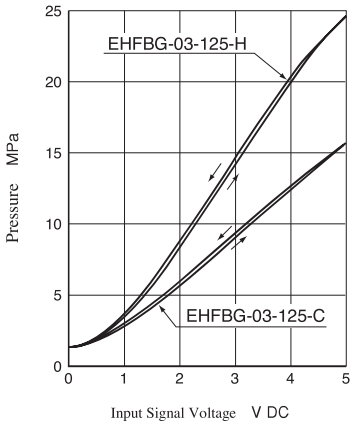



## Input Signal Voltage vs. Pressure

Viscosity : 30 mm²/s

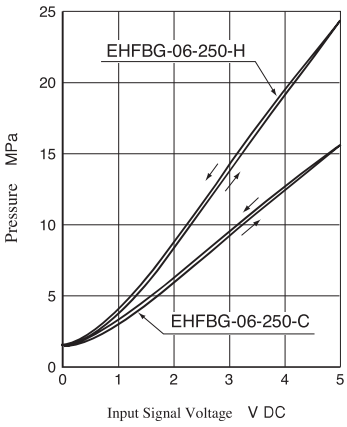
EHFBG-03

Flow Rate : 125 L/min



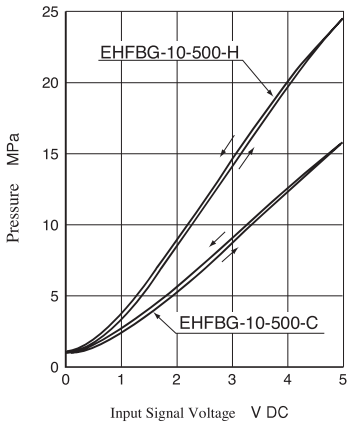

EHFBG-06

Flow Rate : 250 L/min




EHFBG-10

Flow Rate : 500 L/min

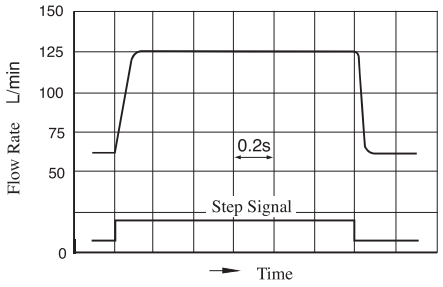


## Step Response (Flow Controls)

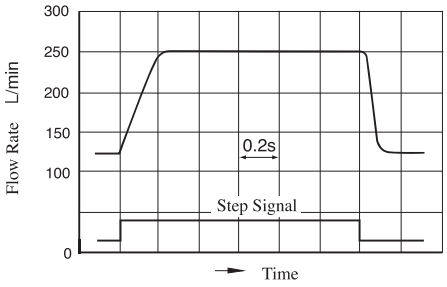
Viscosity : 30 mm²/s

The step responses below are those obtained when the valve itself is tested independently.
The step responses may differ from them when the valve is used in combination with other control valves.

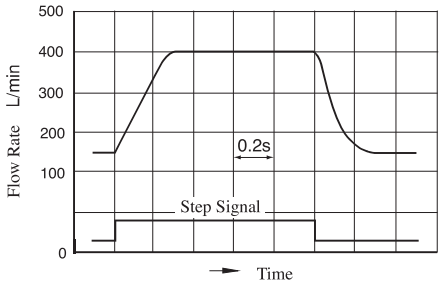
EHFBG-03




EHFBG-06




EHFBG-10

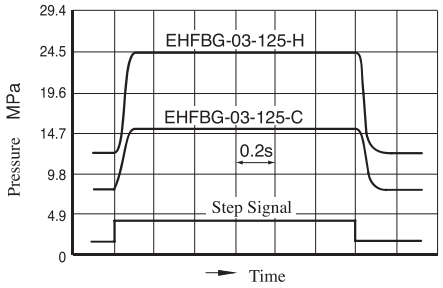



## Step Response (Pressure Controls)

Viscosity : 30 mm²/s

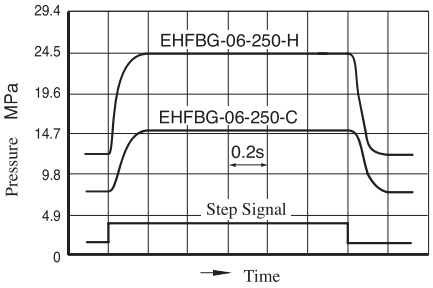
The step responses below are those obtained when the valve itself is tested independently.
The step responses may differ from them when the valve is used in combination with other control valves.

EHFBG-03



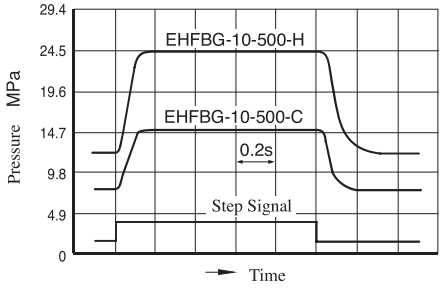

Flow Rate : 125 L/min
Trapped Oil Volume : < 1 L

EHFBG-06




Flow Rate : 250 L/min
Trapped Oil Volume : < 1 L

EHFBG-10

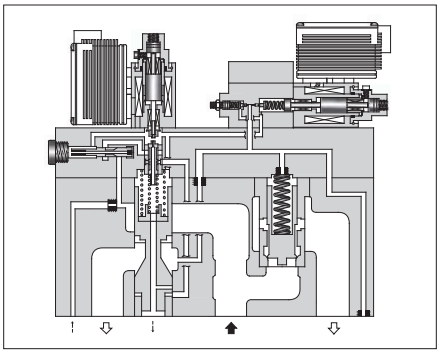



Flow Rate : 500 L/min
Trapped Oil Volume : < 1 L

# High Flow Series
# Proportional Electro-Hydraulic Flow Control and Relief Valves

This flow control and relief valve is a energy-saving valve that supplies the minimum pressure and flow necessary for actuator drive.
For the High Flow Series, double maximum flow rate [03 size: 125 → 250 L/min, 06 size: 250 → 500 L/min] enables a smaller valve size than conventional products; compact-sized devices can be provided.



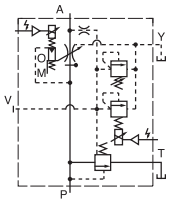


## Specifications

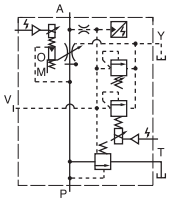
| Descriptions \ Model Numbers | | | EHFBG-03-250 | EHFBG-06-500 |
|---|---|---|---|---|
| Max. Operating Pressure | | MPa | 24.5 | 24.5 |
| Max. Flow | | L/min | 250 | 500 |
| Metered Flow Capacity | | L/min | 2.5-250 | 5-500 |
| Min. Pilot Pressure | | MPa | 1.5 | 1.5 |
| Pilot Flow L/min | at Normal | | 1 | 1 |
| | at Transition | | 4 | 6 |
| Differential Pressure | | MPa | 0.8 | 0.9 |
| Flow Controls | Hysteresis | | 3% or less | |
| | Repeatability | | 1%★ or less | |
| | Input Signal Voltage | | Max. Flow / 5 V DC | |
| | Coil Resistance | | 10 Ω | |
| | Supply Electric Power | | 24 V DC (21 to 28 V DC Included Ripple) | |
| | Input Impedance | | 10 kΩ | |
| | Power Input (Max.) | | 28 W | |
| Pressure Controls | Pres. Adj. Range MPa | Adj. Range:C | 1.6-15.7 | 1.5-15.7 |
| | | Adj. Range:H | 1.8-24.5 | 1.5-24.5 |
| | Hysteresis | | 3% or less | |
| | Repeatability | | 1%★ or less | |
| | Coil Resistance | | 10 Ω | |
| | Input Signal Voltage | | Max. Adj. Pres. / 5 V DC | |
| | Supply Electric Power | | 24 V DC (21 to 28 V DC Included Ripple) | |
| | Input Impedance | | 10 kΩ | |
| | Power Input (Max.) | | 28 W | |
| Output Signal (Sensor Monitor) | | | C : 5 V DC / 15.7 MPa<br>H : 5 V DC / 24.5 MPa | |
| Ambient Temperature | | | 0 - 50°C (With Circulated Air) | |
| Mass | | | Refer to Pages H-47 to H-48 | |

★1. The repeatability of the valves is obtained by having it tested independently on the conditions similar to its original testing.
★2. The specifications for pressure controls is applied to models with pilot relief valve. (Ex. EHFBG-03-125-C-＊-50)
★3. Pressure adjustment range of the valves without pilot relief valves (Ex. EHFBG-03-250-＊-50) is from a minimum adjustable pressure to 24.5 MPa.

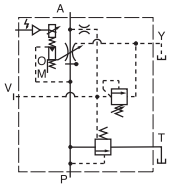
### Graphic Symbols



Models with Proportional Pilot Relief Valve



Models with Proportional Pilot Relief Valve and Sensor



Models without Proportional Pilot Relief Valve



External Pilot Pres. Connection

## Model Number Designation

| EHFB | G | -03 | -250 | -C | -E | -S | -50 |
|---|---|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Max. Metered Flow L/min | Pilot Relief Valve Pres. Adj. Range | Pilot Connection of Flow Control | Pressure Controls | Design Number |
| **EHFB**: Proportional Electro-Hydraulic Flow Control and Relief Valve | **G**: Sub-Plate Mounting | **03** | **250** | **None**: Without Proportional Pilot Relief Valve<br>**C, H**: See Specifications | **None**: Internal Pilot<br>**E**: External Pilot | **None**: Open-Loop<br>**S**: Open-Loop with Sensor | **50** |
| | | **06** | **500** | | | | **50** |

★Phosphate ester type fluids are also supported. When phosphate ester type fluids are used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

## Accessories

### Mounting Bolts

| Model Numbers | Socket Head Cap Screw |
|---|---|
| EHFBG-03-250 | M12 × 120 L ····· 4 Pcs. |
| EHFBG-06-500 | M16 × 120 L ····· 4 Pcs. |

## Instructions

### Drain Back Pressure

Check that the drain back pressure does not exceed 0.2 MPa.

### When Relief Valve Passing Flow Rate is Low in Pressure Control State

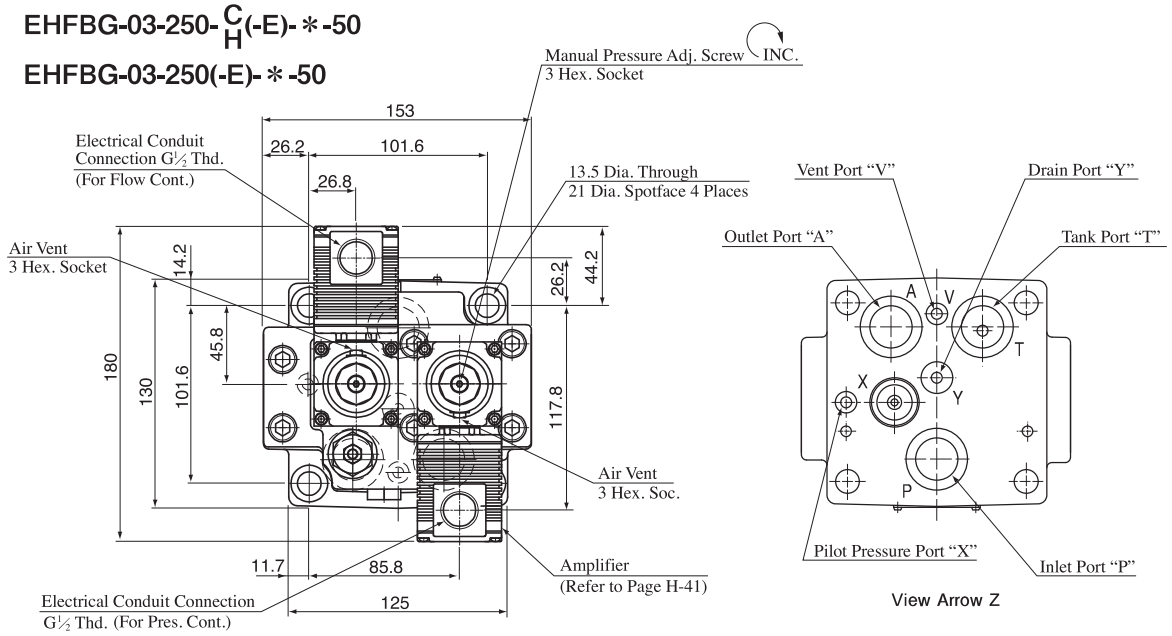
To avoid preselected pressure instability, use a passing flow rate of 15 L/min or higher.
Further, check that the tank-side back pressure does not exceed 0.5 MPa.

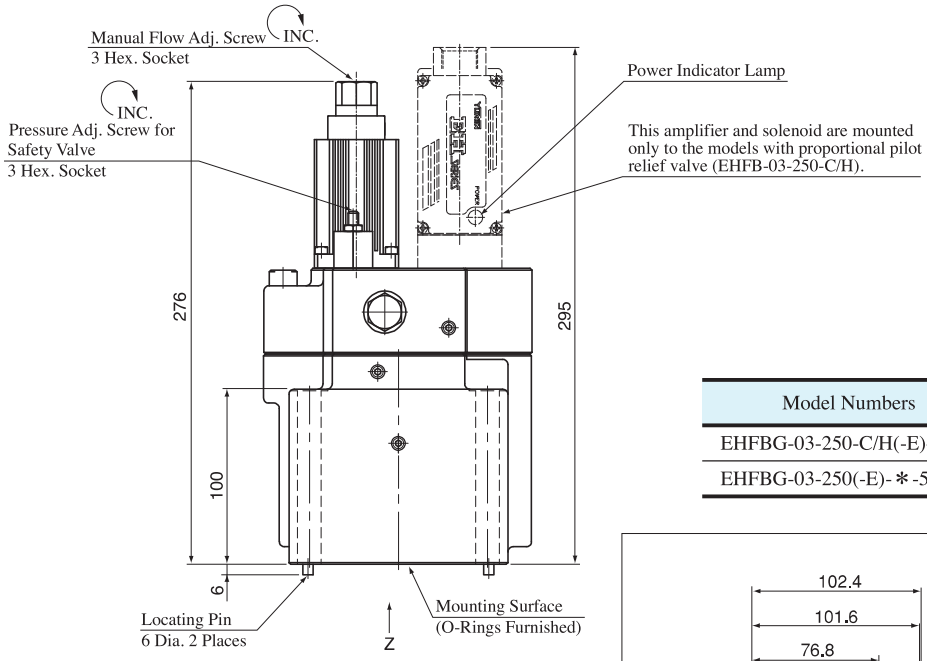
### Safety Valve Pressure Setting

The safety valve is preset to a pressure that is 2 MPa higher than the maximum adjustment pressure.
Therefore, adjust this pressure setting as needed to suit the pressure used.
To lower the pressure setting, turn the safety valve pressure adjustment screw anti-clockwise. After adjustment, be sure to tighten the lock nut.

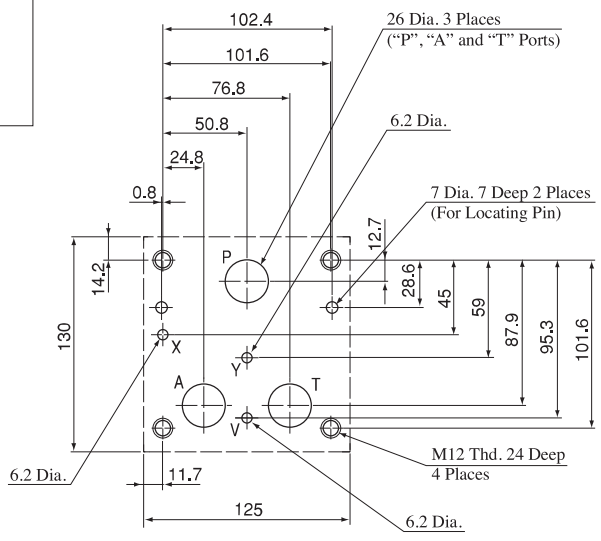
## EHFBG-03-250-$\frac{C}{H}$(-E)-＊-50

## EHFBG-03-250(-E)-＊-50




| Model Numbers | Mass |
|---|---|
| EHFBG-03-250-C/H(-E)-＊-50 | 19 kg |
| EHFBG-03-250(-E)-＊-50 | 17.4 kg |



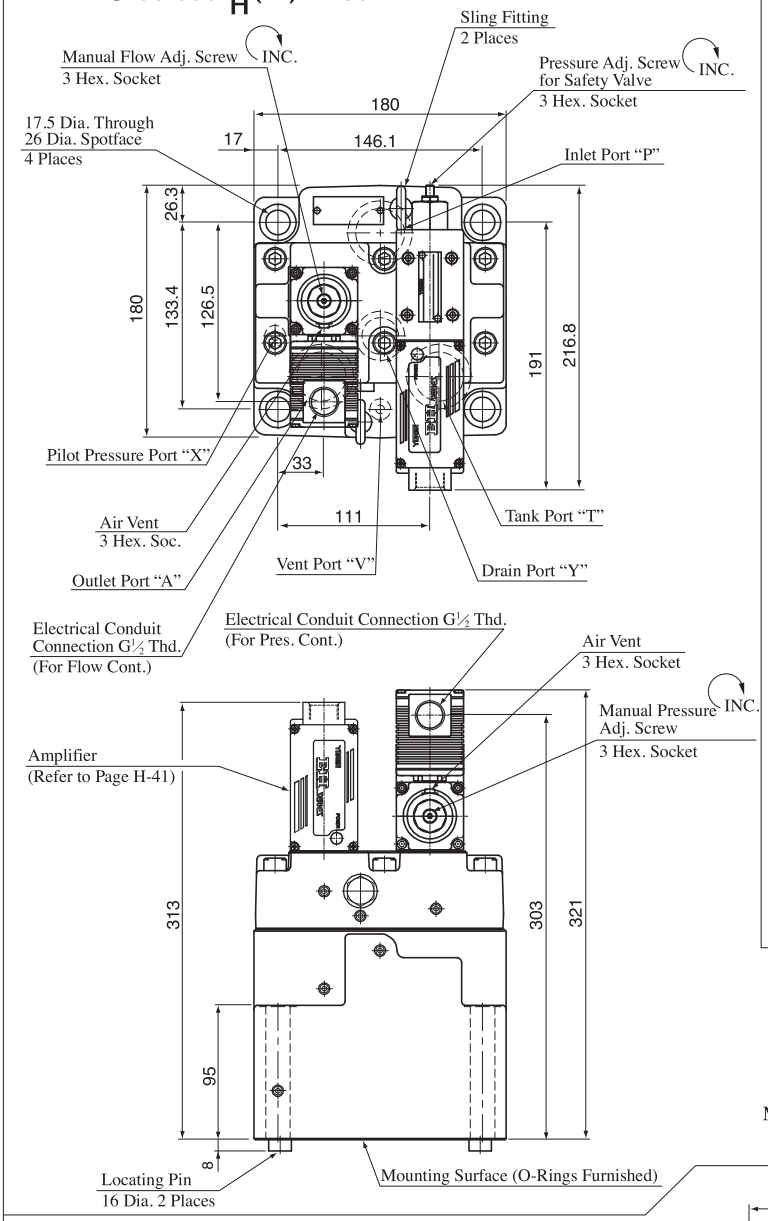

### Dimensions of Valve Mounting Surface

Prepare the mounting surface as shown on the right.
It should be fine finished.

### Mounting Interchangeability with Conventional Models

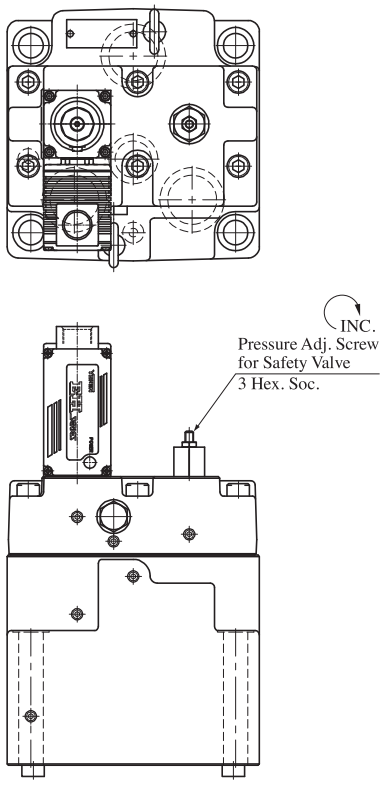
The high flow models are not interchangeable in mounting with the conventional models.

## EHFBG-06-500-$\frac{C}{H}$(-E)-＊-50




Mass ····· 36 kg

## EHFBG-06-500(-E)-＊-50

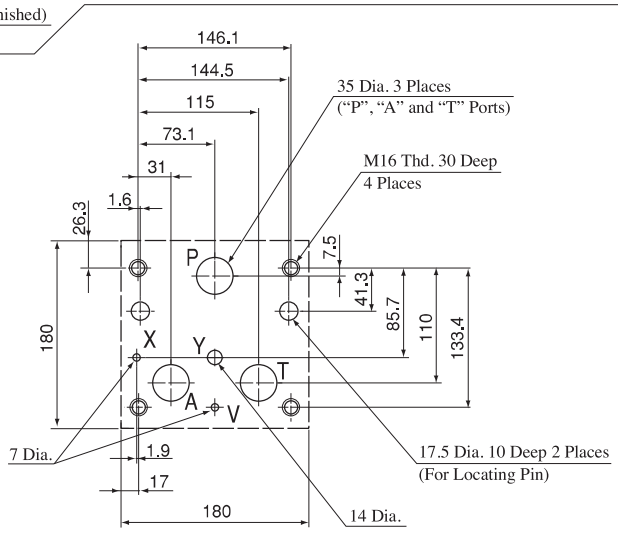



Mass ····· 33.8 kg

For other dimensions, refer to left drawing.

### Dimensions of Valve Mounting Surface

Prepare the mounting surface as shown on the right.
It should be fine finished.



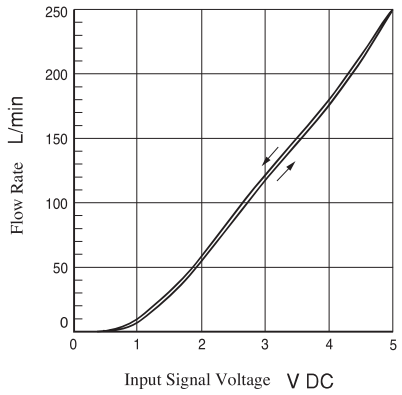

### Mounting Interchangeability with Conventional Models

A valve in the high-flow series can be mounted on the mounting surface for a conventional valve.
(Conventional valve : EHFBG-06-250 cannot be mounted on a mounting surface for the high-flow series.)

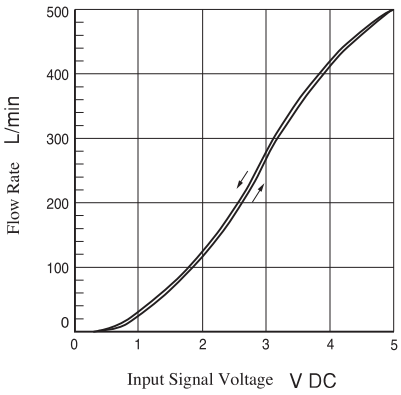
## Input Signal Voltage vs. Flow

Viscosity : 30 mm²/s

EHFBG-03-250



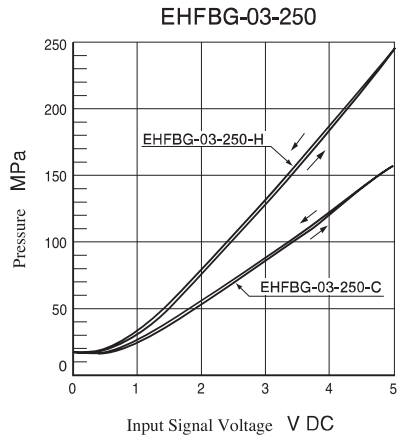

EHFBG-06-500



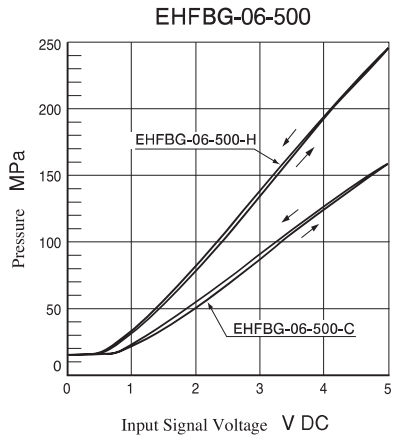

## Input Signal Voltage vs. Pressure

Viscosity : 30 mm²/s

EHFBG-03-250




EHFBG-06-500

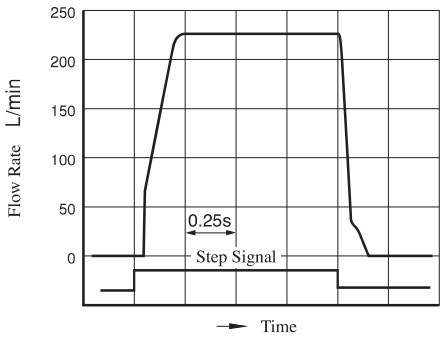


## Step Response (Flow Controls)

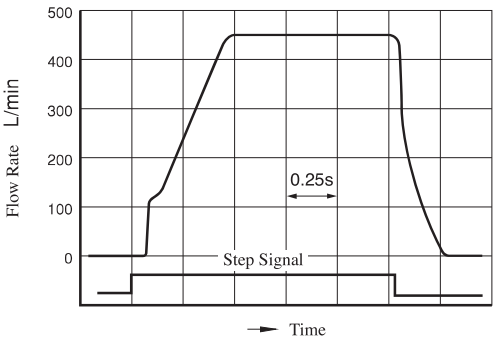
The step responses below are those obtained when the valve itself is tested independently.
The step responses may differ from them when the valve is used in combination with other control valves.

Viscosity : 30 mm²/s

EHFBG-03-250




EHFBG-06-500

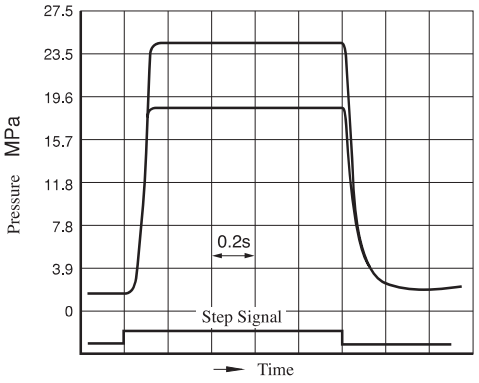



## Step Response (Pressure Controls)

The step responses below are those obtained when the valve itself is tested independently.
The step responses may differ from them when the valve is used in combination with other control valves.

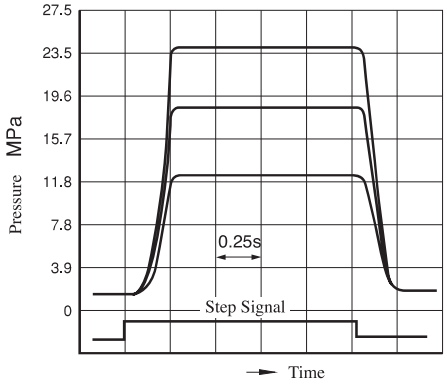
Viscosity : 30 mm²/s

EHFBG-03-250-H




Flow Rate : 250 L/min
Trapped Oil Volume : < 1 L

EHFBG-06-500-H

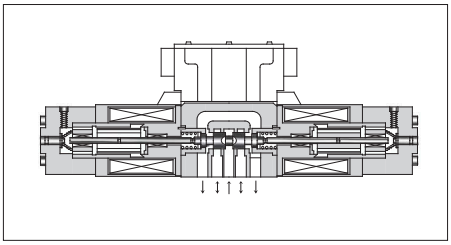



Flow Rate : 500 L/min
Trapped Oil Volume : < 6 L

# Proportional Electro-Hydraulic Directional and Flow Control Valves

These valves incorporate two control functions - flow and direction - which simplify the hydraulic circuit composition and therefore the cost of the system is reduced.





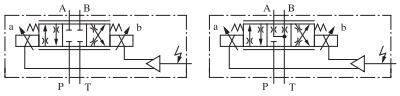
## Specifications

| Descriptions \ Model Numbers | | EHDFG-01 | EHDFG-03 |
|---|---|---|---|
| Max. Operating Pressure MPa | | 25 | 25 |
| Max. Tank Line Back Pres. MPa | | 7 | 7 |
| Rated Flow L/min [Valve ⊿P 7 MPa] | | 30 | 60 |
| Hysteresis | | 5% or less | |
| Repeatability | | 1%★ or less | |
| Frequency Response | | 20 (Phase: -90°) | 17 (Phase: -90°) |
| Coil Resistance | | 10.5 Ω | 8.0 Ω |
| Supply Electric Power | | 24 V DC (21 to 28 V DC Included Ripple) | |
| Input Signal Voltage | By Controlling Variable Resistance (Using of Power from Amp.) | 1 - 2 kΩ Volume Range | |
| | By Controlling Voltage (Using of Power outside Amp.) | 0 - –5 V for SOL a<br>0 - +5 V for SOL b | |
| Input Impedance | | 10 kΩ | 10 kΩ |
| Power Input (Max.) | | 40 W | 45 W |
| Ambient Temperature | | 0 - 50°C (With Circulated Air) | |
| Mass | | 3.0 kg | 9.2 kg |

★The repeatability of the valves is obtained by having it tested independently on the conditions similar to its original testing.

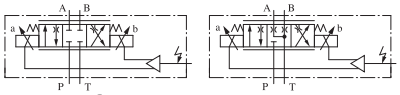
### Graphic Symbols

● Meter-in • Meter-out Control



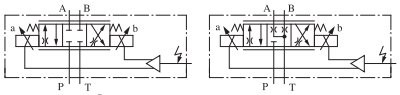
3C2 3C40

● Meter-out Control



3C2 3C40

● Meter-in Control



3C2 3C40

## Model Number Designation

| EHDF | G | -01 | -30 | -3C2 | -E | -30 |
|---|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Rated Flow L/min | Spool Type★ | Direction of Flow | Design Number |
| **EHDF**: Proportional Electro-Hydraulic Directional and Flow Control Valve | **G**: Sub-Plate Mounting | **01** | **30** | **3C2** | **XY** : Meter-in · Meter-out | **30** |
| | | **03** | **60** | **3C40** | **X** : Meter-in<br>**Y** : Meter-out | **30** |

★1. Spool type shown under the neutral position.
★2. Phosphate ester type fluids are also supported. When phosphate ester type fluids are used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

## Accessories

● Mounting Bolts

| Model Numbers | Socket Head Cap Screw |
|---|---|
| EHDFG-01 | M5×45 L ····· 4 Pcs. |
| EHDFG-03 | M6×35 L ····· 4 Pcs. |

## Sub-Plate

| Valve Model Numbers | Sub-Plate Model Numbers | Thread Size Rc | Mass kg |
|---|---|---|---|
| EHDFG-01 | DSGM-01-31★ | 1/8 | 0.8 |
| | DSGM-01X-31★ | 1/4 | |
| | DSGM-01Y-31★ | 3/8 | |
| EHDFG-03 | DSGM-03-40 | 3/8 | 3 |
| | DSGM-03X-40 | 1/2 | |
| | DSGM-03Y-40 | 3/4 | 4.7 |

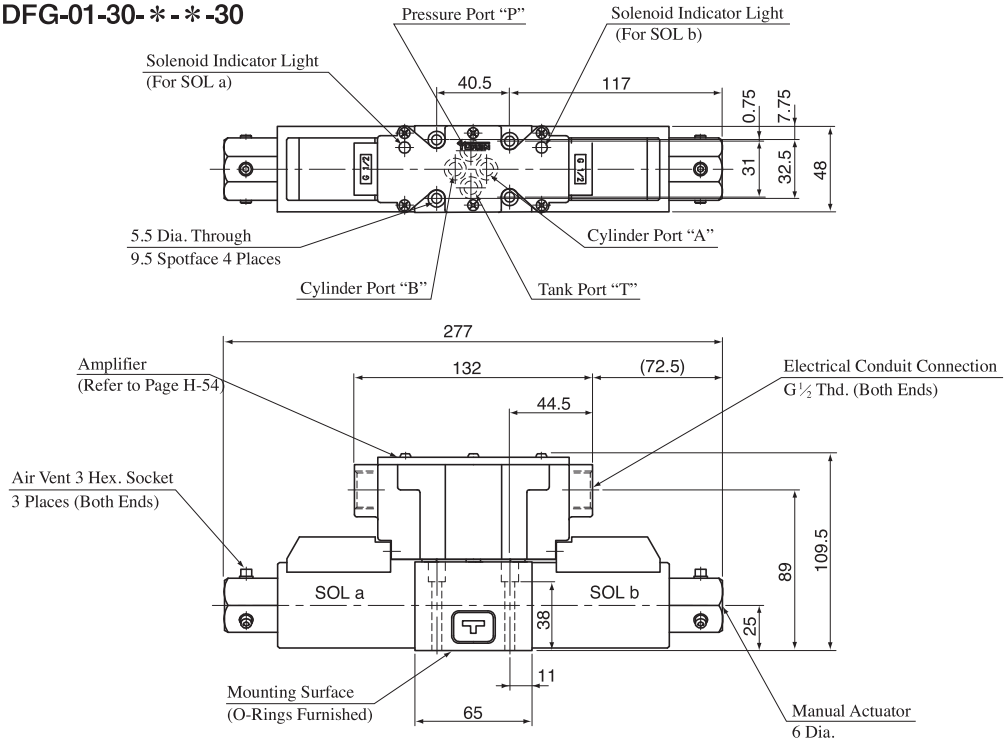
★ Refer to Page H-8.

●Sub-plates are available. Specify sub-plate model from the table left. When sub-plates are not used, the mounting surface should have a good machined finish. (▽)

## Instructions

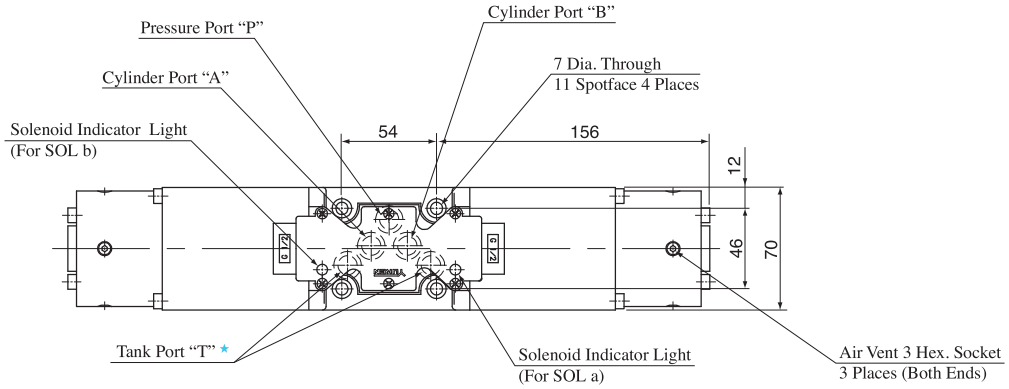
Take care of filling the valve tank port with the hydraulic oil at any time.
However, check valve with cracking pressure 0.04 MPa approx. shall be provided as required.
The pipe from the tank port should be connected to the reservoir directly and the end of the pipe must always be in the oil.

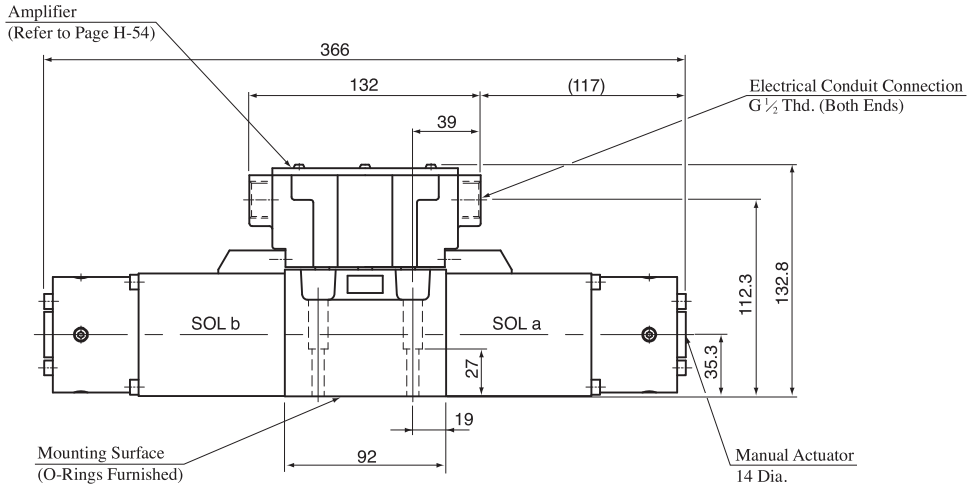
### EHDFG-01-30-＊-＊-30




Note : Sub-plate is common to that of EHDG-01.
Refer to page H-8 for the dimensions of mounting surface.

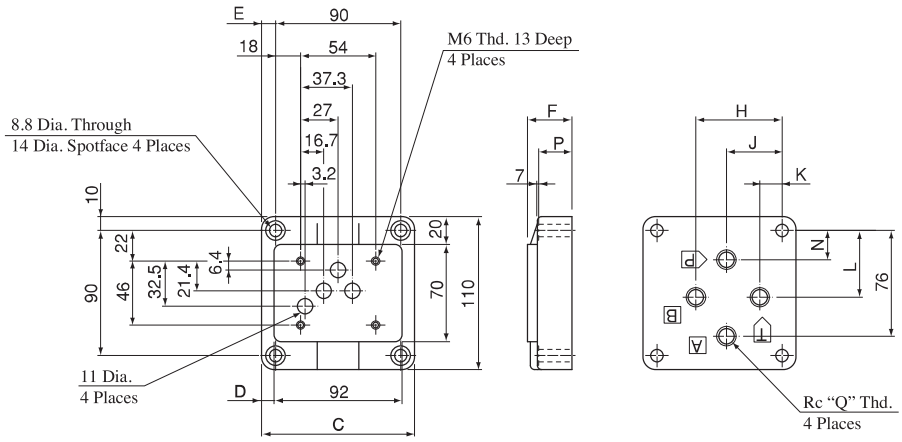
## EHDFG-03-60-＊-＊-30




★Of the two of tank port "T', the tank port in the left side is normally used in our standard sub-plate, though, either side of the tank port "T" can be used without problem.

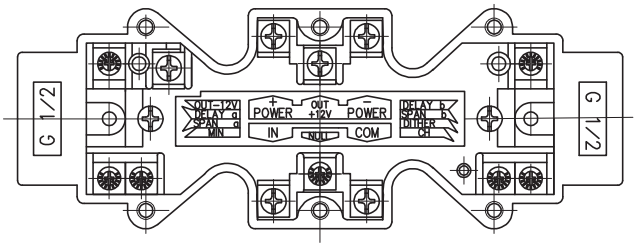
## Sub-Plates




| Sub-Plate Model Numbers | C | D | E | F | H | J | K | L | N | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DSGM-03-40 | 110 | 9 | 10 | 32 | 62 | 40 | 16 | 48 | 21 | 24 | 3/8 |
| DSGM-03X-40 | | | | | | | | | | | 1/2 |
| DSGM-03Y-40 | 120 | 14 | 15 | 50 | 80 | 45 | 10 | 47 | 16 | 42 | 3/4 |

## Detail of Amplifier

### Connecting Terminal

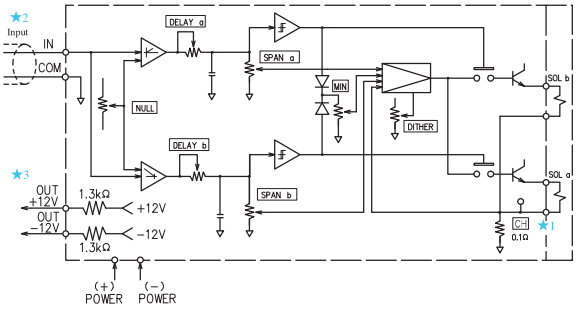



| Terminal | Name |
|---|---|
| POWER ＋ | 24V DC Power Supply |
| POWER － | |
| IN | Input Signal |
| COM | Input Signal (COM) |
| OUT ＋12V | Internal Voltage Output ＋12V |
| OUT －12V | Internal Voltage Output －12V |
| CH | Output Current Check (to COM) |

★1 DITHER / SPAN / NULL / MIN
Use as they are since they are factory-preset to the optimum position. (Do not touch them in normal condition.)

★2 DELAY
The adjusting volume is set to minimum at shipping. Set a delay time according to the machine conditions.

### Circuit Schematic



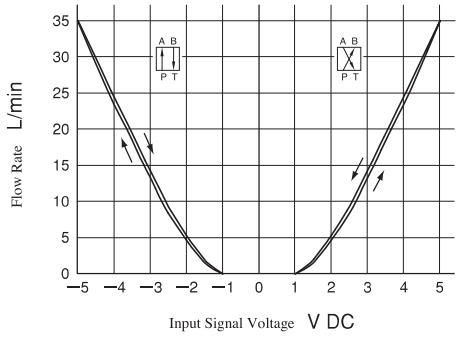

★1. For “CH” terminal, external instruments should have input impedance of more than 10 kΩ.

★2. Use shielded cable for “Input” connection.
The ground of shielded cable must be connected to input signal side.

★3. Internal output voltage ±12V terminal is used when input signal voltage is controlled by variable resister. Volume of 1 kΩ - 2 kΩ should be used.

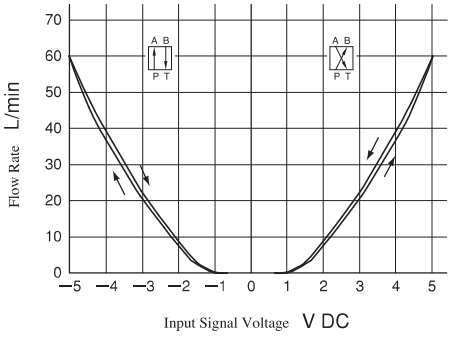
## Input Signal Voltage vs Flow

EHDFG-01




Viscosity : 30 mm²/s
Valve Pres. Difference : 3.4 MPa

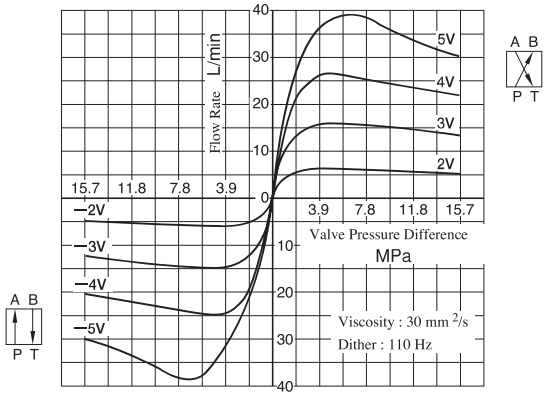
EHDFG-03



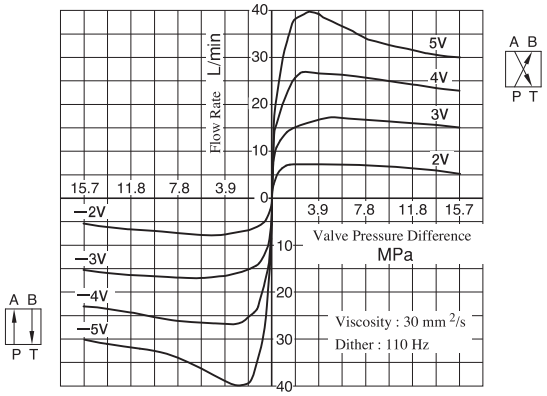

Viscosity : 30 mm²/s
Valve Pres. Difference : 3.4 MPa

## Differential Pressure vs. Metered Flow

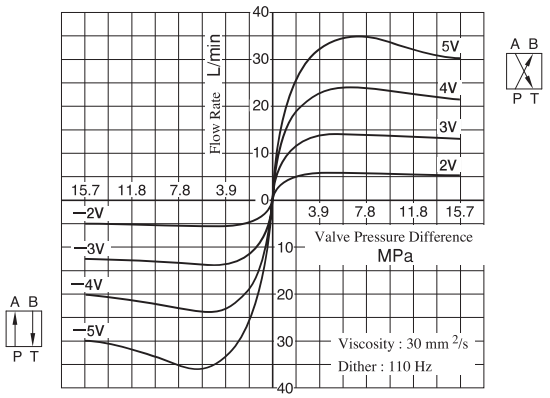
EHDFG-01-30-＊-XY-30



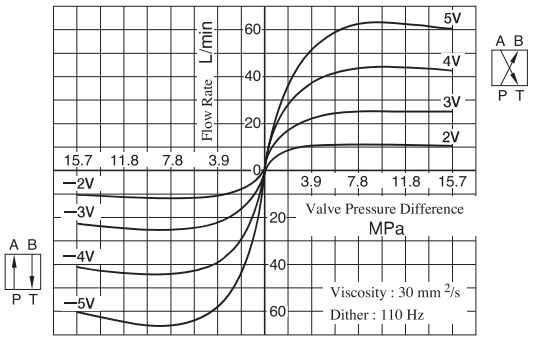

EHDFG-01-30-＊-X-30



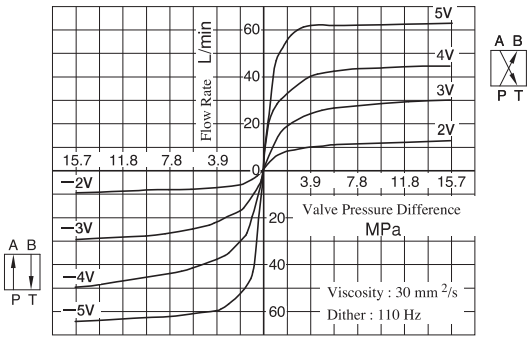

EHDFG-01-30-＊-Y-30



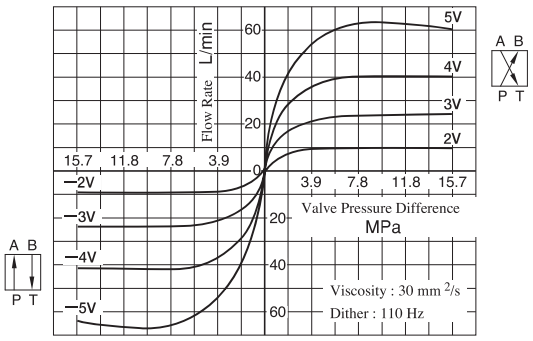

EHDFG-03-60-＊-XY-30




EHDFG-03-60-＊-X-30

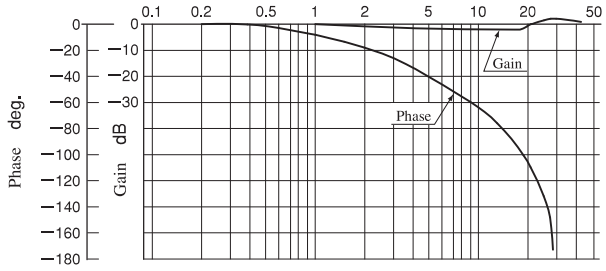



EHDFG-03-60-＊-Y-30



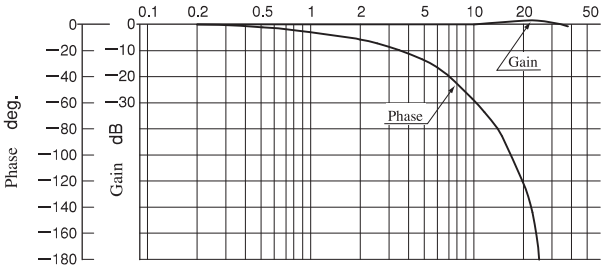
## Frequency Response (Travel of Spool)

EHDFG-01




Model Number : EHDFG-01-03-∗-Y-30
Viscosity : 30 mm²/s
Supply Pressure : 6.9 MPa
Flow Rate : 15±6 L/min

EHDFG-03

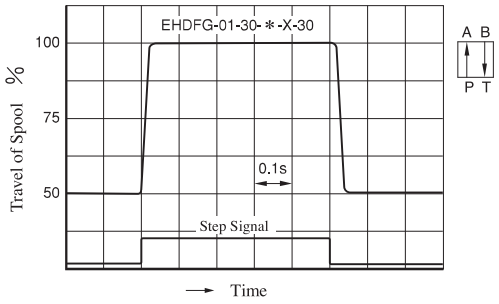



Model Number : EHDFG-03-60-∗-Y-30
Viscosity : 30 mm²/s
Supply Pressure : 6.9 MPa
Flow Rate : 30±6 L/min

## Step Response (Example)

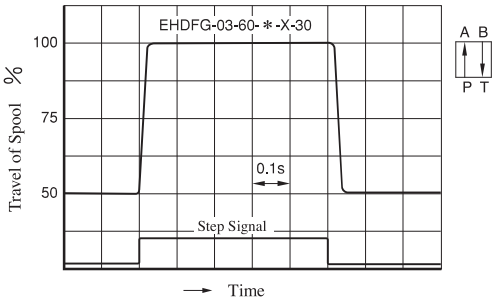
The step responses below are those obtained when the valve itself is tested independently.
The step responses may differ from them when the valve is used in combination with other control valves.

EHDFG-01




Viscosity : 30 mm²/s
Supply Pressure : 6.9 MPa

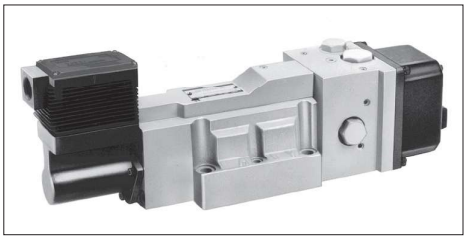
EHDFG-03

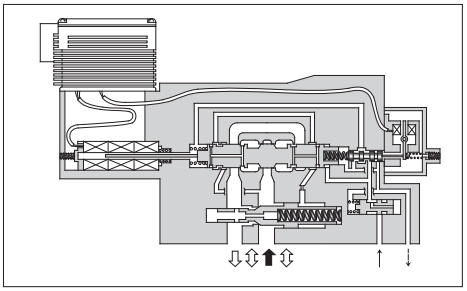



Viscosity : 30 mm²/s
Supply Pressure : 6.9 MPa

# High Response Type Proportional Electro-Hydraulic Directional and Flow Control Valves

These valves pursue the ultimate performance of proportional electro-hydraulic directional & flow control valves and make themselves to have high response features.
The closed-loop is composed in the valve inside by combination of a differential transformer (LVDT) and a power amplifier. Thus, high accuracy and reliability are provided.
In addition to control in the open-loop, these can be used for the closed-loop system as simplified servo valves.





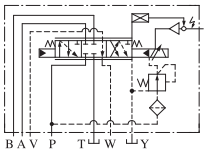
## Specifications

| Descriptions \ Model Numbers | | EHDFG-04 | EHDFG-06 |
|---|---|---|---|
| Max. Operating Pressure MPa | | 15.7 | 15.7 |
| Rated Flow L/min<br>Valve Pres. Difference: 1.5 MPa | | 130 | 280 |
| Min. Required Pilot Pressure MPa | | 1.5 | 1.5 |
| Min. Required Pilot Flow L/min | at Normal | 2 | 2 |
| | at Transition | 6 | 10 |
| Max. Drain Line Back Pressure MPa | | 0.1 | 0.1 |
| Hysteresis | | 1% or less | |
| Repeatability | | 1%★ or less | |
| Frequency Response | | 55<br>(Phase: -90°) | 45<br>(Phase: -90°) |
| Coil Resistance | | 30 Ω | |
| Supply Electric Power | | 24 V DC<br>( 21 to 28 V DC Included Ripple) | |
| Input Signal Voltage | | Rated Flow / 5 V DC | |
| Input Impedance | | 10 kΩ | |
| Power Input (Max.) | | 20 W | |
| Alarm Signal Output (Open Collector) | | Voltage: Max. 30 V DC<br>Current: Max. 30 mA | |
| LVDT Output (Sensor Monitor) | | 5 V DC / Rated Travel of Spool | |
| Ambient Temperature | | 0 - 50°C<br>(With Circulated Air) | |

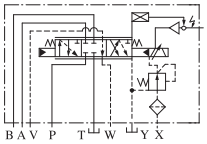
★The repeatability of the valves is obtained by having it tested independently on the conditions similar to its original testing.

### Graphic Symbols

● Models without Pressure Compensator Valve

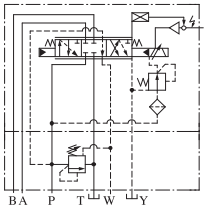


Internal Pilot



External Pilot

● Models with Pressure Compensator Valve



Internal Pilot

## Model Number Designation

| EHDF | G | -04 | -130 | -2 | -E | -CB | -10 |
|---|---|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Rated Flow L/min | Spool Type★ | Pilot Connection | Relief Type Pres. Compensator | Design Number |
| **EHDF**: Proportional Electro-Hydraulic Directional and Flow Control Valve | **G**: Sub-Plate Mounting | **04** | **130** | **2**  | **None**: Internal Pilot | **None**: Not Provided | **10** |
| | | **06** | **280** | **40**  | **E**: External Pilot | **CB**: Provided | **10** |

★1. Spool type shown in the column is for the neutral position.
★2. Phosphate ester type fluids are also supported. When phosphate ester type fluids are used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

## Accessories

### Mounting Bolts

| Model Numbers | Socket Head Cap Screw | | |
|---|---|---|---|
| | Models without Pres. Compensator | Models with Pres. Compensator | Q'ty |
| EHDFG-04 | M6 × 40 L | M6 × 120 L | 2 |
| | M10 × 45 L | M10 × 125 L | 4 |
| EHDFG-06 | M12 × 60 L | — | 6 |
| | — | Mtg. Bolt Kit MBK-06-01-30 | 1 Set |

## Sub-Plate

| Valve Model Numbers | Sub-Plate Model Numbers | Thread Size Rc | Mass kg |
|---|---|---|---|
| EHDFG-04 | DHGM-04-20 | 1/2 | 4.4 |
| | DHGM-04X-20 | 3/4 | 4.1 |
| EHDFG-06 | DHGM-06-50 | 3/4 | 7.4 |
| | DHGM-06X-50 | 1 | |

●Sub-plates are available. Specify sub-plate model from the table above. When sub-plates are not used, the mounting surface should have a good machined finish. (▽)

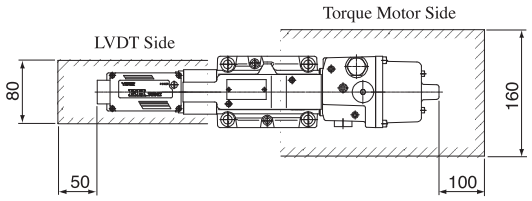
## Instructions

### Back Pressure to Drain Port

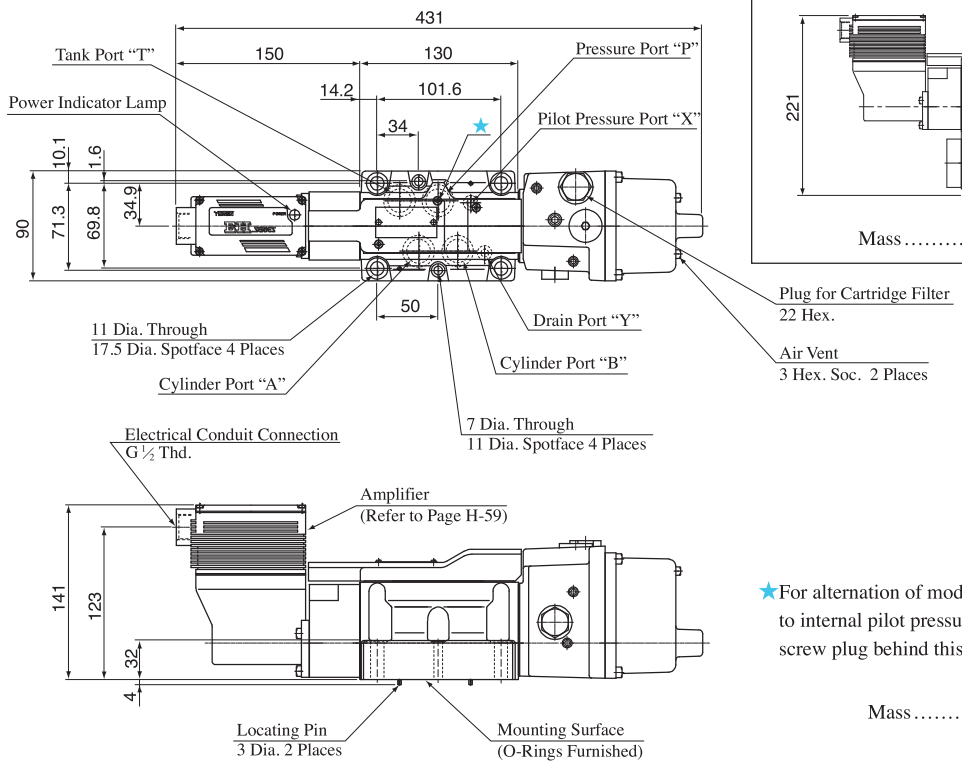
The drain port should be connected directly to the oil tank with a back pressure of not more than 0.1 MPa.

### Installation Condition (Protection from Magnetic Field of DC SOL)

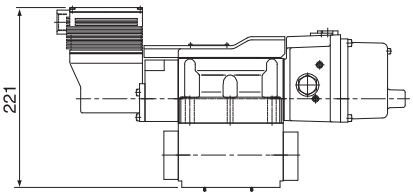
If a DC SOL. is installed near this valve, the magnetic field of DC SOL. may affect the control flow rate. Therefore, install the DC SOL. outside the area shown below.




### EHDFG-04-130-＊-＊-10




### EHDFG-04-130-＊-＊-CB-10

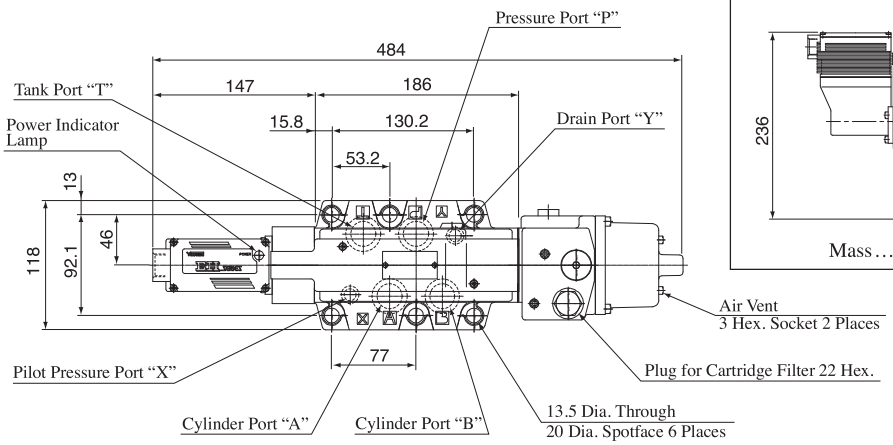


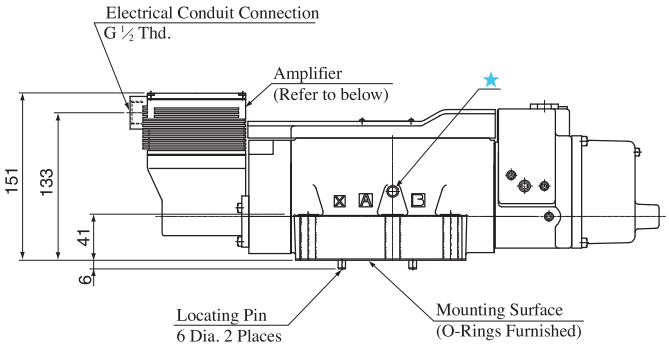

Mass ..... 17 kg

★For alternation of model from external pilot pressure to internal pilot pressure, take out another inner screw plug behind this plug.

Mass ..... 10.5 kg

## EHDFG-06-280-∗-∗-10

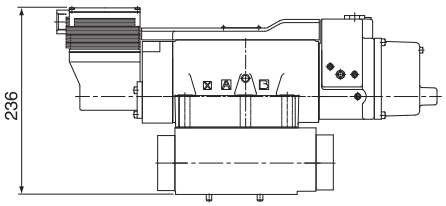



★For alternation of model from external pilot pressure to internal pilot pressure, take out another inner screw plug behind this plug.

Mass ..... 18.5 kg

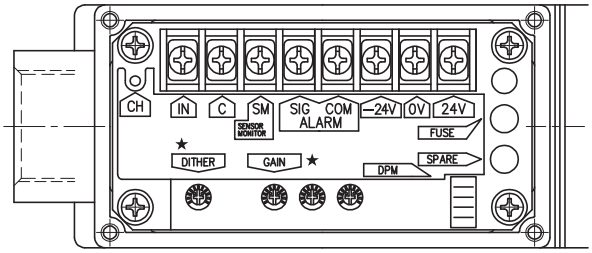
## EHDFG-06-280-∗-∗-CB-10




Mass ..... 29.6 kg

## Detail of Amplifier

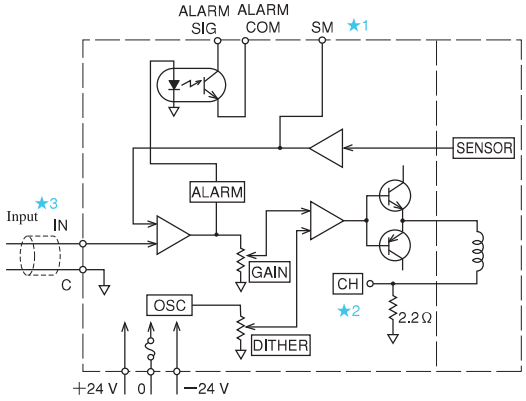
### Connecting Terminal




| Terminal | | Name |
|---|---|---|
| IN | | Input Signal (±) |
| C | | Input Signal (COM) |
| SM | | Sensor Monitor (to C) |
| ALARM | SIG | Alarm Output |
| | COM | |
| −24V | | Power Supply |
| 0V | | |
| 24V | | |
| CH | | Output Current Check (to C) |

★DITHER / GAIN
Use as they are since they are factory-preset to the optimum position.
(Do not touch them in normal condition.)

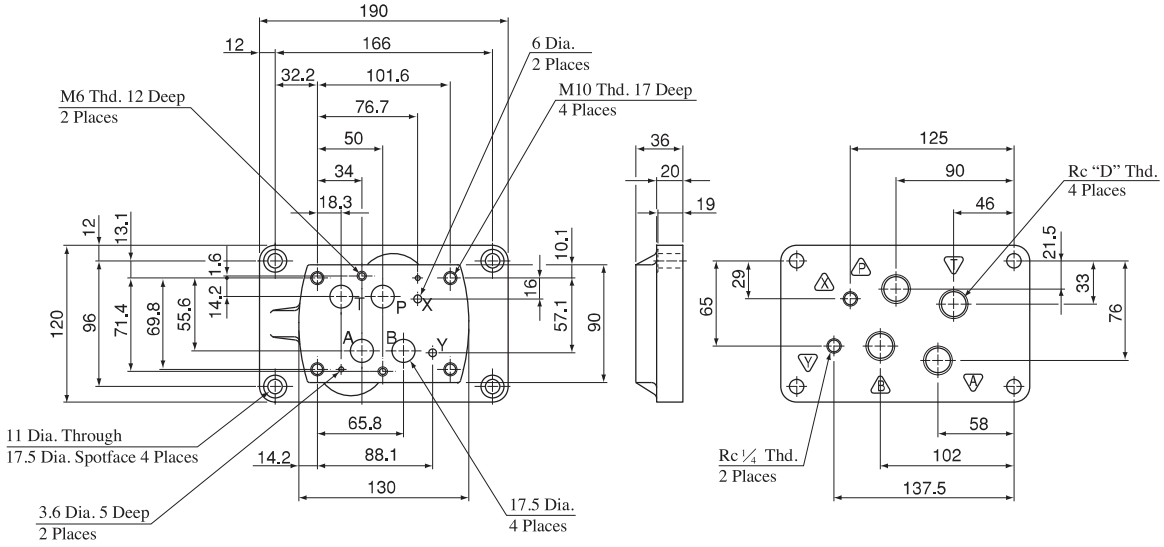
### Circuit Schematic




★1. For "SM" terminal, external instruments should have input impedance of more than 10 kΩ.
★2. For "CH" terminal, external instruments should have input impedance of more than 10 kΩ.
★3. Use shielded cable for "Input" connection.
The ground of shielded cable must be connected to input signal side.

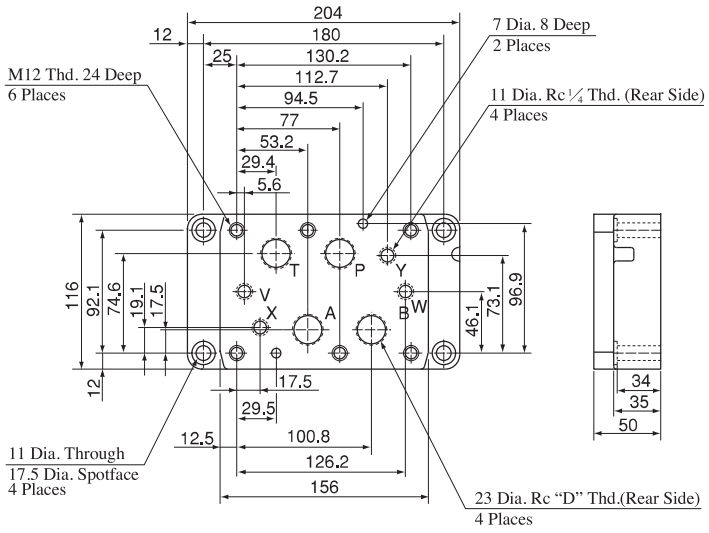
## Sub-Plate

### DHGM-04, 04X




| Model Numbers | D |
|---|---|
| DHGM-04-20 | 1/2 |
| DHGM-04X-20 | 3/4 |

### DHGM-06, 06X

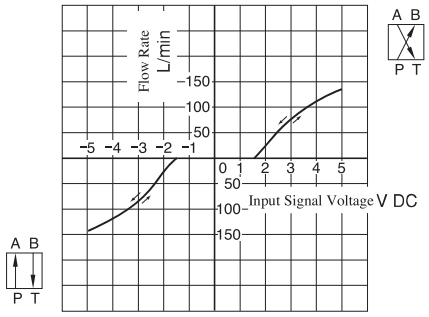



| Model Numbers | D |
|---|---|
| DHGM-06-50 | 3/4 |
| DHGM-06X-50 | 1 |

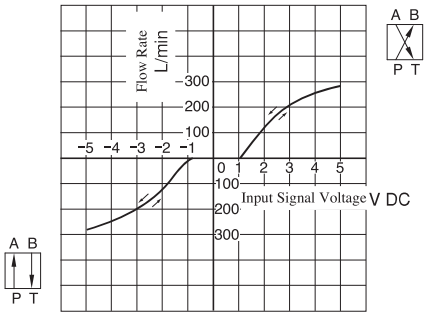
## Input Signal Voltage vs. Flow

Viscosity : 30 mm²/s
Valve Pressure Difference : 1.5 MPa Const.

EHDFG-04



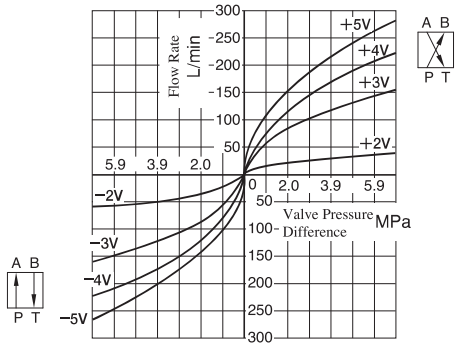

EHDFG-06



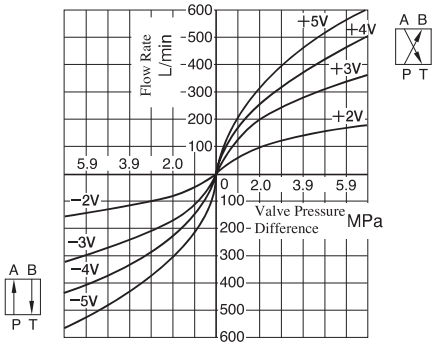

## Differential Pressure vs. Metered Flow

Viscosity : 30 mm²/s

EHDFG-04

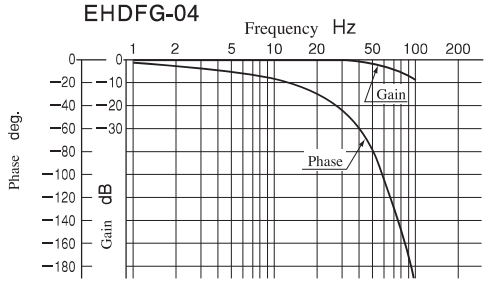



EHDFG-06



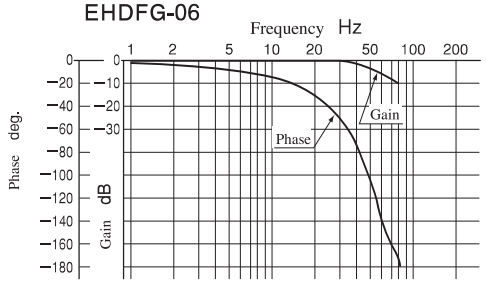

## Frequency Response (Travel of Spool)

EHDFG-04




Model Number : EHDFG-04-130-2-E-10
Viscosity : 30 mm²/s
Pilot Pressure : 15.7 MPa
Travel of Spool : ±10% of Rated Travel

EHDFG-06

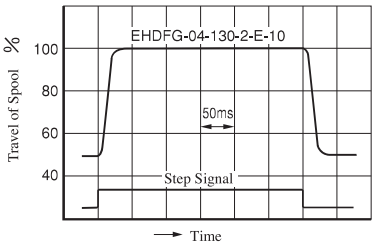



Model Number : EHDFG-06-280-2-E-10
Viscosity : 30 mm²/s
Pilot Pressure : 15.7 MPa
Travel of Spool : ±10% of Rated Travel

## Step Response

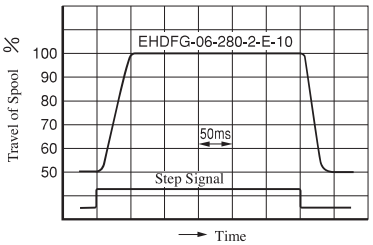
The step responses below are those obtained when the valve itself is tested independently.
The step responses may differ from them when the valve is used in combination with other control valves.

EHDFG-04




Viscosity : 30 mm²/s

EHDFG-06




Viscosity : 30 mm²/s

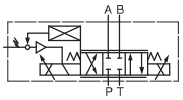
# Direct Operated and High Response Type Proportional Electro-Hydraulic Directional and Flow Control Valves

These valves are closed-loop, high response type proportional electro-hydraulic directional and flow control valves with OBE (on board electronics). Two direct type models with a maximum rated flow rate up to 80 L/min (@ΔP = 1 MPa) are available. The addition of OBE to the well-received ELDFG series valves for simplified wiring offers simple operation and user-friendliness. With closed-loop control based on a combination of newly developed compact, powerful solenoids and a LVDT for spool position detection, the valves provide high response, high accuracy, and high reliability equivalent to those of simple servo valves.
2% Overlap spool type (spool type 3C2L) is suitable for position or pressure control.

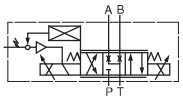


Graphic Symbols

3C2, 3C2L




3C40




## Specifications

| Descriptions \ Model Numbers | | | ELDFG-01EH | | | ELDFG-03EH | |
|---|---|---|---|---|---|---|---|
| | | | -10-3C* | -20-3C* | -35-3C* | -40-3C* | -80-3C* |
| Max. Operating Pressure | | MPa | 35 | | | 35 | |
| Max. Tank Line Back Pressure | | MPa | 21 | | | | |
| Rated Flow [ΔP = 1 MPa (4-Way Valve)]★1 | | L/min | 10 | 20 | 35 | 40 | 80 |
| Hysteresis | | | 0.1% or less | | | | |
| Repeatability | | | 0.1% or less | | | | |
| Step Response Pilot Pressure : 14 MPa (Typical Rating)★2 | (0→100%V) | ms | 16 | | | 23 | |
| | (100→0%V) | ms | | | | | |
| Frequency Response (±25% Amplitude) Pilot Pressure : 14 MPa (Typical Rating)★3 | Gain: -3 dB | Hz | 80 | | | 50 | |
| | Phase: -90° | Hz | | | | | |
| Vibration Proof | | G | 10 | | | | |
| Protection | | | IP65 | | | | |
| Ambient Temperature | | °C | -15 - +60 | | | | |
| Spool Stroke to Stops | | mm | ±2.5 | | | ±3 | |
| Coil Resistance [20 °C] | | Ω | 3 | | | 2 | |
| Current Consumption | | A | 2 (Impulse Load 3) | | | | |
| Approx. Mass | | kg | 3.3 | | | 7.3 | |
| Electric Connection | | | 6 + PE Connector | | | | |

★1. Use the valves so that the relationship between the valve pressure difference and the flow rate, as specified in "Range of Flow Control" on page H-63, is met.
★2. This value is measured for each valve; it may differ depending on the actual circuit.
★3. There are restrictions on the mounting position. See "Mounting Position" on page H-64.

## Model Number Designation

| ELDF | G | -01 | EH | -10 | -3C2 | -XY | -C | -D | -10 |
|---|---|---|---|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Amplifier Type | Rated Flow L/min | Spool Type★1 | Direction of Flow | Fail-Safe Function | Input Signal/Spool Travel Monitoring | Design Number |
| ELDF : Direct Operated and High Response Type Proportional Electro-Hydraulic Directional and Flow Control Valves | G : Sub-Plate Mounting | 01<br>03 | EH : OBE Type | 10<br>20<br>35<br>40<br>80 | 3C2 : 10% Overlap<br>3C40 : A, B, T Connection<br>3C2L : 2% Overlap<br>(Linear Flow Gain) | XY : Meter-In · Meter-Out | C : Neutral<br>A : P-A, B-T Position<br>B : P-B, A-T Position | D : Voltage Signal ±10 V (P→A→B→T Flow with Input Signal (+))<br>E : Current Signal 4 - 20 mA (P→A→B→T Flow with Current 12 - 20 mA Signal)<br>F : Current Signal ±10 mA (P→A→B→T Flow with Input Signal (+)) | 10 |

★1. The spool in the neutral position is shown.
★2. Phosphate ester type fluids are also supported. When phosphate ester type fluids are used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

## Accessories

### Mounting Bolts

| Model No. | Mounting Bolt | Qty. | Tightening Torque Nm |
|---|---|---|---|
| ELDFG-01EH | Socket Head Cap Screw: M5 × 45L | 4 | 6 - 8 |
| ELDFG-03EH | Socket Head Cap Screw: M6 × 35L | 4 | 13 - 16 |

Note) The connector is separately available. Use a 6 + PE connector [EN175201 Part 804].

## Instructions

Take care of filling the valve tank port with the hydraulic oil at any time. However, check valve with cracking pressure 0.04 MPa approx. shall be provided as required. The pipe from the tank port should be connected to the reservoir directly and the end of the pipe must always be in the oil.

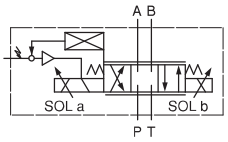
## Sub-Plate

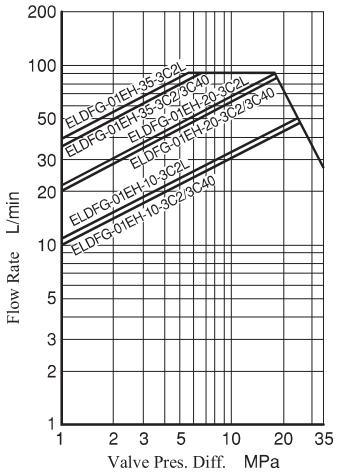
| Model Number | Sub-Plate Model Numbers | Thread Size Rc | Mass | Page |
|---|---|---|---|---|
| ELDFG-01EH | DSGM-01-31 | 1/8 | 0.8 | H-8 |
| | DSGM-01X-31 | 1/4 | | |
| | DSGM-01Y-31 | 3/8 | | |
| ELDFG-03EH | DSGM-03-40 | 3/8 | 3 | H-53 |
| | DSGM-03X-40 | 1/2 | | |
| | DSGM-03Y-40 | 3/4 | 4.7 | |

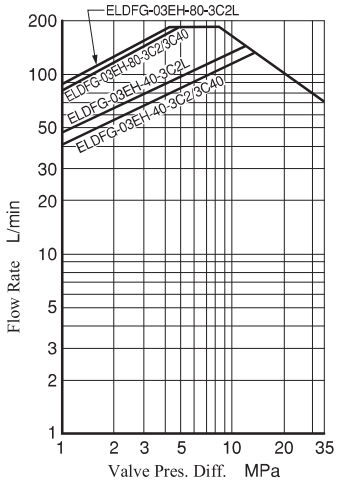
★Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish (▽).

## Range of Flow Control

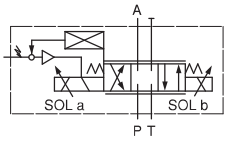
### Control Method: 4-Way Valve

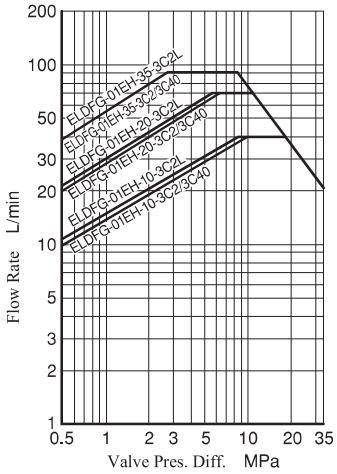


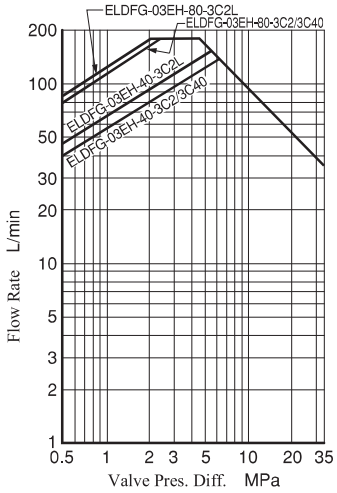



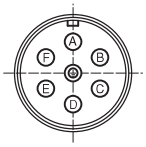

### Control Method: 3-Way Valve



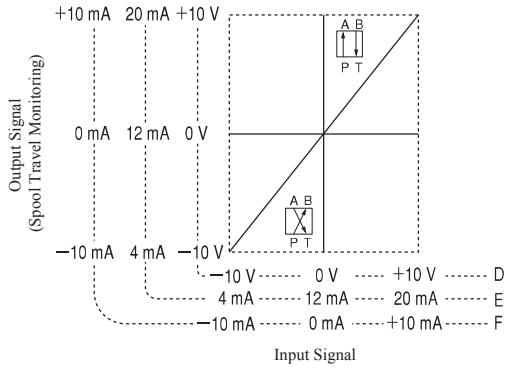
## Electrical Specification



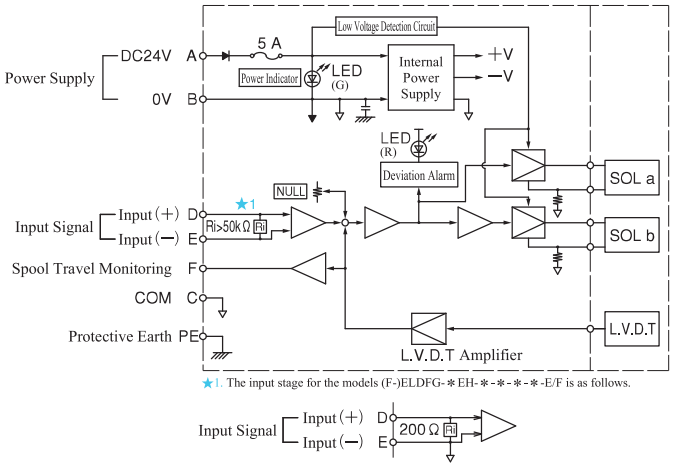

| Pin | | Valve Model ELDFG-＊EH-＊-D | ELDFG-＊EH-＊-E | ELDFG-＊EH-＊-F |
|---|---|---|---|---|
| Pin A | Power Supply | 24 V DC (21.6 - 26.4 V DC Included Ripple), 75 VA or more | | |
| Pin B | | 0 V | | |
| Pin C | Signal Common | COM (0 V) | | |
| Pin D | Input (+) (Differential)★1 | 0 - ±10 V<br>Ri ≧ 50 kΩ | 4 - 20 mA<br>Ri = 200 Ω | 0 - ±10 mA<br>Ri = 200 Ω |
| Pin E | Input (-) (Differential)★1 | | | |
| Pin F | Spool Travel Monitoring | 0 - ±10 V<br>Ri ≧ 10 kΩ | 4 - 20 mA<br>Ri = 100 - 500 Ω★2 | 0 - ±10 mA<br>Ri = 100 - 500 Ω★2 |
| Pin ⏚ | Protective Earth | — | | |

★1. Differential input signals can be used only for the valves with the voltage signal specifications of ±10 V (ELDFG-＊EH-＊-D).
★2. The recommended load resistance is 200 Ω.

### I/O Signal Characteristics




## Circuit Schematic




★1. The input stage for the models (F-)ELDFG-＊EH-＊-＊-＊-＊-E/F is as follows.




## Details of the Valve Fail-Safe Functions

With reference to the information given table right, select the option for the fail-safe function according to the use of applications.
A separate safety circuit should be provided if the hydraulic actuator must be reliably held or stopped.

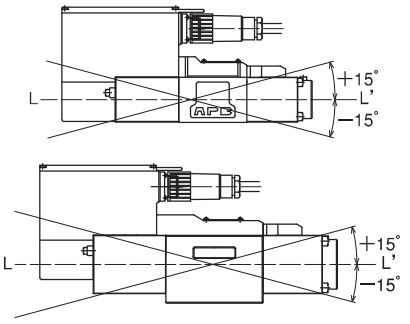
### Condition: Electric System OFF

| Model Numbers | Fail-Safe Function | | |
|---|---|---|---|
| | Spool Position | Function | Graphic Symbol |
| ELDFG-＊＊EH-＊-3C2-XY-C | Neutral | All Ports Blocked | |
| ELDFG-＊＊EH-＊-3C2L-XY-C | Neutral | — | or or |
| ELDFG-＊＊EH-＊-3C40-XY-C | Neutral | A, B, T Connection | |
| ELDFG-01EH-＊-＊-XY-A | about 20% | PABT Position | |
| ELDFG-03EH-＊-＊-XY-A | about 17% | | |
| ELDFG-01EH-＊-＊-XY-B | about 20% | PBAT Position | |
| ELDFG-03EH-＊-＊-XY-B | about 17% | | |

★The fail-safe function's activation time depends on the electric and hydraulic conditions.

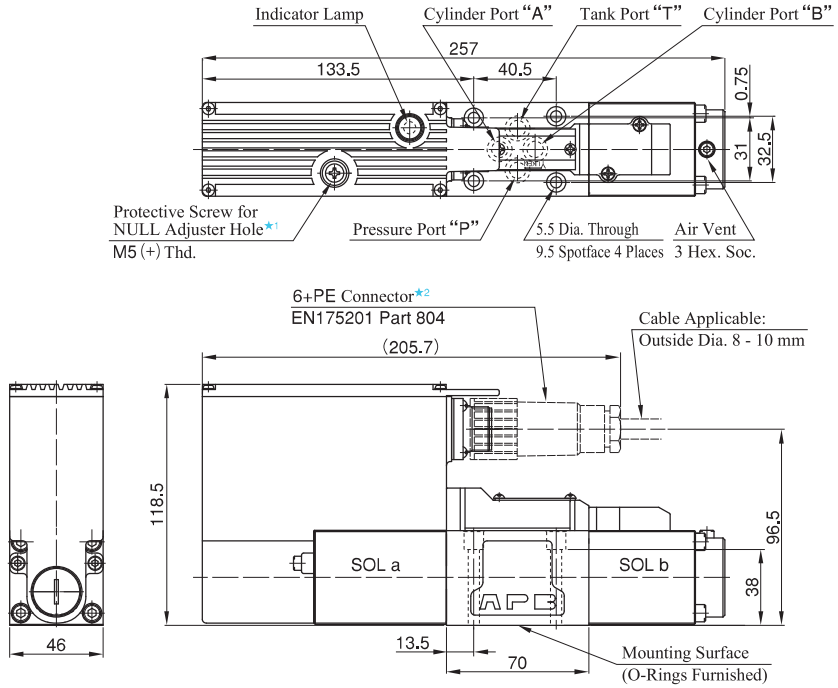
## Mounting Position

Mount the valve with the angle of the axis line L-L′ within about ±15° from the horizontal plane, as shown in the right figures. If the axial direction of the spool corresponds to the principal vibration direction, an external force may cause the spool to malfunction. The valve must be mounted in such a way that the axial direction of the spool does not correspond to the principal vibration direction.



## ELDFG-01EH-＊-＊-XY-＊-＊-10

Mounting surface: ISO4401-AB-03-02-0-05



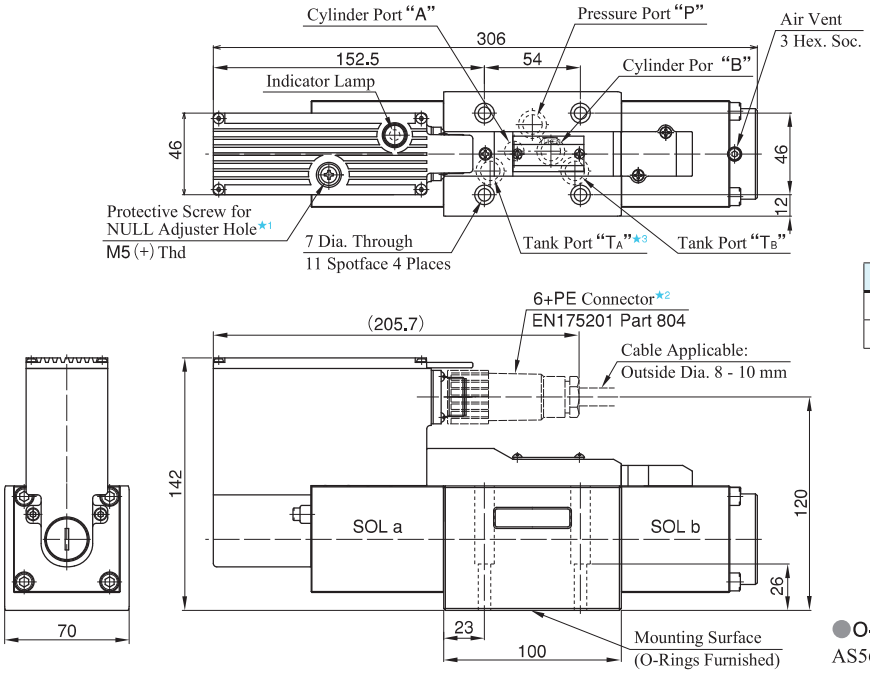

| Color | Indicator Lamp |
|---|---|
| Green | Power Supply |
| Red | Deviation Alarm |

●O-Rings for the Ports
AS568-012 (NBR-90): 4 Pieces

★1. For NULL adjustment, remove the protective screw and turn the trimmer behind the screw. After adjustment, be sure to attach the protective screw.
★2. The 6 + PE connector is not included with the valve. Prepare it separately.
YUKEN parts number: TK290457-1
Note: For valve mounting surface dimensions, see the dimensional drawings of sub-plates (H-8) in common use.

## ELDFG-03EH-＊-＊-XY-＊-＊-10

Mounting surface: ISO4401-05-04-0-05




| Color | Indicator Lamp |
|---|---|
| Green | Power Supply |
| Red | Deviation Alarm |

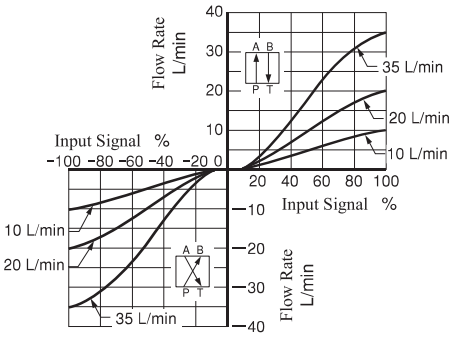
●O-Rings for the Ports
AS568-014 (NBR-90): 5 Pieces

★1. For NULL adjustment, remove the protective screw and turn the trimmer behind the screw. After adjustment, be sure to attach the protective screw.
★2. The 6 + PE connector is not included with the valve. Prepare it separately.
YUKEN parts number: TK290457-1
★3. With standard sub-plates, one ("TA") of the two tank ports is used, but either one may be used.
Note: For valve mounting surface dimensions, see the dimensional drawings of sub-plates (H-53) in common use.

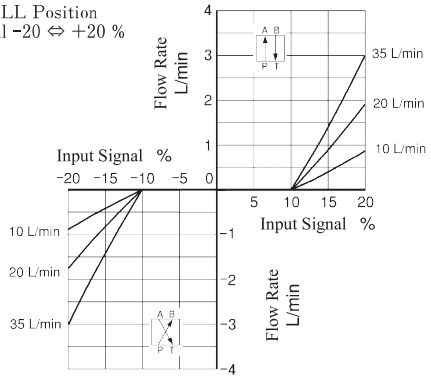
## No-Load Flow Characteristics

〈Conditions〉 ●Valve Pressure Difference: 1 MPa ●Viscosity: 30 mm²/s

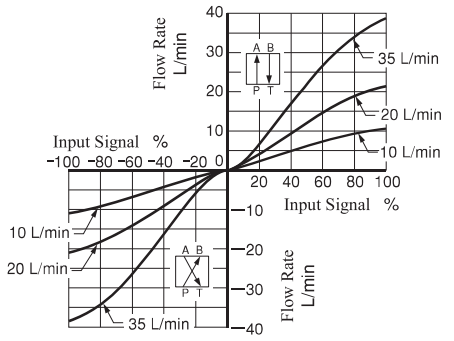
### ELDFG-01EH-＊-3C2/3C40-XY-＊-＊-10



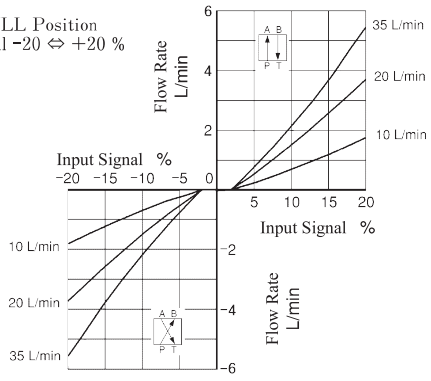

Around NULL Position
Input Signal −20 ⇔ +20 %



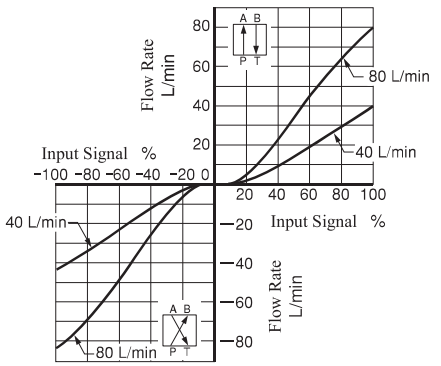

### ELDFG-01EH-＊-3C2L-XY-＊-＊-10



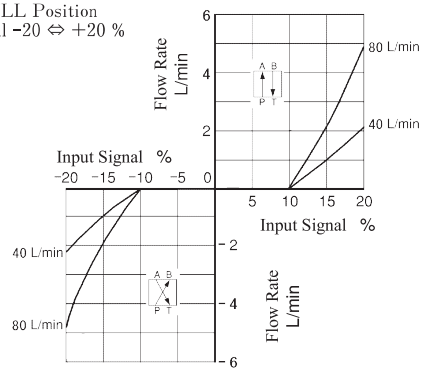

Around NULL Position
Input Signal −20 ⇔ +20 %



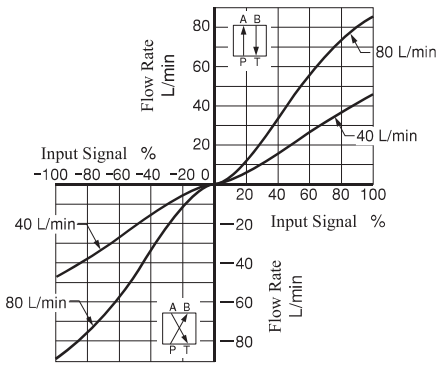

### ELDFG-03EH-＊-3C2/3C40-XY-＊-＊-10



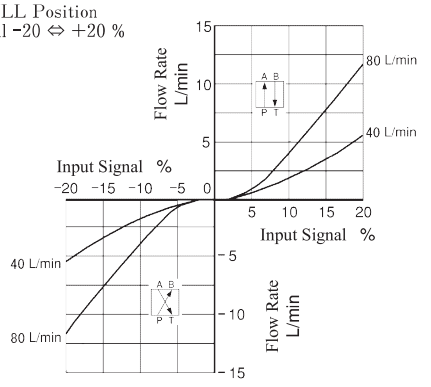

Around NULL Position
Input Signal −20 ⇔ +20 %




### ELDFG-03EH-＊-3C2L-XY-＊-＊-10




Around NULL Position
Input Signal −20 ⇔ +20 %

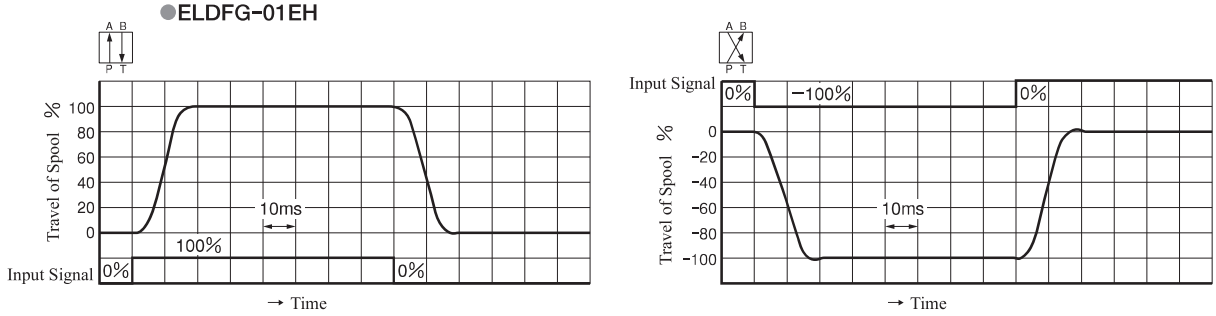


## Step Response (Example)

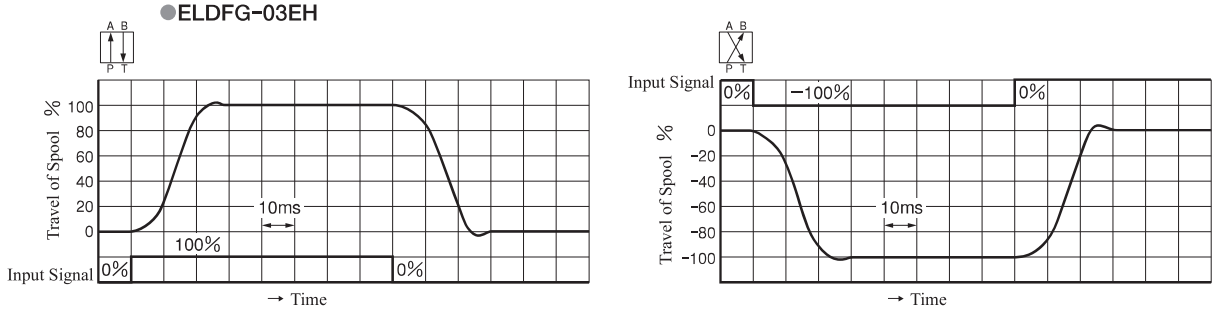
〈Conditions〉 ●Hydraulic Circuit: Port A/B Closed ●Input Signal: 0 ↔ 100% ●Viscosity: 30 mm²/s

This value is measured for each valve; it may differ depending on the actual circuit.

●ELDFG-01EH



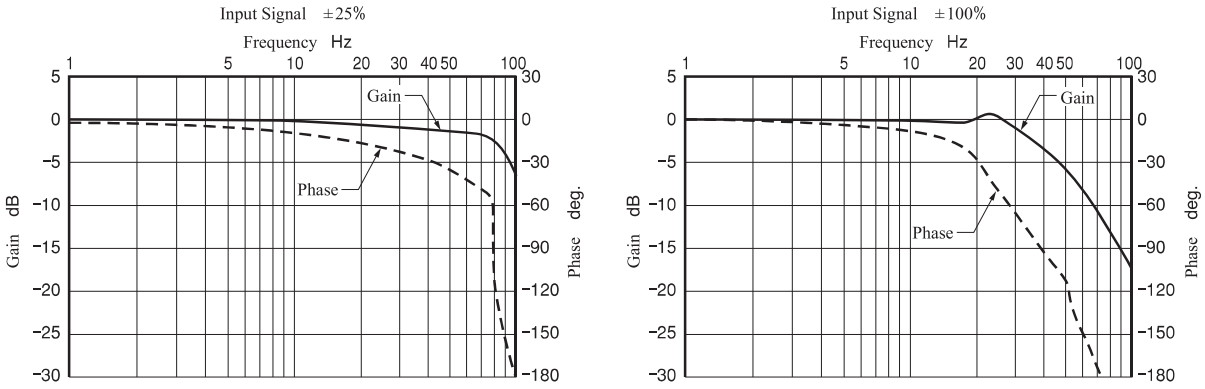

●ELDFG-03EH



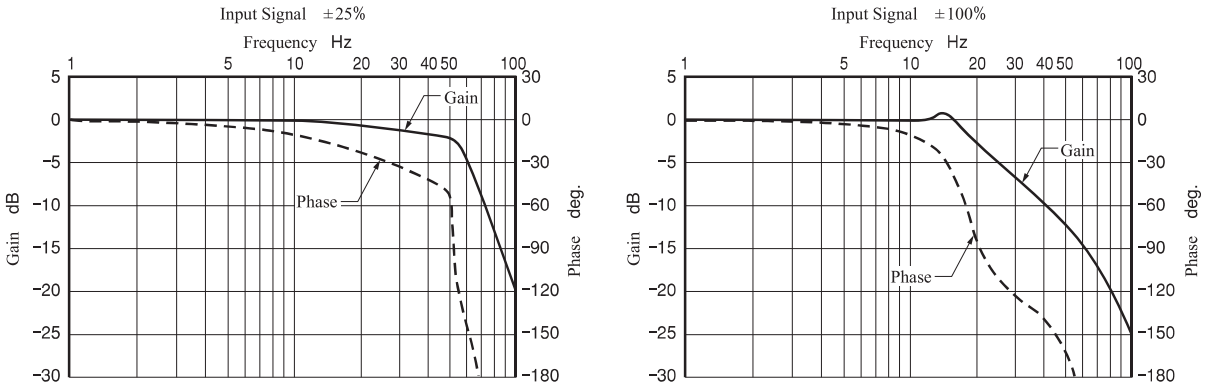

## Frequency Response

〈Conditions〉 ●Hydraulic Circuit: Port A/B Closed ●Supply Pressure: 14 MPa ●Viscosity: 30 mm²/s

●ELDFG-01EH

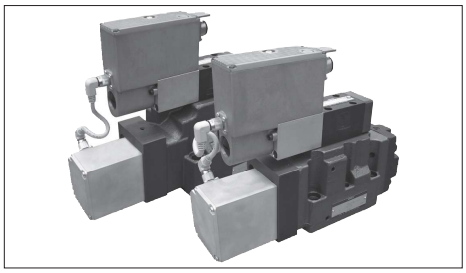



●ELDFG-03EH



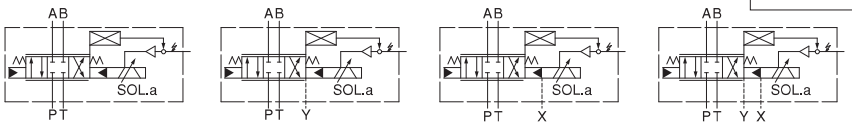
# High Response Type Proportional Electro-Hydraulic Directional and Flow Control Valves (Two Stage Type)

These are high flow rate and two stage type valves as an addition to our highly appreciated product series: OBE type direct operated and high response proportional electro-hydraulic directional and flow control valve series.



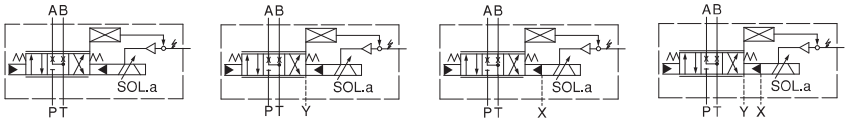
## Graphic Symbols

### Spool Type "3C2", "3C2P", "3C2L"

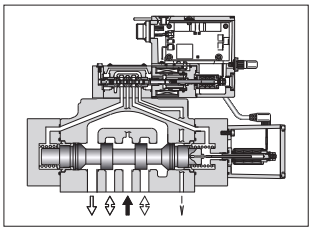



Internal Pilot Internal Drain Type | Internal Pilot External Drain Type | External Pilot Internal Drain Type | External Pilot External Drain Type

### Spool Type "3C40"




Internal Pilot Internal Drain Type | Internal Pilot External Drain Type | External Pilot Internal Drain Type | External Pilot External Drain Type



* "SOL.a" is for the model 04EH & 03EH.
For the model-06EH & 10EH, it is "SOL.b"

## Specifications

| Descriptions \ Model Numbers | | | ELDFHG-03EH-100-3C2L | ELDFHG-03EH-100-* | ELDFHG-04EH | ELDFHG-06EH-350 | ELDFHG-06EH-500 | ELDFHG-10EH |
|---|---|---|---|---|---|---|---|---|
| Rated Flow [ΔP=1 MPa (4-Way Valve)] ΔP = 0.5 MPa per Land | | L/min | 90 | 100 | 280 | 350 | 500 | 1440 |
| Max. Operating Pressure | | MPa | 31.5 | | 35 | | 31.5 | 35 |
| Proof Pres. at Return Port★1 | External Drain T Port | MPa | 21 | | 31.5 | 35 | 25 | 28 |
| | External Drain Y Port | MPa | 21 | | | | | |
| | Internal Drain T & Y Ports | MPa | 21 | | | | | |
| Pilot Pressure★2 | | MPa | 1.5 to 25 | | | | | |
| Pilot Flow Rate★3 | | L/min | 5 or more | | 11 or more | 12 or more | 16 or more | 17 or more |
| Internal Leakage Supply Pressure: 14MPa Pilot Pressure: 14MPa Fluid Viscosity: 32mm²/s | Pilot Valve | L/min | 1.5 or less | | 1.8 or less | | | 1.5 or less |
| | Main Valve L/min | 3C2 | 3C2L:1.6 or less | 3C2:0.5 or less 3C40:1.0 or less 3C2P:5.6 or less | 0.8 or less | 0.9 or less | 1.0 or less | 5.0 or less |
| | | 3C40 | | | 1.6 or less | 1.8 or less | 1.8 or less | 9.0 or less |
| | | 3C2P | | | 6.8 or less | 7.0 or less | 8.0 or less | 14.5 or less |
| | | 3C2L | | | 2.1 or less | 2.5 or less | 2.5 or less | 11.5 or less |
| Hysteresis | | | 0.2% or less | | 0.1% or less | | | 0.1% or less |
| Step Response (0 <=> 100%) V Pilot Pressure: 14MPa (Typical Rating)★4 | | ms | 15 | 14 | 20 | 20 | 22 | 28 |
| Frequency Response ±25% Amplitude Pilot Pressure: 14MPa (Typical Rating)★4 | Phase: -90° | Hz | 50 | 55 | 51 | 50 | 45 | 33 |
| | Gain: -3 dB | Hz | 56 | 60 | 56 | | | 40 |
| Vibration Proof★5 | | m/s² | 100 | | | | | |
| Protection | | | Equivalent to IP65 | | | | | |
| Ambient Temperature | | ℃ | -15 - +60 | | | | | |
| Spool Stroke to Stops | | mm | ±4 | ±3.5 | ±5 | ±5 | ±7 | ±7 |
| Spool End Area | | cm² | 3 | | 7 | 8 | 8 | 11.3 |
| Current | | A | 2 (Impulse Loud 3) | | | | | |
| Coil Resistance at 20 ºC | | Ω | 3 | | | | | |
| Approx. Mass | | kg | 10.7 | 8.2 | 13 | 19 | | 74.5 |
| Electric Connection | | | 6 + PE Connector [EN 175201 Part 804] | | | | | |

★1. Pressure at the return port should be the actual supply pressure or less.
★2. Supply pressure for the pilot valve should be within the range described above and should also be 60% of the actual main valve supply pressure or more.
★3. Pilot flow is calculated with the above step response time at pilot pressure 14 MPa.
★4. This value is measured on a per-valve basis under the conditions described above; it may differ depending on the actual circuit and operating conditions.
★5. There are restrictions on the mounting position. See page H-71 for details.

## Model Number Designation

| ELDFHG | - 04 | EH | - 280 | -3C2P | - XY | -E | T | - C | -D | -10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Series Number | Valve Size | Amplifier Type | Rated Flow L/min ΔP= 1 MPa (4-Way Valve) | Spool Type | Direction of Flow | Pilot Type | Drain Type | Fail-Safe Function | Input Signal/ Spool Travel Monitoring | Design Number |
| ELDFHG: Two Stage Type High Response Type Proportional Electro-Hydraulic Directional and Flow Control Valves (Sub-Plate Mounting) | 03 | EH: OBE Type | 100★2 | 3C2: 10% Overlap 3C40: A, B, T Connection | XY: Meter-In /Meter-Out | None: Internal Pilot E: External Pilot | None: External Drain T: Internal Drain | C: Neutral | D: Voltage Signal ± 10 V (PABT Flow with Positive Input) E: Current Signal 4 to 20 mA (PABT Flow with 12 to 20 mA Input) F: Current Signal ± 10 mA (PABT Flow with Positive Input) | 10 |
| | | | | 3C2P: Zero Lap (Dual Flow Gain) 3C2L: 2% Overlap (Linear Flow Gain) | | | | A: P→A,B→T Position (Valve Opening: 20%) B: P→B,A→T Position (Valve Opening: 20%) | | |
| | 04 | | 280 | 3C2: 10% Overlap 3C40: A, B, T Connection | | | | C: Neutral | | |
| | | | | 3C2P: Zero Lap (Dual Flow Gain) 3C2L: 2% Overlap (Linear Flow Gain) | | | | A: P→A,B→T Position (Valve Opening: 10%) B: P→B,A→T Position (Valve Opening: 10%) | | |
| | 06 | | 350 500 | 3C2: 10% Overlap 3C40: A, B, T Connection | | | | C: Neutral | | |
| | | | | 3C2P: Zero Lap (Dual Flow Gain) 3C2L: 2% Overlap (Linear Flow Gain) | | | | A: P→A,B→T Position (Valve Opening: 10%) B: P→B,A→T Position (Valve Opening: 10%) | | |
| | 10 | | 1440 | 3C2: 10% Overlap 3C40: A, B, T Connection | | | | C: Neutral | | |
| | | | | 3C2P: Zero Lap (Dual Flow Gain) 3C2L: 2% Overlap (Linear Flow Gain) | | | | A: P→A,B→T Position (Valve Opening: 20%) B: P→B,A→T Position (Valve Opening: 20%) | | |

★1. Phosphate ester type fluids are also supported. When phosphate ester type fluids are used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.
★2. In case of spool type "3C2L", it is 90L/min.

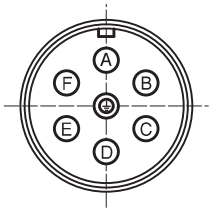
## Details of the Valve Fail-Safe Functions

With reference to the information given below, select the option for the fail-safe function according to the use of applications.
A separate safety circuit should be provided if the hydraulic actuator must be reliably held or stopped.

| No. | Model Numbers | Fail-Safe Function | |
|---|---|---|---|
| | | Spool Position | Function |
| 1 | ELDFHG-＊EH-＊-3C2-XY-＊＊-C | Neutral | All Ports Blocked |
| 2 | ELDFHG-＊EH-＊-3C40-XY-＊＊-C | Neutral | A, B, T Connection |
| 3 | ELDFHG-＊EH-＊-3C2L/3C2P-XY-＊＊-A | Valve Opening: 10% (04EH, 06EH) Valve Opening: 20% (03EH, 10EH) | PABT Position |
| 4 | ELDFHG-＊EH-＊-3C2L/3C2P-XY-＊＊-B | Valve Opening: 10% (04EH, 06EH) Valve Opening: 20% (03EH, 10EH) | PBAT Position |

＊The fail-safe function's activation time depends on the electric and hydraulic conditions.

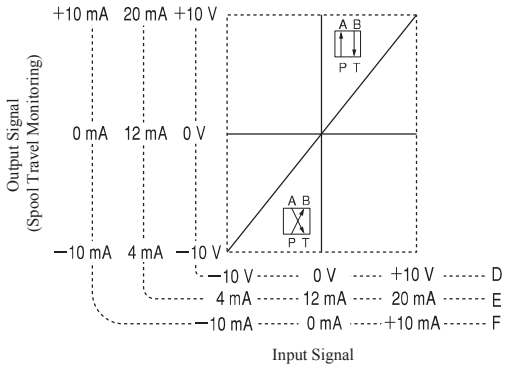
## Electrical specifications



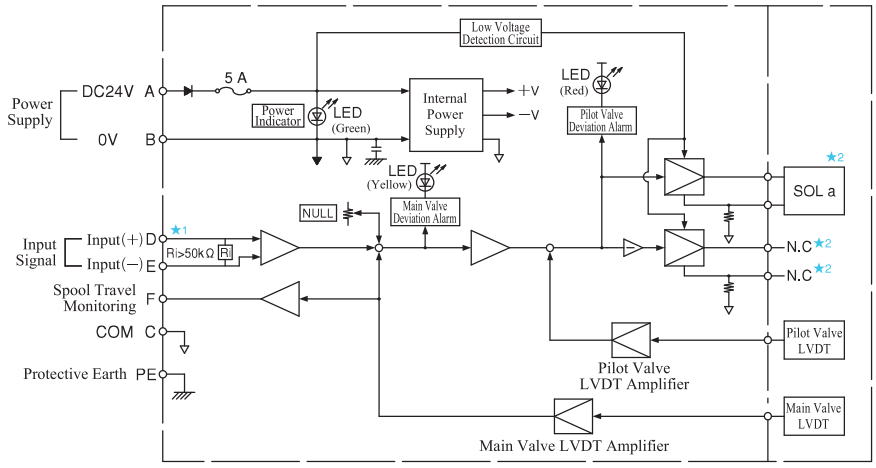

| Input Signal | | Voltage Signal "D" | Current Signal "E" | Current Signal "F" |
|---|---|---|---|---|
| Pin A | Power Supply | 24 V DC (21.6 - 26.4 V DC Included Ripple), 75 VA or more | | |
| Pin B | | 0 V | | |
| Pin C | Signal Common | COM (0 V) | | |
| Pin D | Input (+)(Differential)★2 | 0-±10 V<br>Ri ≧ 50 kΩ | 4-20 mA<br>Ri = 200 Ω | 0-±10 mA<br>Ri = 200 Ω |
| Pin E | Input (−)(Differential)★2 | | | |
| Pin F | Spool Travel Monitoring | 0-±10 V<br>RL ≧ 10 kΩ | 4-20 mA<br>RL = 100-500 Ω★1 | 0-±10 mA<br>RL = 100-500 Ω★1 |
| Pin ⏚ | Protective Earth | — | | |

★1. The recommended load resistance is 200 Ω.
★2. Differential input signals can be used only for the valves with the voltage signal specifications of ±10V.
(ELDFHG-＊EH-＊-D)

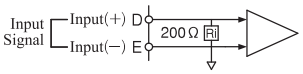
### I/O Signal Characteristics



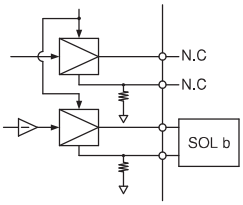

## Block Diagram




★1. The input stage for the current signal "E" and "F" is as follows.




★2. The solenoid name is for the model ELDFHG-03EH & 04EH. The name for the model ELDFHG-06EH & 10EH are as follows.




## Accessories

### Mounting Bolts

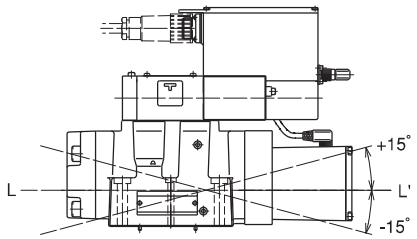
| Valve Model Number | Mounting Bolt | Qty. | Tightening Torque Nm |
|---|---|---|---|
| ELDFHG-03EH | Hex. Socket Head Cap Screw: M6 × 35L | 4 | 12.9 - 15.9 |
| ELDFHG-04EH | Hex. Socket Head Cap Screw: M6 × 55L | 2 | |
| | Hex. Socket Head Cap Screw: M10×60L | 4 | 60.6 - 74.1 |
| ELDFHG-06EH | Hex. Socket Head Cap Screw: M12×85L | 6 | 104 - 127 |
| ELDFHG-10EH | Hex. Socket Head Cap Screw: M20×90L | | 493 - 603 |

## Instructions

Take care of filling the valve tank port with the hydraulic oil at any time.
However, check valve with cracking pressure 0.04 MPa approx. shall be provided as required.
The pipe from the tank port should be connected to the reservoir directly and the end of the pipe must always be in the oil.

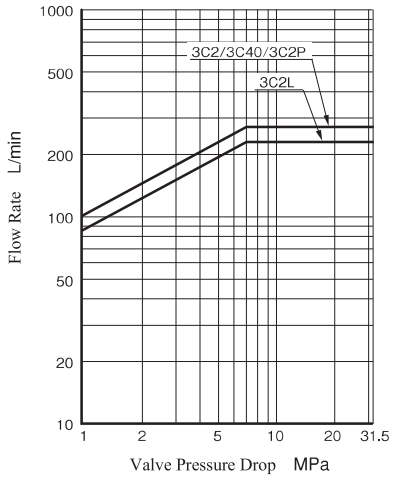
## Mounting Position

Mount the valve with the angle of the axis line L-L' within about ±15° from the horizontal plane as shown in the right figure. When the principal vibration direction is consistent with the axial direction of the spool, the spool may malfunction due to external force. Make sure that the principal vibration direction is not consistent with the axial direction of the spool.

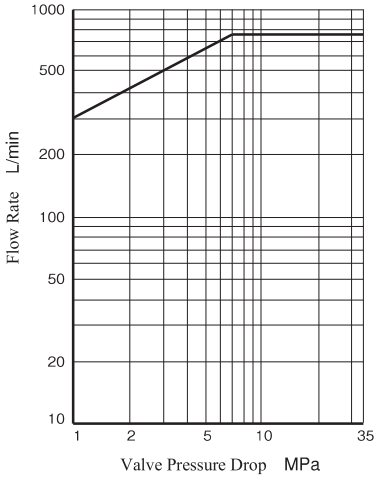



## The Effective Range of The Fail-Safe Function

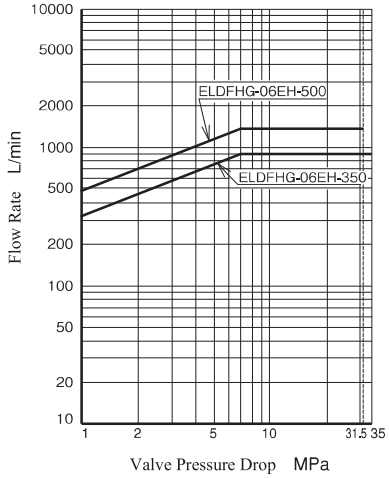
ELDFHG-03EH-100-3C2/3C40/3C2P/3C2L



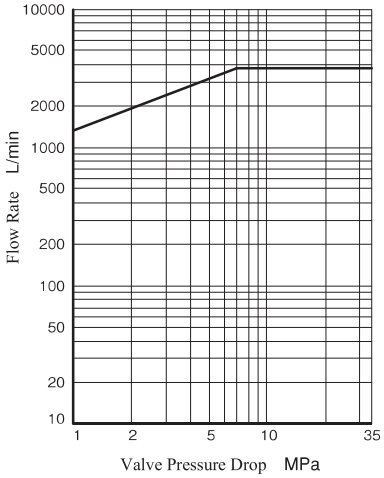

ELDFHG-04EH




ELDFHG-06EH

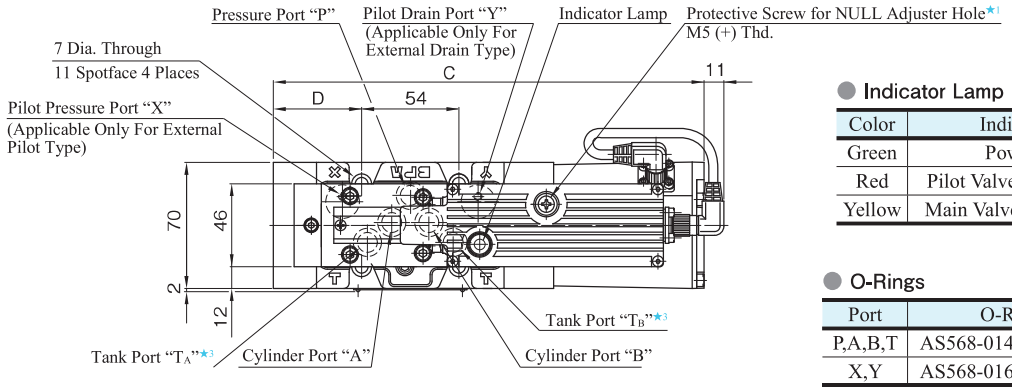



ELDFHG-10EH



## ELDFHG-03EH-100-＊-XY-＊＊-＊-＊-10

Mounting Surface: ISO 4401-05-05-0-05

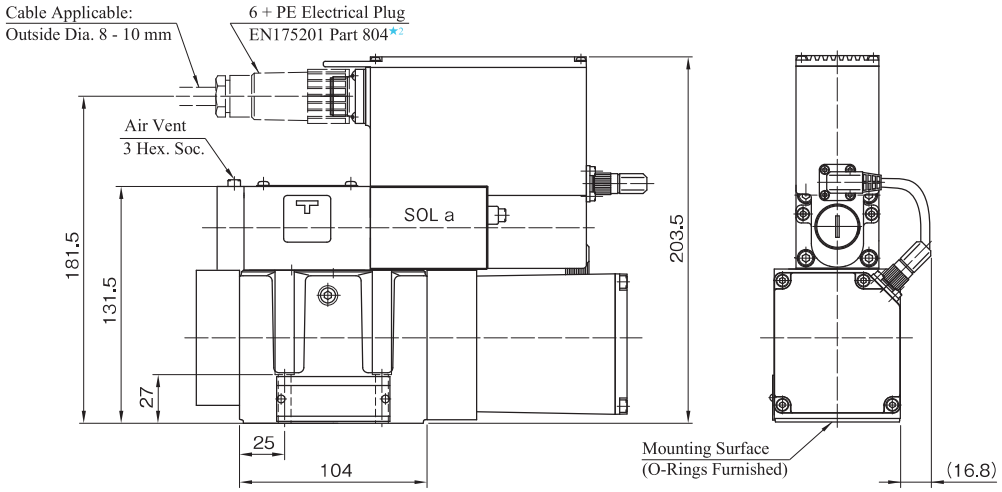



### Indicator Lamp

| Color | Indicator Lamp |
|---|---|
| Green | Power Supply |
| Red | Pilot Valve Deviation Alarm |
| Yellow | Main Valve Deviation Alarm |

### O-Rings

| Port | O-Ring | Qty. |
|---|---|---|
| P,A,B,T | AS568-014 (NBR-90) | 5 |
| X,Y | AS568-016 (NBR-90) | 2 |

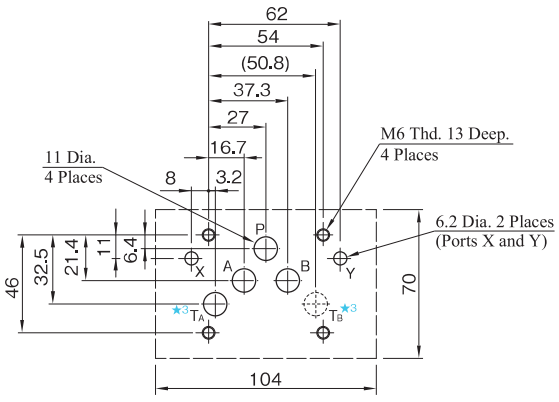



| Model Numbers | C | D |
|---|---|---|
| ELDFHG-03EH-100-3C2/3C40/3C2P | 239 | 49 |
| ELDFHG-03EH-100-3C2L | 248 | 58 |

### Dimensions of Mounting Surface

Prepare the mounting surface as shown below.

The mounting surface should have a good machined finish. (▽)



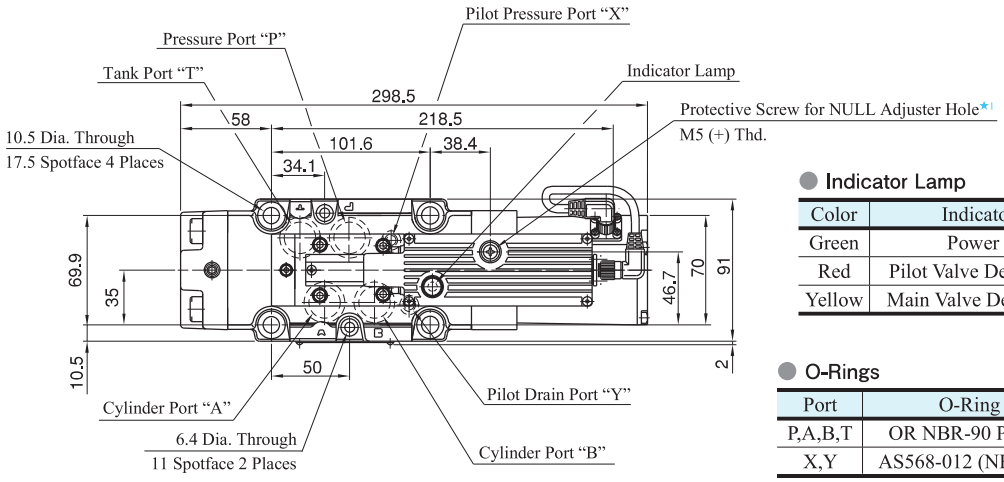

★1. For NULL adjustment, remove the protective screw and turn the trimmer behind the screw. After adjustment, be sure to attach the protective screw.

★2. The 6 + PE Electrical Plug is not included with the valve. Prepare it separately. YUKEN parts number: TK290457-1

★3. There are two tank ports "TA" and "TB"; however, "TA" may be used alone.

## ELDFHG-04EH-280-＊-XY-＊＊-＊-＊-＊-10

Mounting Surface: ISO 4401-07-07-0-05

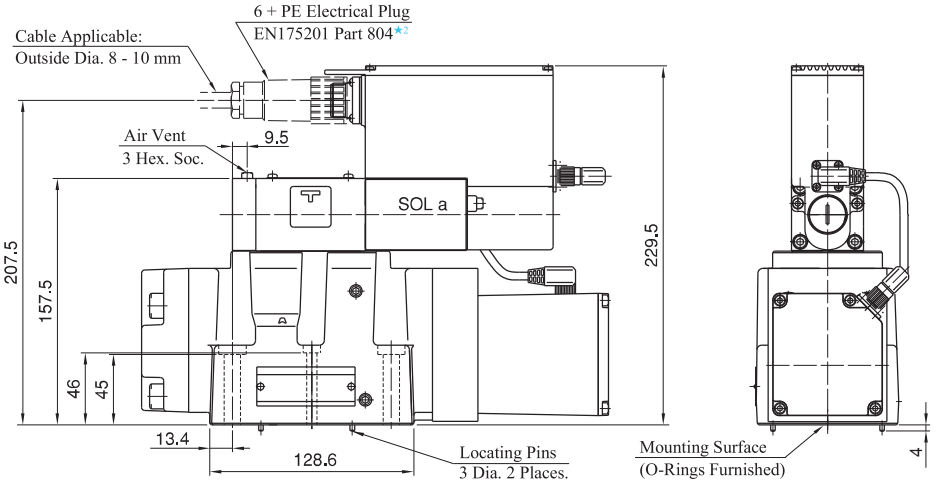



### Indicator Lamp

| Color | Indicator Lamp |
|---|---|
| Green | Power Supply |
| Red | Pilot Valve Deviation Alarm |
| Yellow | Main Valve Deviation Alarm |

### O-Rings

| Port | O-Ring | Qty. |
|---|---|---|
| P,A,B,T | OR NBR-90 P22-N | 4 |
| X,Y | AS568-012 (NBR-90) | 2 |



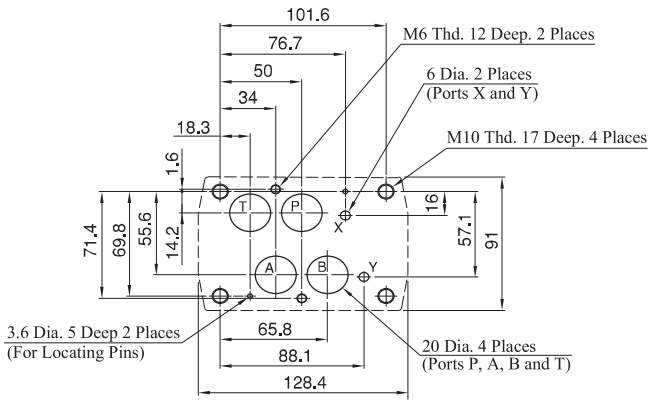

★1. For NULL adjustment, remove the protective screw and turn the trimmer behind the screw.
After adjustment, be sure to attach the protective screw.

★2. The 6 + PE Electrical Plug is not included with the valve. Prepare it separately.
YUKEN parts number: TK290457-1

### Dimensions of Mounting Surface

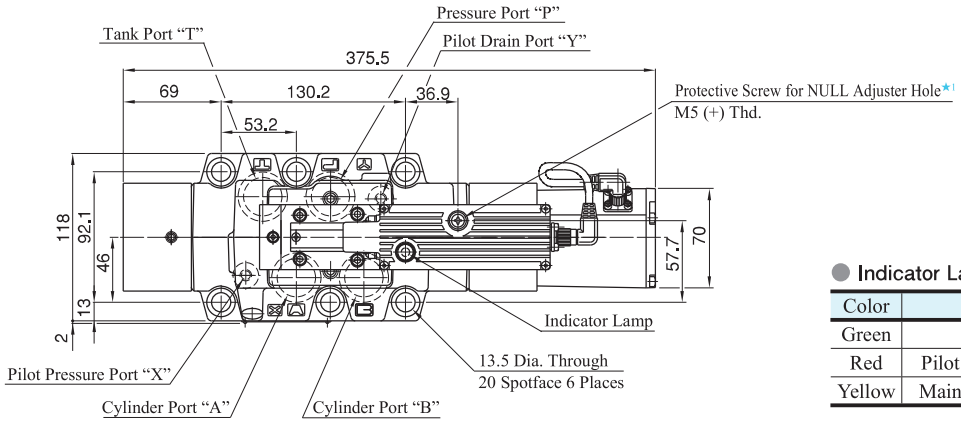
Prepare the mounting surface as shown below.

The mounting surface should have a good machined finish. (▽6)



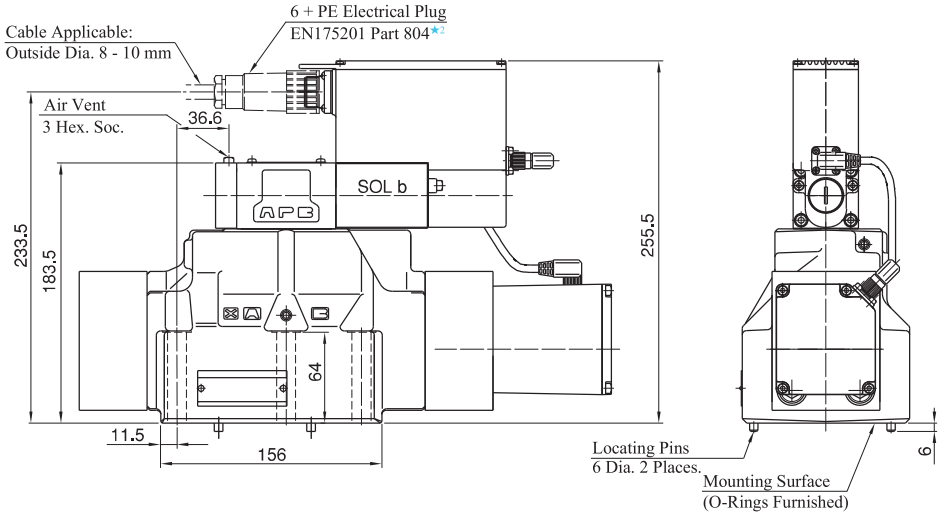
## ELDFHG-06EH-350/500-＊-XY-＊＊-＊-＊-10

Mounting Surface: ISO 4401-08-08-0-05




### Indicator Lamp

| Color | Indicator Lamp |
|---|---|
| Green | Power Supply |
| Red | Pilot Valve Deviation Alarm |
| Yellow | Main Valve Deviation Alarm |




### O-Rings

| Port | Model Numbers | O-Ring | Qty. |
|---|---|---|---|
| P,A,B,T | ELDFHG-06EH-350 | AS568-123 (NBR-90) | 4 |
| | ELDFHG-06EH-500 | AS568-126 (NBR-90) | 4 |
| X,Y | ELDFHG-06EH-350/500 | OR NBR-90 P14-N | 2 |

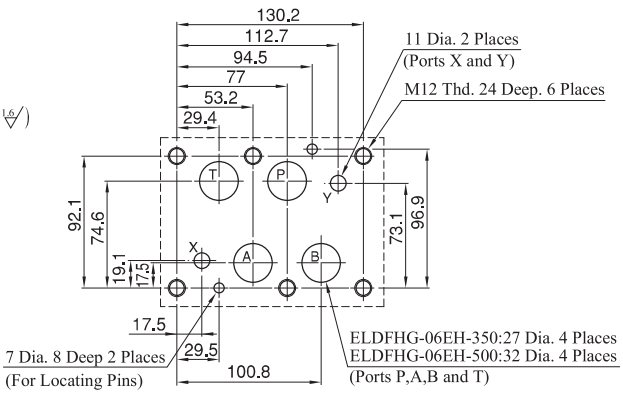
★1. For NULL adjustment, remove the protective screw and turn the trimmer behind the screw.
After adjustment, be sure to attach the protective screw.

★2. The 6 + PE Electrical Plug is not included with the valve. Prepare it separately.
YUKEN parts number: TK290457-1

### Dimensions of Mounting Surface

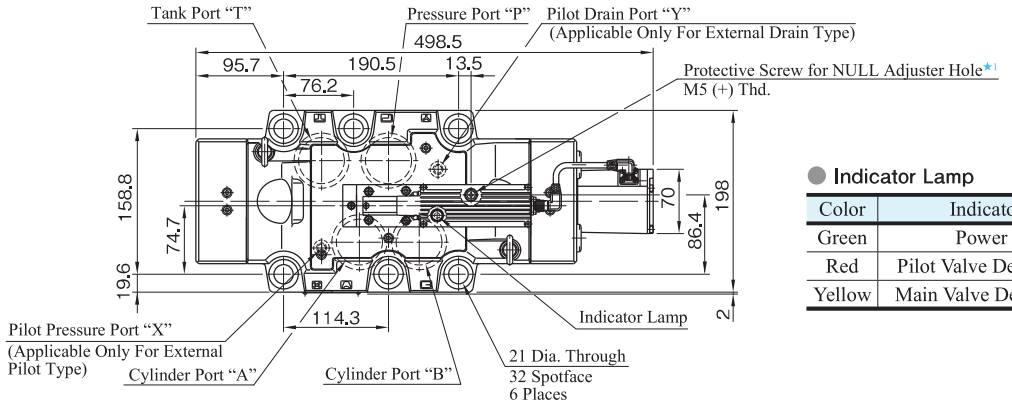
Prepare the mounting surface as shown in the right figure

The mounting surface should have a good machined finish. (▽6)



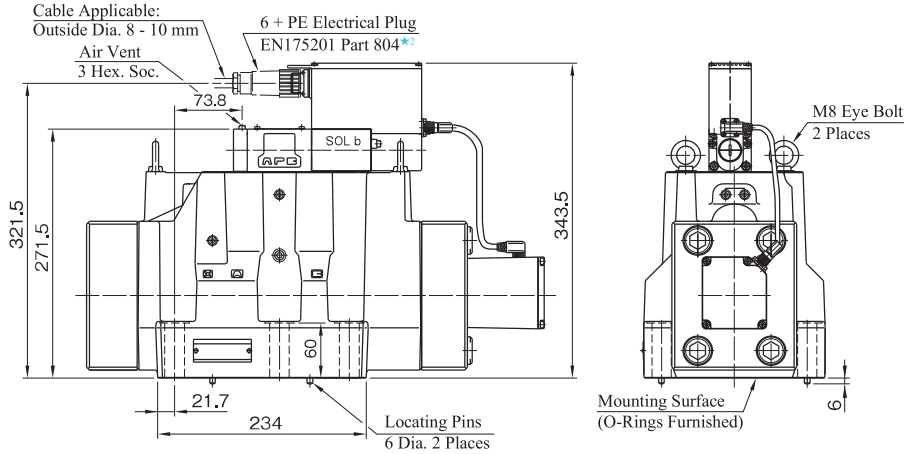
## ELDFHG-10EH-1440-＊-XY-＊＊-＊-＊-10

Mounting Surface: ISO 4401-10-09-0-05




### Indicator Lamp

| Color | Indicator Lamp |
|---|---|
| Green | Power Supply |
| Red | Pilot Valve Deviation Alarm |
| Yellow | Main Valve Deviation Alarm |



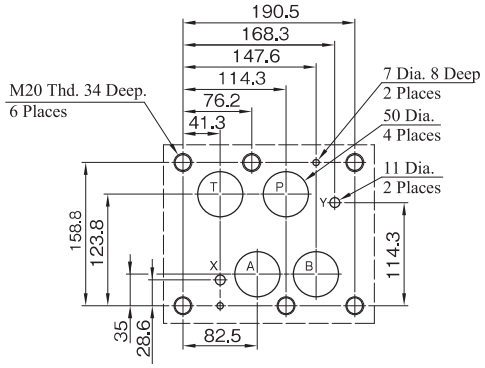

### O-Rings

| Port | O-Ring | Qty. |
|---|---|---|
| P,A,B,T | AS568-227 (NBR-90) | 4 |
| X,Y | AS568-015 (NBR-90) | 2 |

★1. For NULL adjustment, remove the protective screw and turn the trimmer behind the screw.
After adjustment, be sure to attach the protective screw.
★2. The 6 + PE Electrical Plug is not included with the valve. Prepare it separately.
YUKEN parts number: TK290457-1

### Dimensions of Mounting Surface

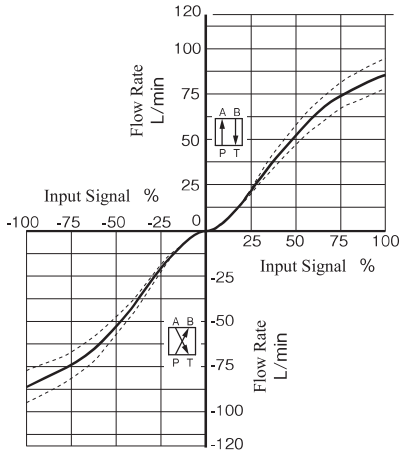
Prepare the mounting surface as shown in the below figure
The mounting surface should have a good machined finish. (1.6▽)



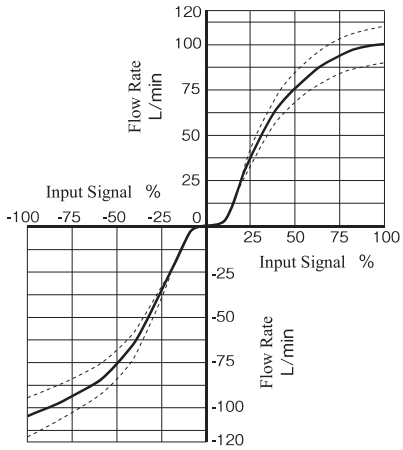
## No-Load Flow Characteristics

〈Conditions〉 ●Valve Pressure Difference: 1 MPa (4-Way Valve/Pressure Difference per Land: 0.5 MPa)
●Viscosity: 30 mm²/s

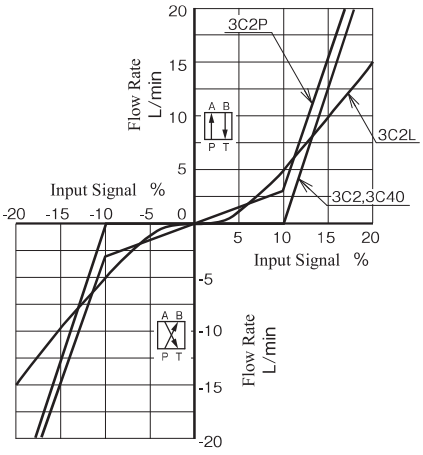
ELDFHG-03EH-100-3C2L



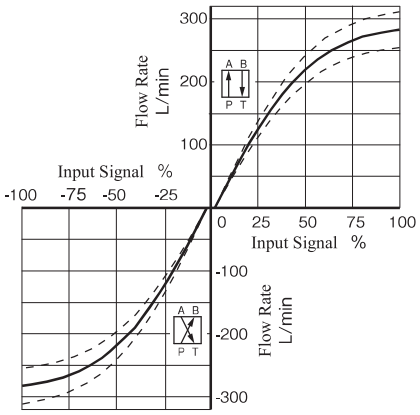

ELDFHG-03EH-100-3C2/3C40/3C2P



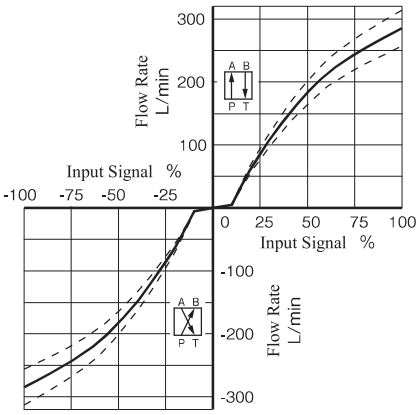

Around Null Position
Input Signal -20⇔+20%



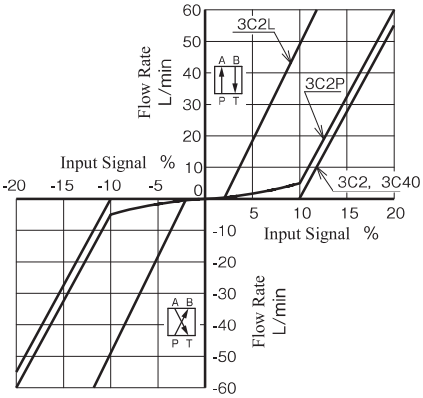

ELDFHG-04EH-280-3C2L



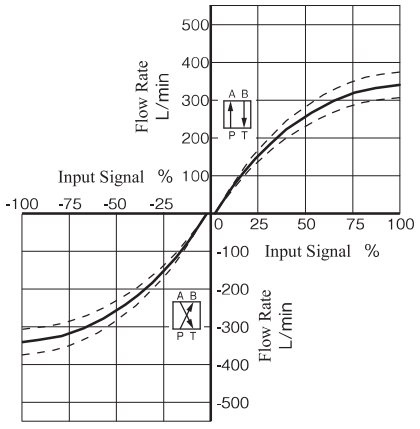

ELDFHG-04EH-280-3C2/3C40/3C2P



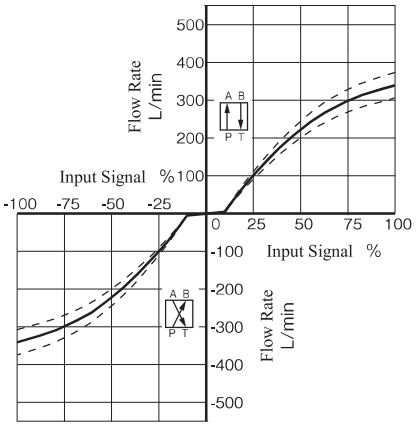

Around Null Position
Input Signal -20⇔+20%



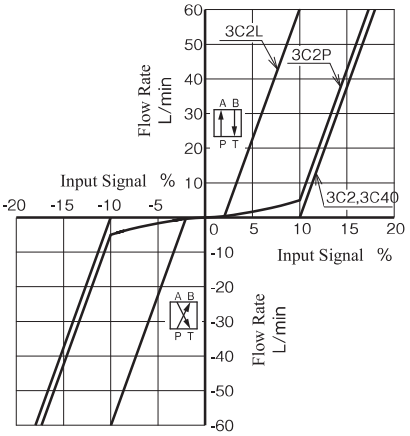

ELDFHG-06EH-350-3C2L



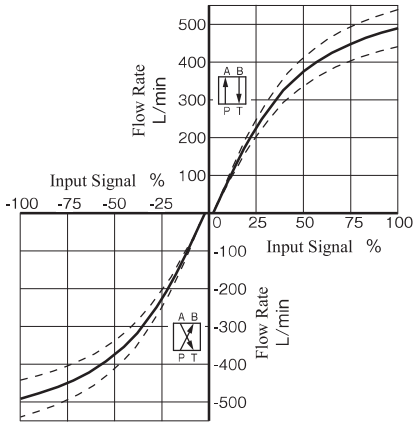

ELDFHG-06EH-350-3C2/3C40/3C2P



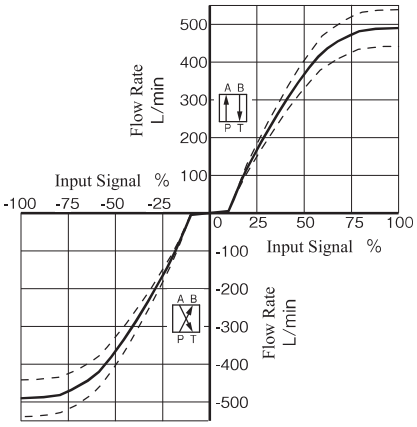

Around Null Position
Input Signal -20⇔+20%



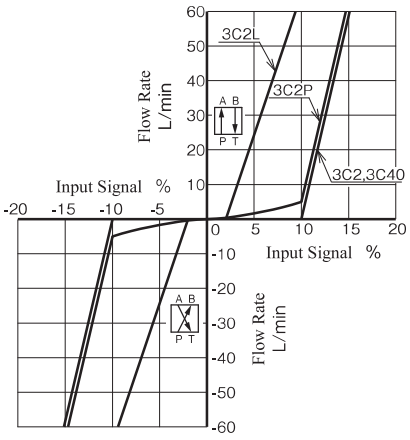
ELDFHG-06EH-500-3C2L



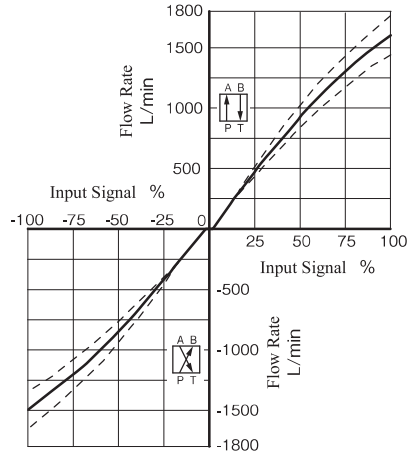

ELDFHG-06EH-500-3C2/3C40/3C2P



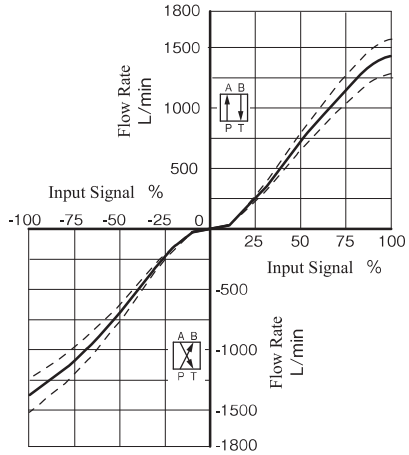

Around Null Position
Input Signal -20⇔+20%



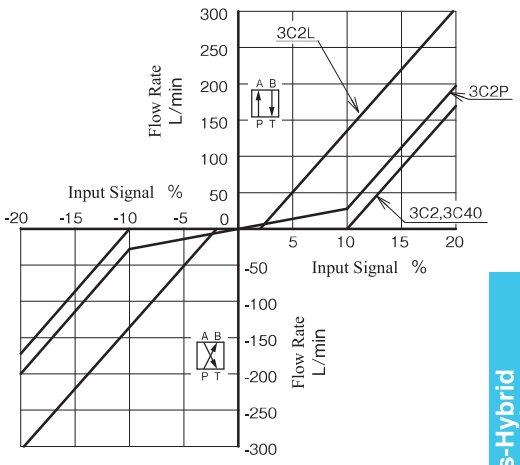

ELDFHG-10EH-1440-3C2L




ELDFHG-10EH-1440-3C2/3C40/3C2P




Around Null Position
Input Signal -20⇔+20%

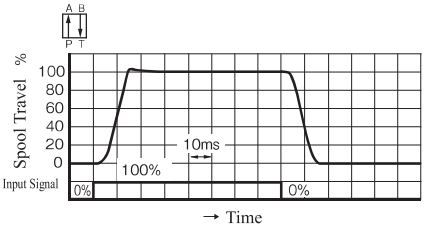


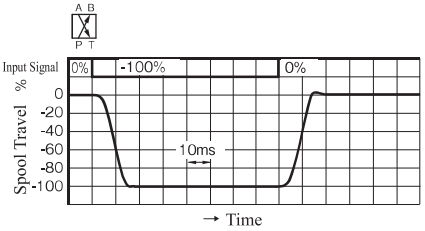
## Step Response (Example)

〈Conditions〉 ●Hydraulic Circuit: Port A/B Closed ●Supply Pressure and Pilot Pressure: 14 MPa
●Input Signal: 0⇔100% ●Viscosity: 30 mm²/s

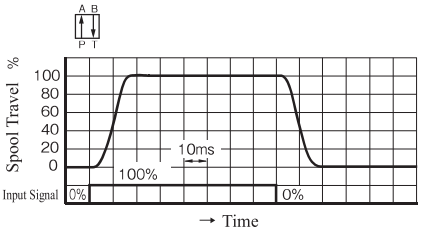
This value is measured on a per valve basis; the actual step response may differ depending on the actual circuit.

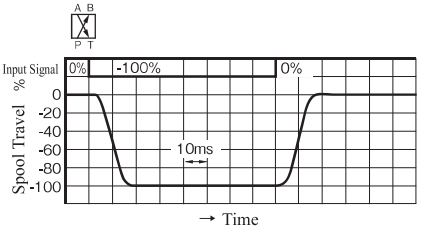
### ELDFHG-03EH-100-3C2/3C40/3C2P



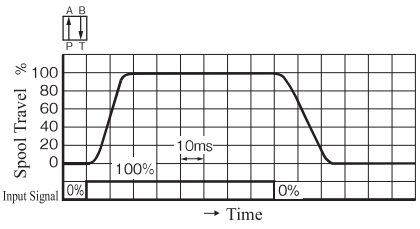



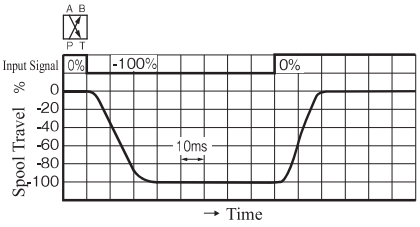

### ELDFHG-03EH-100-3C2L



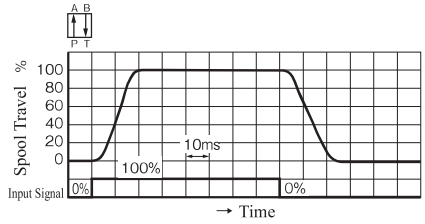



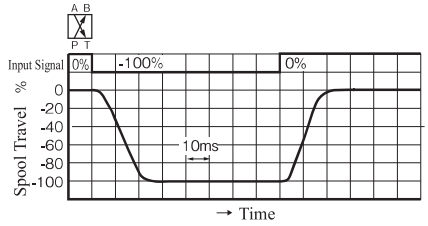

### ELDFHG-04EH



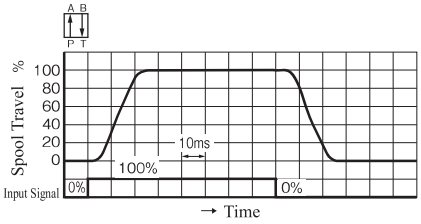



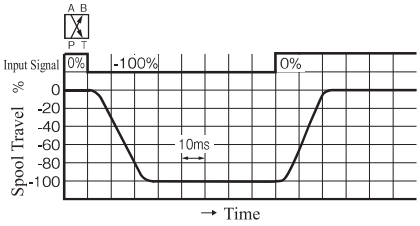

### ELDFHG-06EH-350



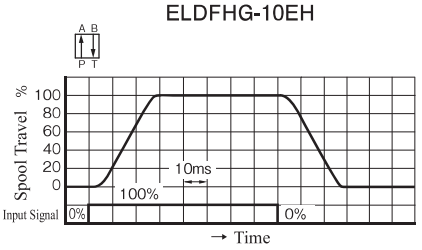



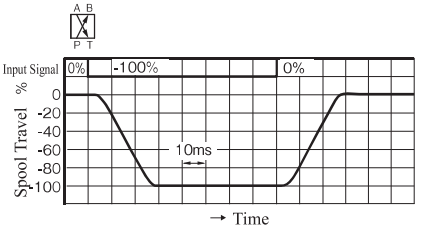

### ELDFHG-06EH-500




### ELDFHG-10EH



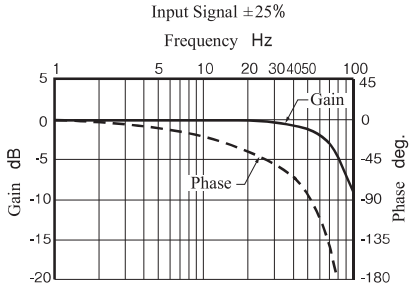



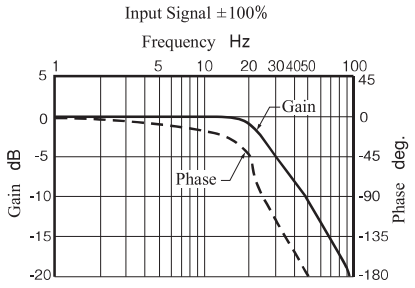
## Frequency Response (Example)

〈Conditions〉 ●Hydraulic Circuit: Port A/B Closed ●Supply Pressure and Pilot Pressure: 14 MPa
●Viscosity: 30 mm²/s

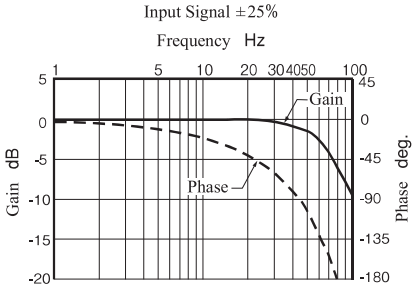
This value is measured on a per valve basis; the actual frequency response may differ depending on the actual circuit.

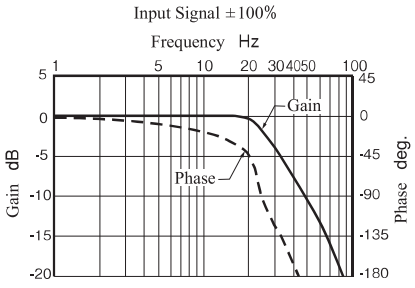
### ELDFHG-03EH-100-3C2/3C40/3C2P



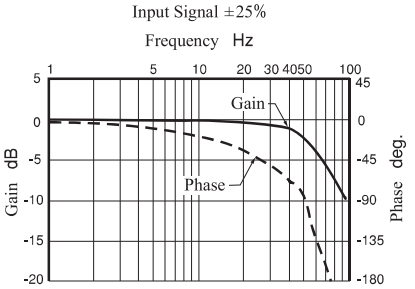



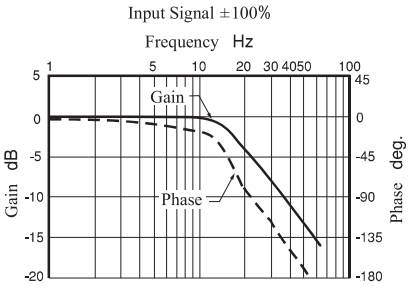

### ELDFHG-03EH-100-3C2L



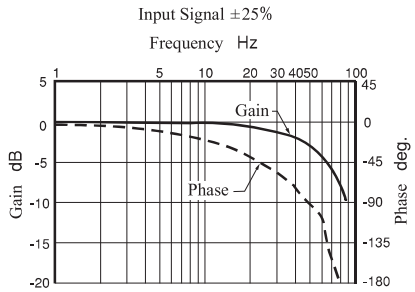



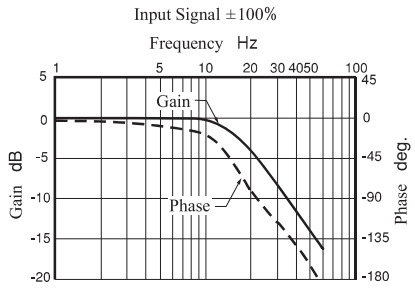

### ELDFHG-04EH



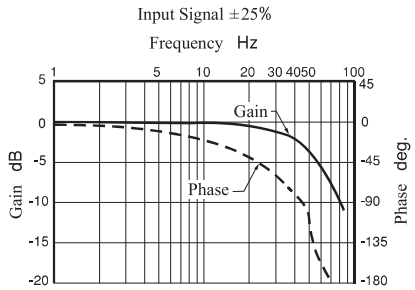



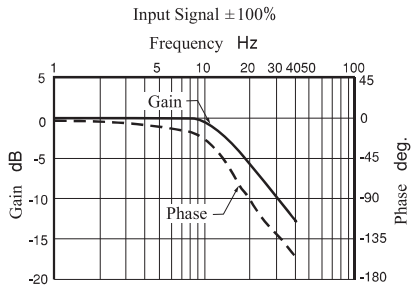

### ELDFHG-06EH-350



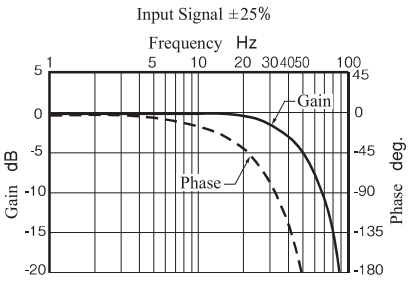



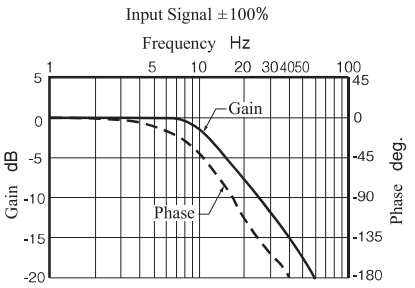

### ELDFHG-06EH-500



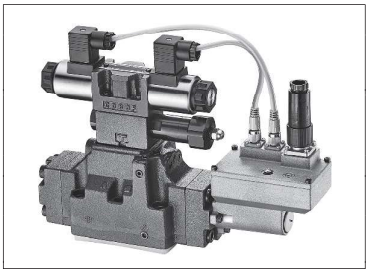

### ELDFHG-10EH

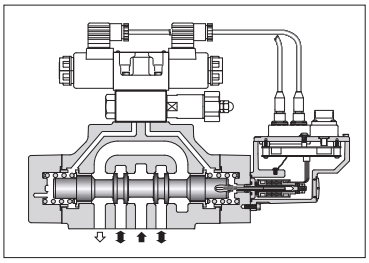


# Proportional Electro-Hydraulic Directional and Flow Control Valves (with Main Valve Feedback Control)

OBE (on-board electronics) type proportional electro-hydraulic directional and flow control valve with a LVDT for spool position detection built into the main valve. High accuracy is achieved by configuring a closed loop.





## Features

### Simpler

Highly accurate hydraulic control can be obtained only by supplying 24 V DC power and inputting a command signal

### High Accuracy

Hysteresis : 0.5 % or less

### Safety

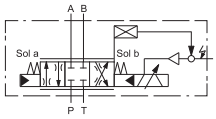
The valves support a fail-safe function to ensure safe operation in the event of electric failure (power failure, power cable disconnection, etc.).

### High Flow

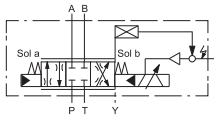
Significantly increased flow rate compared to current products

## Graphic Symbols

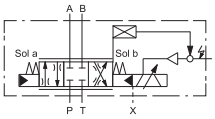
### Spool Type "3C2" , "3C21, "3C22"



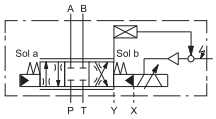

Internal Pilot
Internal Drain Type




Internal Pilot
External Drain Type

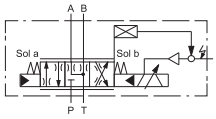



External Pilot
Internal Drain Type

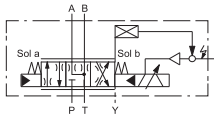



External Pilot
External Drain Type

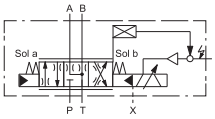
### Spool Type "3C40"



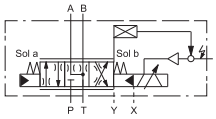

Internal Pilot
Internal Drain Type




Internal Pilot
External Drain Type




External Pilot
Internal Drain Type




External Pilot
External Drain Type

## Specifications

| Model Numbers | | | ECDFHG-04EH-150 | ECDFHG-04EH-200 | ECDFHG-06EH-350 | ECDFHG-06EH-500 |
|---|---|---|---|---|---|---|
| Rated Flow [ΔP=1 MPa (4-Way Valve)] ΔP = 0.5 MPa per Land | | L/min | 3C21(P→B, B→T) 3C22(P→A, A→T) :120<br>3C2, 3C40 3C21(P→A, A→T) :150 3C22(P→B, B→T) | 3C2, 3C40 : 200 | 3C21(P→B, B→T) 3C22(P→A, A→T) :230<br>3C2, 3C40 3C21(P→A, A→T) :350 3C22(P→B, B→T) | 3C2, 3C40 : 500 |
| Max. Operating Pressure | | MPa | 35 | | 31.5 | |
| Pilot Pressure★1 | | MPa | 2.5 - 35 | | 2.5 - 31.5 | |
| Pilot Flow Rate★2 | | L/min | 5.5 | | 7.5 | |
| Proof Pres. at Return Port★3 | External Drain T Port | MPa | 31.5 | | 25 | |
| | External Drain Y Port | MPa | 1 or less | | 1 or less | |
| | Internal Drain T&Y Ports | MPa | 1 or less | | | |
| Internal Leakage★4 | Pilot Valve | L/min | 1.2 or less | | | |
| | Main Valve | L/min | 3C2, 3C21, 3C22 : 1.0 or less<br>3C40 : 1.4 or less | 3C2 : 1.4 or less<br>3C40 : 2.8 or less | 3C2, 3C21, 3C22 : 1.5 or less<br>3C40 : 2.0 or less | 3C40 : 2.0 or less<br>3C40 : 4.0 or less |
| Step Response (0 → 100%)★5 | | ms | 38 | | 45 | |
| Frequency Response ±25% Amplitude★5 | Phase: -90° | Hz | 26 | | 24 | |
| | Gain: -3 dB | Hz | 30 | | 27 | |
| Hysteresis | | | 0.5% or less | | | |
| Repeatability | | | 0.5% or less | | | |
| Power Supply | | | 21.6 - 26.4 V DC Included Ripple | | | |
| Ambient Temperature | | | ˚C | | -15 - +60 | |
| Current | | A | 2 (Impulse Loud 3) | | | |
| Power Input | | VA | 75 | | | |
| Coil Resistance at 20 ºC | | Ω | 4.6 | | | |
| Input Signal | | | ±10V, 4 - 20 mA, ±10 mA | | | |
| Electric Connection | | | 6 + PE Connector [EN 175201 Part 804] | | | |
| Protection | | | Equivalent to IP64 | | | |
| Approx. Mass | | kg | 13 | | 21 | |

★1. Pilot pressure should be between 2.5 MPa and 35 MPa (04EH), 2.5 MPa and 31.5 MPa (06EH), and should exceed 60% of the actual supply pressure to main valve.
★2. Pilot flow is calculated with the above step response time at pilot pressure 3 MPa.
★3. Return pressure should be less than the actual supply pressure.
★4. This value is measured at a supply pressure of 14 MPa, pilot pressure of 14 MPa, and viscosity of 30 $mm^2$ /s; it may vary depending on the actual circuit/operation conditions.
★5. This value is measured for each valve based a pilot pressure of 14 MPa; it may vary depending on the actual circuit/operation conditions.

## Details of the Valve Fail-Safe Functions

With reference to the information given below, select the option for the fail-safe function according to the use of applications.
A separate safety circuit should be provided if the hydraulic actuator must be reliably held or stopped.

| No. | Model Numbers | Fail-Safe Function★ | |
|---|---|---|---|
| | | Spool Position | Function |
| 1 | ECDFHG-＊EH-＊-3C2-XY-＊＊-C<br>ECDFHG-＊EH-＊-3C21-XY-＊＊-C<br>ECDFHG-＊EH-＊-3C22-XY-＊＊-C | Neutral | All Ports Blocked  |
| 2 | ECDFHG-＊EH-＊-3C40-XY-＊＊-C | | A, B, T Connection  |

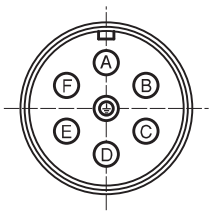
★The fail-safe function's activation time depends on the electric and hydraulic conditions.

## Model Number Designation

| ECDFHG | - 04 | EH | - 150 | - 3C2 | - XY | - E | T | - C | - D | - 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Series Number | Valve Size | Amplifier Type | Rated Flow L/min ΔP= 1 MPa (4-Way Valve) | Spool Type | Direction of Flow | Pilot Type | Drain Type | Fail-Safe Function★2 | Input Signal/ Spool Travel Monitoring | Design Number |
| ★1 ECDFHG: Proportional Electro-Hydraulic Directional and Flow Control Valves (with Main Valve Feedback Control) | 04 | EH: OBE Type | 150 : 150 L/min | 3C2 3C40 3C21 3C22 | XY: Meter-in/ Meter-out | None: Internal Pilot E: External Pilot | None: External Drain T: Internal Drain | C: Neutral | D: Voltage Signal ± 10 V (PABT Flow with Positive Input) E: Current Signal 4 to 20 mA (PABT Flow with 12 to 20 mA Input) F: Current Signal ± 10 mA (PABT Flow with Positive Input) | 10 |
| | | | 200 : 200 L/min | 3C2 3C40 | | | | | | |
| | 06 | | 350 : 350 L/min | 3C2 3C40 3C21 3C22 | | | | | | |
| | | | 500 : 500 L/min | 3C2 3C40 | | | | | | |

★1. Phosphate ester type fluids are also supported. When phosphate ester type fluids are used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.
★2. Refer to the previous page for details on the fail-safe function.

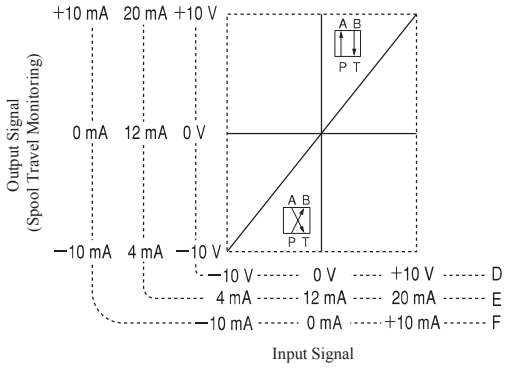
## Electrical Specifications



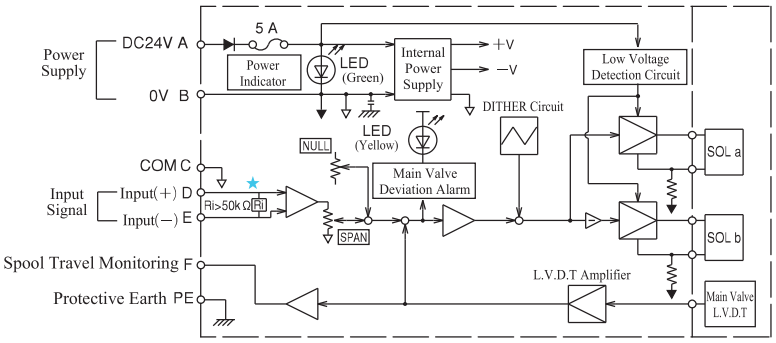

| Input Signal | | Voltage Signal "D" | Current Signal "E" | Current Signal "F" |
|---|---|---|---|---|
| Pin A | Power Supply | 24 V DC (21.6 - 26.4 V DC Included Ripple), 75 VA or more | | |
| Pin B | | 0 V | | |
| Pin C | Signal Common | COM (0 V) | | |
| Pin D | Input (+)(Differential)★1 | 0 - ±10 V R i≧50 kΩ | 4 - 20 mA R i=200 Ω | 0 - ±10 mA R i=200 Ω |
| Pin E | Input (−)(Differential)★1 | | | |
| Pin F | Spool Travel Monitoring | 0 - ±10 V $R_L$≧10 kΩ | 4 - 20 mA $R_L$=100 - 500 Ω★2 | 0 - ±10 mA $R_L$=100 - 500 Ω★2 |
| Pin ⏚ | Protective Earth | — | | |

★1. Differential input signals can be used only for the valves with the voltage signal specifications of ±10V. (ECDFHG-＊EH-＊-D)
★2. The recommended load resistance is 200 Ω.

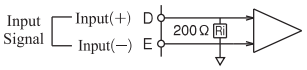
### I/O Signal Characteristics



## Block Diagram




★The input stage for the current signal "E" and "F" is as follows.



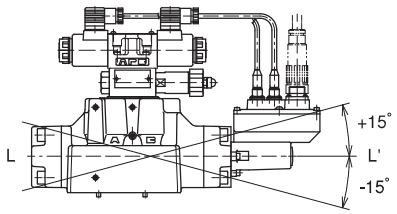

## Accessories

### Mounting Bolts

| Valve Model Numbers | Mounting Bolt | Qty. | Tightening Torque Nm |
|---|---|---|---|
| ECDFHG-04EH | Hex. Socket Head Cap Screw: M6 × 55L | 2 | 12.9 - 15.9 |
| | Hex. Socket Head Cap Screw: M10×60L | 4 | 60.6 - 74.1 |
| ECDFHG-06EH | Hex. Socket Head Cap Screw: M12×85L | 6 | 104 - 127 |

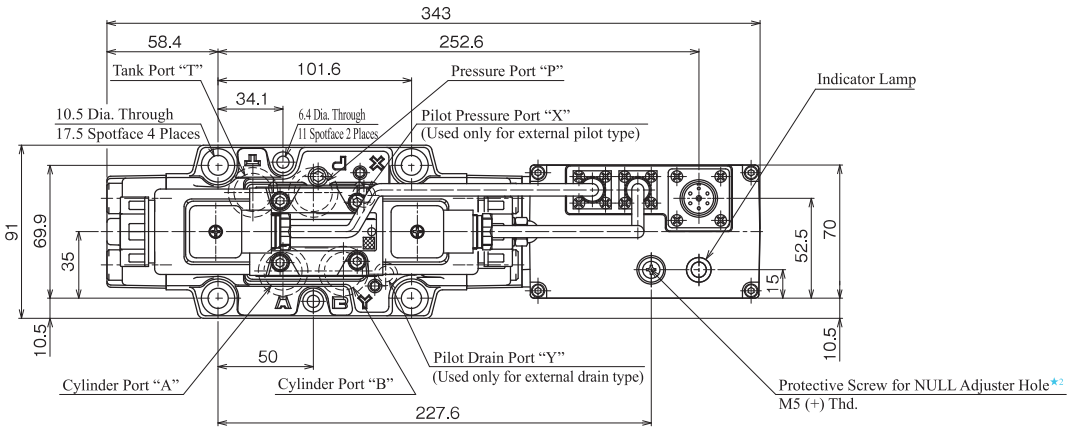
## Mounting Position

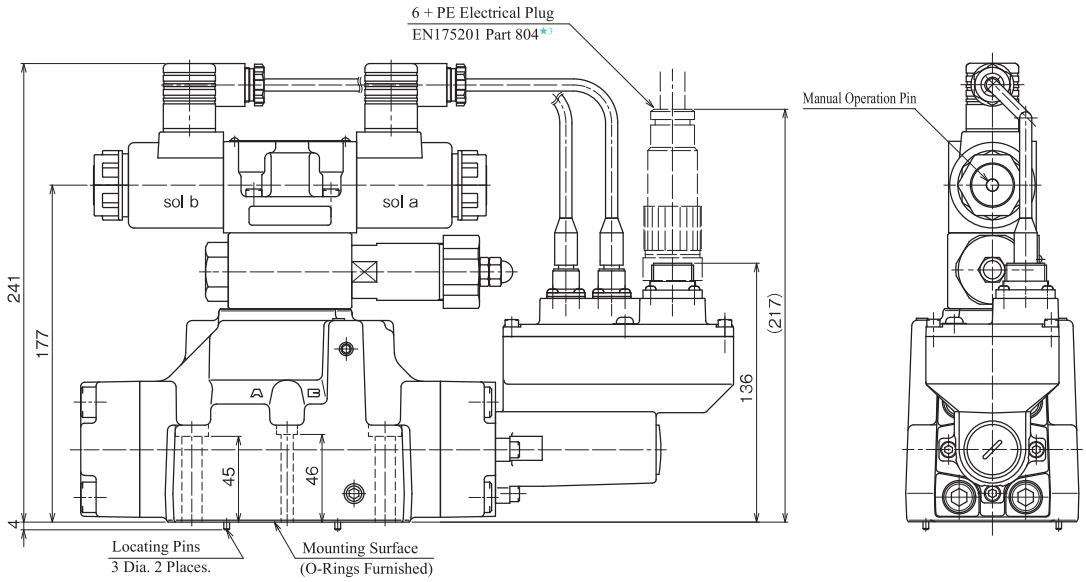
Mount the valve with the angle of the axis line L-L' within about ±15° from the horizontal plane as shown in the right figure. When the principal vibration direction is consistent with the axial direction of the spool, the spool may malfunction due to external force. Make sure that the principal vibration direction is not consistent with the axial direction of the spool.



## ECDFHG-04EH

Mounting Surface: ISO 4401-07-07-0-05★1




### Indicator Lamp

| Color | Indicator Lamp |
|---|---|
| Green | Power Supply |
| Yellow | Main Valve Deviation Alarm |

### O-Rings

| Port | O-Ring | Qty. |
|---|---|---|
| P,A,B,T | OR NBR-90 P22-N | 4 |
| X,Y | OR NBR-90 P9-N | 2 |

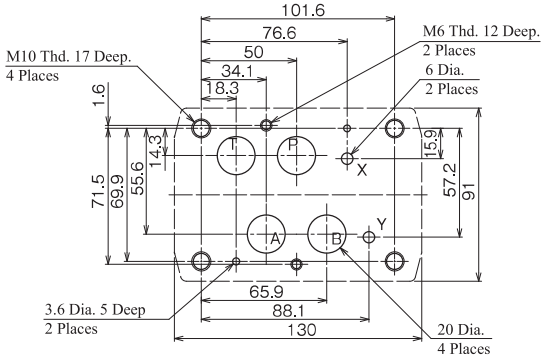
★1. This valve can be mounted on ISO mounting surface.
However, in this case, the pressure loss becomes large and the rated flow rate cannot be achieved.

★2. For NULL adjustment, remove the protective screw and turn the trimmer behind the screw. After adjustment, be sure to attach the protective screw.

★3. The 6 + PE Electrical Plug is not included with the valve.
Prepare it separately.
YUKEN parts number: TK290457-1

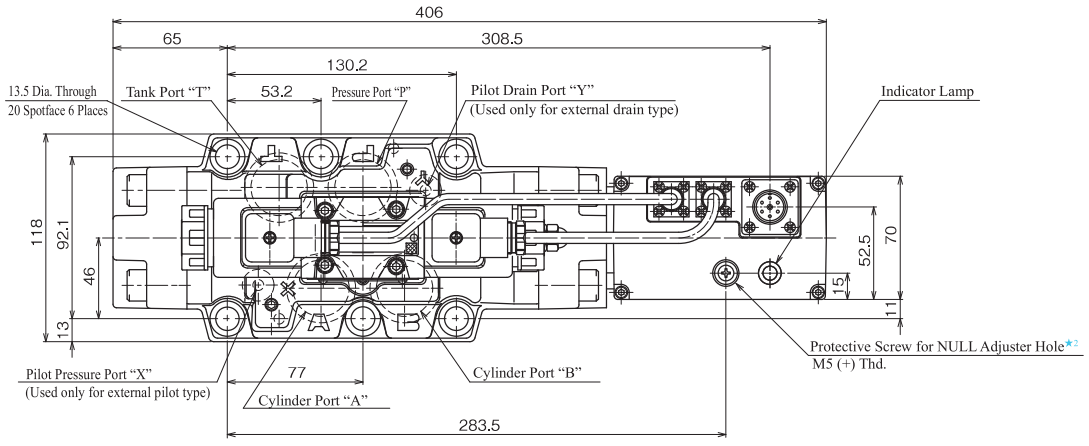
### Dimensions of Mounting Surface

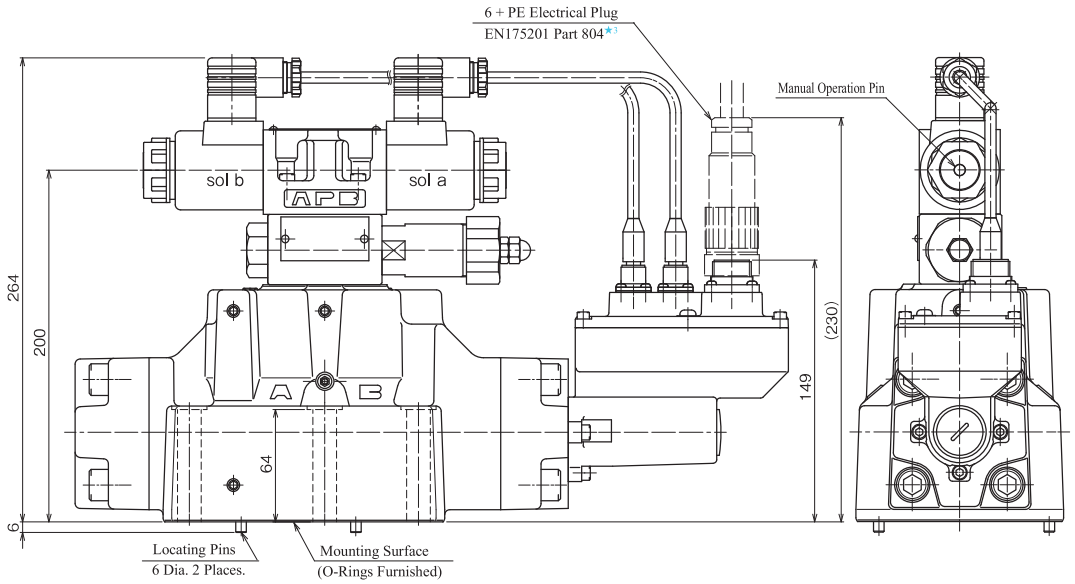
Prepare the mounting surface as shown in the figure below.
The mounting surface should have a good machined finish (▽6).



## ECDFHG-06EH

Mounting Surface: ISO 4401-08-08-0-05★1




### Indicator Lamp

| Color | Indicator Lamp |
|---|---|
| Green | Power Supply |
| Yellow | Main Valve Deviation Alarm |

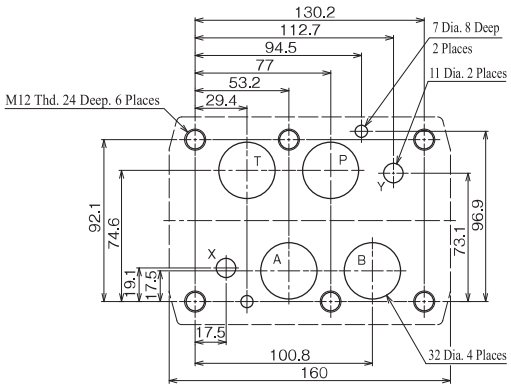
### O-Rings

| Port | O-Ring | Qty. |
|---|---|---|
| P,A,B,T | AS568-126 (NBR-90) | 4 |
| X,Y | OR NBR-90 P14-N | 2 |

### Dimensions of Mounting Surface

Prepare the mounting surface as shown in the figure below.

The mounting surface should have a good machined finish (⌀6).




★1. This valve can be mounted on ISO mounting surface. However, in this case, the pressure loss becomes large and the rated flow rate cannot be achieved.

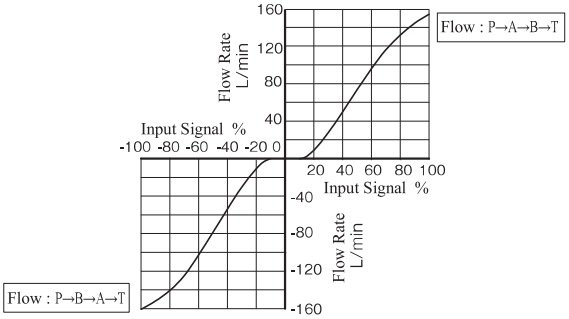
★2. For NULL adjustment, remove the protective screw and turn the trimmer behind the screw. After adjustment, be sure to attach the protective screw.

★3. The 6 + PE Electrical Plug is not included with the valve. Prepare it separately.
YUKEN parts number: TK290457-1

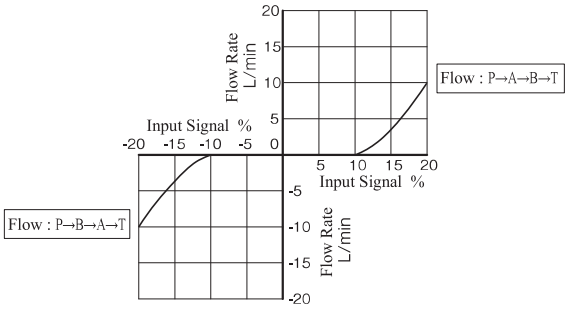
## No-Load Flow Characteristics

〈Conditions〉 ● Valve Pressure Difference: 1 MPa (4-Way Valve/Pressure Difference per Land: 0.5 MPa)
● Viscosity: 30 mm²/s

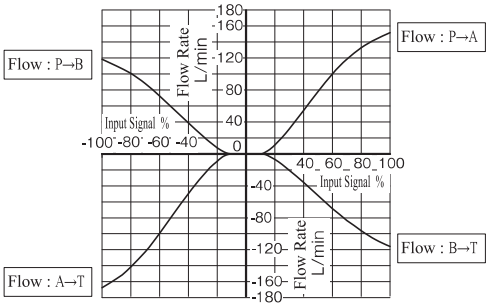
### ECDFHG-04EH-150-3C2/3C40



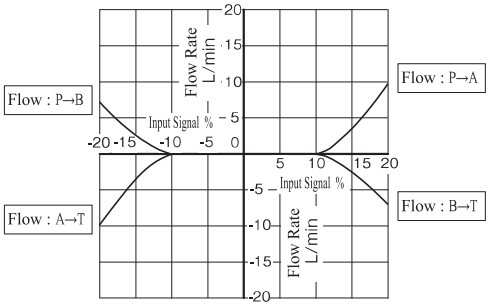

Around Null Position
Input Signal -20⇔+20%



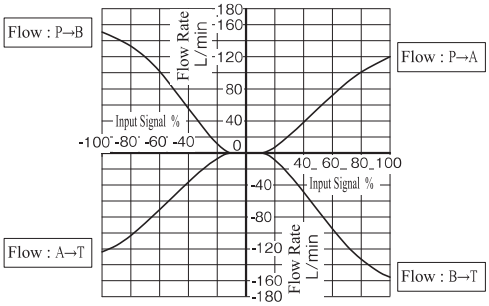

### ECDFHG-04EH-150-3C21



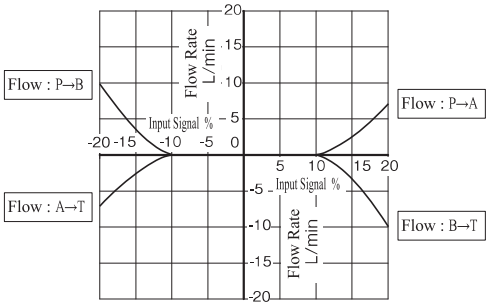

Around Null Position
Input Signal -20⇔+20%



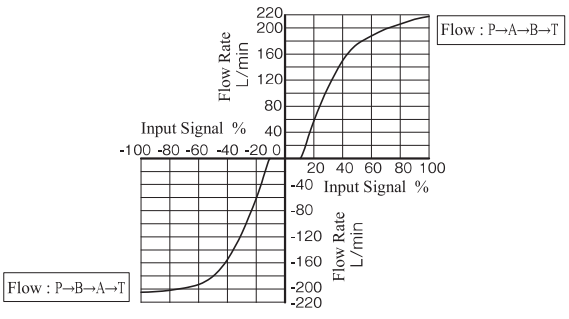

### ECDFHG-04EH-150-3C22



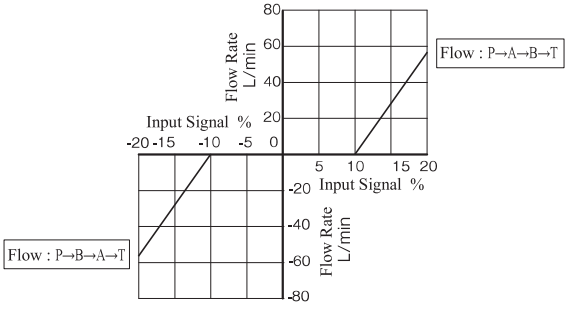

Around Null Position
Input Signal -20⇔+20%



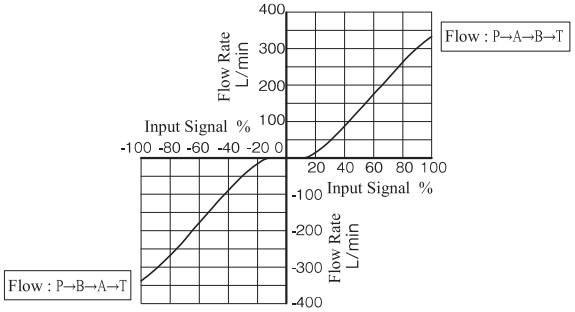

### ECDFHG-04EH-200-3C2/3C40



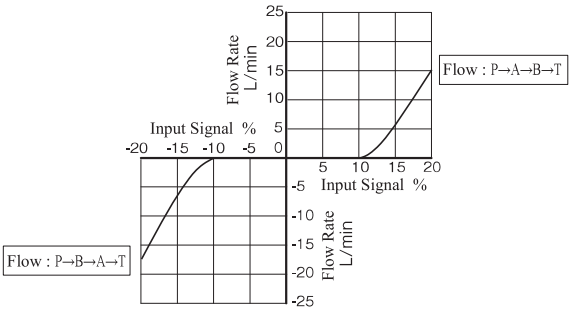

Around Null Position
Input Signal -20⇔+20%



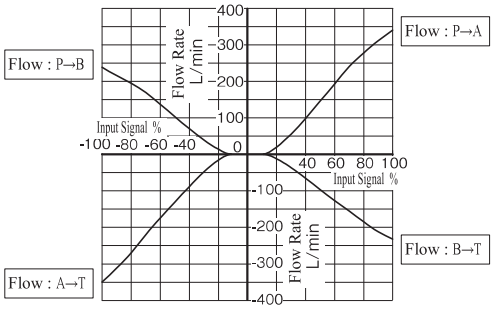
### ECDFHG-06EH-350-3C2/3C40



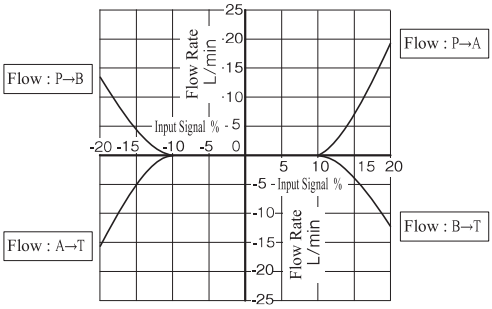

Around Null Position
Input Signal -20⇔+20%



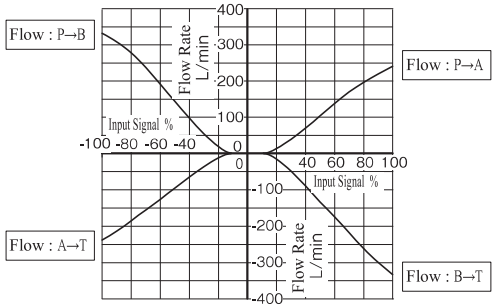

### ECDFHG-06EH-350-3C21



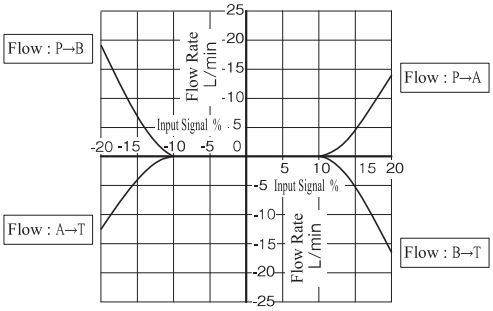

Around Null Position
Input Signal -20⇔+20%



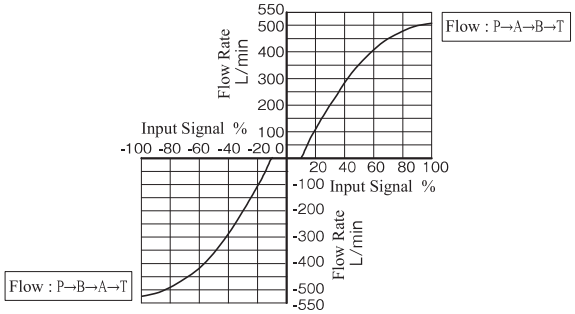

### ECDFHG-06EH-350-3C22



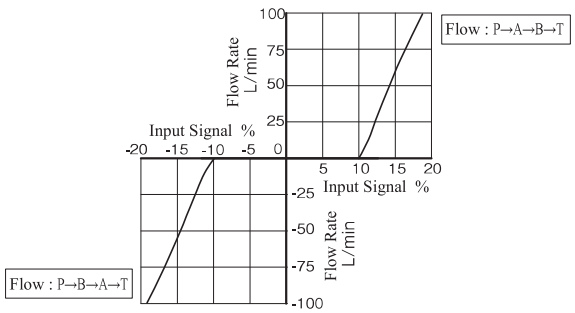

Around Null Position
Input Signal -20⇔+20%




### ECDFHG-06EH-500-3C2/3C40



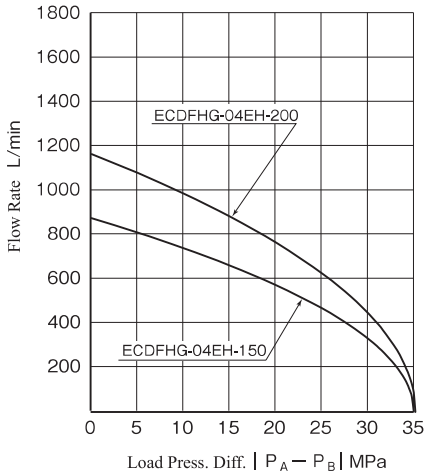

Around Null Position
Input Signal -20⇔+20%



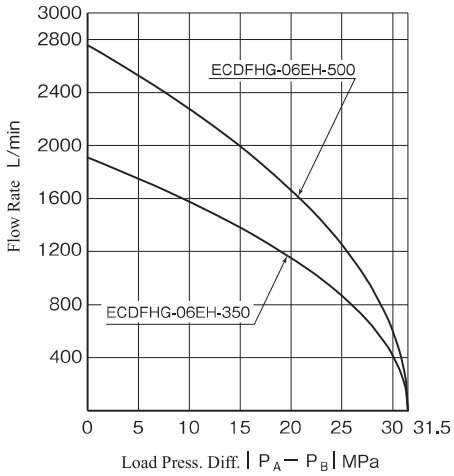
## Load Flow Characteristics

〈Conditions〉 ●Viscosity: 30 mm²/s

ECDFHG-04EH-*-3C2/3C40




ECDFHG-06EH-*-3C2/3C40

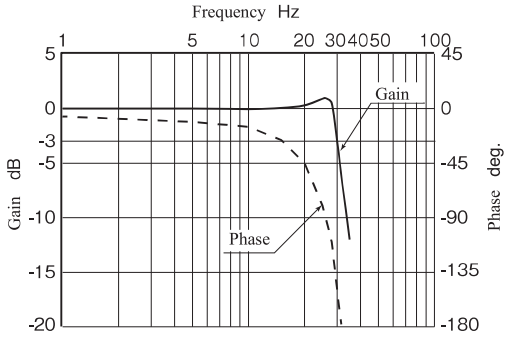



## Frequency Response

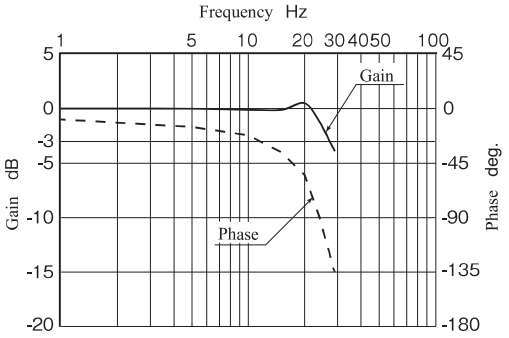
〈Conditions〉 ●Hydraulic Circuit: Port A/B Closed ●Supply Pressure and Pilot Pressure: 14 MPa
●Viscosity: 30 mm²/s ●Amplitude: 50±25%

This value is measured on a per valve basis; the actual frequency response may differ depending on the actual circuit.

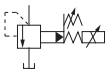
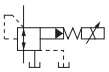
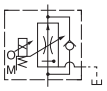
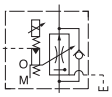
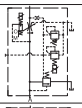
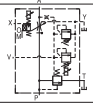
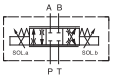
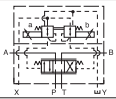
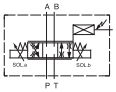
ECDFHG-04EH




ECDFHG-06EH



# E Series Proportional Electro-Hydraulic Controls

| Types | Graphic Symbols | Max. Operating Pressure MPa | Maximum Flow L/min (1 2 3 5 10 20 30 50 100 200 300 500 1000) | Page |
|---|---|---|---|---|
| Pilot Relief Valves |  | 24.5 | EDG 01 | H-93 |
| Relief Valves |  | 24.5 | EBG 03 06 10 | H-99 |
| Relieving and Reducing Valves |  | 24.5 | ERBG 06 10 | H-108 |
| 40 Ω Series Flow Control (and Check) Valves |  | 20.6 | EFG EFCG 02 03 06 10 | H-118 |
| 10 Ω Series Flow Control (and Check) Valves |  | 03: 20.6 06: 24.5 | EFG EFCG 03 06 | H-128 |
| 10 Ω - 10 Ω Series Flow Control and Relief Valves |  | 24.5 | EFBG 03 06 10 | H-135 |
| High Flow Series Flow Control and Relief Valves |  | 24.5 | EFBG 03 06 10 | H-145 |
| Shockless Type Directional and Flow Control Valves |  | 25 | EDFG 01 | H-155 |
| Directional and Flow Control Valves |  | 25 | EDFHG 03 04 06 | H-157 |
| High Response Type Directional and Flow Control Valves |  | 01/03: 31.5 04/06: 35 | ELDFG 01 03 ELDFHG 04 06 | H-163 |

**Power Amplifiers** ..... Page H-172
**Setting Adjusters** ..... Page H-194

## Hydraulic Fluids

### Fluid Types

Any type of hydraulic fluid listed in the table below can be used.

| | |
|---|---|
| Petroleum Base Oils | Use fluids equivalent to ISO VG 32 or VG 46. |
| Synthetic Fluids | Use phosphate ester or polyol ester fluids. When phosphate ester fluid is used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used. |
| Water-containing Fluids | Use water-glycol fluid. |

Note: For use with hydraulic fluids other than those listed above, please consult your Yuken representatives in advance.

### Recommended Fluid Viscosity and Temperature

Use hydraulic fluids which satisfy the both recommended viscosity and oil temperatures given in the table below.

| Name | Viscosity | Temperature |
|---|---|---|
| Pilot Relief Valves<br>Relief Valves<br>Relieving and Reducing Valves | 15 - 400 $mm^2/s$ | -15 - +70°C |
| Flow Control Valves<br>Flow Control and Check Valves<br>Flow Control and Relief Valves | 20 - 200 $mm^2/s$ | |
| Directional and Flow Control Valves | 20 - 400 $mm^2/s$ | 0 - +60°C |
| Shockless Type Directional and Flow Control Valves<br>High Response Type Directional and Flow Control Valves (Direct Type) | 20 - 200 $mm^2/s$ | 0 - +60°C |
| High Response Type Directional and Flow Control Valves (Two Stage Type) | 15 - 400 $mm^2/s$ | -15 - +60°C |

### Control of Contamination

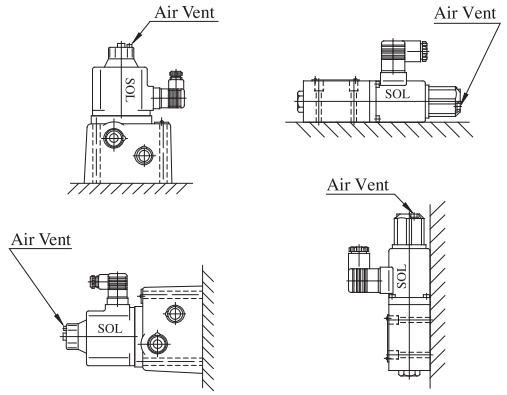
Due caution must be paid to maintaining control over contamination of the hydraulic fluids which may otherwise lead to breakdowns and shorten the life of the valve. Please maintain the degree of contamination within NAS 1638-Grade 11. Use 20 µm or finer line filter.

## Instructions

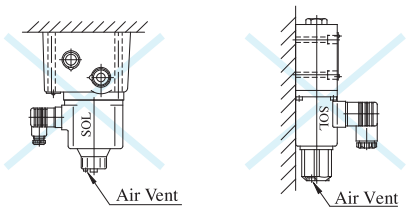
### Mounting

Be sure that the air vent faces up.
In addition, if the valve is mounted vertically, the minimum adjustment pressure is 0.2 MPa or higher.

[Good example]

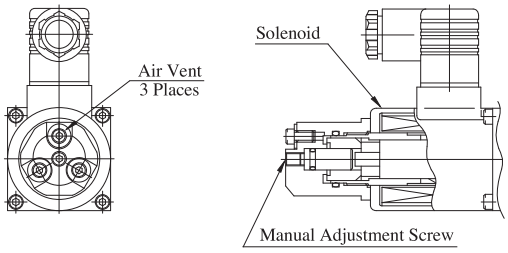



[Bad example]




### Air Bleeding

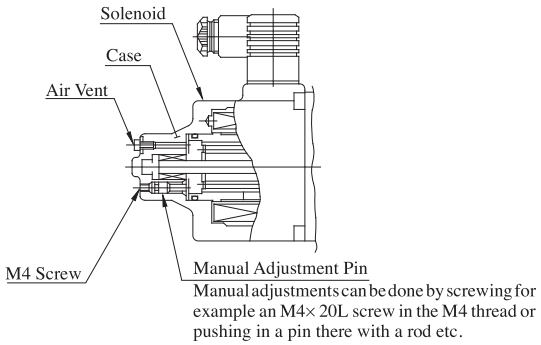
To ensure stable control, bleed the air from solenoid completely and fill its core with oil.
Bleeding can be done by slowly loosening one of the air vents at the end of the solenoid. Choose one of the three air vents which is expected to work most effectively (see the figure to the right).




10 Ω Series Solenoid

### Manual Adjustment Screw

When initial adjustments are to be made or when no current is supplied to the valve due to electrical failure or other problem, turn the manual adjustment screw to temporarily set the valve pressure / flow rate. In that case, when turn the manual adjustment screw clockwise, the valve pressure / flow rate increases. Under normal condition, however, this screw must be kept in its original position (see the figure to the right).




40 Ω Series Solenoid

### Tank and Drain Piping

The tank-line back pressure and drain back pressure directly affect the minimum adjustment pressure. Therefore, do not connect the tank or drain pipes to other lines, but connect them directly to the reservoir maintaining the back pressure as low as possible. Be sure that the tank and drain pipe ends are immersed in fluid.

### Hysteresis and Repeatability Value Indications

The hysteresis and repeatability values indicated in the specifications for each control valve are determined under the following conditions:

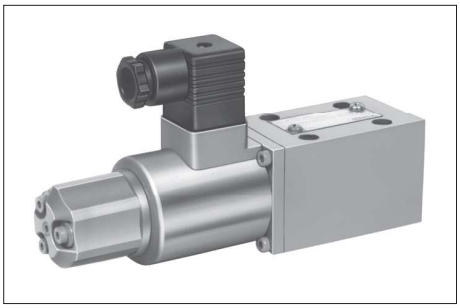
- Hysteresis Value: Obtained when Yuken's applicable power amplifier is used.
- Repeatability Value: Obtained when Yuken's applicable power amplifier is used under the same conditions.

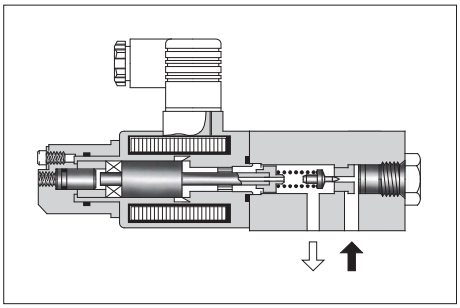
## Interchangeability between Current and New Model Change Products

| Name | Model Numbers | Design Number | | Installation Interchangeability | Major Changes | Page |
|---|---|---|---|---|---|---|
| | | Current | New | | | |
| Pilot Relief Valves | EDG-01 | 50 | 51 | YES | ● Solenoid Ass'y Change | H-98 |
| Relief Valves | EBG-03 | 50 | 51 | YES | ● Pilot Valve Change<br>EDG-01V, 50→51 Design | H-107 |
| | EBG-06 | 50 | 51 | YES | | |
| | EBG-10 | 50 | 51 | YES | | |
| Relieving and Reducing Valves | ERBG-06 | 50 | 51 | YES | ● Pilot Valve Change<br>EDG-01V, 5001→5101 Design<br>● No change in specifications | H-117 |
| | ERBG-10 | 50 | 51 | YES | | |
| 10Ω Series Flow Control (and Check) Valves | EFG<br>EFCG -03 | 50 | 51 | YES | ● Solenoid Ass'y Change<br>● No change in specifications | H-133 |
| | EFG<br>EFCG -06 | 50 | 51 | YES | | |
| 10Ω - 10Ω Series Flow Control and Relief Valves | EFBG-03 | 50・51 | 61 | YES | ● 03/06 : $50^{D}$, $51^{D}$→$61^{D}$<br>・Pilot Valve (EDG-01) is now integrated into the cover<br>・Solenoid Ass'y Change<br>● 03/06 : $60^{D}$, $61^{D}$, 10 : $50^{D}$→$51^{D}$<br>・Solenoid Ass'y Change | H-144 |
| | | 60 | | | | |
| | EFBG-06 | 50・51 | 61 | YES | | |
| | | 60 | | | | |
| | EFBG-10 | 50 | 51 | YES | | |
| High Flow Series Flow Control and Relief Valves | EFBG-03 | 50 | 51 | YES | ● Solenoid Ass'y Change | H-154 |
| | EFBG-06 | 50 | 51 | YES | ● Pilot Valve Change EDG-01V, 5003→5103 Design<br>● Solenoid Ass'y Change | |
| Directional and Flow Control Valves | EDFHG-03 | 30 | 31 | YES | ● Solenoid Ass'y Change<br>● No change in specifications | H-160 |
| | EDFHG-04 | 30 | 31 | YES | | |
| | EDFHG-06 | 30 | 31 | YES | | |
| Power Amplifiers For 40Ω Series Flow Control Valves | AME-D | 41 | 50 | YES | ● Additional power supply, functions and installation | H-180 |
| | AME-DF | 22 | 50 | YES | | |
| Power Amplifiers For High Response Type Directional and Flow Control Valves | AMB-EL | 10 | 20 | YES | ● Addition of input/output classification | H-194 |
| Multifunction Slope Controllers | AMC-T | 10 | 20 | YES | ● Compact and Lightweight<br>● Shockless control mode and stop mode functions added | H-200 |

# Proportional Electro-Hydraulic Pilot Relief Valves

This valve consists of a small DC solenoid and a direct-acting relief valve. It serves as a pilot valve for a low flow rate hydraulic system or a proportional electro-hydraulic control valve and controls the pressure in proportion to the input current. Note that this valve is used in conjunction with the applicable power amplifier.

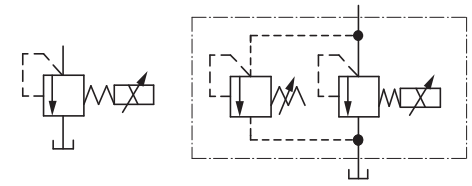




## Specifications

| Descriptions \ Model Numbers | | EDG-01 |
|---|---|---|
| Max. Operating Pres. | MPa | 24.5 |
| Max. Flow | L /min | 2 |
| Min. Flow | L /min | 0.3 |
| Pressure Adj. Range | MPa | Refer to Model Number Designation |
| Rated Current | mA | EDG-01∗-B : 800<br>EDG-01∗-C : 900<br>EDG-01∗-H : 950 |
| Coil Resistance | Ω | 10 |
| Hysteresis | | 3% or less |
| Repeatability | | 1% or less |
| Mass | kg | 2 |

### Graphic Symbols



Without Safety Valve  With Safety Valve

## Model Number Designation

| ED | G | -01 | V | -C | -1 | -PN | T13 | -51 |
|---|---|---|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Applicable Control ★1 | Pressure Adj. Range MPa | Safety Valve | P-Line Orifice | T-Line★2 Orifice | Design Number |
| ED: Proportional Electro-Hydraulic Pilot Relief Valve | G: Sub-Plate Mounting | 01 | None: General Use<br>V: Vent Control of Relief Valve (Omit if not required) | B: 0.5 - 6.9<br>C: 1.0 - 15.7<br>H: 1.2 - 24.5 | None: Without Safety Valve<br>1: With Safety Valve | PN: Without Orifice (Standard) | T15<br>T13<br>T11 | 51 |

★1. When the valve is to be used for vent control purpose, orifice adjustment is required due to piping capacity limitations. Therefore, consult your Yuken representative in advance.

★2. Standard orifices for T-line orifices are as follows.
Pressure Adj. Range B: T15, C: T13, H: T11
The orifice used as the pilot valve may differ from the standard orifice.

## Accessories

### Mounting Bolts

| Socket Head Cap Screw |
|---|
| M5 ×45 L ····· 4 pcs. |

## Applicable Power Amplifier

For stable performance, it is recommended that Yuken's applicable power amplifiers be used (for details see pages H-173, H-177 and H-183).

Model Numbers : AME-D-10-*-20
AME-D2-1010-*-11
SK1022-*-*-11
SK1015-11 (For DC power supply)
AMN-D-10 (For DC power supply)

## Sub-Plate

| Piping Size | Sub-Plate Model Numbers | Thread Size Rc | Approx. Mass kg |
|---|---|---|---|
| 1/8 | DSGM-01-31 | 1/8 | 0.8 |
| 1/4 | DSGM-01X-31 | 1/4 | 0.8 |
| 3/8 | DSGM-01Y-31 | 3/8 | 0.8 |

- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish. ($\frac{1.6}{\nabla}$)
- Sub-plates are those for 1/8 solenoid operated directional valves. For dimensoins, see page H-8.

## Instructions

### Tank-Line Back Pressure

Check that the tank line back pressure does not exceed 0.2 MPa.

### Vent Control

When the valve is used for vent control of relief valves or others, use the pipes of 6 mm ID. 300 mm or less length for connection.

If the pressure is instable, provide a 1.0 to 1.5 mm diameter orifice to the vent port of the relief valves or others.

### Circuit Pressure Control

When the pressure in a circuit is directly controlled with this valve, set the trapped oil volume being more than 40cm$^3$.

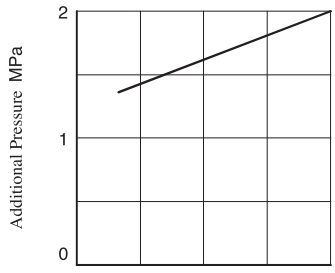
### Safety Valve Pressure Setting

The pressure of the safty valve at the maximum flow is preset at the value equal to the upper limit of the pressure adjustment range plus 2 MPa.

In case where the upper limit of operating pressure is low or the upper limit of flow rate to be used is different from the specified maximum flow, please adjust and determine the setting pressure of the safety valve at the value calculated from the following formula.

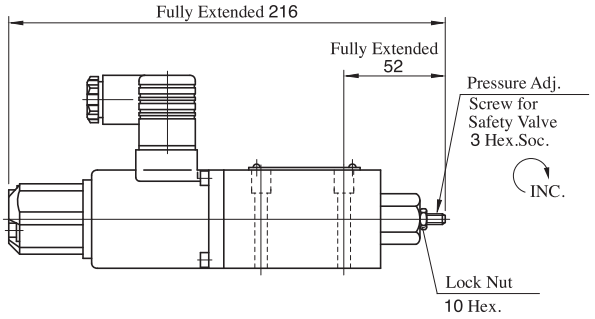
Setting pressure = (Operating pressure upper limit) + (Additional pressure indicated below)

To lower the setting pressure, turn the safety valve pressure adjustment screw anti-clockwise. After adjustment, be sure to tighten the lock nut.



## EDG-01∗-∗-1-PNT∗-51

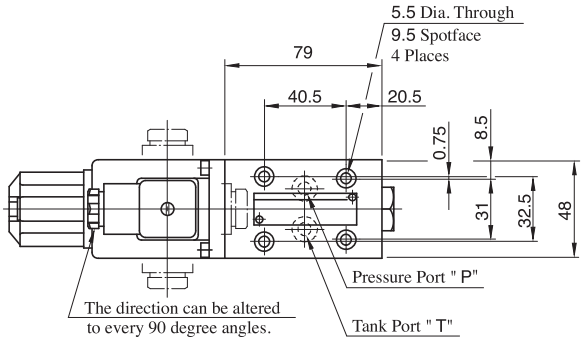
With Safety Valve

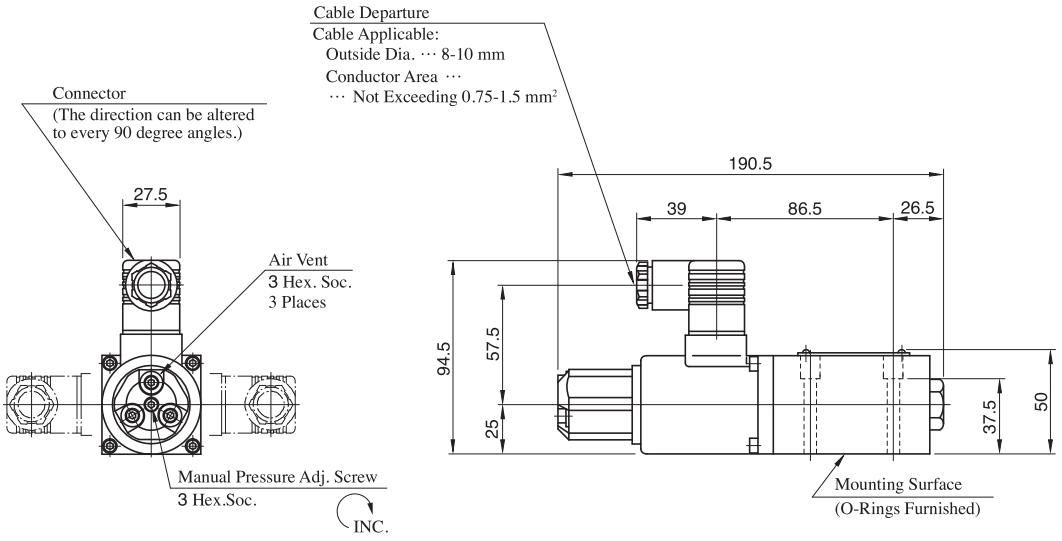



● For other dimensions, refer to the without safety valve.

## EDG-01∗-∗-PNT∗-51

Without Safety Valve



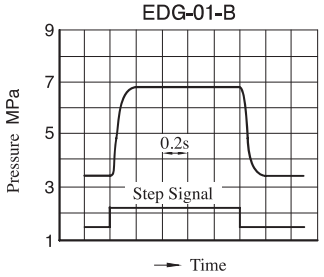

Note: For valve mounting surface dimensions, see the dimensional drawings of sub-plates (page H-8) in common use.

## Step Response (Example)

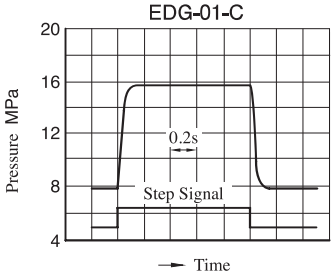
These characteristics have been obtained by measuring on each valve.
Therefore, they may vary according to a hydraulic circuit to be used.

Flow Rate : 2 L/min
Trapped Oil Volume : 40 cm³
Viscosity : 30 mm²/s

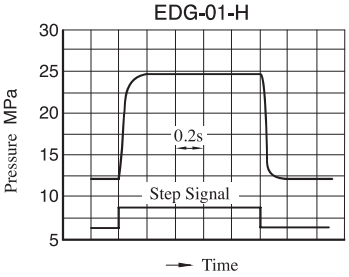
EDG-01-B



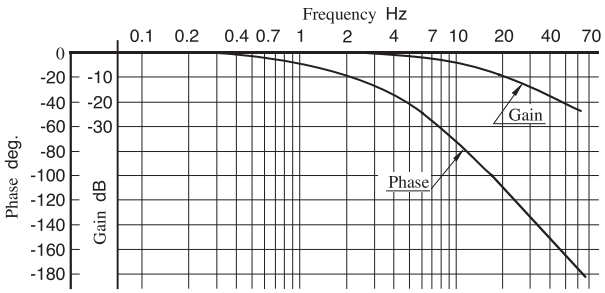

EDG-01-C




EDG-01-H



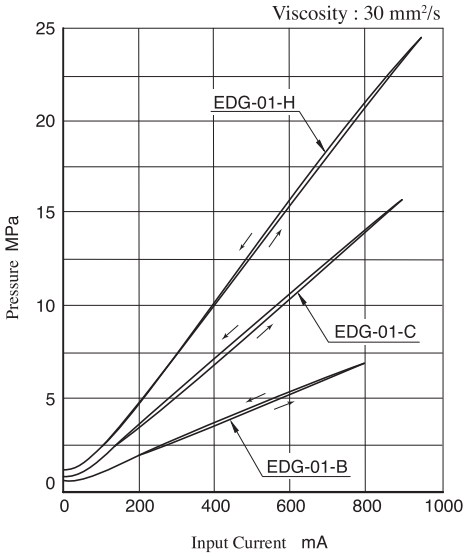

## Frequency Response




Flow Rate : 2 L/min
Pressure :7.8 ± 1.6 MPa
Trapped Oil Volume : 30 cm³
Viscosity : 30 mm²/s

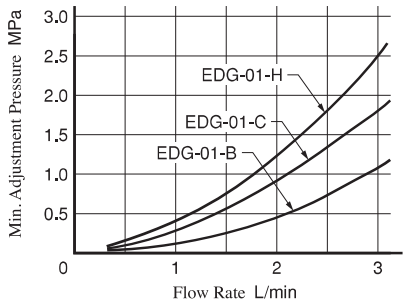
## Control Pressure vs. Input Current

Viscosity : 30 mm²/s



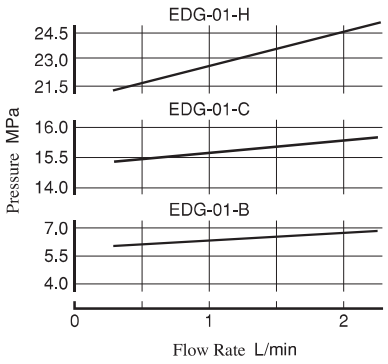

## Min. Adjustment Pressure

Viscosity : 30 mm²/s



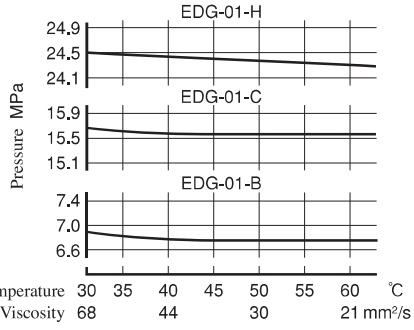

## Flow Rate vs. Pressure

Viscosity : 30 mm²/s




## Viscosity vs. Pressure

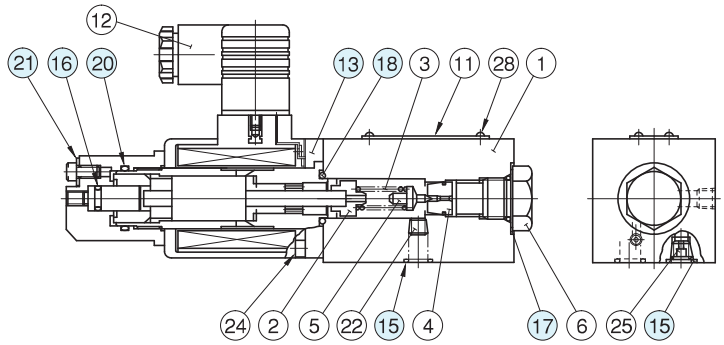
Flow Rate : 2 L/min
Oil : ISO VG 46 Oil



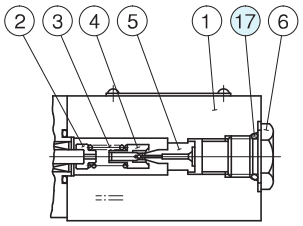
## List of Seals and Solenoid Ass'y

### Without Safety Valve

**EDG-01∗-∗-PNT∗-51**
**EDG-01V-∗-PNT∗-5103**

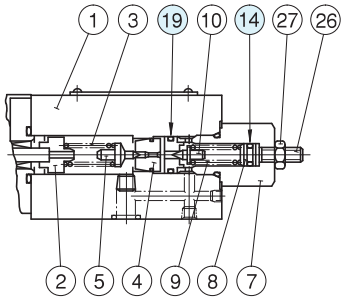



**EDG-01-∗-PNT∗-5101**




### With Safety Valve

**EDG-01∗-∗-1-PNT∗-51**
**EDG-01V-∗-1-PNT∗-5103**
**EDG-01V-∗-1-PNT20-5197**




### List of Seals

| Item | Name of Parts | Part Numbers | Qty. |
|---|---|---|---|
| 14 | O-Ring | OR NBR-70-1 P6-N | 1 |
| 15 | O-Ring | OR NBR-90 P9-N | 2 |
| 16 | O-Ring | OR NBR-90 P7-N | 1 |
| 17 | O-Ring | OR NBR-90 P14-N | 1 |
| 18 | O-Ring | OR NBR-90 P18-N | 1 |
| 19 | O-Ring | AS568-013(NBR-90) | 1 |
| 20 | O-Ring | OR NBR-90 P22-N | 1 |
| 21 | Fastener Seal | W4 | 3 |

Note: O-ring (Item 16, 18, 20) and the fastener seal (Item 21) are included in the solenoid assembly.

### Solenoid Ass'y

| Valve Model Numbers | ⑬ Solenoid Ass'y |
|---|---|
| EDG-01V-∗-∗-P∗T∗-51<br>EDG-01-∗-∗-P T -5101 | E318-Y06M1-28-61 |
| EDG-01-∗-∗-P∗T∗-51 | E318-Y06M1-05-61 |
| EDG-01V-∗-∗-PNT∗-5103 | E318-Y06M1-04-61 |

Note: The connector assembly GDM-211-B-11 (Item 12) is not included in the solenoid assembly.

### Pilot Valve

Model numbers of proportional electro-hydraulic control valves whose pilot valve is this valve (EDG-01∗) and the pilot valve are shown.

| Valve Model No. | Pilot Valve Model Numbers |
|---|---|
| EBG-03-C-51 | EDG-01V-C-1-PNT09-51 |
| EBG-03-H-51 | EDG-01V-H-1-PNT09-51 |
| EBG-03-C-T-51 | EDG-01V-C-PNT09-51 |
| EBG-03-H-T-51 | EDG-01V-H-PNT09-51 |
| EBG-06-C-51 | EDG-01V-C-1-PNT10-51 |
| EBG-06-H-51 | EDG-01V-H-1-PNT10-51 |
| EBG-06-C-T-51 | EDG-01V-C-PNT10-51 |
| EBG-06-H-T-51 | EDG-01V-H-PNT10-51 |
| EBG-10-C-51 | EDG-01V-C-1-PNT11-5103 |
| EBG-10-H-51 | EDG-01V-H-1-PNT11-5103 |
| EBG-10-C-T-51 | EDG-01V-C-PNT11-5103 |
| EBG-10-H-T-51 | EDG-01V-H-PNT11-5103 |
| ERBG-06-B-51 | EDG-01-B-PNTN-5101 |
| ERBG-06-C-51 | EDG-01-C-PNTN-5101 |
| ERBG-06-H-51 | EDG-01-H-PNT15-5101 |
| ERBG-10-B-51 | EDG-01-B-PNTN-5101 |
| ERBG-10-C-51 | EDG-01-C-PNTN-5101 |
| ERBG-10-H-51 | EDG-01-H-PNT15-5101 |
| EFBG-10-500-C-∗-51 | EDG-01V-C-1-PNT12-5103 |
| EFBG-10-500-H-∗-51 | EDG-01V-H-1-PNT12-5103 |
| EFBG-06-500-C-∗-51 | EDG-01V-C-1-PNT11-5103 |
| EFBG-06-500-H-∗-51 | EDG-01V-H-1-PNT11-5103 |
| EFBG-10-1000-C-∗-51 | EDG-01V-C-1-PNT20-5197 |
| EFBG-10-1000-H-∗-51 | EDG-01V-H-1-PNT20-5197 |

## Interchangeability between Current and New Design

EDG-01 series valve has changed model from 50 to 51 design in line with the solenoid improvement.

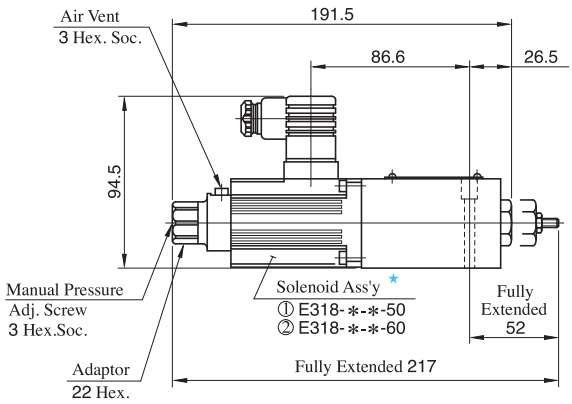
### Specifications and Characteristics

Input current-pressure characteristics differ between current and new design. Please inquire separately for details.
Other specifications remain unchanged.

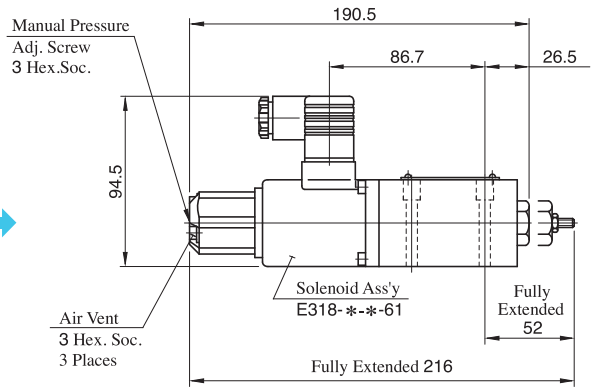
### Mounting Interchangeability

There is an interchangeability in the mounting dimensions, however, the outside shape and dimensions are changed as shown below due to solenoid improvement and other modifications.

Current: Design 50




New: Design 51

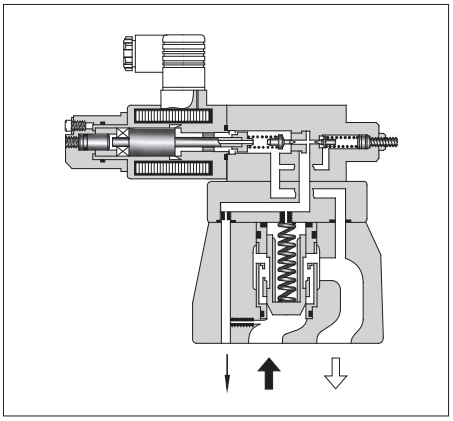



★ The solenoid assembly current design comes in two types: ① E318-50 design and ② 60 design.
See the figure on the left for an external view of type ①. See the figure on the right for type ②.

# Proportional Electro-Hydraulic Relief Valves

This valve is derived by combining a small, high-performance 1/8 proportional electro-hydraulic pilot relief valve with a specially developed low-noise relief valve.
With this valve, it is possible to regulate the system pressure in proportion to the input current. Note that this valve is used in conjunction with the applicable power amplifier.

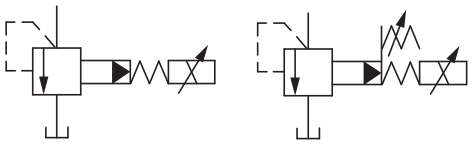




## Specifications

| Descriptions \ Model Numbers | | EBG-03 | EBG-06 | EBG-10 |
|---|---|---|---|---|
| Max. Operating Pres. | MPa | 24.5 | 24.5 | 24.5 |
| Max. Flow | L/min | 100 | 200 | 400 |
| Min. Flow | L/min | 3 | 3 | 3 |
| Pressure Adjustment Range | MPa | Refer to Model Number Designation | | |
| Rated Current | mA | C: 770<br>H: 820 | C: 750<br>H: 800 | C: 730<br>H: 780 |
| Coil Resistance | Ω | 10 | 10 | 10 |
| Hysteresis | | 3% or less | 3% or less | 3% or less |
| Repeatability | | 1% or less | 1% or less | 1% or less |
| Approx. Mass | kg | 5.6 | 6.3 | 10 |

Graphic Symbols



Without Safety Valve | With Safety Valve

## Model Number Designation

| EB | G | -03 | -C | -T | -51 |
|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Pressure Adj. Range MPa | Safety Valve | Design Number |
| **EB:** Proportional Electro-Hydraulic Relief Valve | **G:** Sub-Plate Mounting | **03**<br>**06**<br>**10** | **C:** ✻-15.7★1<br>**H:** ✻-24.5★1 | **None:** With Safety Valve<br>**T:** Without Safety Valve | **51** |

★1. Min. adjustment pressure shall be referred to the curves on page H-103.

## Accessories

### Mounting Bolts

| Valve Model Numbers | Socket Head Cap Screw | Qty. |
|---|---|---|
| EBG-03 | M12 × 40 L | 4 |
| EBG-06 | M16 × 50 L | 4 |
| EBG-10 | M20 × 60 L | 4 |

### Applicable Power Amplifiers

For stable performance, it is recommended that Yuken's applicable power amplifiers be used (for details see pages H-173, H-177 and H-183).

Model Numbers : AME-D-10-✻-20 SK1022-✻-✻-11
AME-D2-1010-11 SK1015-11 (For DC power supply)
AMN-D-10 (For DC power supply)

## Sub-Plates

| Valve Model Numbers | Sub-Plate Model Numbers | Thread Size Rc | Approx. Mass kg |
|---|---|---|---|
| EBG-03 | BGM-03-20 | 3/8 | 2.4 |
| | BGM-03X-20 | 1/2 | 3.1 |
| EBG-06 | BGM-06-20 | 3/4 | 4.7 |
| | BGM-06X-20 | 1 | 5.7 |
| EBG-10 | BGM-10-20 | 1-1/4 | 8.4 |
| | BGM-10X-20 | 1-1/2 | 10.3 |

- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish. ($\frac{1.6}{\nabla}$)
- Sub-plates are those for pilot operated relief valves. For dimensions, see page H-18.

## Instructions

A flow rate of 3 L/min or higher should be used to avoid preselected pressure instability.

### Safety Valve

At shipment, the pressure of safety valves is set to the upper limits of the adjustable pressure ranges plus the extra as shown below.

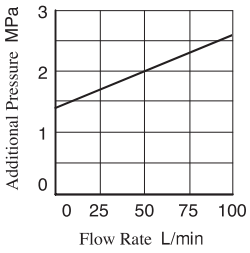
Additional Pressures for Safety Valves at Shipment

| Valve Model Numbers | Additional Pressures at Shipment MPa |
|---|---|
| EBG-03 | 2.0 (at 50 L/min) |
| EBG-06 | 3.5 (at 100 L/min) |
| EBG-10 | 4.0 (at 200 L/min) |

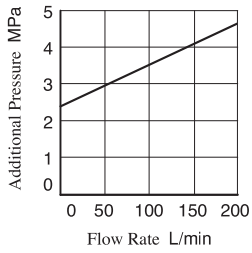
In case where the upper limit of operating pressure is low or the upper limit of flow rate to be used is different from the specified maximum flow, please adjust and determine the setting pressure of the safety valve at the value calculated from the following formula.

Setting pressure = (Operating pressure upper limit) + (Additional pressure indicated below)

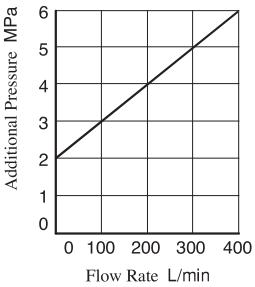
EBG-03




EBG-06




EBG-10

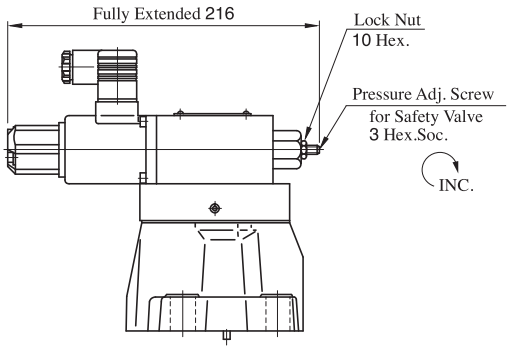



To lower the setting pressure, turn the safety valve pressure adjustment screw anti-clockwise. After adjustment, be sure to tighten the lock nut.

**Mounting Surface**
**EBG-03 : ISO 6264-06-09-1-97**
**EBG-06 : ISO 6264-08-13-1-97**

## EBG-$\frac{03}{06}$-⁎-51

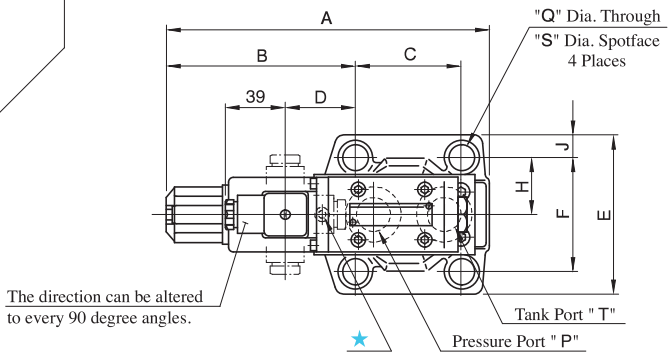
With Safety Valve

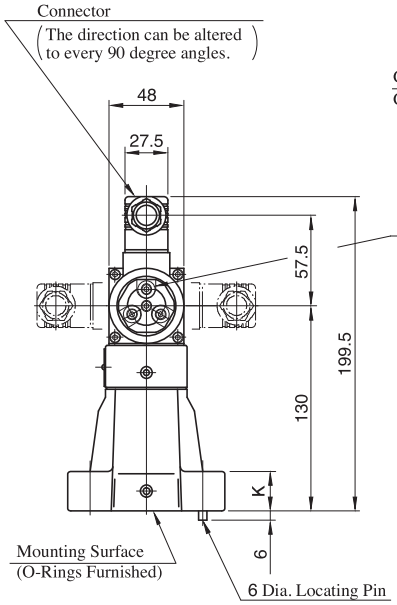


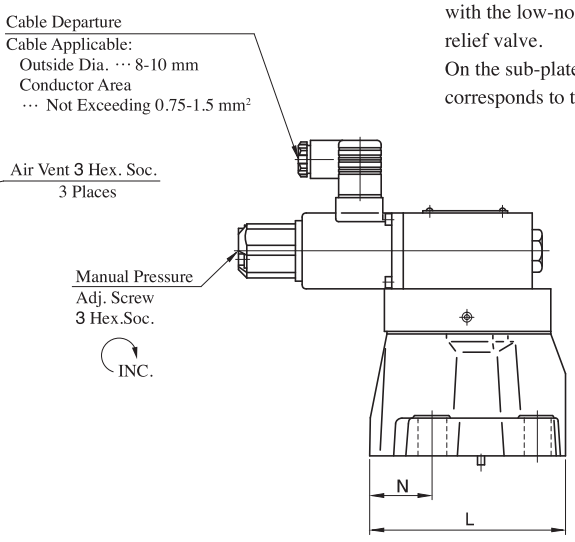

● For other dimensions, refer to the without safety valve.

## EBG-$\frac{03}{06}$-⁎-T-51

Without Safety Valve




★This port is not used. It is provided because of the common use of the body with the low-noise type pilot operated relief valve.
On the sub-plate, plug the port which corresponds to this port.

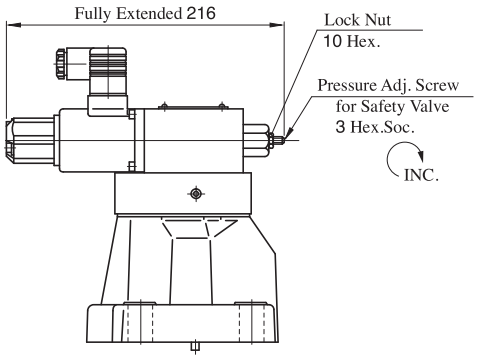
| Model Numbers | Dimensions mm | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | H | J | K | L | N | Q | S |
| EBG-03 | 197.5 | 117.6 | 53.8 | 40.2 | 76 | 53.8 | 26.9 | 11.1 | 21.5 | 106 | 26.1 | 13.5 | 21 |
| EBG-06 | 205.5 | 119.5 | 66.7 | 42.1 | 98 | 70 | 35 | 14 | 26 | 122 | 36 | 17.5 | 26 |

Note: For valve mounting surface dimensions, see the dimensional drawings of sub-plates (page H-18) in common use.

Mounting Surface:
ISO 6264-10-17-1-97

## EBG-10-＊-51

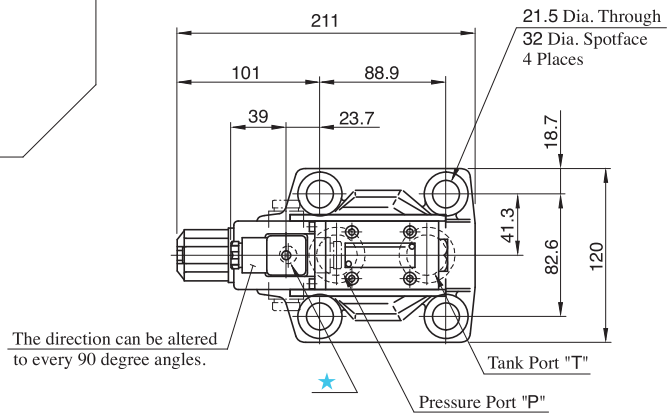
With Safety Valve



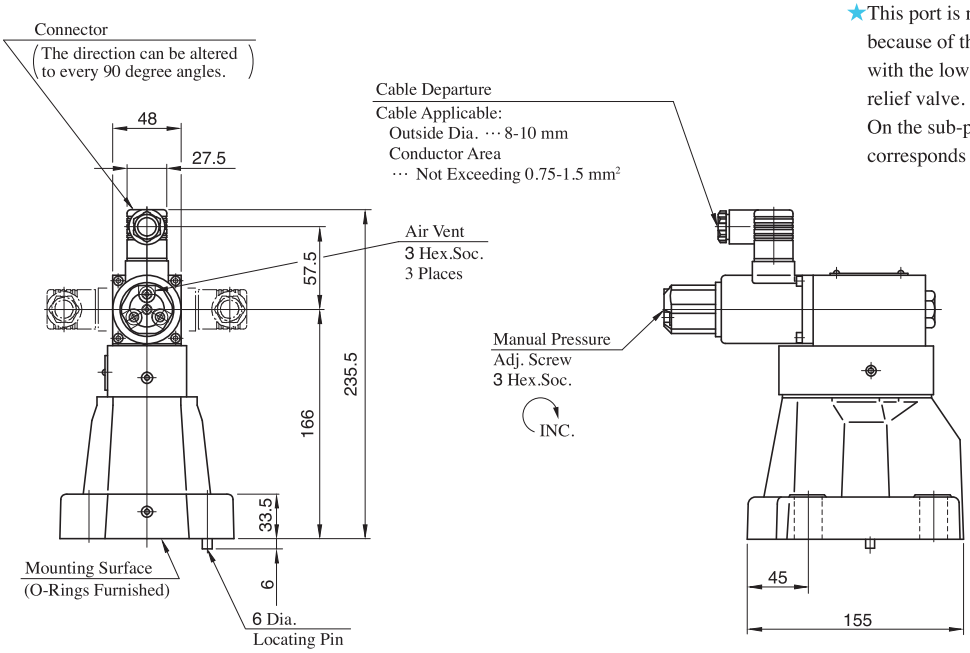

● For other dimensions, refer to the without safety valve.

## EBG-10-＊-T-51

Without Safety Valve




★This port is not used. It is provided because of the common use of the body with the low-noise type pilot operated relief valve.
On the sub-plate, plug the port which corresponds to this port.

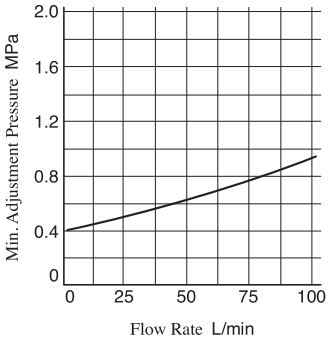



Note: For valve mounting surface dimensions, see the dimensional drawings of sub-plates (page H-18) in common use.

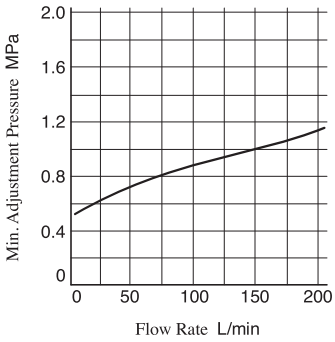
## Min. Adjustment Pressure

Viscosity : 30 mm²/s

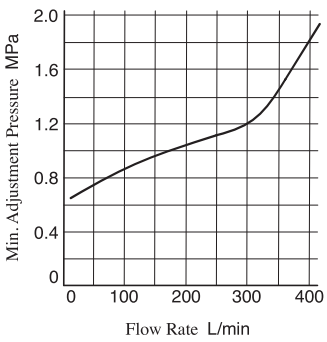
EBG-03




EBG-06




EBG-10

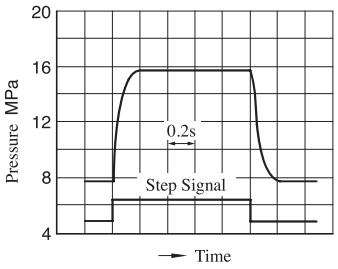



## Step Response (Example)

These Characteristics have been obtained by measuring on each valve.
Therefore, they may vary according to a hydraulic circuit to be used.

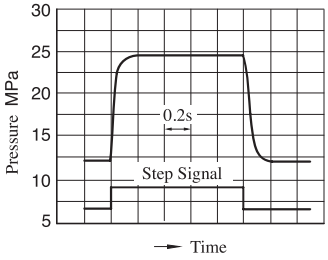
Trapped Oil Volume : 1 L
Viscosity : 30 mm²/s

EBG-03-C



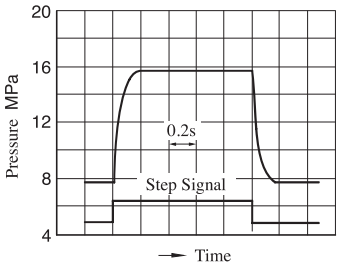

(Flow Rate : 100 L/min)

EBG-03-H



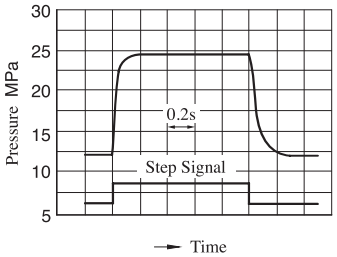

(Flow Rate : 100 L/min)

EBG-06-C



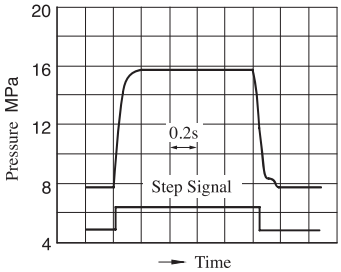

(Flow Rate : 200 L/min)

EBG-06-H



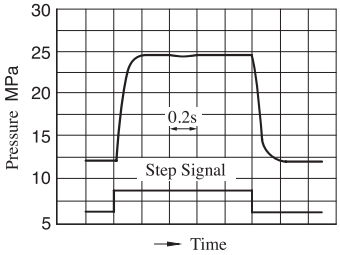

(Flow Rate : 200 L/min)

EBG-10-C




(Flow Rate : 400 L/min)

EBG-10-H

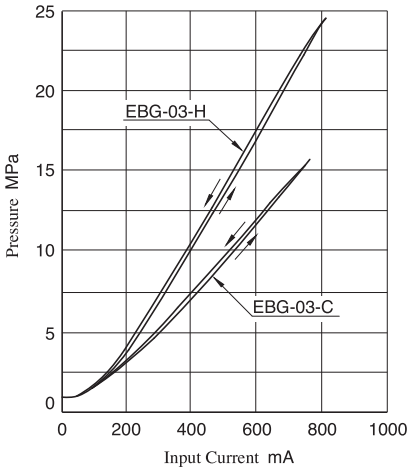



(Flow Rate : 400 L/min)

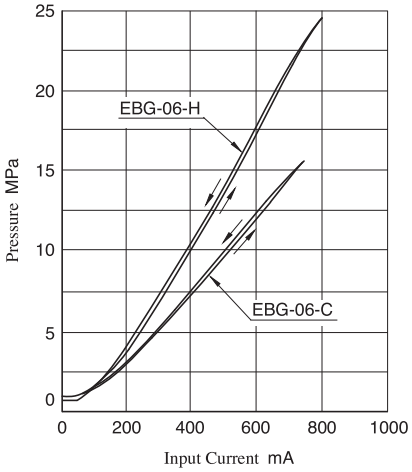
## Input Current vs. Pressure

Viscosity : 30 mm²/s

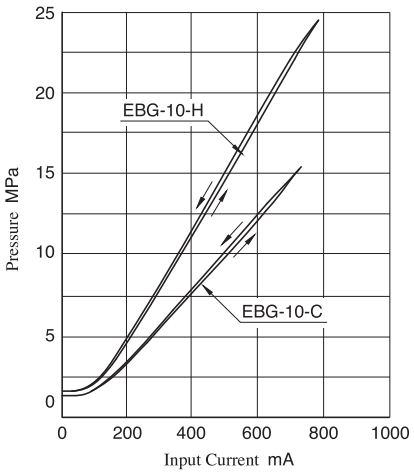
### EBG-03




### EBG-06



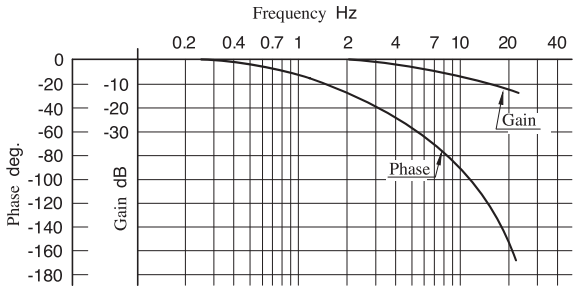

### EBG-10




## Frequency Response

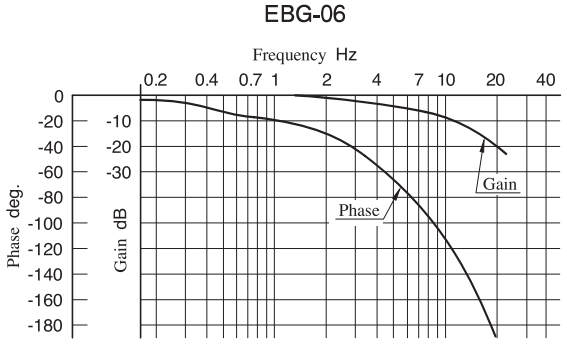
Trapped Oil Volume : 1 L
Viscosity : 30 mm²/s

### EBG-03



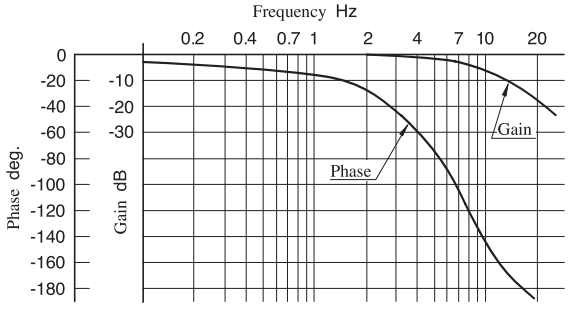

Pressure : 7.8 ± 1.6 MPa
Flow Rate : 100 L/min

### EBG-06




Pressure : 7.8 ± 1.6 MPa
Flow Rate : 200 L/min

### EBG-10

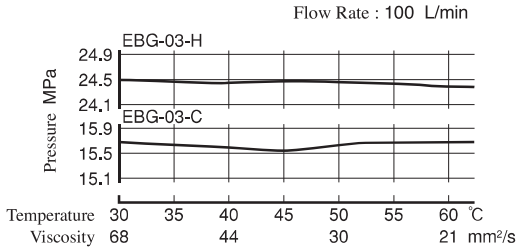



Pressure : 7.8 ± 1.6 MPa
Flow Rate : 400 L/min

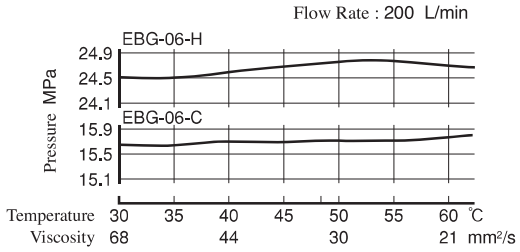
## Viscosity vs. Pressure

Oil : ISO VG 46

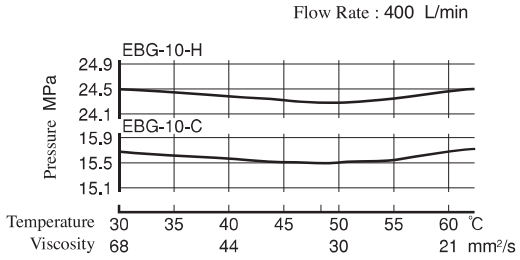
### EBG-03




### EBG-06



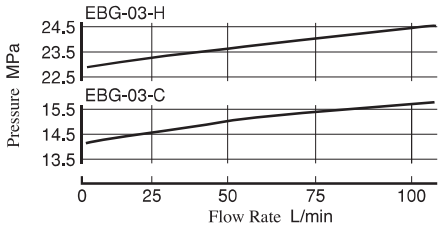

### EBG-10



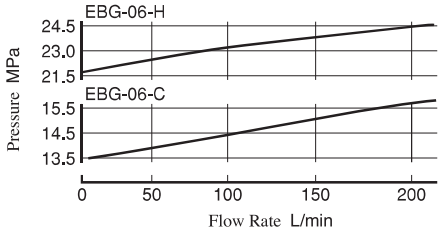

## Flow Rate vs. Pressure

Viscosity : 30 mm²/s

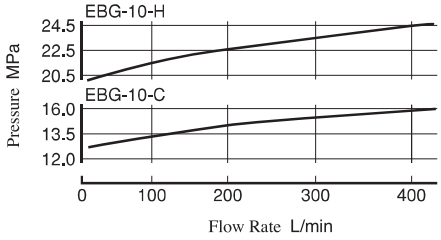
### EBG-03




### EBG-06

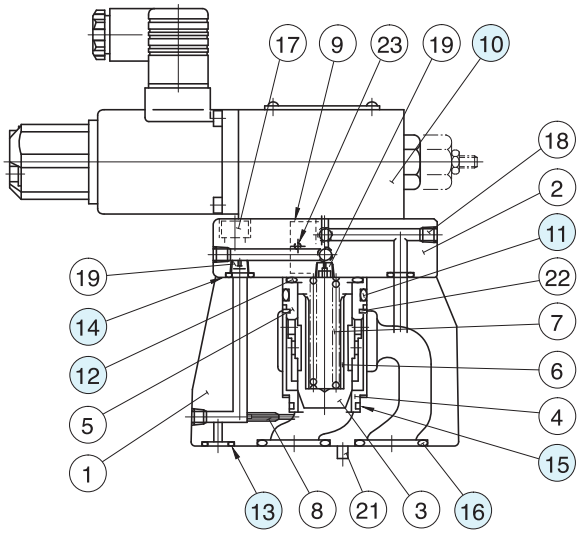



### EBG-10



## List of Seals and Pilot Valves

### EBG-03, 06, 10




#### Pilot Valves

| Valve Model Numbers | ⑩ Pilot Valve Model Numbers |
|---|---|
| EBG-03-C-51 | EDG-01V-C-1-PNT09-51 |
| EBG-03-H-51 | EDG-01V-H-1-PNT09-51 |
| EBG-03-C-T-51 | EDG-01V-C-PNT09-51 |
| EBG-03-H-T-51 | EDG-01V-H-PNT09-51 |
| EBG-06-C-51 | EDG-01V-C-1-PNT10-51 |
| EBG-06-H-51 | EDG-01V-H-1-PNT10-51 |
| EBG-06-C-T-51 | EDG-01V-C-PNT10-51 |
| EBG-06-H-T-51 | EDG-01V-H-PNT10-51 |
| EBG-10-C-51 | EDG-01V-C-1-PNT11-5103 |
| EBG-10-H-51 | EDG-01V-H-1-PNT11-5103 |
| EBG-10-C-T-51 | EDG-01V-C-PNT11-5103 |
| EBG-10-H-T-51 | EDG-01V-H-PNT11-5103 |

Note: For the details of pilot valves, refer to "Pilot Relief Valves" on page H-97.

#### List of Seals

| Item | Name of Parts | Part Numbers | | | Qty. |
|---|---|---|---|---|---|
| | | EBG-03 | EBG-06 | EBG-10 | |
| 11 | O-Ring | OR NBR-90 P32-N | OR NBR-90 P32-N | OR NBR-90 P42-N | 1 |
| 12 | O-Ring | OR NBR-90 P28-N | OR NBR-90 P28-N | OR NBR-90 P28-N | 1 |
| 13 | O-Ring | OR NBR-90 P9-N | OR NBR-90 P11-N | OR NBR-90 P9-N | 1 |
| 14 | O-Ring | OR NBR-90 P9-N | OR NBR-90 P9-N | OR NBR-90 P9-N | 2 |
| 15 | O-Ring | AS568-024(NBR-90) | AS568-024(NBR-90) | AS568-128(NBR-90) | 1 |
| 16 | O-Ring | OR NBR-90 P18-N | OR NBR-90 P28-N | OR NBR-90 P32-N | 2 |

## Interchangeability between Current and New Design

EBG-03/06/10 series valves have changed model from 50 to 51 design in line with the model change of pilot valve (EDG-01).

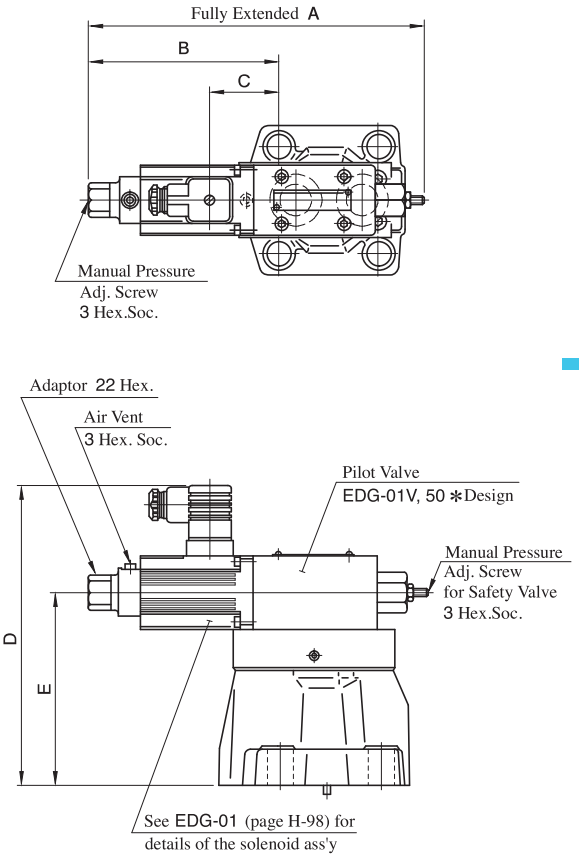
### Specifications and Characteristics

Input current-pressure characteristics differ between current and new design. Please inquire separately for details.
Other specifications remain unchanged.

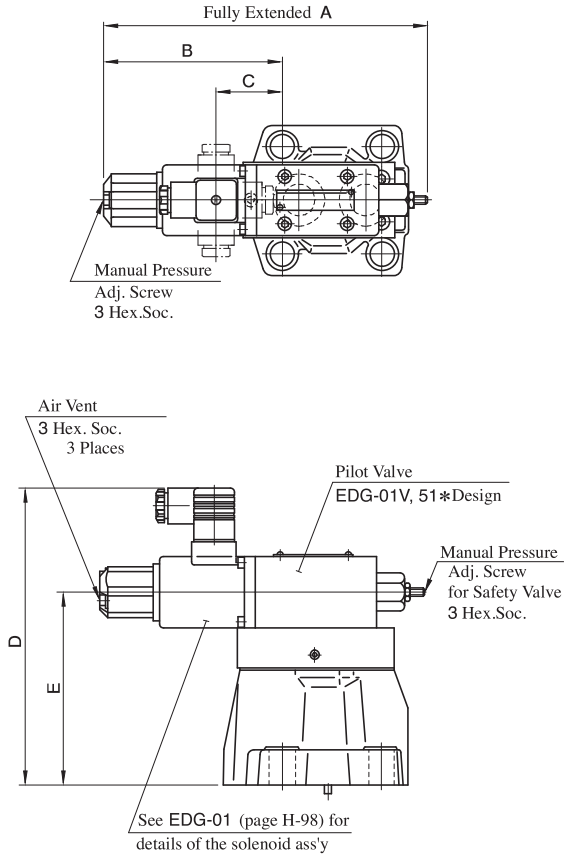
### Mounting Interchangeability

There is an interchangeability in the mounting dimensions, however, the outside shape and dimensions are changed as shown below due to pilot valve improvement and other modifications.

Current: Design 50



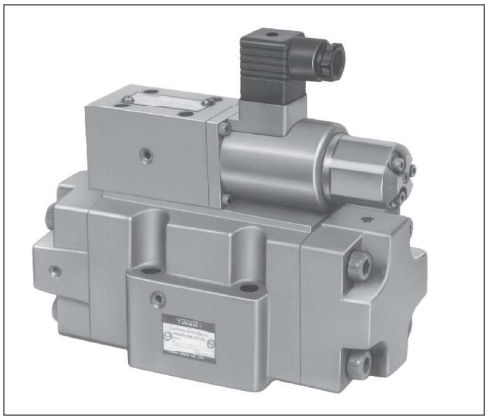

New: Design 51

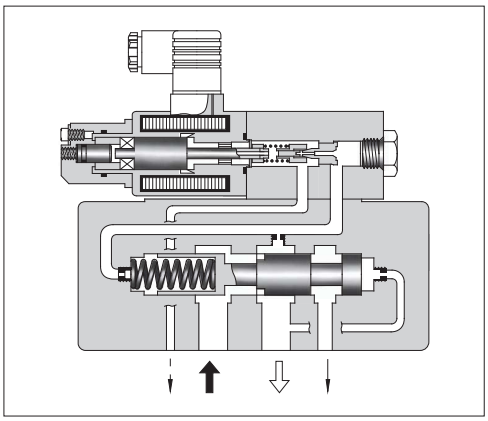



| Model Numbers | | A | B | C | D | E |
|---|---|---|---|---|---|---|
| Current | EBG-03-∗-∗-50 | 217 | 118.6 | 40.2 | 199.5 | 130 |
| New | EBG-03-∗-∗-51 | 216 | 117.6 | 40.2 | | |
| Current | EBG-06-∗-∗-50 | 217 | 120.5 | 42.1 | 199.5 | 130 |
| New | EBG-06-∗-∗-51 | 216 | 119.5 | 42.1 | | |
| Current | EBG-10-∗-∗-50 | 217 | 102 | 23.6 | 235.5 | 166 |
| New | EBG-10-∗-∗-51 | 216 | 101 | 23.6 | | |

# Proportional Electro-Hydraulic Relieving and Reducing Valves

This valve is derived by combining a small, high-performance 1/8 proportional electro-hydraulic pilot relief valve with a relieving and reducing valve.
With this valve, it is possible to regulate the system pressure in proportion to the input current.
Incorporating a relief mechanism, this valve provides a good response speed and the pressure decreases even if the load is large. Note that this valve is used in conjunction with the applicable power amplifier.



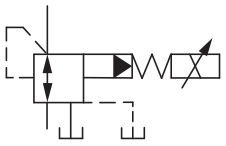


## Specifications

| Descriptions \ Model Numbers | | ERBG-06 | ERBG-10 |
|---|---|---|---|
| Max. Operating Pres. | MPa | 24.5 | 24.5 |
| Max. Flow | L/min | 100 | 250 |
| Max. Relieving Flow | L/min | 35 | 15 |
| Secondary Pres. Adj. Range | MPa | Refer to Model Number Designation | |
| Rated Current | mA | B: 800<br>C: 800<br>H: 950 | B: 800<br>C: 800<br>H: 950 |
| Coil Resistance | Ω | 10 | 10 |
| Hysteresis | | 3% or less | 3% or less |
| Repeatability | | 1% or less | 1% or less |
| Mass | kg | 12 | 13.5 |

★ The values shown are those obtained where the differential pressure between the secondary pressure port and tank port is 13.7 MPa.

Graphic Symbol



## Model Number Designation

| ERB | G | -06 | -C | -51 |
|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Secondary Pres. Adj. Range MPa | Design Number |
| **ERB:** Proportional Electro-Hydraulic Relieving and Reducing Valve | **G:** Sub-Plate Mounting | **06** | **B:** 0.8 - 6.9<br>**C:** 1.2 - 13.7<br>**H:** 1.5 - 20.6 | **51** |
| | | **10** | **B:** 0.9 - 6.9<br>**C:** 1.2 - 13.7<br>**H:** 1.5 - 20.6 | |

## Accessories

### Mounting Bolts

| Valve Model Numbers | Socket Head Cap Screw | Qty. |
|---|---|---|
| ERBG-06 | M10 × 70 L | 4 |
| EBBG-10 | M10 × 70 L | 6 |

### Applicable Power Amplifiers

For stable performance, it is recommended that Yuken's applicable power amplifiers be used (for details see pages H-173, H-177 and H-183).

Model Numbers : AME-D-10-✻-20
AME-D2-1010-11
AMN-D-10 (For DC power supply)
SK1022-✻-✻-11
SK1015-11 (For DC power supply)

## Sub-Plates

| Valve Model Numbers | Sub-Plate Model Numbers | Thread Size Rc | Mass kg |
|---|---|---|---|
| ERBG-06 | ERBGM-06-20 | 3/4 | 3.0 |
| ERBG-10 | ERBGM-10-20 | 1-1/4 | 6.5 |

- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish. ($\frac{16}{\nabla}$)

## Instructions

### Primary Pressure Required for Preselected Pressure

The primary pressure must be 1 MPa higher than the preselected pressure.

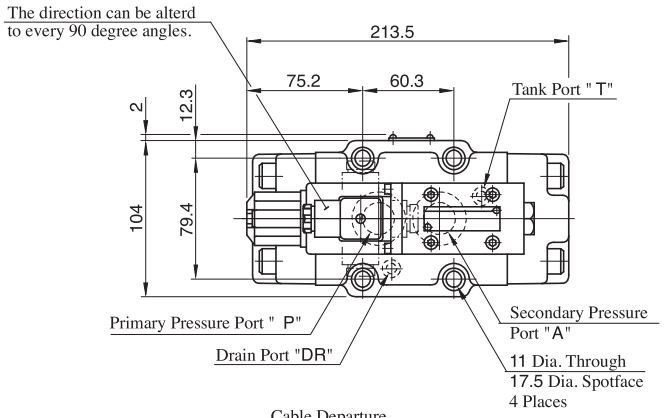
### Drain Back Pressure

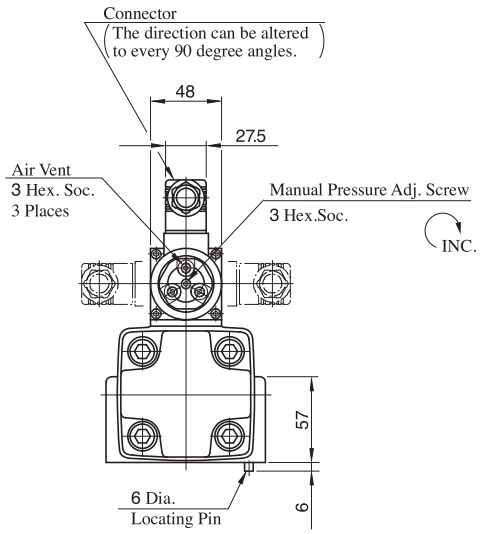
Check that the drain back pressure does not exceed 0.2 MPa.

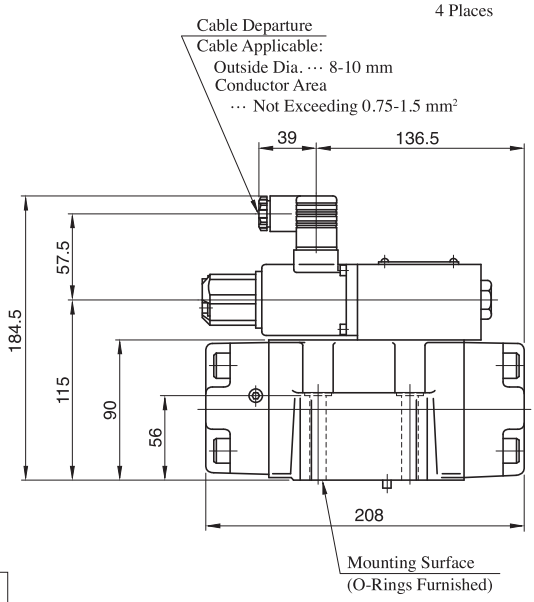
### Trapped Oil Volume

The recommended secondary side trapped oil volume is about 20 liters. Note that the trapped oil volume must not be lower than 1.4 liters.

## ERBG-06

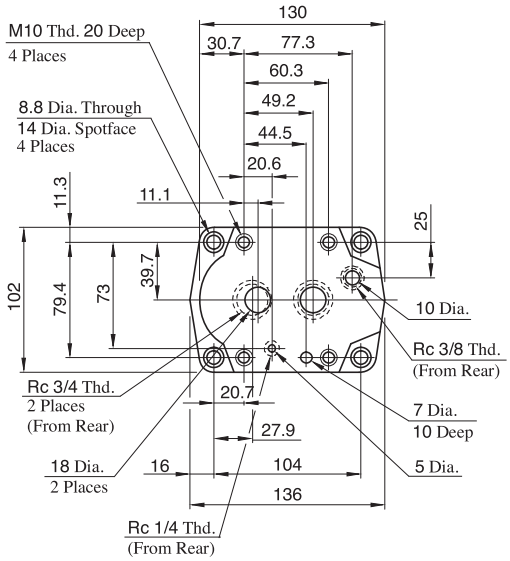


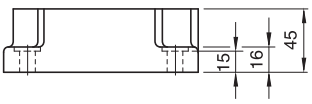



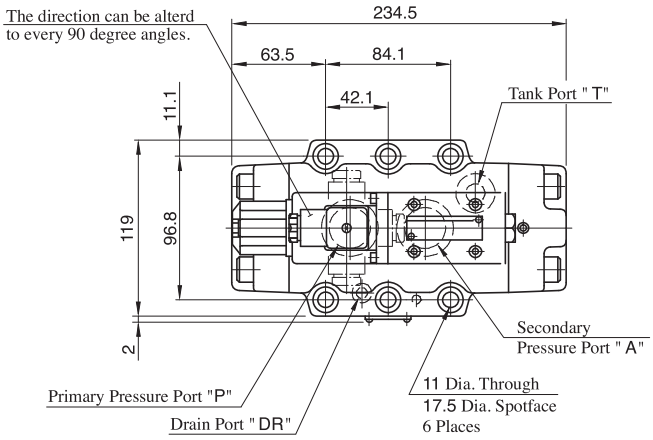

Sub-Plate

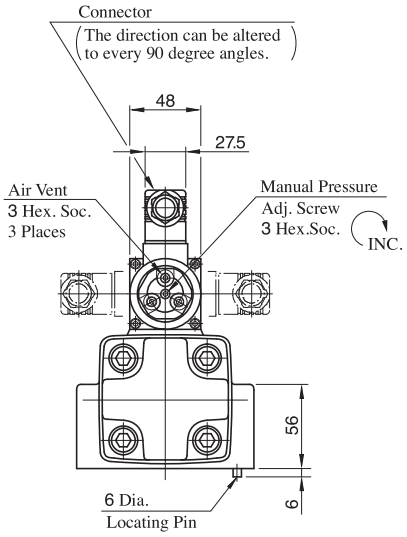
## ERBGM-06

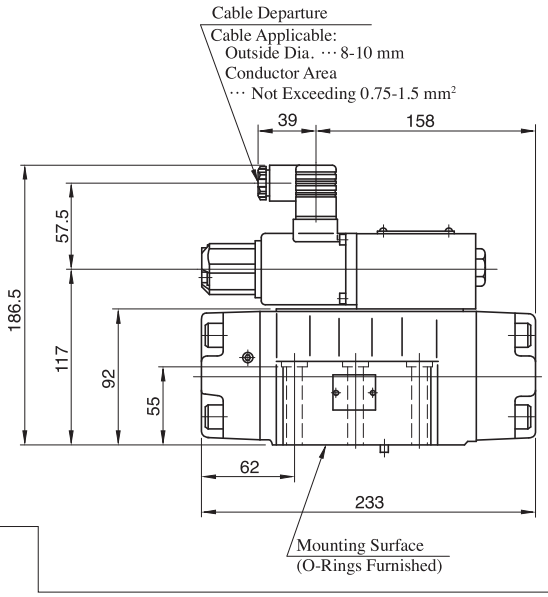


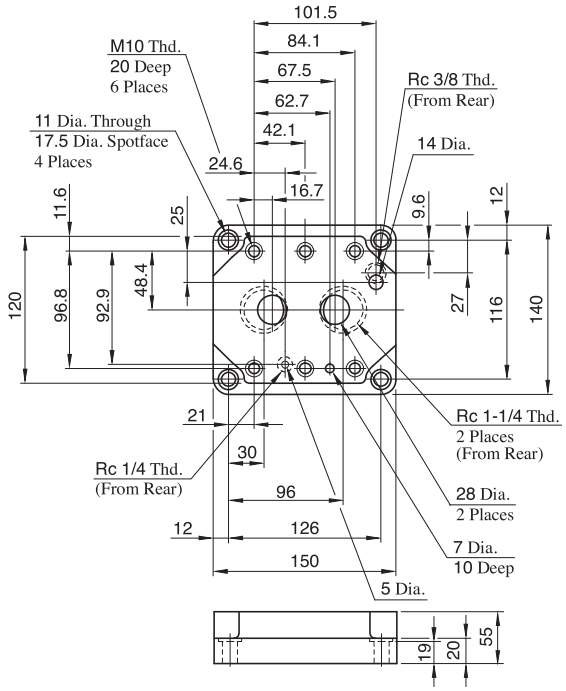
## ERBG-10




## Sub-Plate
## ERBGM-10

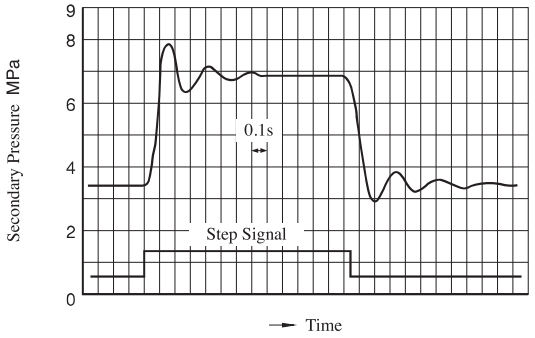


## Step Response (Example)

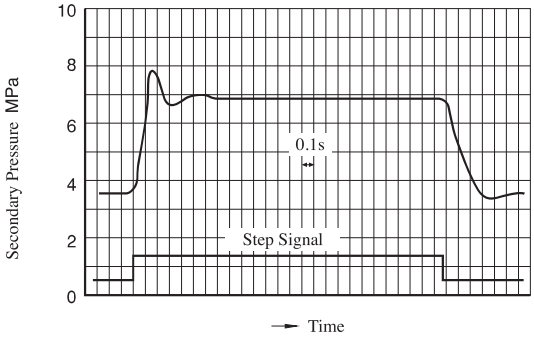
The following step response characteristics are taken when the trapped oil volume is 20 liters.
The step response varies by trapped oil volume.

Primary Pressure : 24.5 MPa
Trapped Oil Volume : 20 L
Viscosity : 30 mm²/s

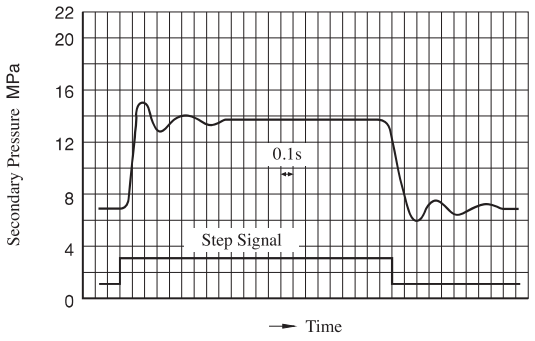
### ERBG-06-B



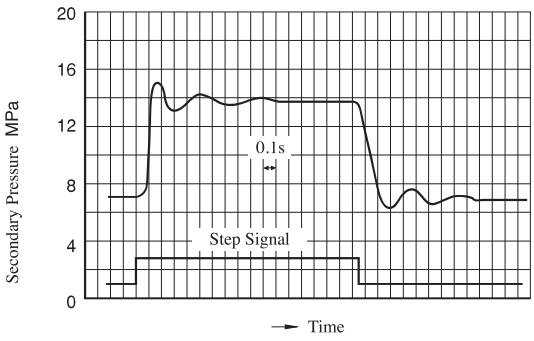

### ERBG-10-B



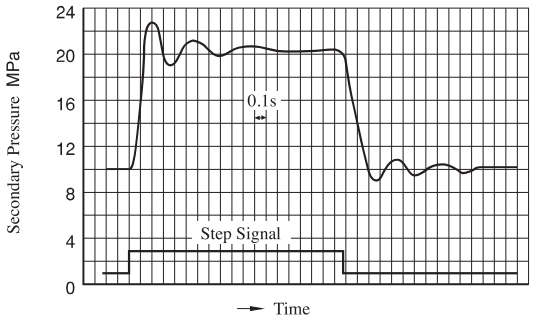

### ERBG-06-C



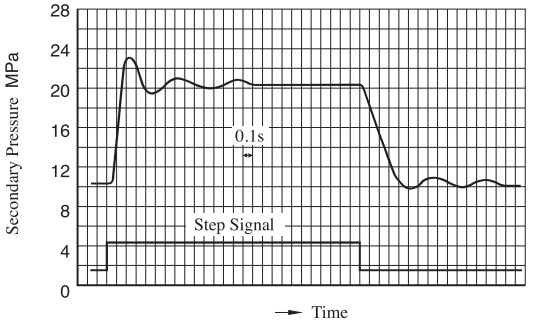

### ERBG-10-C




### ERBG-06-H



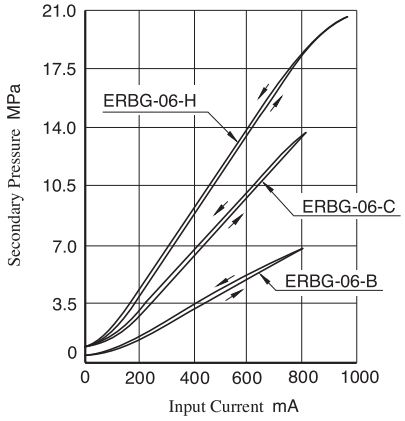

### ERBG-10-H



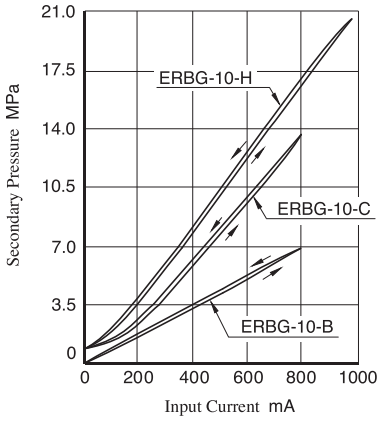
## Input Current vs. Secondary Pressure

Primary Pressure : 24.5 MPa
Viscosity : 30 mm²/s

### ERBG-06



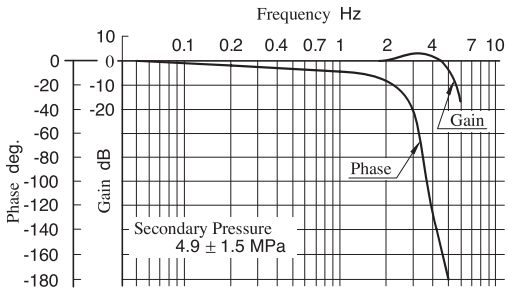

### ERBG-10



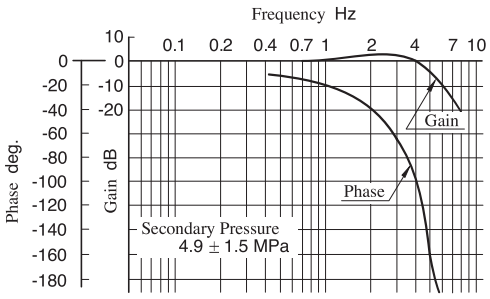

## Frequency Response

Primary Pressure : 24.5 MPa
Trapped Oil Volume : 20 L
Viscosity : 30 mm²/s

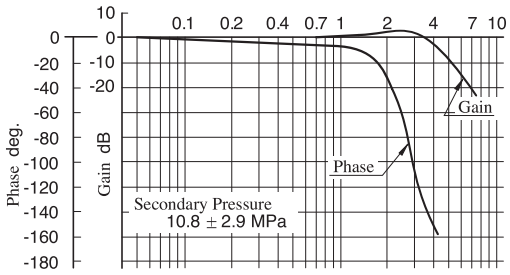
### ERBG-06-B



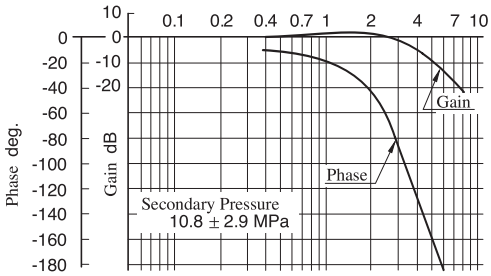

### ERBG-10-B



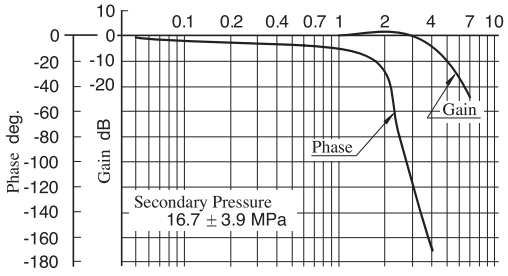

### ERBG-06-C



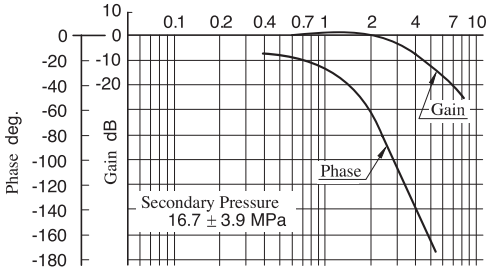

### ERBG-10-C




### ERBG-06-H



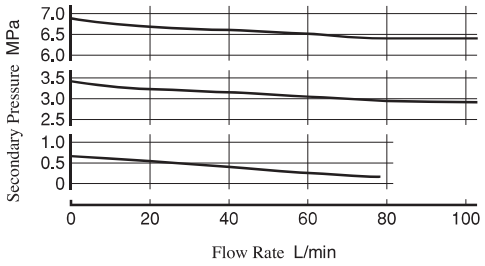

### ERBG-10-H



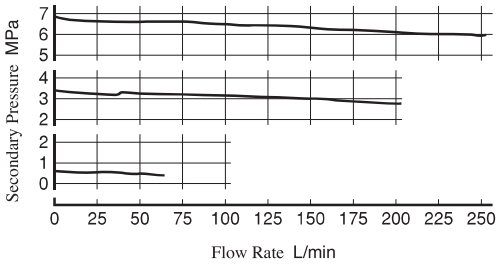
## Flow Rate vs. Secondary Pressure

Viscosity : 30 mm²/s

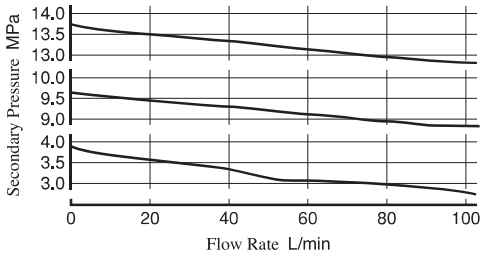
### ERBG-06-B



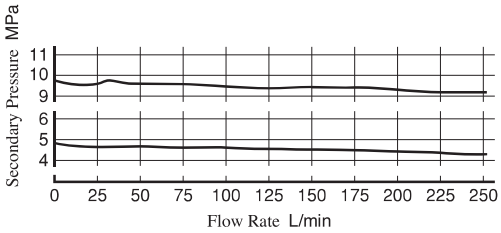

### ERBG-10-B



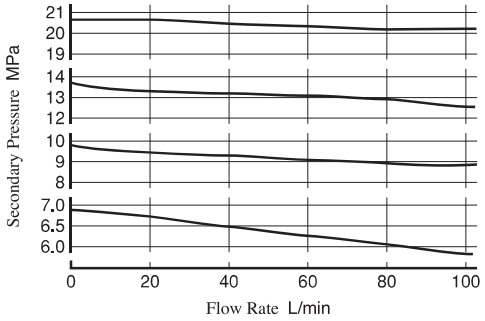

### ERBG-06-C



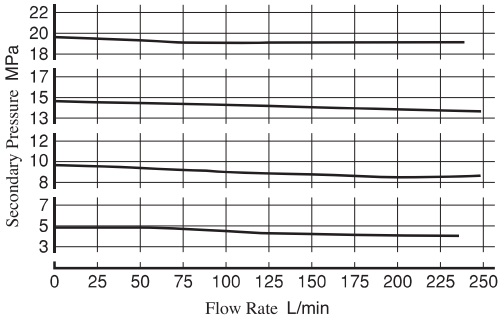

### ERBG-10-C




### ERBG-06-H



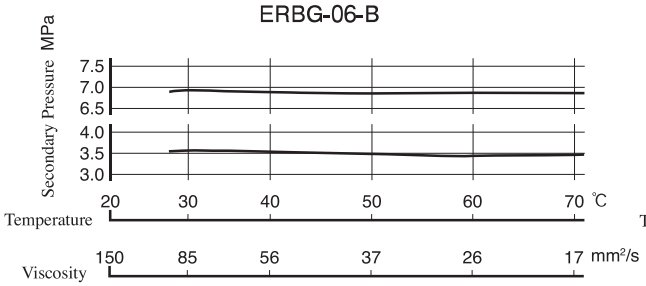

### ERBG-10-H



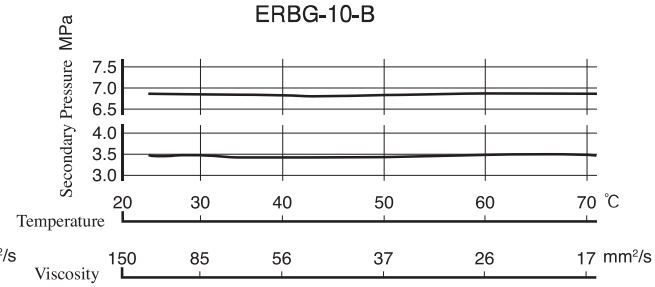
## Viscosity vs. Secondary Pressure

Oil: ISO VG32

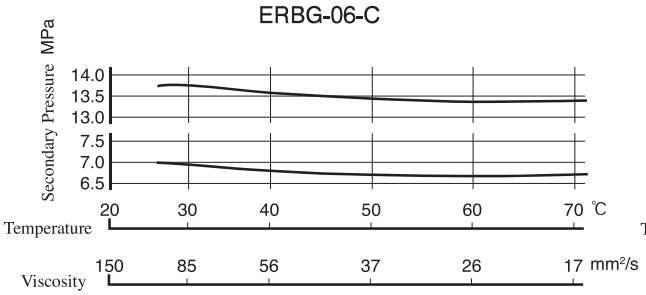
ERBG-06-B



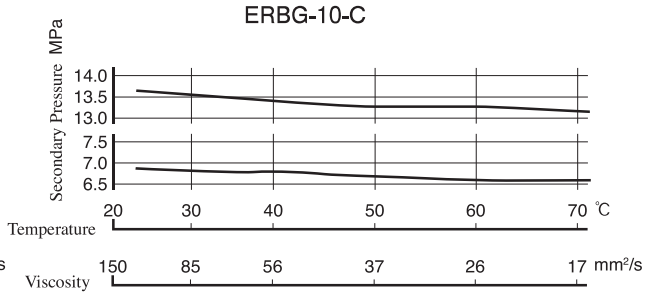

ERBG-10-B



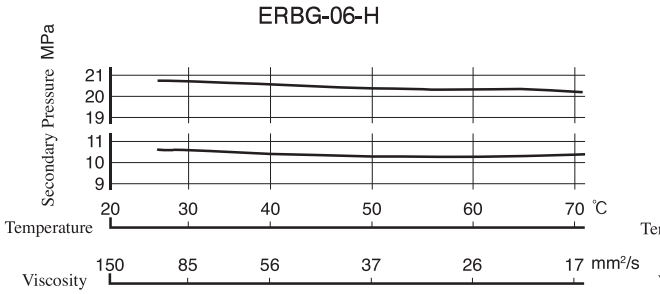

ERBG-06-C



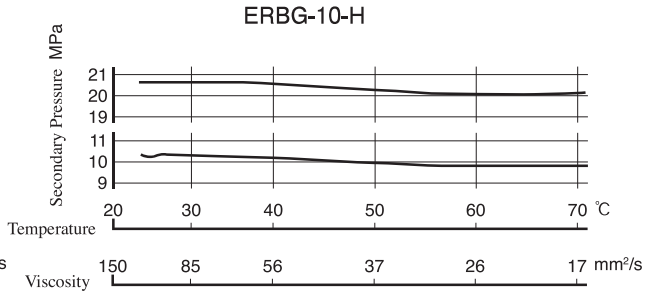

ERBG-10-C




ERBG-06-H

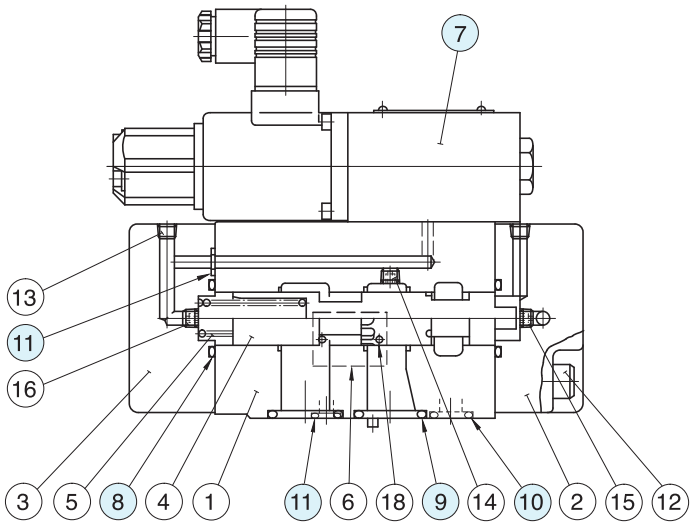



ERBG-10-H



## List of Seals and Pilot Valves

ERBG-$^{06}_{10}$




### List of Seals

| Item | Name of Parts | Part Numbers | | Qty. |
|---|---|---|---|---|
| | | ERBG-06 | ERBG-10 | |
| 8 | O-Ring | OR NBR-90 G30-N | OR NBR-90 P36-N | 2 |
| 9 | O-Ring | OR NBR-90 P28-N | OR NBR-90 P28-N | 2 |
| 10 | O-Ring | OR NBR-90 P14-N | OR NBR-90 P18-N | 1 |
| 11 | O-Ring | OR NBR-90 P9-N | OR NBR-90 P9-N | 3 |

### Pilot Valves

| Valve Model No. | ⑦ Pilot Valve Model Numbers |
|---|---|
| ERBG-06-B-51 | EDG-01-B-PNTN-5101 |
| ERBG-06-C-51 | EDG-01-C-PNTN-5101 |
| ERBG-06-H-51 | EDG-01-H-PNT15-5101 |
| ERBG-10-B-51 | EDG-01-B-PNTN-5101 |
| ERBG-10-C-51 | EDG-01-C-PNTN-5101 |
| ERBG-10-H-51 | EDG-01-H-PNT15-5101 |

Note: For the details of pilot valves, refer to "Pilot Relief Valves" on page H-97.

## Interchangeability between Current and New Design

ERBG-06/10 series valves have changed model from 50 to 51 design in line with the model change of pilot valve (EDG-01).

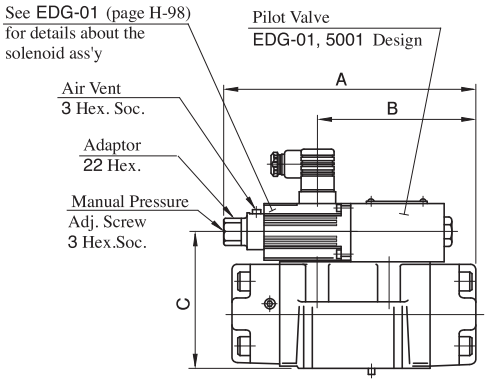
### Specifications and Characteristics

Input current-secondary pressure characteristics differ between current and new design. Please inquire separately for details. Other specifications remain unchanged.

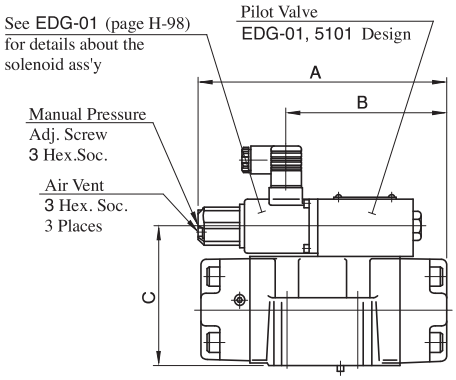
### Mounting Interchangeability

There is an interchangeability in the mounting dimensions, however, the outside shape and dimensions are changed as shown below due to pilot valve improvement and other modifications.

Current: Design 50



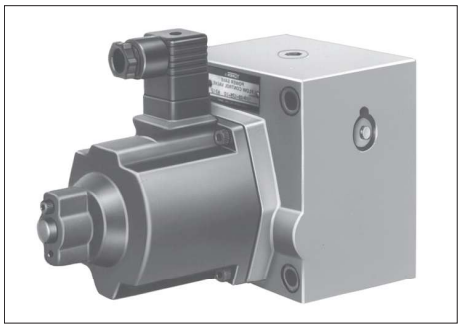

New: Design 51

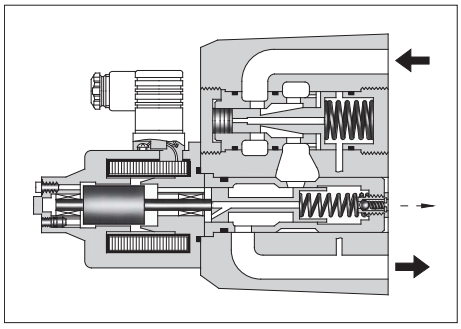



| Model Numbers | | A | B | C |
|---|---|---|---|---|
| Current | ERBG-06-✻-50 | 214.5 | 136.5 | 115 |
| New | ERBG-06-✻-51 | 213.5 | 136.5 | 115 |
| Current | ERBG-10-✻-50 | 235.5 | 158 | 117 |
| New | ERBG-10-✻-51 | 234.5 | 158 | 117 |

# 40Ω Series
# Proportional Electro-Hydraulic Flow Control (and Check) Valves

Since the preselected flow rate continuously varies in proportion to the current input to the valve, the system flow rate can be remote-controlled as desired by regulating the amplifier current output. Further, since pressure and temperature compensation functions are provided, the preselected flow rate is not affected by pressure (load) or temperature (fluid viscosity).
This valve is ideal for use where actuator startup, stop, and speed changes are to be implemented without producing a shock. Note that this valve is used in conjunction with the applicable power amplifier.



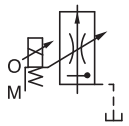


## Specifications

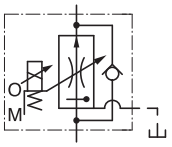
| Descriptions \ Model No. | EFG EFCG -02- 10 30 | EFG EFCG -03- 60 125 | EFG EFCG -06-250 | EFG EFCG -10-500 |
|---|---|---|---|---|
| Max. Operating Pres. MPa | 20.6 | 20.6 | 20.6 | 20.6 |
| Metered Flow Adjustment Range L/min | 10: 0.3-10<br>30: 0.3-30 | 60: 2-60<br>125: 2-125 | 3-250 | 5-500 |
| Min. Differential Pres.★ MPa | 0.6 | 1.0 | 1.3 | 2.0 |
| Free Flow (EFCG Models Only.) L/min | 40 | 130 | 280 | 550 |
| Rated Current mA | 600 | 600 | 600 | 600 |
| Coil Resistance Ω | 45 | 45 | 45 | 45 |
| Hysteresis | 5% or less | 7% or less | 7% or less | 7% or less |
| Repeatability | 1% or less | 1% or less | 1% or less | 1% or less |
| Mass kg | 8.2 | 12.5 | 25 | 51 |

★ Min. pressure difference required between inlet and outlet ports to maintain function as pressure compensator.

Graphic Symbols




EFG-∗




EFCG-∗

## Model Number Designation

| EFC | G | -02 | -10 | -N | -31 |
|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Max. Metered Flow L/min | Pres. Compensator Stroke Adjustment | Design Number |
| **EF:** Proportional Electro-Hydraulic Flow Control Valve<br>**EFC:** Proportional Electro-Hydraulic Flow Control and Check Valve | **G:** Sub-Plate Mounting | **02** | **10**<br>**30** | **N:** Applicable only for Press. Compensator Stroke Adjustment (Option - Omit if not required) | **31** |
| | | **03** | **60**<br>**125** | | **26, 2603**★ |
| | | **06** | **250** | | **22** |
| | | **10** | **500** | | **11** |

Note: If you are going to use the model with pressure compensator stroke adjustment screw, consult your Yuken representative in advance.
★ Only for the "EFG-03-∗-N," the design number is "2603."

## Accessories

### Mounting Bolts

| Valve Model Numbers | Socket Head Cap Screw | Qty. |
|---|---|---|
| EFG / EFCG-02 | M8 × 75 L | 4 |
| EFG / EFCG-03 | M10 × 100 L | 4 |
| EFG / EFCG-06 | M16 × 130 L | 4 |
| EFG / EFCG-10 | M20 × 160 L | 4 |

### Applicable Power Amplifiers

For stable performance, it is recommended that Yuken's applicable power amplifiers be used (for details see page H-178).

Model Numbers : AME-D-＊-＊-50
AME-DF-＊-＊-52
AME-T-S-＊-22

## Sub-Plates

| Valve Model Numbers | Sub-Plate Model Numbers | Thread Size Rc | Mass kg |
|---|---|---|---|
| EFG / EFCG-02 | EFGM-02X-20 | 3/8 | 2.3 |
| | EFGM-02Y-20 | 1/2 | 3.1 |
| EFG / EFCG-03 | EFGM-03Y-3001 | 3/4 | 5.7 |
| | EFGM-03Z-3001 | 1 | 5.6 |
| EFG / EFCG-06 | EFGM-06X-3001 | 1 | 12.5 |
| | EFGM-06Y-3001 | 1-1/4 | 16 |
| EFG / EFCG-10 | EFGM-10Y-10★ | 1-1/2, 2 Flange Mounting | 37 |

- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish. (16)
- When ordering the EFGM-10Y, please order "F3" Series Pipe Flange Kits separately.
  Please inquire separately for details on the "F3" Series Pipe Flange Kits.

## Models with Pressure Compensator Stroke Adjustment Screw

A models with pressure compensator stroke adjustment screw is optionally available to minimize the actuator protrusion (jumping) at startup. For the details, please consult us or your Yuken distributors.

## Instructions

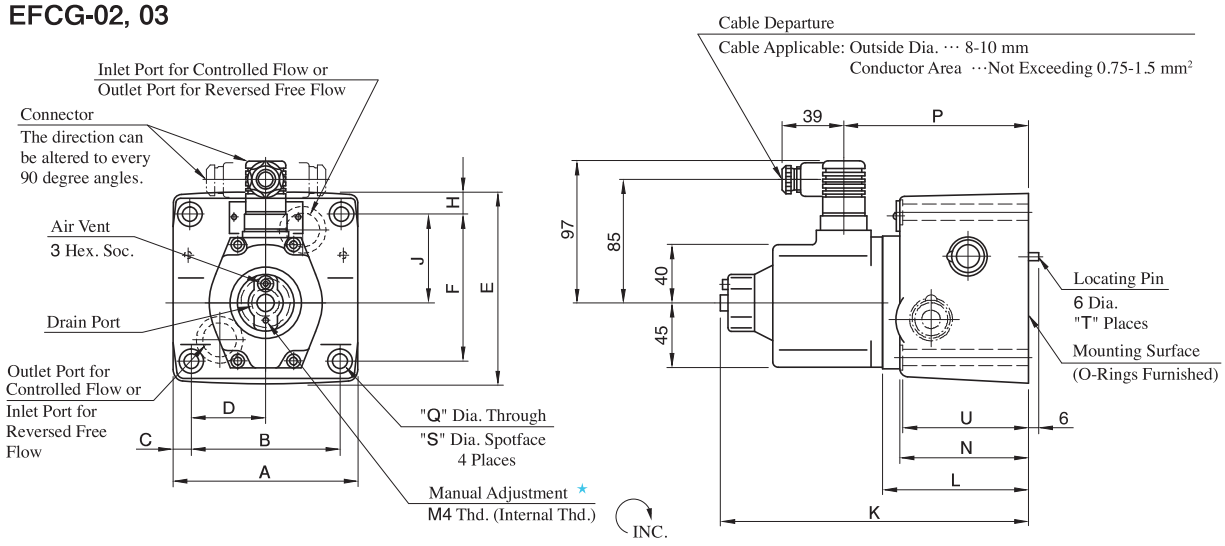
### Drain Back Pressure

Check that the drain back pressure does not exceed 0.2 MPa.

### Models with Check Valve

A models with check valve makes it possible to obtain a free flow in the direction opposite that of the controlled flow without respect to the input current.

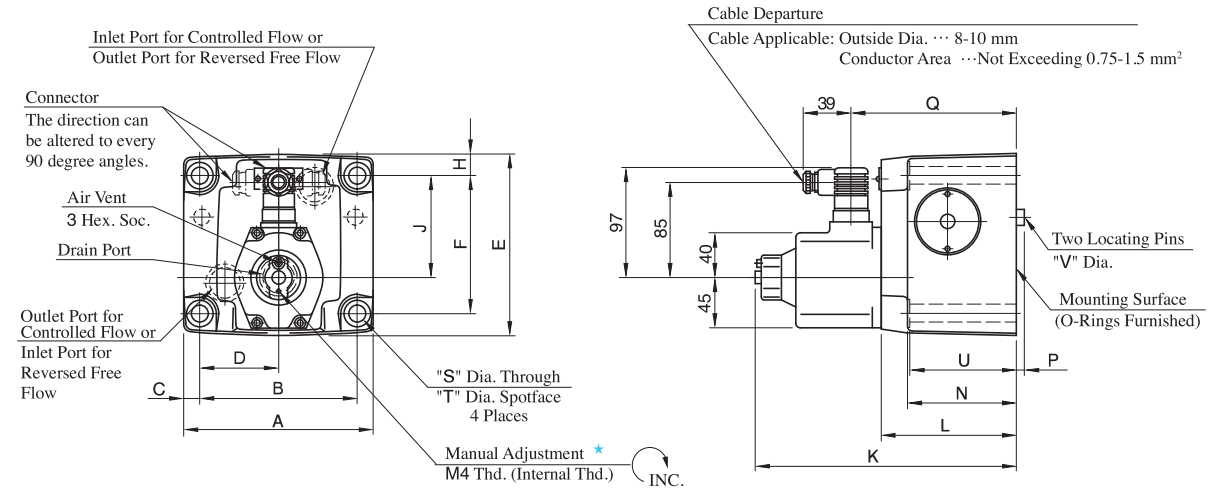
## EFG-02, 03
## EFCG-02, 03




★Manual adjustment can be done by screwing for example an M4 × 20 L screw in the M4 thread or pushing in a rod etc. there.

| Model Numbers | Dimensions mm | | | | | | | | | | | | | | | U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | H | J | K | L | N | P | Q | S | T | |
| EF∗G-02 | 96 | 76.2 | 9.9 | 38.1 | 106 | 82.6 | 11.7 | 46.3 | 195 | 81 | 66 | 108 | 8.8 | 14 | 1 | 65 |
| EF∗G-03 | 125 | 101.6 | 11.7 | 50.8 | 130 | 101.6 | 14.2 | 61.8 | 212 | 98 | 85 | 125 | 11 | 17.5 | 2 | 84 |

## EFG-06, 10
## EFCG-06, 10

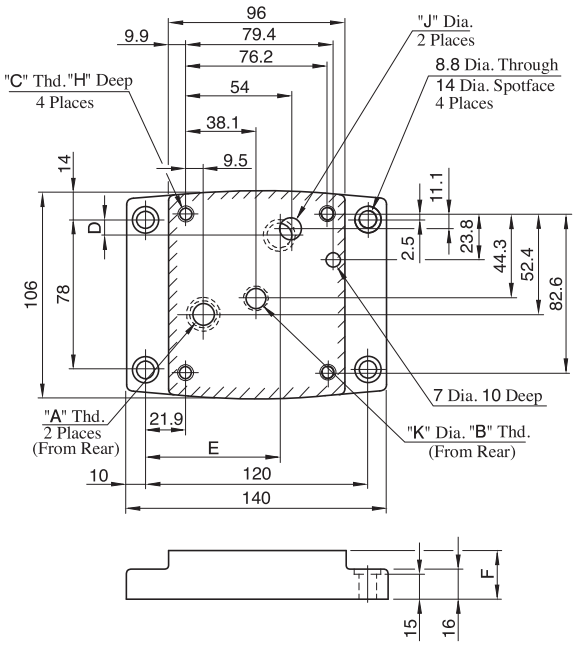



★Manual adjustment can be done by screwing for example an M4 × 20 L screw in the M4 thread or pushing in a rod etc. there.

| Model Numbers | Dimensions mm | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | H | J | K | L | N | P | Q | S | T | U | V |
| EF∗G-06 | 180 | 146.1 | 17 | 73.1 | 174 | 133.4 | 20.3 | 99 | 244 | 130 | 105 | 7 | 157 | 17.5 | 26 | 103.5 | 16 |
| EF∗G-10 | 244 | 196.9 | 23.5 | 98.5 | 228 | 177.8 | 25 | 144.5 | 274 | 160 | 137 | 10 | 187 | 21.5 | 32 | 135 | 18 |

## Sub-Plate

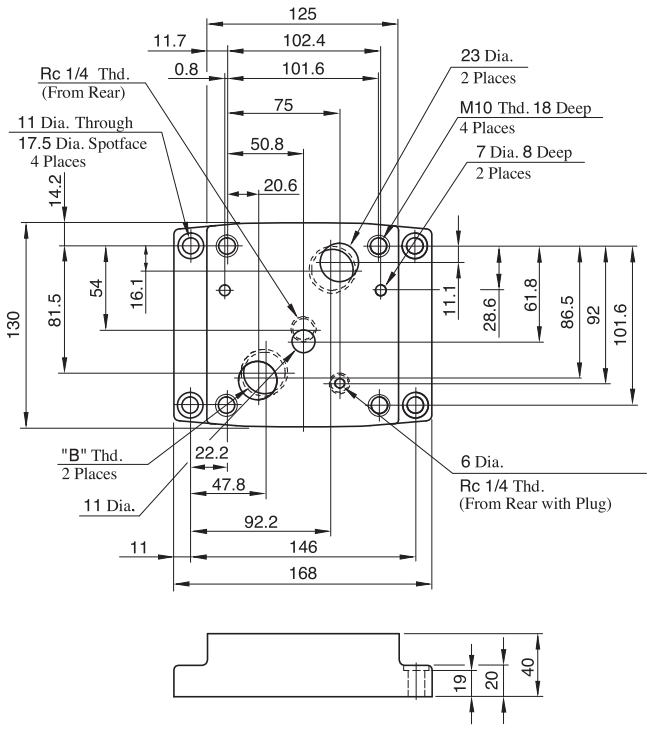
### EFGM-02X, 02Y




| Sub-Plate Model Numbers | Thread Size | | |
|---|---|---|---|
| | "A" Thd. | "B" Thd. | "C" Thd. |
| EFGM-02X-20 | Rc 3/8 | Rc 1/4 | M8 |
| EFGM-02Y-20 | Rc 1/2 | | |

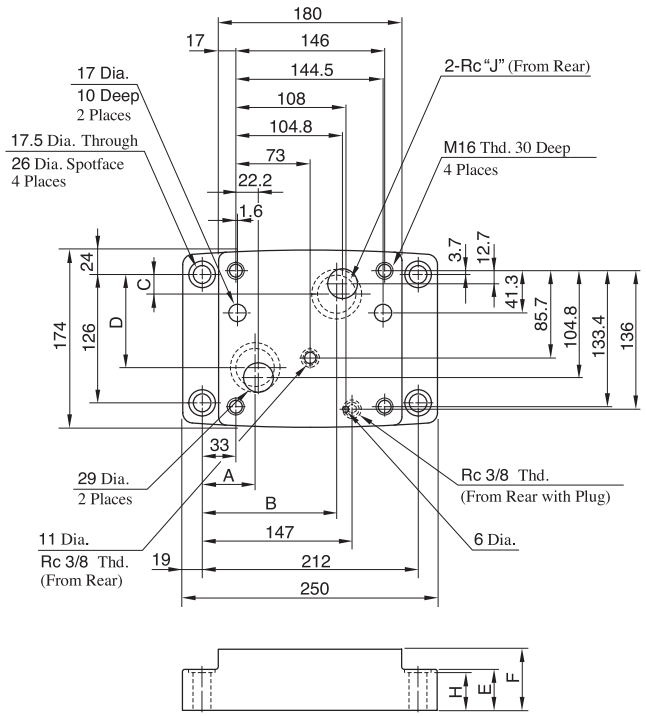
| Sub-Plate Model Numbers | Dimensions mm | | | | | |
|---|---|---|---|---|---|---|
| | D | E | F | H | J | K |
| EFGM-02X-20 | 8.6 | 75.9 | 25 | 14 | 14 | 11 |
| EFGM-02Y-20 | 11.5 | 72.9 | 35 | | | |

### EFGM-03Y, 03Z (3001D)



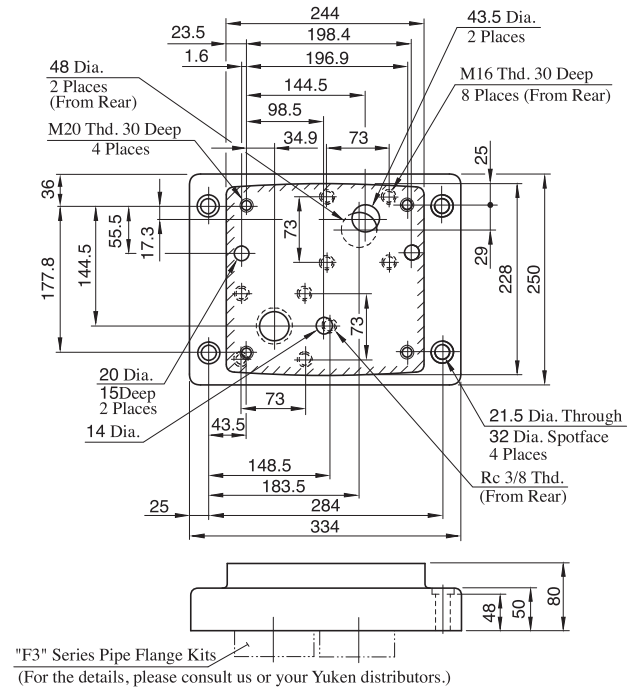

| Sub-Plate Model Numbers | Thread Size |
|---|---|
| | "B" Thd. |
| EFGM-03Y-3001 | Rc 3/4 |
| EFGM-03Z-3001 | Rc 1 |

## Sub-Plate
### EFGM-06X, 06Y (3001D)




| Sub-Plate Model Numbers | A | B | C | D | E | F | H | J |
|---|---|---|---|---|---|---|---|---|
| EFGM-06X-3001 | 55.2 | 137.8 | 14.3 | 101.1 | 35 | 45 | 34 | 1 |
| EFGM-06Y-3001 | 52 | 132 | 19.3 | 91.3 | 40 | 60 | 39 | 1-1/4 |

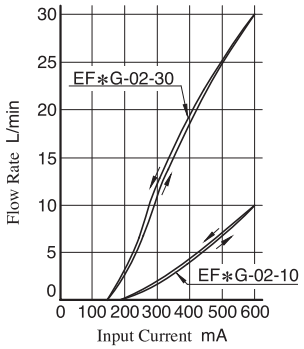
### EFGM-10Y



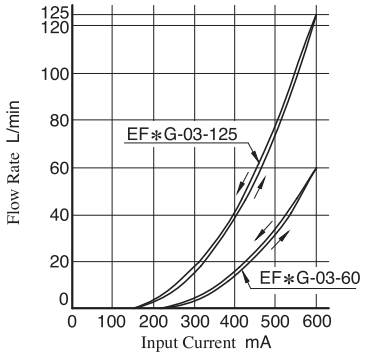
## Input Current vs. Flow

Viscosity: 30 mm²/s

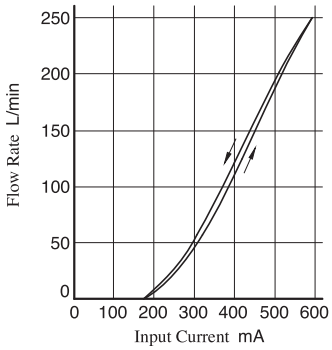
EFG EFCG-02



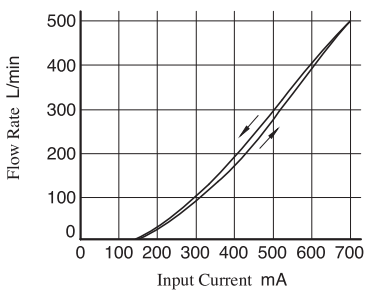

EFG EFCG-03




EFG EFCG-06



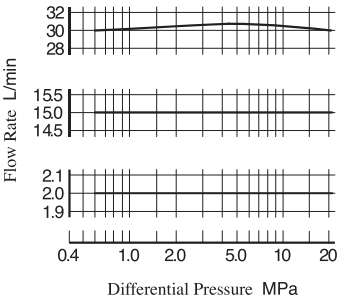

EFG EFCG-10



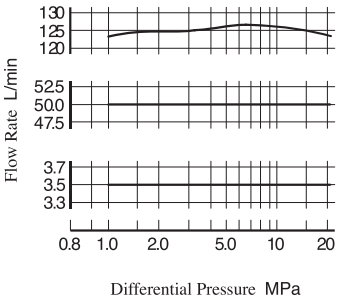

## Differential Pressure vs. Metered Flow

Viscosity: 30 mm²/s

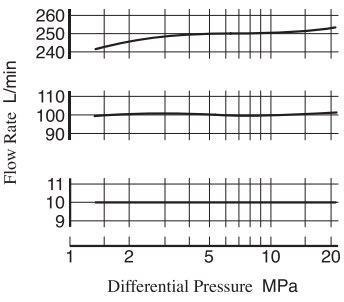
EFG EFCG-02



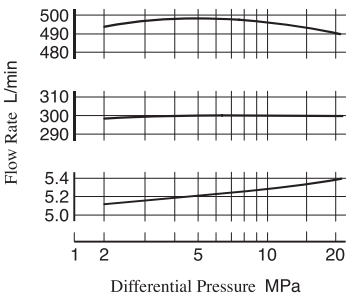

EFG EFCG-03




EFG EFCG-06




EFG EFCG-10

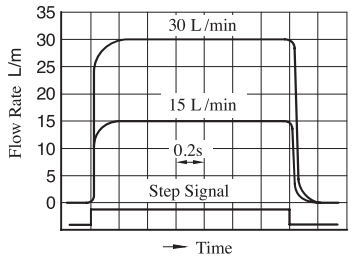


## Step Response

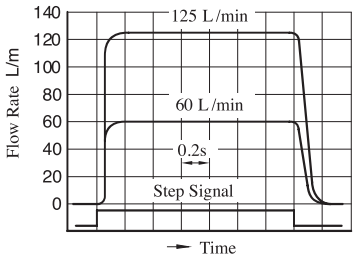
Viscosity: 30 mm²/s

These characteristics have been obtained by measuring on each valve.
Therefore, they may vary according to a hydraulic circuit to be used.

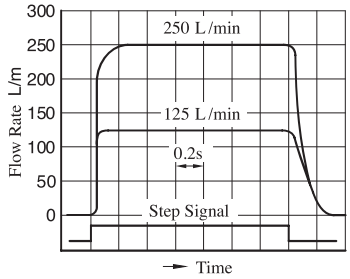
EFG EFCG-02



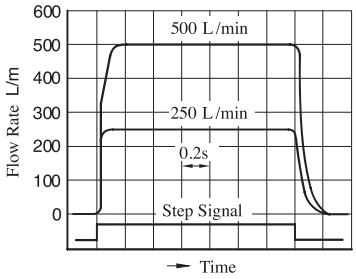

EFG EFCG-03




EFG EFCG-06



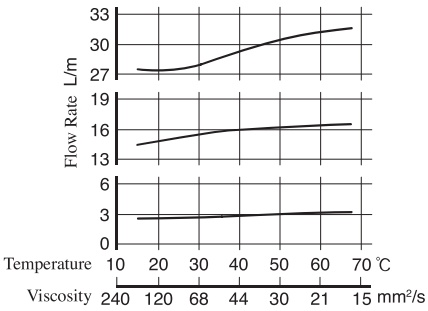

EFG EFCG-10



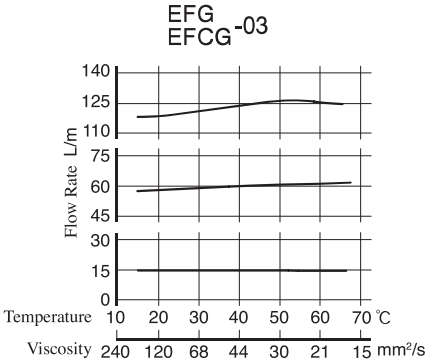

## Viscosity vs. Flow

Oil: ISO VG 46

EFG EFCG-02



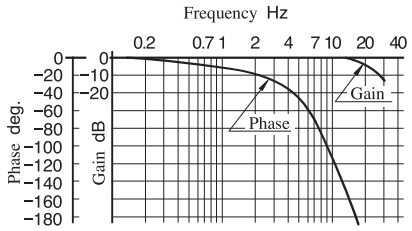

EFG EFCG-03




## Frequency Response

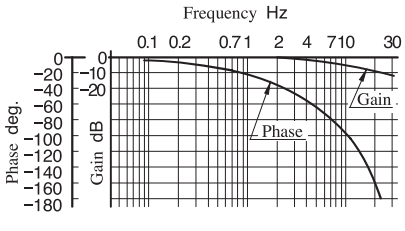
Viscosity: 30 mm²/s

EFG EFCG-02



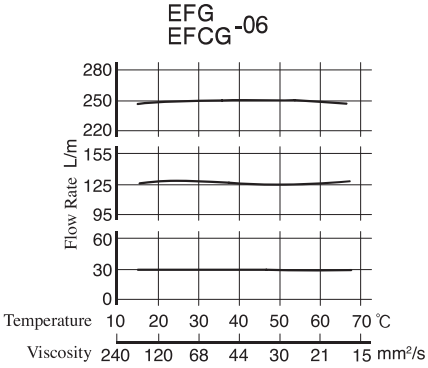

Input Current : 400 ± 100 mA
Pressure : 6.9 MPa

EFG EFCG-03

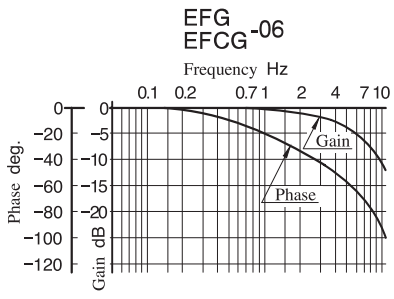



Input Current : 460 ± 70 mA
Pressure : 6.9 MPa

EFG EFCG-06

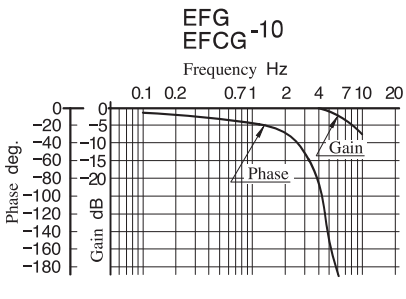



EFG EFCG-06



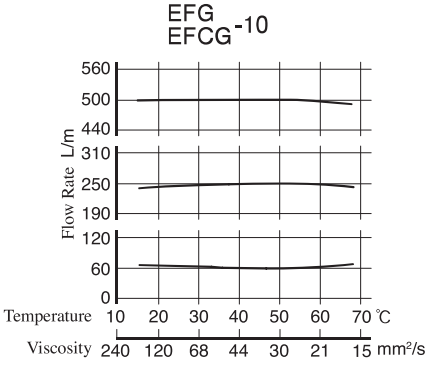

Input Current : 460 ± 70 mA
Pressure : 6.9 MPa

EFG EFCG-10




Input Current : 475 ± 125 mA
Pressure : 6.9 MPa

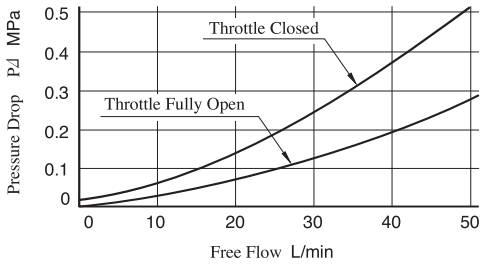
EFG EFCG-10



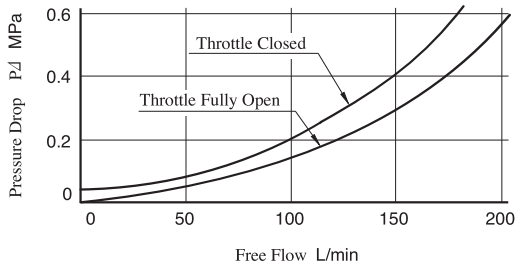
## Pressure Drop for Reversed Free Flow (Only for "EFCG" Models)

Oil Viscosity: 35 mm²/s
Specific Gravity: 0.850

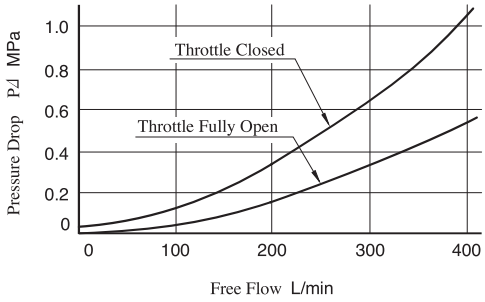
### EFCG-02



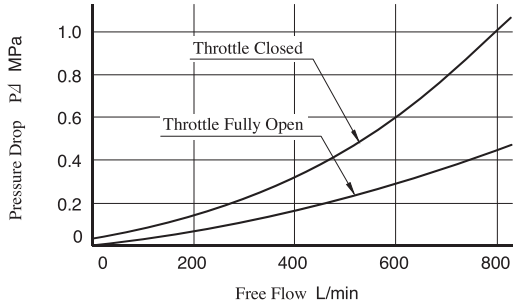

### EFCG-03




### EFCG-06




### EFCG-10




- For any other viscosity, multiply the factors in the table below.

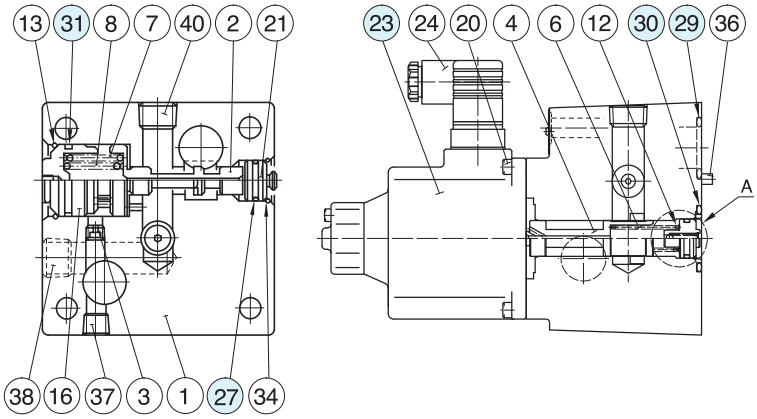
| Viscosity mm²/s | 20 | 40 | 60 | 80 | 100 |
|---|---|---|---|---|---|
| Factor | 0.87 | 1.03 | 1.14 | 1.23 | 1.30 |

- For any other specific gravity (G'), the pressure drop (ΔP') may be obtained from the formula below.
  ΔP'=ΔP (G'/0.850)

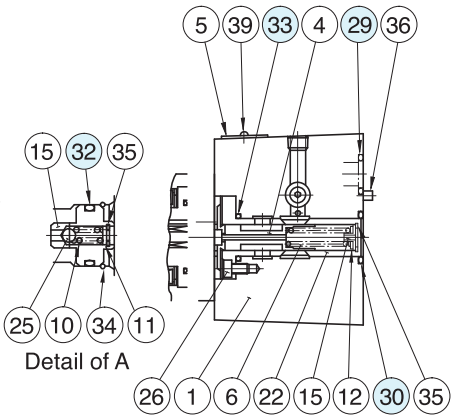
## List of Seals and Solenoid Ass'y

**EFG**
**EFCG-02, 03**

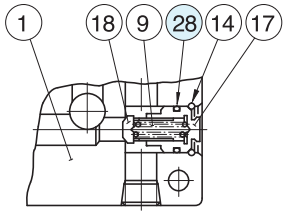
EF∗G-03




EF∗G-02




With Check Valve (EFCG-02, 03)



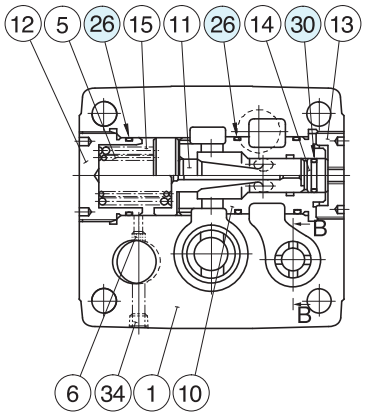

### List of Seals and Solenoid Ass'y

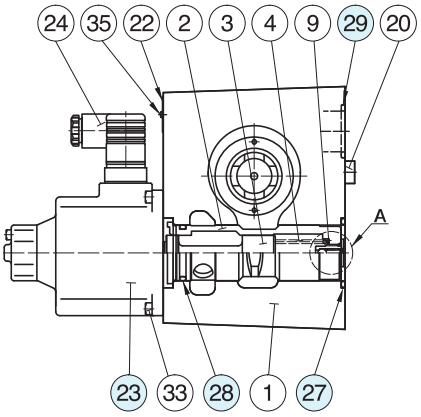
| Item | Name of Parts | Part Numbers | | Qty. |
|---|---|---|---|---|
| | | EF∗G-02 | EF∗G-03 | |
| 23 | Solenoid Ass'y | E321-45-20 | E321-45-20 | 1 |
| 27 | O-Ring | OR NBR-90 P18-N | OR NBR-90 P18-N | 1 |
| 28 | O-Ring | OR NBR-90 P10A-N | OR NBR-90 P21-N | 1 |
| 29 | O-Ring | OR NBR-90 P18-N | OR NBR-90 P28-N | 2 |
| 30 | O-Ring | OR NBR-90 P22-N | OR NBR-90 P31-N | 1 |
| 31 | O-Ring | OR NBR-90 G25-N | OR NBR-90 G35-N | 1 |
| 32 | O-Ring | — | OR NBR-90 P18-N | 1 |
| 33 | O-Ring | OR NBR-90 P22-N | — | 1 |

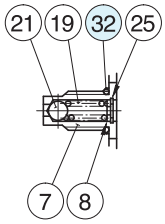
Note 1: The connector assembly GDM-211-B-11 (Item 24) is not included in the solenoid assembly.

## List of Seals and Solenoid Ass'y

**EFG**
**EFCG-06, 10**

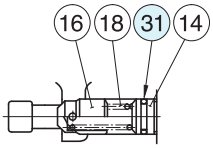



Detail of A

With Check Valve (EFCG-06, 10)




Section B-B

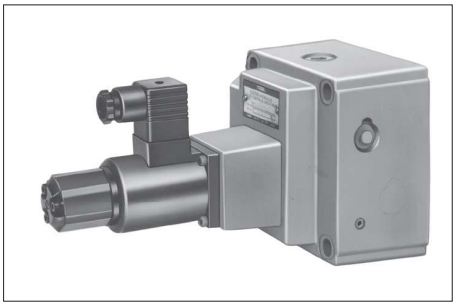
### List of Seals and Solenoid Ass'y

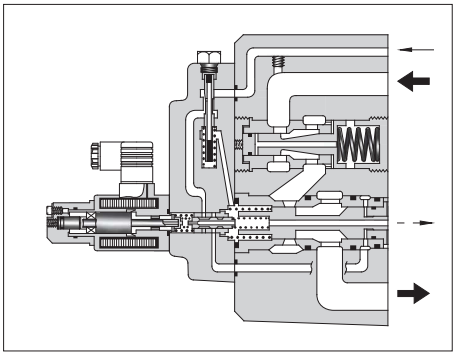
| Item | Name of Parts | Part Numbers | | Qty. |
|---|---|---|---|---|
| | | EF✻G-06 | EF✻G-10 | |
| 23 | Solenoid Ass'y | E321-45-20 | E321-45-20 | 1 |
| 26 | O-Ring | OR NBR-90 P50-N | OR NBR-90 G75-N | 3 |
| 27 | O-Ring | OR NBR-90 P44-N | OR NBR-90 G60-N | 1 |
| 28 | O-Ring | OR NBR-90 P34-N | OR NBR-90 P50-N | 1 |
| 29 | O-Ring | OR NBR-90 P32-N | OR NBR-90 P48-N | 2 |
| 30 | O-Ring | OR NBR-90 P21-N | OR NBR-90 P34-N | 1 |
| 31 | O-Ring | OR NBR-90 P21-N | OR NBR-90 P26-N | 1 |
| 32 | O-Ring | OR NBR-70-1 P10-N | OR NBR-70-1 P10-N | 1 |

Note 1: The connector assembly GDM-211-B-11 (Item 24) is not included in the solenoid assembly.

# 10Ω Series
# Proportional Electro-Hydraulic Flow Control (and Check) Valves

Since the preselected flow rate continuously varies in proportion to the current input to the valve, the system flow rate can be remote-controlled as desired by regulating the current output from the amplifier. Further, since the pressure and temperature compensation functions are provided, the preselected flow rate is not be affected by pressure (load) or temperature (fluid viscosity). This valve is ideal for use where actuator startup, stop, and speed changes are to be implemented without producing a shock. Note that this valve is used in conjunction with the applicable power amplifier.



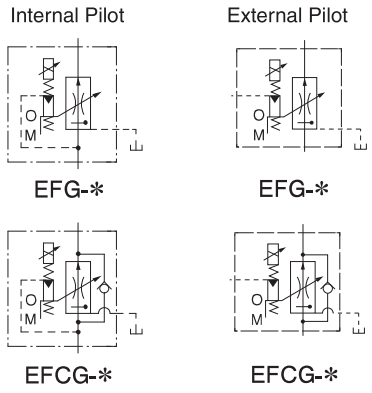


## Specifications

| Descriptions \ Model Numbers | | EFG / EFCG -03- 60 / 125 | EFG / EFCG -06-250 |
|---|---|---|---|
| Max. Operating Pressure | MPa | 20.6 | 24.5 |
| Metered Flow Adj. Range | L/min | 60: 1-60<br>125: 1-125 | 2.5-250 |
| Min. Differential Pressure★1 | MPa | 1.0 | 1.0 |
| Free Flow (EFCG Models Only) | L/min | 130 | 280 |
| Min. Pilot Pressure★2 | MPa | 1.0 | 1.5 |
| Min. Pilot L/min | at Normal | 0.5 | 1 |
| | at Transition | 2.6 | 4 |
| Rated Current | mA | 780 | 820 |
| Coil Resistance | Ω | 10 | 10 |
| Hysteresis | | 3% or less | 3% or less |
| Repeatability | | 1% or less | 1% or less |
| Approx. Mass | kg | 10 | 25 |

★1. Min. pressure difference required between inlet and outlet ports to maintain function as pressure compensator.
★2. The minimum required value for the external pilot type.

### Graphic Symbols




## Model Number Designation

| EFC | G | -03 | -125 | -E | -51 |
|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Max. Metered Flow L/min | Pilot Connection | Design Number |
| **EF:** Proportional Electro-Hydraulic Flow Control Valve | **G:** Sub-Plate Mounting | **03** | **60**<br>**125** | **None:** Internal Pilot | **51** |
| **EFC:** Proportional Electro-Hydraulic Flow Control and Check Valve | | **03** | **250** | **E:** External Pilot | **51** |

## Accessories

### Mounting bolts

| Valve Model Numbers | Socket Head Cap Screw | Qty. |
|---|---|---|
| EFG EFCG-03 | M10 × 80 L | 4 |
| EFG EFCG-06 | M16 × 130 L | 4 |

### Applicable Power Amplifiers

For stable performance, it is recommended that Yuken's applicable power amplifiers be used (for details see page H-173, H-177 and H-183).

Model Numbers : AME-D-10-＊-20 AMN-D-10 (For DC power supply)
SK1022-＊-＊-11
AME-D2-1010-11 SK1015-11 (For DC power supply)

## Sub-Plate

| Valve Model Numbers | Sub-Plate Model Numbers | Thread Size Rc | Approx. Mass kg |
|---|---|---|---|
| EFG EFCG-03 | EFGM-03Y-30 | 3/4 | 5.7 |
| | EFGM-03Z-30 | 1 | 5.6 |
| EFG EFCG-06 | EFGM-06X-30 | 1 | 12.5 |
| | EFGM-06Y-30 | 1-1/4 | 16 |

- Sub-plates are available. Specify the sub-plate model number from the tabel above. When sub-ptates are not used, the mounting surface should have a good machined finish. ($\frac{1.6}{\nabla}$)

## Instructions

### Drain Back Pressure

Check that the drain back pressure dose not exceed 0.2 MPa.

### Pilot Type Selection

This valve is constructed so as to operate at a predetermined pilot pressure. For the 03, a pilot pressure of 1 MPa or higher is required. For the 06, the requied pilot pressure is 1.5 MPa or higher.

To obtain such a required pilot pressure, select the pilot type according to the circuit examples on the right.

①/②

Use the external pilot type (pilot connection code: E) whether a meter-in or meter-out circuit is employed.

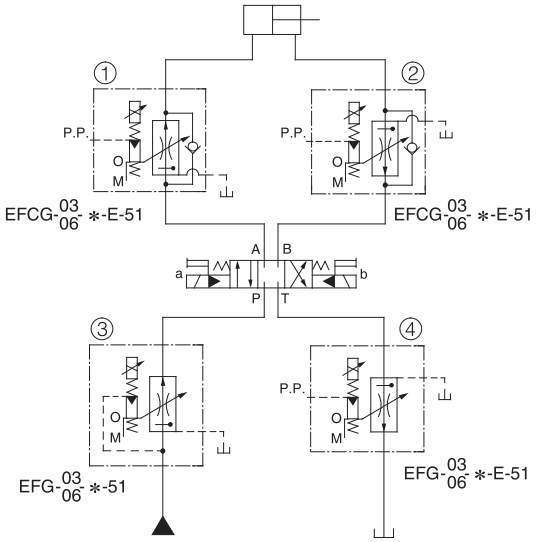
③

Use the internal pilot type (pilot connection code: None)

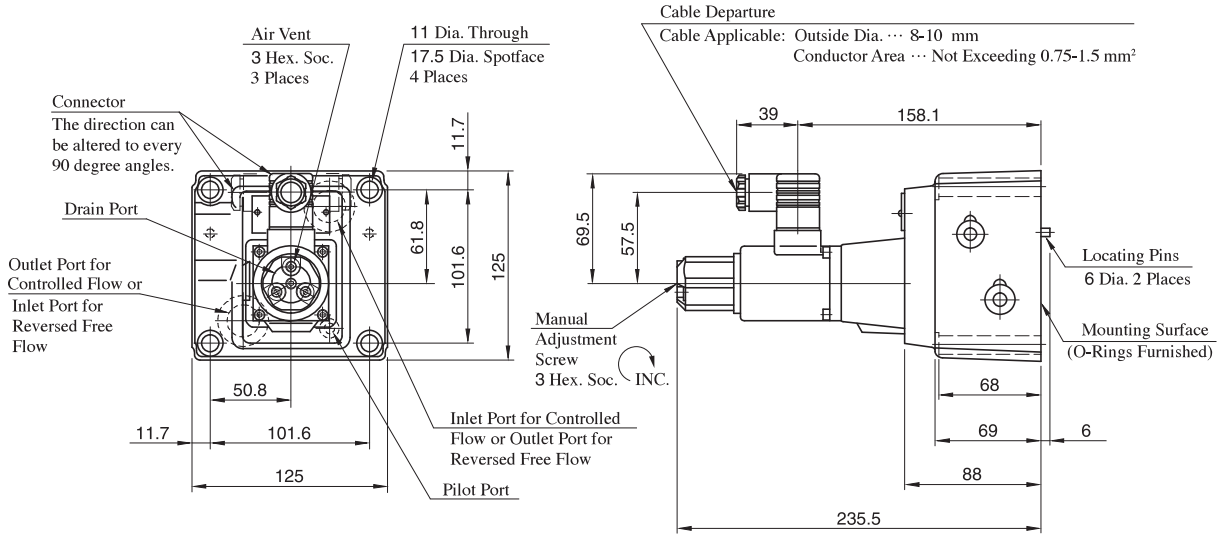
④

Use the external pilot type (pilot connection code: E)

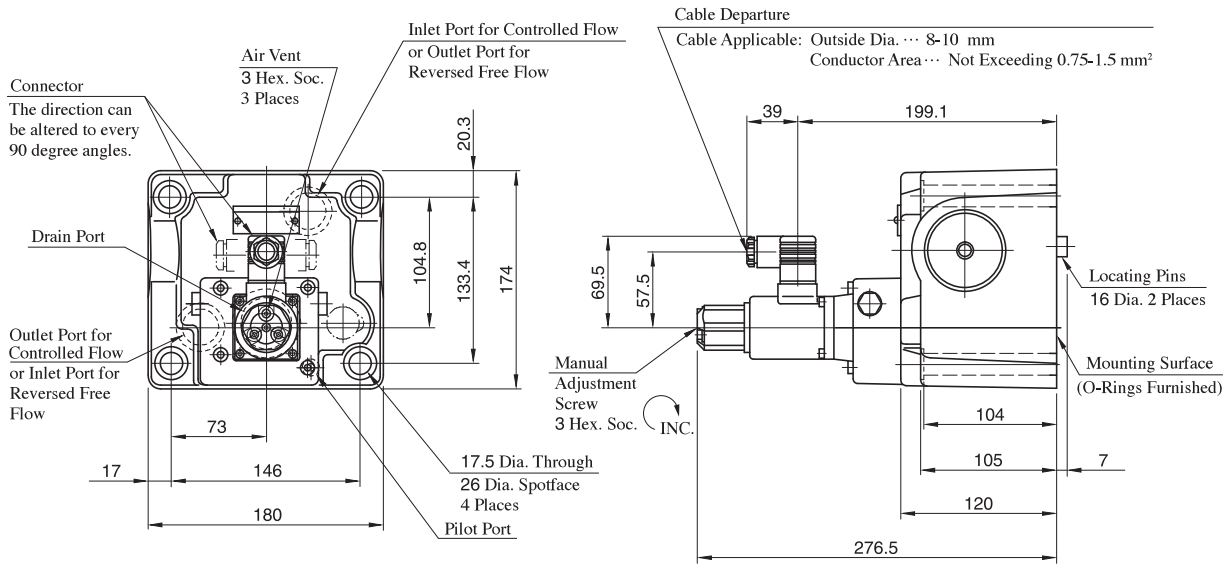
[Example of Circuit]



## EFG
## EFCG-03

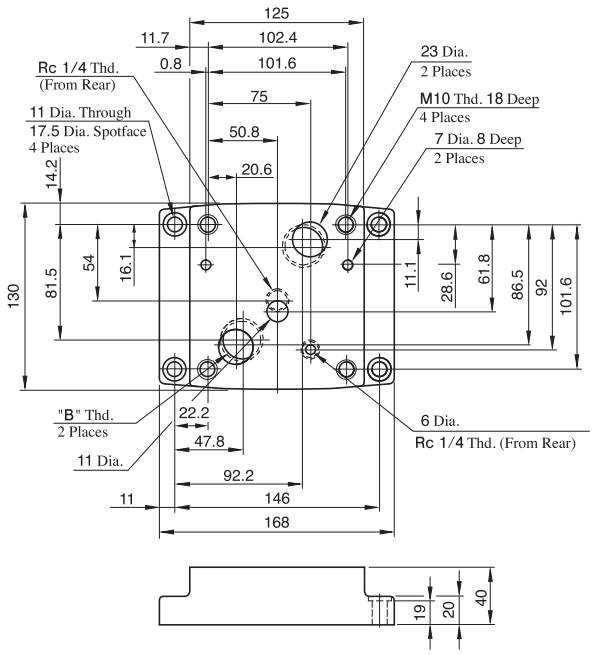



## EFG
## EFCG-06



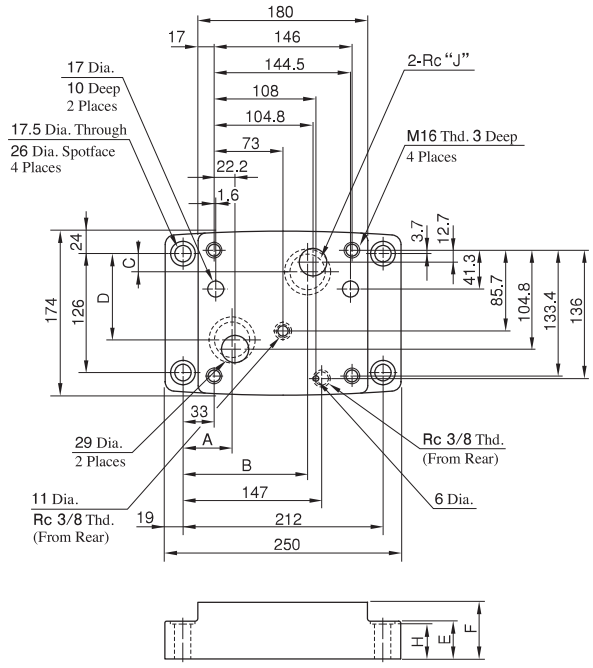
## Sub-Plate

### EFGM-03Y, 03Z




| Sub-Plate Model Numbers | Thread Size "B" Thd. |
|---|---|
| EFGM-03Y-30 | Rc 3/4 |
| EFGM-03Z-30 | Rc 1 |

### EFGM-06X, 06Y

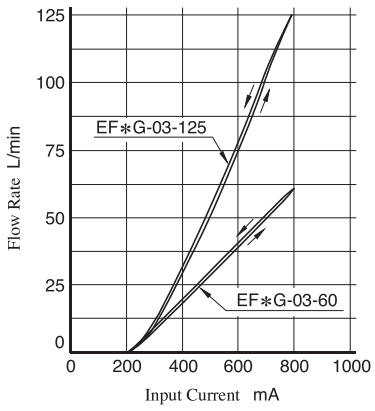



| Sub-Plate Model Numbers | A | B | C | D | E | F | H | J |
|---|---|---|---|---|---|---|---|---|
| EFGM-06X-30 | 55.2 | 137.8 | 14.3 | 101.1 | 35 | 45 | 34 | 1 |
| EFGM-06Y-30 | 52 | 132 | 19.3 | 91.3 | 40 | 60 | 39 | 1-1/4 |

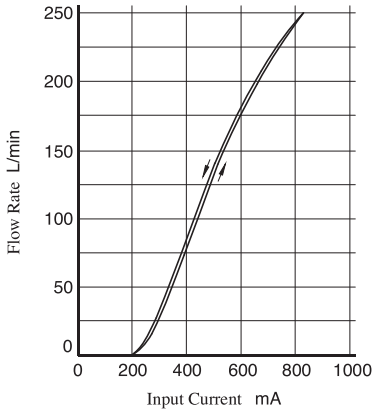
## Input Current vs. Flow

Viscosity: 30 mm²/s

EFG EFCG -03




EFG EFCG -06

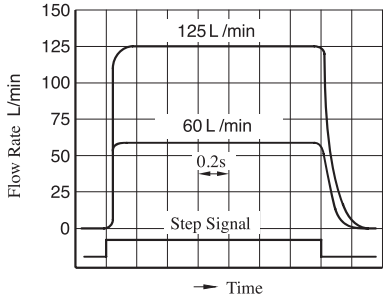



## Step Response

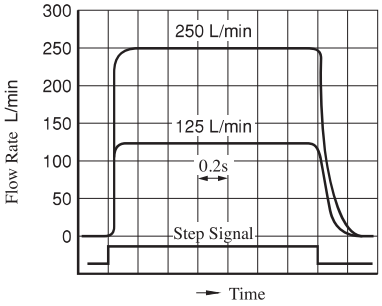
These characteristics have been obtained by measuring on each valve. Therefore , they may vary according to a hydraulic circuit to be used.

Viscosity: 30 mm²/s

EFG EFCG -03



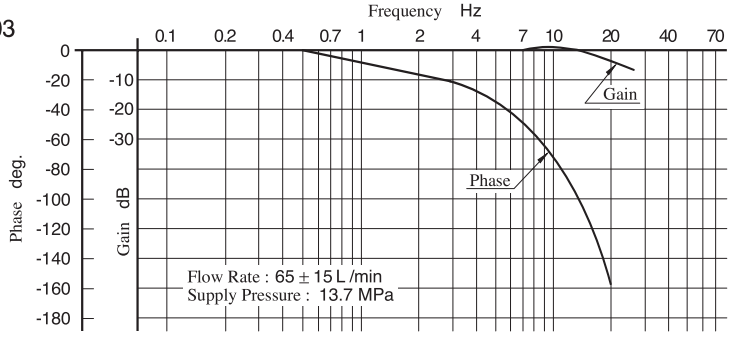

EFG EFCG -06



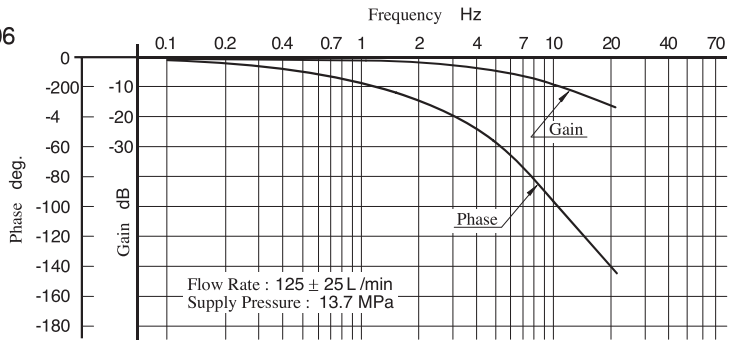

## Frequency Response

Viscosity: 30 mm²/s

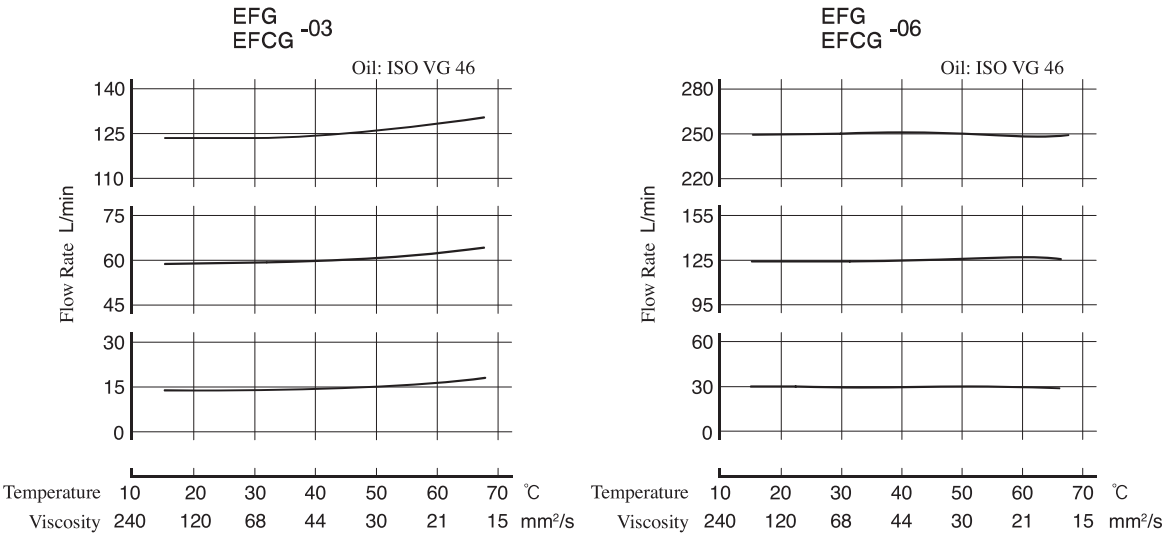
EFG EFCG -03



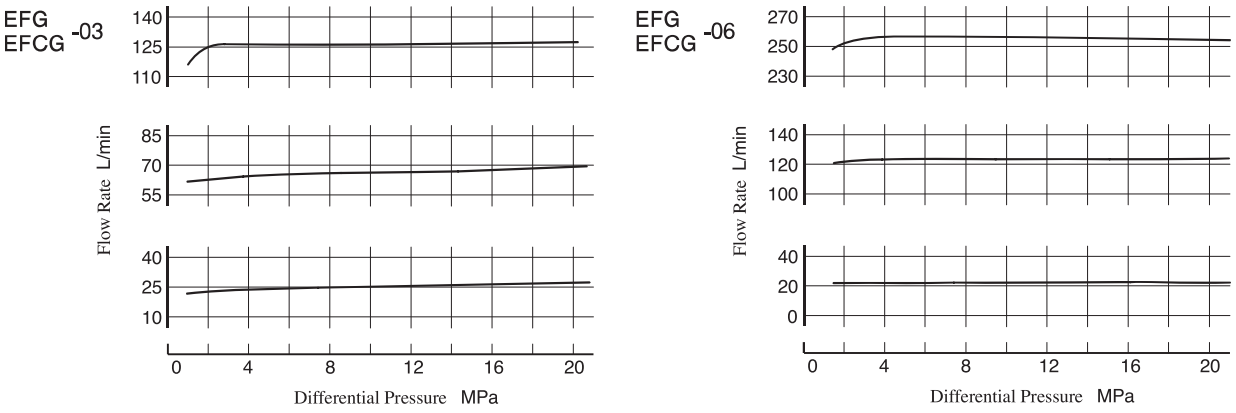

EFG EFCG -06



## Viscosity vs. Flow




## Differential Pressure vs. Metered Flow




## Interchangeability between Current and New Design

### Specifications and Characteristics

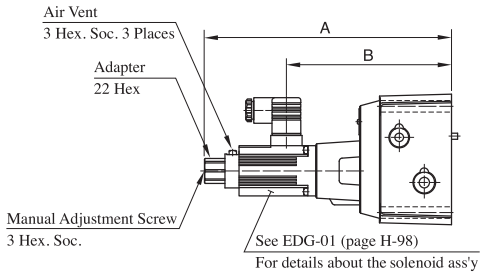
Input current-flow characteristics differ between current and new design. Please inquire separately for details.
Other specifications remain unchanged.

| Model Numbers | A | B |
|---|---|---|
| (Current) EF✻G-03-✻-✻-50 | 236.5 | 158.1 |
| (New) EF✻G-03-✻-✻-51 | 235.5 | 158.1 |
| (Current) EF✻G-06-250-✻-50 | 277.5 | 199.1 |
| (New) EF✻G-06-250-✻-51 | 276.5 | 199.1 |

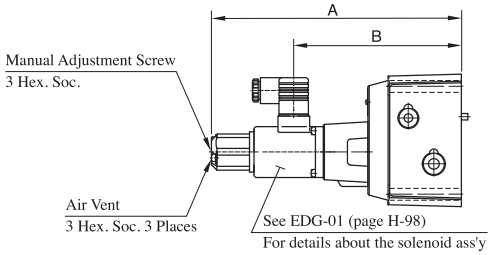
### Installation Interchangeability

There is an interchangeability in the mounting dimensions between current and new design, however, note that because of improvements made on the solenoids, the overall shapes and dimensions have been changed as shown below.

Current : 50 Design

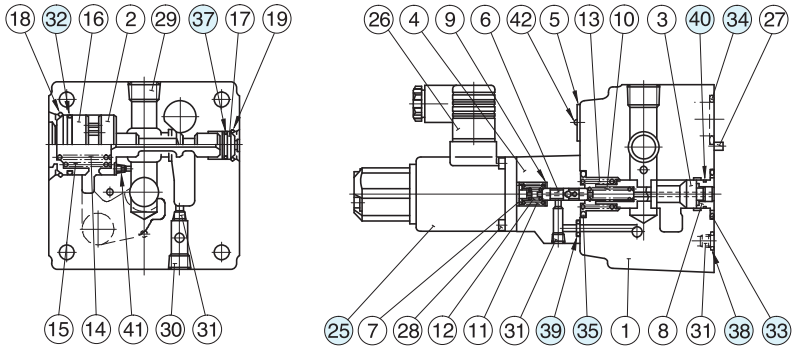


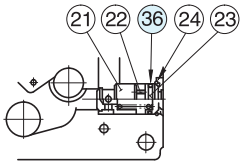

New : 51 Design



## List of Seals and Solenoid Ass'y

### EFG EFCG-03



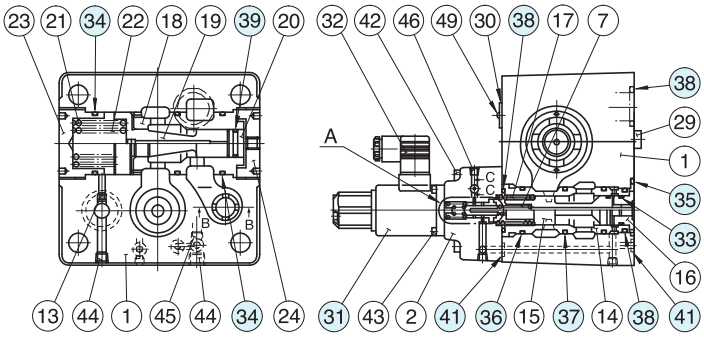

With Check Valve (EFCG-03)

Note) The connector assembly GDM-211-B-11 (Item 26) is not included in the solenoid assembly.

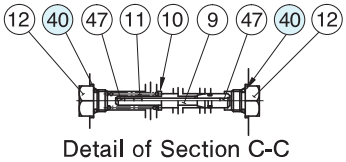
● List of Seals and Solenoid Ass'y

| Item | Name of Parts | Part Numbers | Qty. |
|---|---|---|---|
| 25 | Solenoid Ass'y | E318-Y06M1-28-61 | 1 |
| 32 | O-Ring | OR NBR-90 G35-N | 1 |
| 33 | O-Ring | OR NBR-90 P28-N | 1 |
| 34 | O-Ring | OR NBR-90 P28-N | 2 |
| 35 | O-Ring | OR NBR-90 P26-N | 1 |
| 36 | O-Ring | OR NBR-90 P16-N | 1 |
| 37 | O-Ring | OR NBR-90 P14-N | 1 |
| 38 | O-Ring | OR NBR-90 P9-N | 1 |
| 39 | O-Ring | OR NBR-90 P6-N | 2 |
| 40 | O-Ring | AS568-016(NBR-70-1) | 1 |

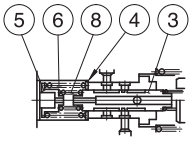
### EFG EFCG-06



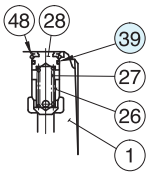

With Check Valve (EFCG-06)




Detail of Section C-C




Detail of "A"




Section B-B

Note) The connector assembly GDM-211-B-11 (Item 32) is not included in the solenoid assembly.

● List of Seals and Solenoid Ass'y

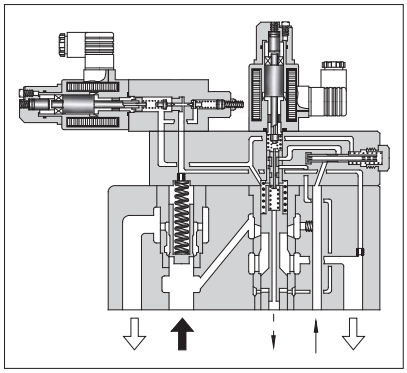
| Item | Name of Parts | Part Numbers | Qty. |
|---|---|---|---|
| 31 | Solenoid Ass'y | E318-Y06M1-28-61 | 1 |
| 33 | O-Ring | OR NBR-70-1 P21-N | 1 |
| 34 | O-Ring | OR NBR-90 P50-N | 3 |
| 35 | O-Ring | OR NBR-90 P46-N | 1 |
| 36 | O-Ring | OR NBR-90 P36-N | 1 |
| 37 | O-Ring | OR NBR-90 P34-N | 2 |
| 38 | O-Ring | OR NBR-90 P32-N | 4 |
| 39 | O-Ring | OR NBR-70-1 P21-N | 1★ |
| 40 | O-Ring | OR NBR-90 P10-N | 2 |
| 41 | O-Ring | OR NBR-90 P9-N | 3 |

★Two o-rings are required for the EFCG.

# 10Ω–10Ω Series
# Proportional Electro-Hydraulic Flow Control and Relief Valves

This flow control and relief valve is an energy-saving valve that supplies the minimum pressure and flow necessary for actuator drive.
Since this valve controls the pump pressure by following the load pressure while keeping the differential pressure minimized, it serves as a low power-consumption energy-saving, meter-in, controlled flow control valve.
Further, since a temperature compensation function is incorporated, this valve provides consistent flow control without respect to the fluid temperature.





## Specifications

| Descriptions \ Model Numbers | | | EFBG-03-125 -*-*-61 | EFBG-06-250 -*-*-61 | EFBG-10-500 -*-*-61 |
|---|---|---|---|---|---|
| Max. Operating Pressure | | MPa | 24.5 | 24.5 | 24.5 |
| Max. Flow | | L/min | 125 | 250 | 500 |
| Metered Flow Adjustment Range | | L/min | 1-125 | 2.5-250 | 5-500 |
| Min. Pilot Pressure | | MPa | 1.5 | 1.5 | 1.5 |
| Pilot Flow L/min | | at Normal | 1 | 1 | 1 |
| | | at Transition | 3 | 4 | 6 |
| Flow Controls | Rated Current | mA | 800 | 750 | 900 |
| | Coil Resistance | Ω | 10 | 10 | 10 |
| | Differential Pressure | MPa | 0.7 | 0.7 | 0.9 |
| | Hysteresis | | 3% or less | 3% or less | 3% or less |
| | Repeatability | | 1% or less | 1% or less | 1% or less |
| Pressure Controls ★1 | Pres. Adj. Range | MPa ★2 | C: 1.4-15.7<br>H: 1.4-24.5 | C: 1.4-15.7<br>H: 1.4-24.5 | C: 1.5-15.7<br>H: 1.5-24.5 |
| | Rated Current | mA | C: 890<br>H: 930 | C: 820<br>H: 880 | C: 800<br>H: 900 |
| | Coil Resistance | Ω | 10 | 10 | 10 |
| | Hysteresis | | 3% or less | 3% or less | 3% or less |
| | Repeatability | | 1% or less | 1% or less | 1% or less |
| Approx. Mass | | kg | Refer to pages H-137 to H-139 | | |

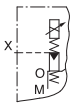
★1. The specifications for pressure controls are applied to models with proportional pilot relief valve. (Ex. EFBG-03-125-C-*-61)

★2. The maximum pressure adjustment range of the models without proportional pilot relief valves is 24.5 MPa.

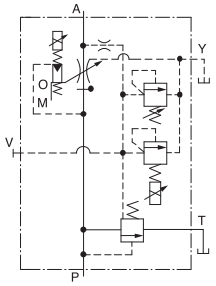
### Graphic Symbols

With Proportional Pilot Relief Valve

External Pilot

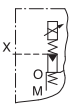



Internal Pilot

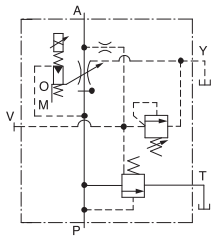



Without Proportional Pilot Relief Valve

External Pilot




Internal Pilot



## Model Number Designation

| EFB | G | -03 | -125 | -C | -E | -61 |
|---|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Max. Metered Flow L/min | Proportional Pilot Relief Valve Pressure Adj. Range | Pilot Connection | Design Number |
| **EFB:** Proportional Electro-Hydraulic Flow Control and Relief Valve | **G:** Sub-Plate Mounting | **03** | **125** | **C, H:** See Specifications | **None:** Internal Pilot | **61** |
| | | **06** | **250** | **None:** Without Proportional Pilot Relief Valve | **E:** External Pilot | **61** |
| | | **10** | **500** | | | **51** |

## Accessories

### Mounting Bolts

| Valve Model Numbers | Socket Head Cap Screw | Qty. |
|---|---|---|
| EFBG-03 | M10 × 65 L | 4 |
| EFBG-06 | M16 × 100 L | 4 |
| EFBG-10 | M20 × 130 L | 4 |

## Applicable Power Amplifiers

For stable performance, it is recommended that Yuken's applicable power amplifiers be used (for details see page H-173, H-177 and H-183).

| Valve Model Numbers | Power Amplifier Model Numbers | |
|---|---|---|
| | For Flow Control | For Pres. Control |
| EFBG-03-125(-E)-61<br>EFBG-06-250(-E)-61<br>EFBG-10-500(-E)-51 | AME-D-10-＊-20<br>AMN-D-10 (For DC Power Supply) | — |
| EFBG-03-125C/H(-E)-61<br>EFBG-06-250C/H(-E)-61<br>EFBG-10-500C/H-(E)-51 | AME-D2-1010-11 | |

## Sub-Plate

| Valve Model Numbers | Sub-Plate Model Numbers | Thread Size Rc | Approx. Mass kg |
|---|---|---|---|
| EFBG-03 | EFBGM-03Y-20 | 3/4 | 6 |
| | EFBGM-03Z-20 | 1 | |
| EFBG-06 | EFBGM-06X-20 | 1 | 12.5 |
| | EFBGM-06Y-20 | 1-1/4 | 16 |
| EFBG-10 | EFBGM-10Y-20★ | 1-1/2, 2 Flange Mounting | 37 |

● Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish. (▽)

★When ordering the EFBGM-10Y, also order a F3 series pipe flange kit. For details on the kit, consult us.

## Instructions

### Drain Back Pressure

Check that the drain back pressure dose not exceed 0.2 MPa.

### When Relief Valve Passing Flow Rate is Low in Pressure Control State

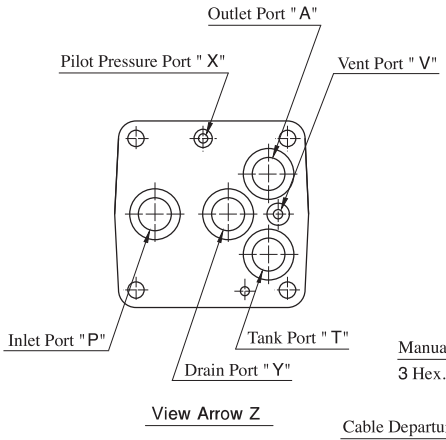
To avoid preselected pressure instability, use a passing flow rate of 15 L/min or higher.
Further, check that the tank-line back pressure dose not exceed 0.5 MPa.

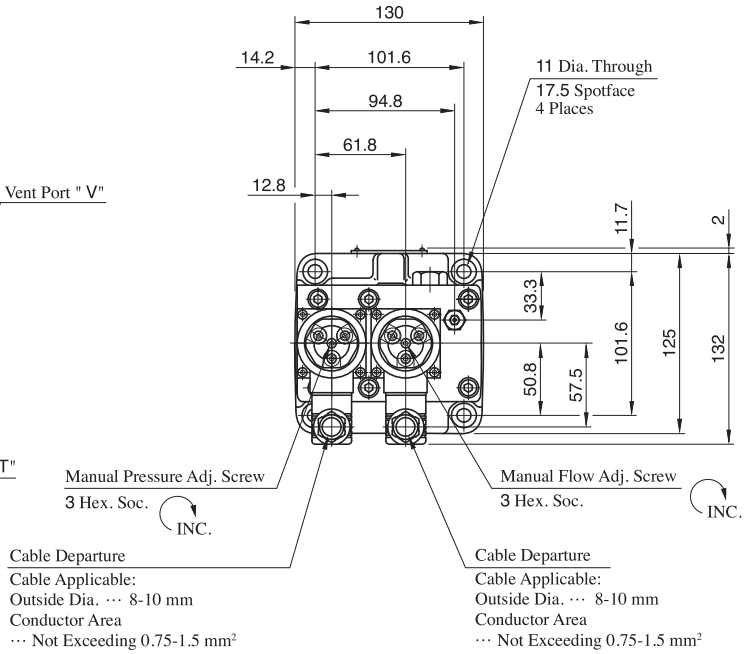
### Safety Valve Pressure Setting

The pressure of the safety valve is preset at the value equal to the upper limit of the pressure adjustment range plus 2 MPa. Please adjust the pressure of the valve so preset to meet the pressure to be used actually.
To lower the pressure setting, turn the safety valve pressure adjustment screw anti-clockwise. After adjustment, be sure to tighten the lock nut.

## Models with Proportional Pilot Relief Valve

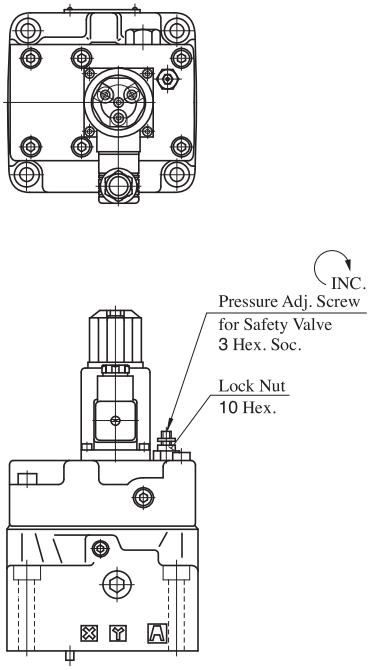
**EFBG-03-125 - $\frac{C}{H}$(-E)-61**



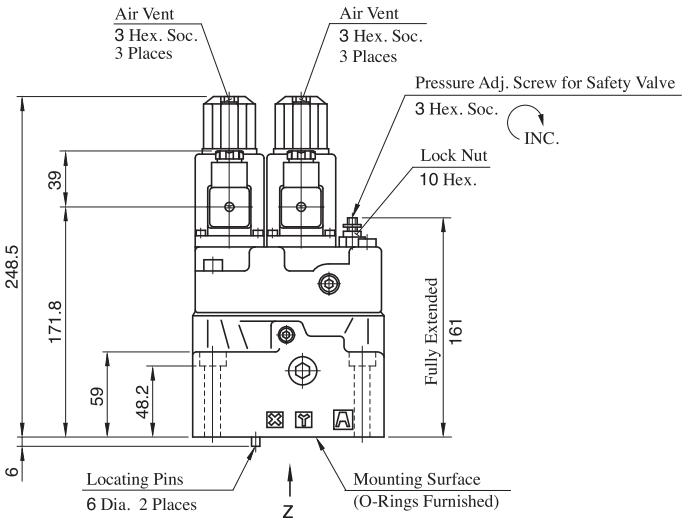

## Models without Proportional Pilot Relief Valve

**EFBG-03-125(-E)-61**




● For other dimensions, please refer to the models with Proportional Pilot Relief Valve.

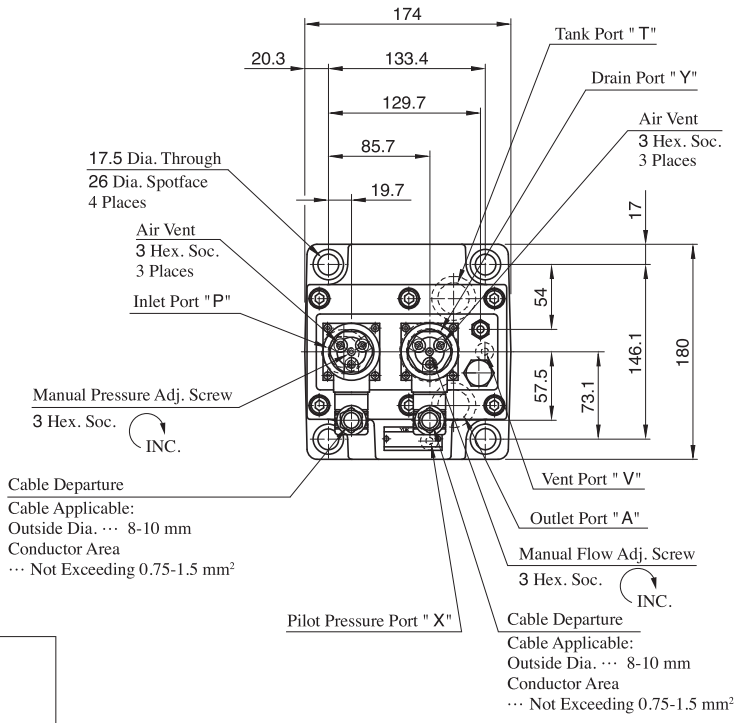
Approx. Mass ..... 13.3 kg




Approx. Mass ..... 14 kg

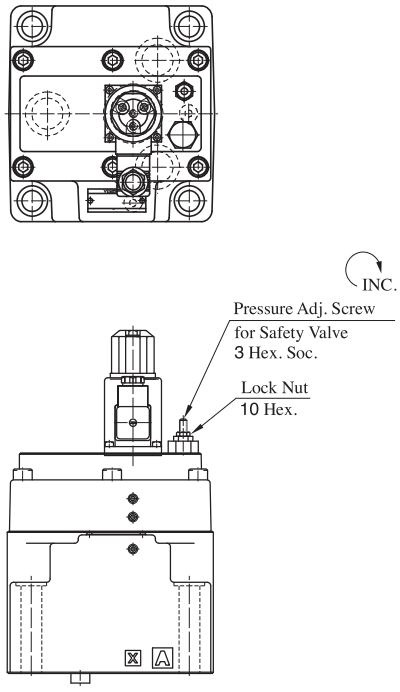
## Models with Proportional Pilot Relief Valve

### EFBG-06-250 - $\frac{C}{H}$(-E)-61



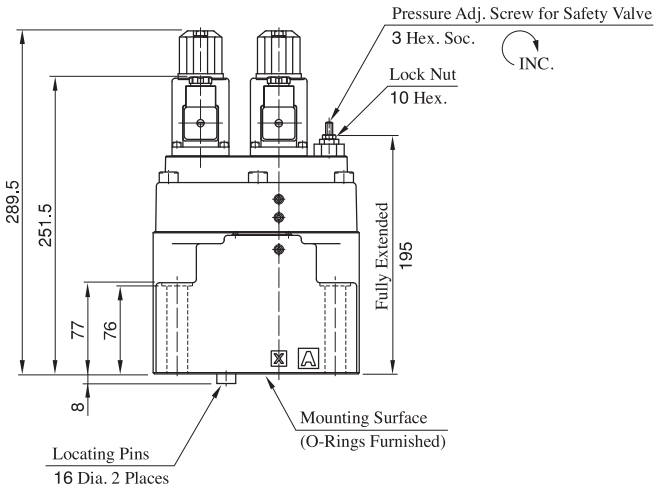

## Models without Proportional Pilot Relief Valve

### EFBG-06-250(-E)-61




● For other dimensions, please refer to the models with Proportional Pilot Relief Valve.

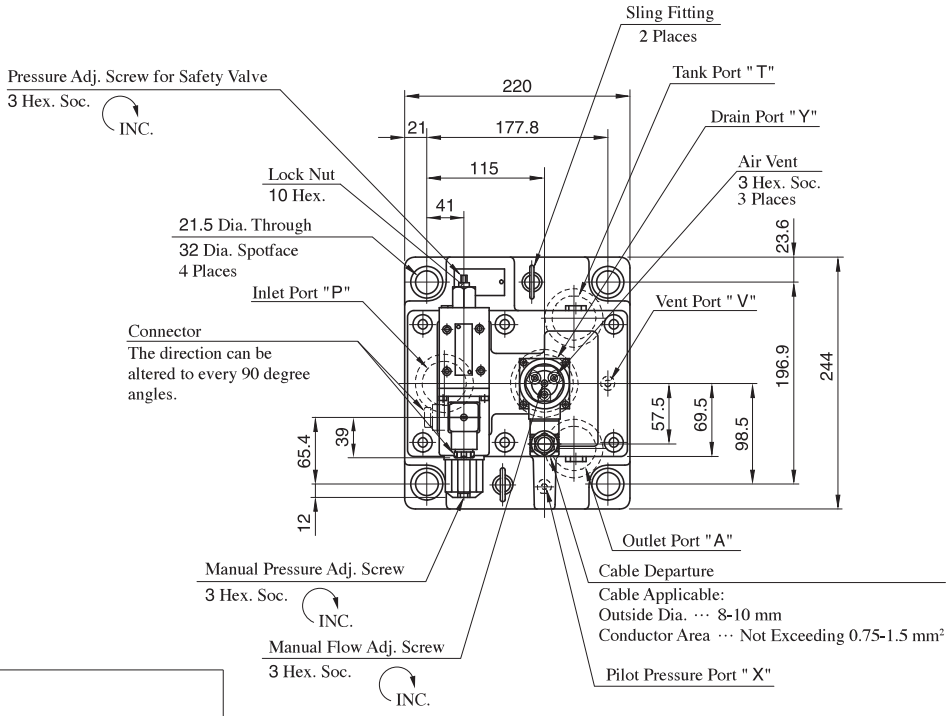
Approx. Mass ..... 21.3 kg




Approx. Mass ..... 22 kg

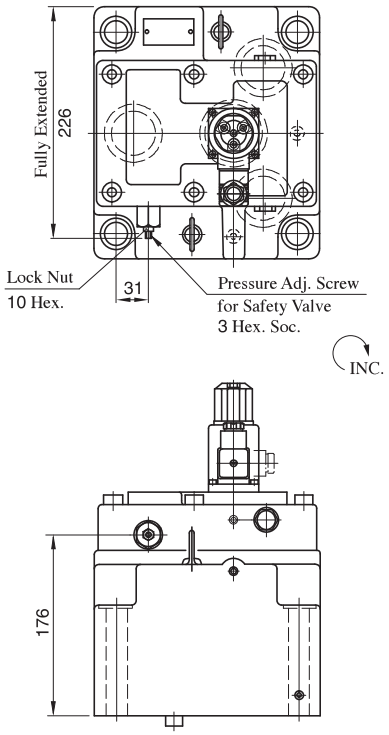
## Models with Proportional Pilot Relief Valve

### EFBG-10-500 - $^{C}_{H}$(-E)-51



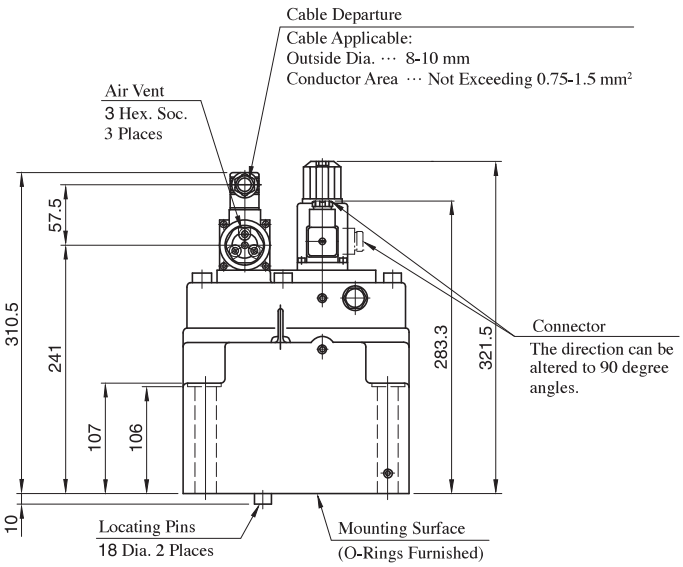

## Models without Proportional Pilot Relief Valve

### EFBG-10-500(-E)-51




● For other dimensions, please refer to the models with Proportional Pilot Relief Valve.

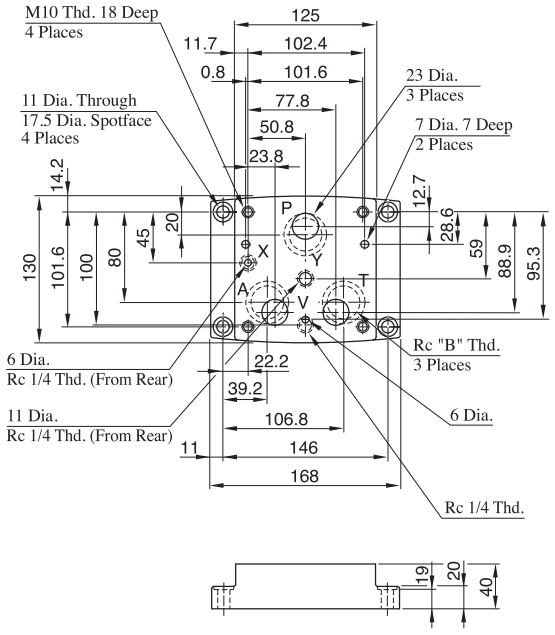
Approx. Mass ..... 60 kg




Approx. Mass ..... 62 kg

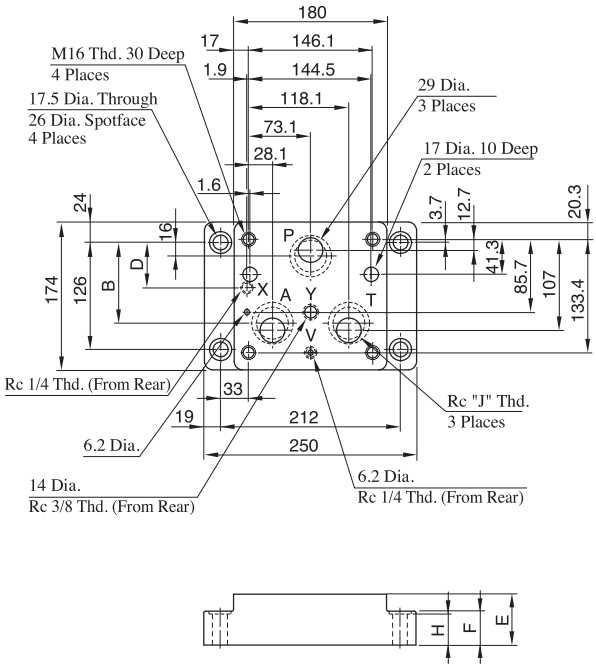
## Sub Plates

### EFBGM-$^{03Y}_{03Z}$-20



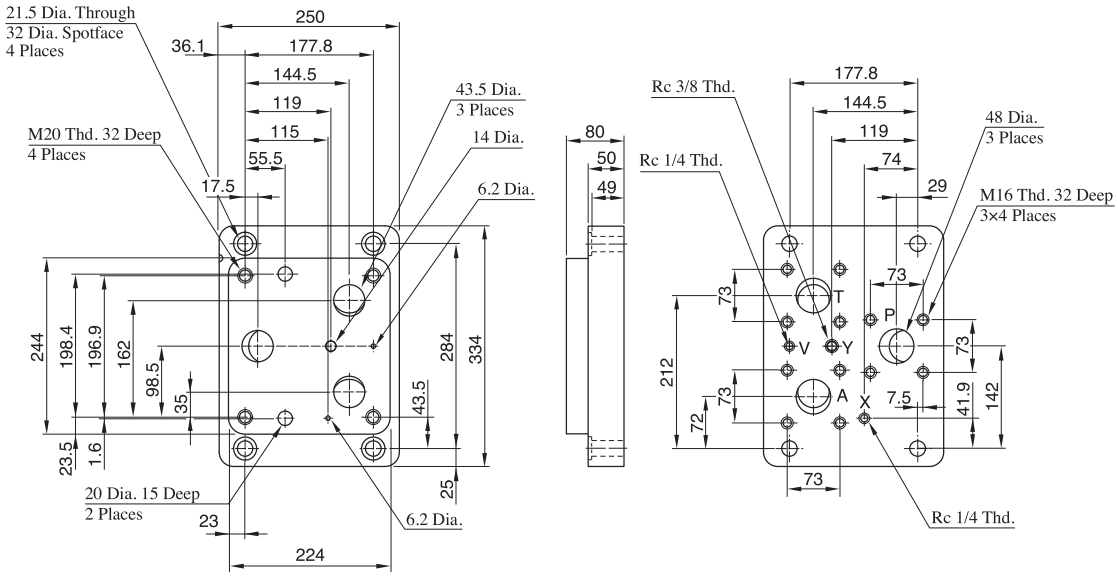

| Sub-Plate Model Numbers | B |
|---|---|
| EFBGM-03Y-20 | 3/4 |
| EFBGM-03Z-20 | 1 |

### EFBGM-$^{06X}_{06Y}$-20




| Sub-Plate Model Numbers | B | D | E | F | H | J |
|---|---|---|---|---|---|---|
| EFBGM-06X-20 | 103.3 | 63.3 | 45 | 35 | 34 | 1 |
| EFBGM-06Y-20 | 95 | 53.3 | 60 | 40 | 39 | 1 1/4 |

### EFBGM-10Y-20



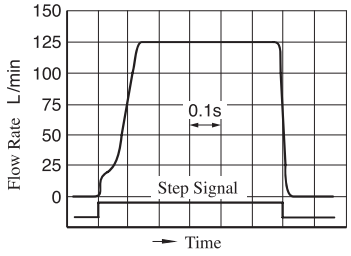
## Step Response

These characteristics have been obtained by measuring on each valve.
Therefore, they may vary according to a hydraulic circuit to be used.

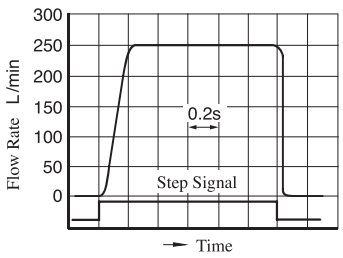
Viscosity: 30 mm²/s

### Flow Controls

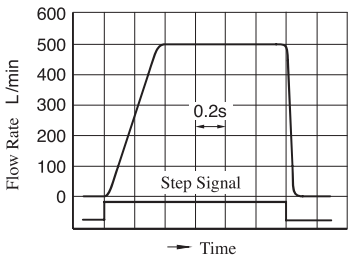
EFBG-03




EFBG-06

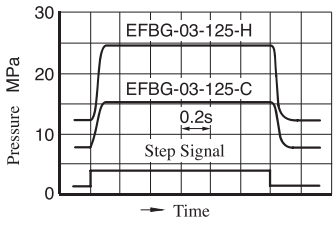



EFBG-10



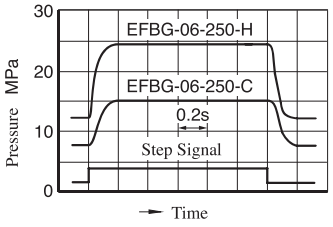

### Pressure Controls

EFBG-03



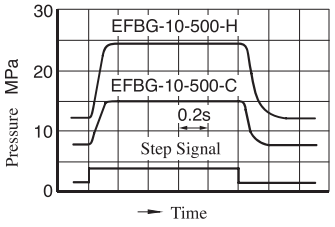

Flow Rate : 125 L/min
Trapped Oil Volume : < 1 L

EFBG-06




Flow Rate : 250 L/min
Trapped Oil Volume : < 1 L

EFBG-10

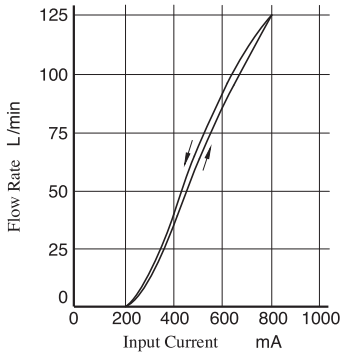



Flow Rate : 500 L/min
Trapped Oil Volume : < 1 L

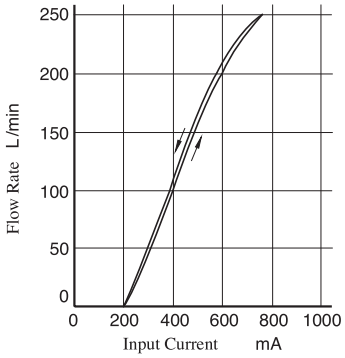
## Input Current vs. Flow

Viscosity: 30 mm²/s

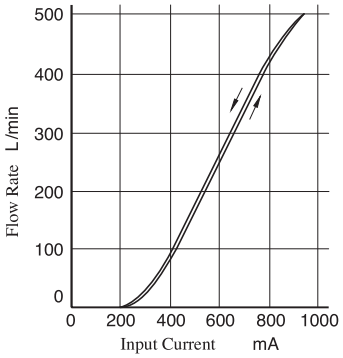
EFBG-03




EFBG-06



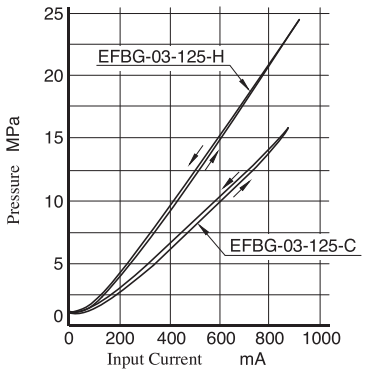

EFBG-10



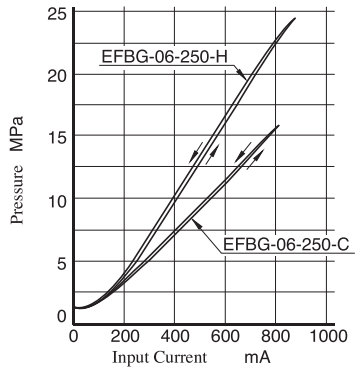

## Input Current vs. Pressure

Viscosity: 30 mm²/s

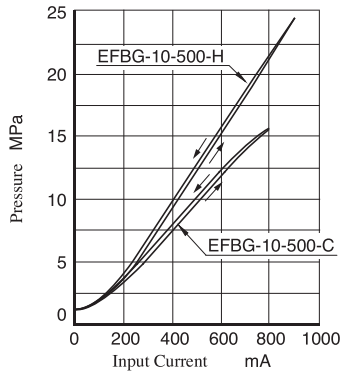
EFBG-03




EFBG-06

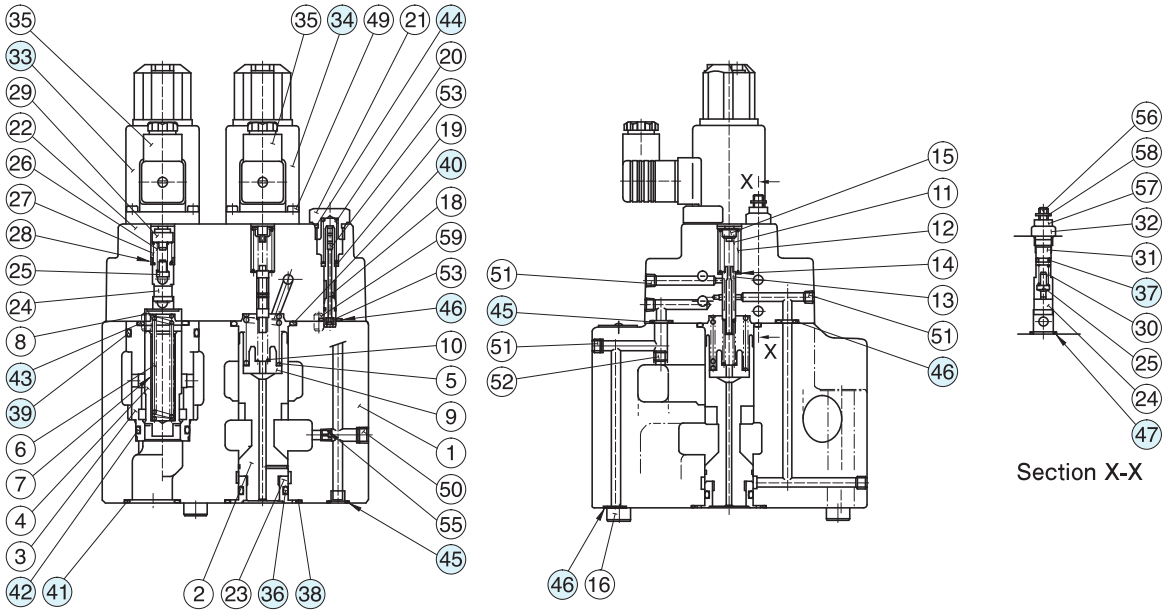



EFBG-10



## List of Seals and Solenoid Ass'y

**EFBG-03-125-∗-∗-61**
**EFBG-06-250-∗-∗-61**




### List of Seals and Solenoid Ass'y

| Item | Name of Parts | EFBG-03 | | EFBG-06 | |
|---|---|---|---|---|---|
| | | Part Numbers | Qty. | Part Numbers | Qty. |
| 36 | O-Ring | AS568-016(NB-70-1) | 1 | OR NBR-70-1 P26-N | 1 |
| 37 | O-Ring | OR NBR-70-1 P6-N | 1 | OR NBR-70-1 P6-N | 1 |
| 38 | O-Ring | OR NBR-90 P28-N | 1 | OR NBR-90 P44-N | 1 |
| 39 | O-Ring | OR NBR-90 P32-N | 1 | OR NBR-90 P42-N | 1 |
| 40 | O-Ring | OR NBR-90 P28-N | 1 | OR NBR-90 P36-N | 1 |
| 41 | O-Ring | OR NBR-90 P28-N | 3 | OR NBR-90 P32-N | 3 |
| 42 | O-Ring | OR NBR-90 G30-N | 1 | OR NBR-90 P30-N | 1 |
| 43 | O-Ring | OR NBR-90 P28-N | 1 | OR NBR-90 P28-N | 1 |
| 44 | O-Ring | OR NBR-90 P15-N | 1 | OR NBR-90 P15-N | 1 |
| 45 | O-Ring | OR NBR-90 P11-N | 2 | OR NBR-90 P11-N | 2 |
| 46 | O-Ring | OR NBR-90 P9-N | 5 | OR NBR-90 P11-N | 4 |
| 47 | O-Ring | AS568-016(NB-70-1) | 1 | AS568-016(NB-90) | 1 |

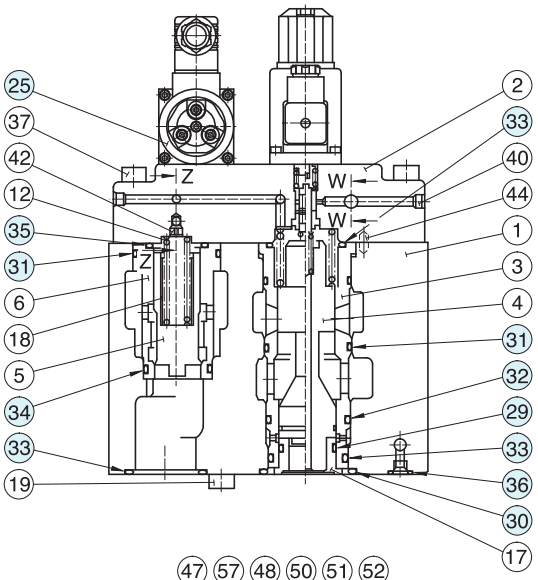
### Solenoid Ass'y

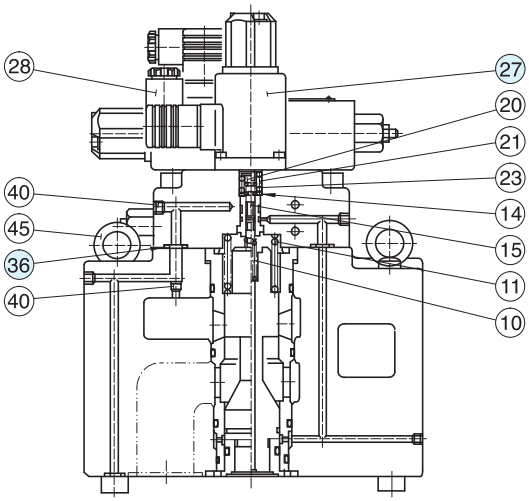
| Valve Model Numbers | ㉝ Solenoid Ass'y Model Numbers | ㉞ Solenoid Ass'y Model Numbers |
|---|---|---|
| EFBG-$^{03}_{06}$-$^{125}_{250}$-C(E)-61 | E318-Y06M1-04-61 | E318-Y06M1-28-61 |
| EFBG-$^{03}_{06}$-$^{125}_{250}$-E(E)-61 | | |
| EFBG-$^{03}_{06}$-$^{125}_{250}$-(E)-61 | — | |

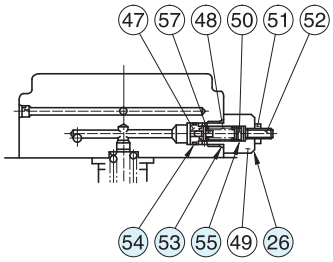
Note) The connector assembly GDM-211-B-11 (Item 35) is not included in the solenoid assembly.

## List of Seals, Pilot Valves, Solenoid Ass'y and Safety Valve

### EFBG-10-500-∗-∗-51

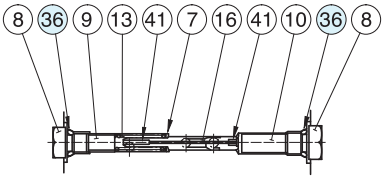



Section W-W

(Only for Models without Pilot Relief Valve)




Section Z-Z

### List of Seals

| Item | Name of Parts | Part Numbers | Qty. | |
|---|---|---|---|---|
| | | | Models with Pilot Relief Valve | Models without Pilot Relief Valve |
| 29 | O-Ring | OR NBR-70-1 P34-N | 1 | 1 |
| 30 | O-Ring | OR NBR-90 G60-N | 1 | 1 |
| 31 | O-Ring | OR NBR-90 G55-N | 3 | 3 |
| 32 | O-Ring | OR NBR-90 P50-N | 1 | 1 |
| 33 | O-Ring | OR NBR-90 P48-N | 5 | 5 |
| 34 | O-Ring | OR NBR-90 P42-N | 1 | 1 |
| 35 | O-Ring | OR NBR-90 P36-N | 1 | 1 |
| 36 | O-Ring | OR NBR-90 P11-N | 8 | 8 |
| 53 | O-Ring | OR NBR-90 P14-N | — | 1 |
| 54 | O-Ring | AS568-013(NBR-90) | — | 1 |
| 55 | O-Ring | OR NBR-70-1 P6-N | — | 1 |

### Pilot Valve, Solenoid Ass'y and Safety Valve

| Valve Model Numbers | ㉕ Pilot Valve Model Numbers | ㉗ Solenoid Ass'y Model No. | ㉖ Safety Valve Model No. |
|---|---|---|---|
| EFBG-10-500-C(-E)-51 | EDG-01V-C-1-PNT12-5103 | E318-Y06M1-28-61 | — |
| EFBG-10-500-H(-E)-51 | EDG-01V-H-1-PNT12-5103 | | — |
| EFBG-10-500(-E)-51 | — | | SB1094-2002 |

Note) The connector assembly GDM-211-B-11 (Item 28) is not included in the solenoid assembly.

## Interchangeability between Current and New Design

Model changes have been made from 50, 51 to 61 design in the EFBG-03/06 because of changes in the pilot valve building-in method and model changes have been made from 50 to 51 design in the EFBG-10 because of improvement in solenoid ass'y.

### Specification and Characteristics

The input current and pressure–flow characteristics differ between the new and old models. Ask Yuken for details.
No changes in specifications and characteristics between current and new design.

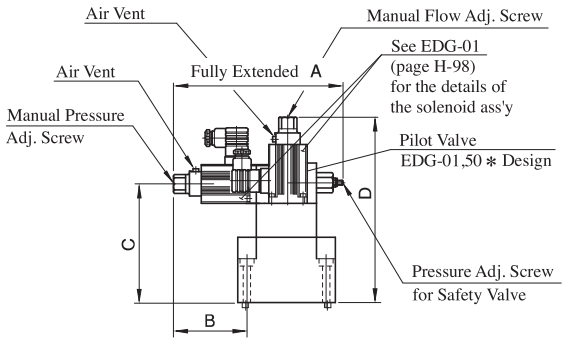
### Safety Valve Pressure Setting

・EFBG-03/06

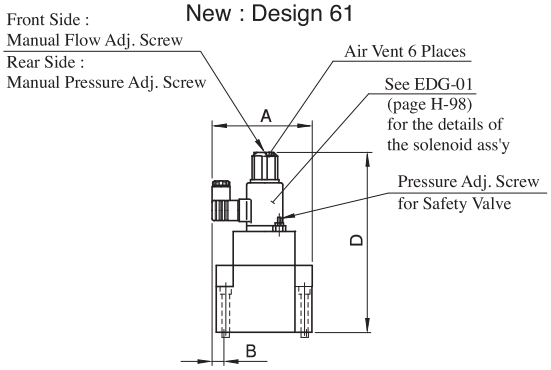
50・51 Design → 61 Design

The mounting surface are interchangeable. However, the method of building in the pilot valve has been changed, bringing about changes in the appearance shapes and dimensions as shown below.

Current : Design 50・51




New : Design 61




| Valve Model Numbers | | A | B | C | D |
|---|---|---|---|---|---|
| (Current) | EFBG-03-125-∗-∗-$^{50}_{51}$ | 217 | 93.2 | 155 | 2236.5 |
| (New) | EFBG-03-125-∗-∗-61 | 132 | 18.7 | — | 248.5 |
| (Current) | EFBG-06-250-∗-∗-$^{50}_{51}$ | 217 | 53.3 | 196 | 277.5 |
| (New) | EFBG-06-125-∗-∗-61 | 180 | 16.9 | — | 289.5 |

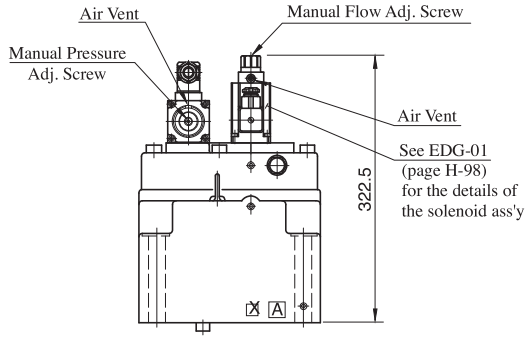
60 Design → 61 Design

The mounting surface are interchangeable. There are no changes in the appearance shapes and dimensions.

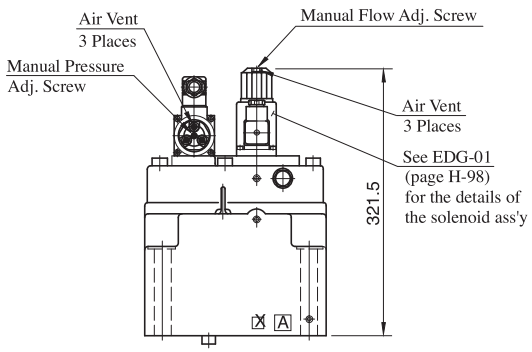
・EFBG-10

Mounting compatibility is provided.
Note that because of improvements made on the solenoids, the overall shapes have been changed as shown below.

Current : Design 50

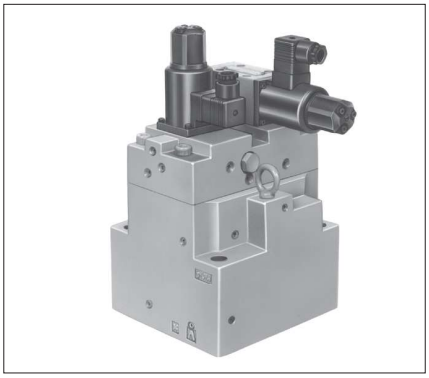


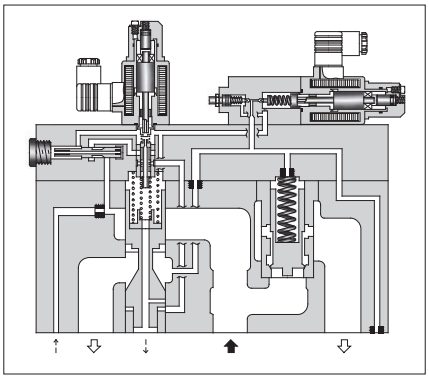

New : Design 51



# High Flow Series Proportional Electro-Hydraulic Flow Control and Relief Valves

This flow control and relief valve is an energy-saving valve that supplies the minimum pressure and flow necessary for actuator drive.
For the High Flow Series, double maximum flow rate [03 size: 125→250 L/min, 06 size: 250→500 L/min, 10 size: 500→1000 L/min] enables a smaller valve size than conventional products; compact-sized devices can be provided.





## Specifications

| Descriptions \ Model No. | | | EFBG-03 -250-＊-＊-51 | EFBG-06 -500-＊-＊-51 | EFBG-10 -1000-＊-＊-51 |
|---|---|---|---|---|---|
| Max. Operating Pressure | | MPa | 24.5 | 24.5 | 24.5 |
| Max. Flow | | L/min | 250 | 500 | 1000 |
| Metered Flow Adjustment Range | | L/min | 2.5-250 | 5-500 | 10-1000 |
| Min. Pilot Pressure | | MPa | 1.5 | 1.5 | 1.5 |
| Pilot Flow L/min | | at Normal | 1 | 1 | 4.5 |
| | | at Transition | 4 | 6 | 10.0 |
| Flow Controls | Rated Current | mA | 830 | 780 | 830 |
| | Coil Resistance | Ω | 10 | 10 | 10 |
| | Differential Pressure | MPa | 0.8 | 0.9 | 1.2 |
| | Hysteresis | | 3% or less | 3% or less | 3% or less |
| | Repeatability | | 1% or less | 1% or less | 1% or less |
| Pressure Controls ★1 | Pres. Adj. Range | MPa ★2 | C: 1.6-15.7 H: 1.8-24.5 | C: 1.5-15.7 H: 1.5-24.5 | C: 1.1-15.7 H: 1.1-24.5 |
| | Rated Current | mA | C: 850 H: 870 | C: 800 H: 900 | C: 900 H: 950 |
| | Coil Resistance | Ω | 10 | 10 | 10 |
| | Hysteresis | | 3% or less | 3% or less | 3% or less |
| | Repeatability | | 1% or less | 1% or less | 1% or less |
| Approx. Mass | | kg | Refer to pages H-147 to H-149 | | |

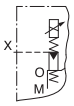
★1. The specifications for pressure controls are applied to models with proportional pilot relief valve. (Ex. EFBG-03-250-C-＊-51)

★2. The maximum pressure adjustment range of the valves without proportional pilot relief valves is 24.5 MPa.

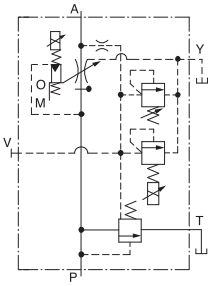
### Graphic Symbols

With Proportional Pilot Relief Valve

External Pilot

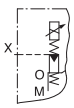



Internal Pilot

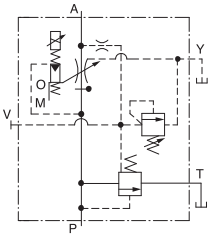



Without Proportional Pilot Relief Valve

External Pilot




Internal Pilot



## Model Number Designation

| EFB | G | -03 | -250 | -C | -E | -51 |
|---|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Max. Metered Flow L/min | Proportional Pilot Relief Valve Pressure Adj. Range | Pilot Connection | Design Number |
| **EFB:** Proportional Electro-Hydraulic Flow Control and Relief Valve | **G:** Sub-Plate Mounting | **03** | **250** | **C, H:** See Specifications | **None:** Internal Pilot | **51** |
| | | **06** | **500** | **None:** Without Proportional Pilot Relief Valve | **E:** External Pilot | **51** |
| | | **10** | **1000** | | | **51** |

## Accessories

### Mounting Bolts

| Valve Model Numbers | Socket Head Cap Screw | Qty. |
|---|---|---|
| EFBG-03 | M12 × 120 L | 4 |
| EFBG-06 | M16 × 120 L | 4 |
| EFBG-10 | M20 × 150 L | 4 |

## Applicable Power Amplifiers

For stable performance, it is recommended that Yuken's applicable power amplifiers be used (for details see pages H-173, H-177 and H-183).

| Valve Model Numbers | Power Amplifier Model Numbers | |
|---|---|---|
| | For Flow Control | For Pres. Control |
| EFBG-03- 250(-E)-51<br>EFBG-06- 500(-E)-51<br>EFBG-10-1000(-E)-51 | AME-D-10-＊-20<br>AMN-D-10 (For DC Power Supply) | — |
| EFBG-06- 03 125 / 500 / 10 1000 -C/H(-E)-51 | AME-D2-1010-11 | |

## Instructions

### Drain Back Pressure

Check that the drain back pressure dose not exceed 0.2 MPa.

### When Relief Valve Passing Flow Rate is Low in Pressure Control State

To avoid preselected pressure instability, use a passing flow rate of 15 L/min or higher.
Further, check that the tank-line back pressure dose not exceed 0.5 MPa.

### Safety Valve Pressure Setting

The pressure of the safety valve is preset at the value equal to the upper limit of the pressure adjustment range plus 2 MPa. Please adjust the pressure of the valve so preset to meet the pressure to be used actually.
To lower the pressure setting, turn the safety valve pressure adjustment screw anti-clockwise. After adjustment, be sure to tighten the lock nut.

### Interchangeability in Installation with Conventional Valves (10Ω-10Ω Series)

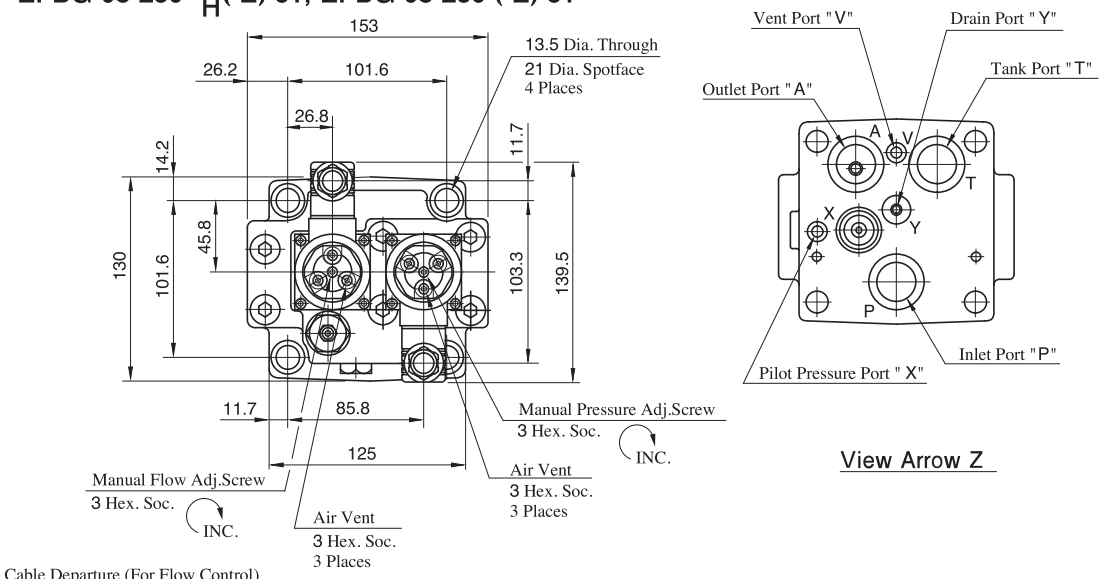
- EFBG-03

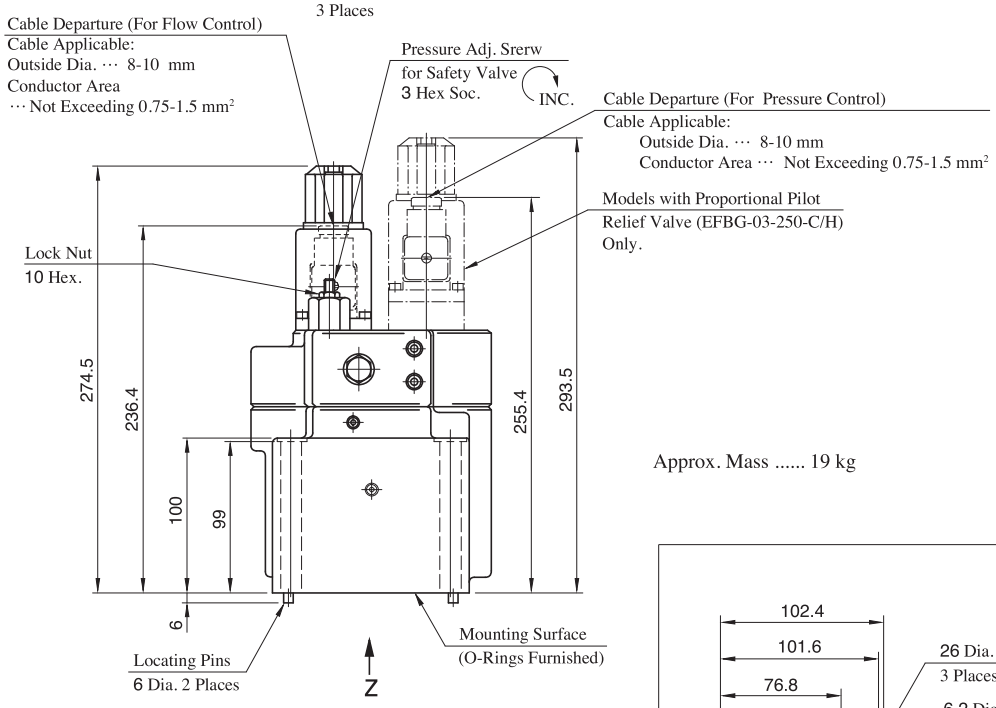
  There is no interchangeability in installation.

- EFBG-06/10

  A product in the high-flow series can be mounted on the conventional mounting surface but no conventional product can be mounted on the mounting surface of the high-flow series.

## EFBG-03-250-$\frac{C}{H}$(-E)-51, EFBG-03-250 (-E)-51

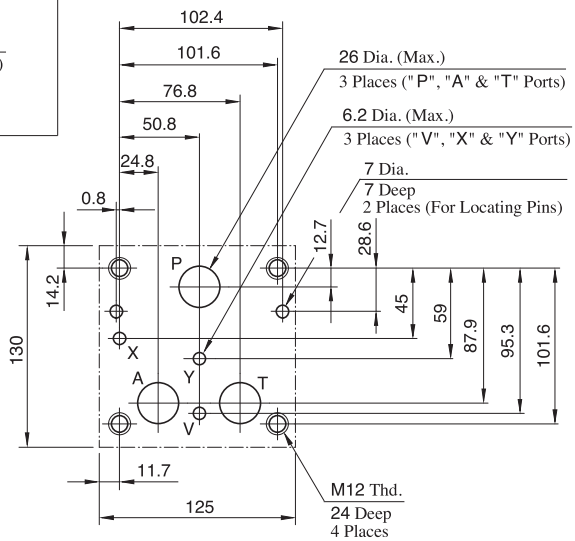



Approx. Mass ..... 19 kg

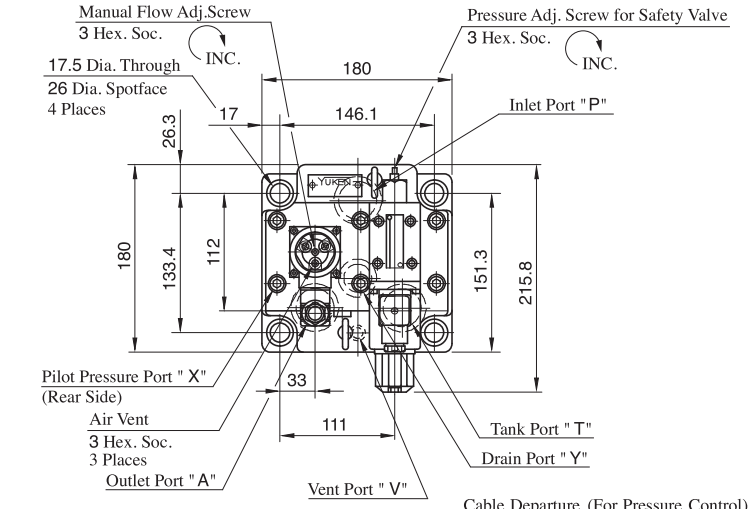
### Dimensions of Valve Mounting Surface

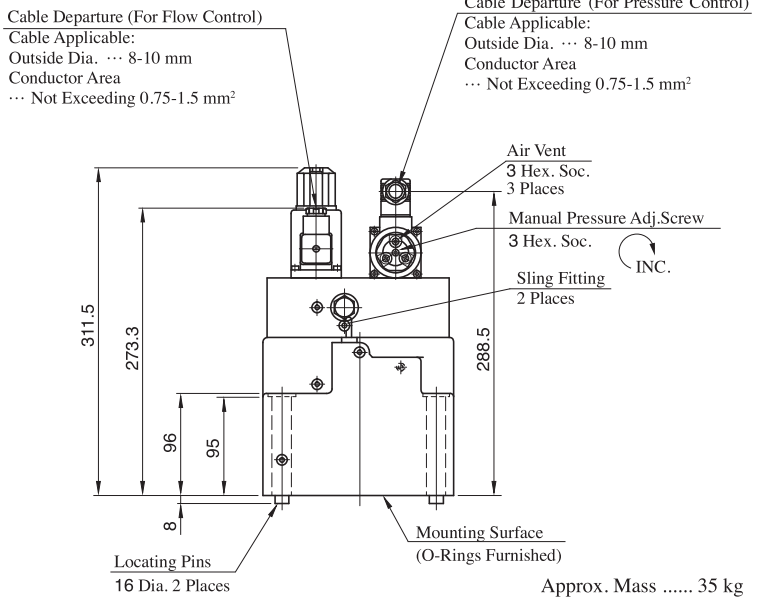
Prepare a mounting surface as shown to the right.
Also finish it finely. (1.6)



## Models with Proportional Pilot Relief Valve

### EFBG-06-500 -$\frac{C}{H}$(-E)-51

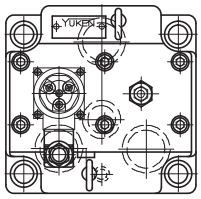


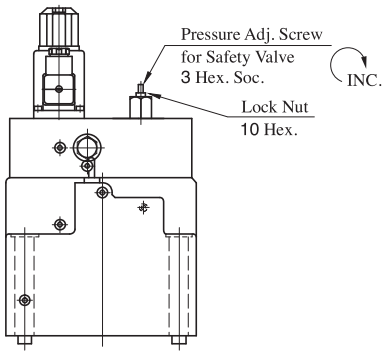




Approx. Mass ..... 35 kg

## Models without Proportional Pilot Relief Valve

### EFBG-06-500(-E)-51



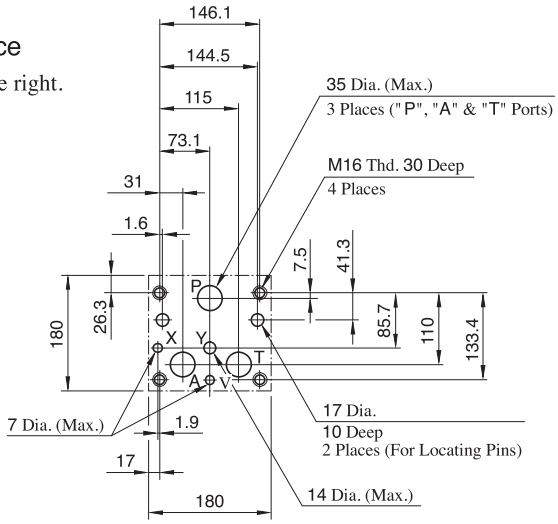



● For other dimensions, please refer to the models with Proportional Pilot Relief Valve.

Approx. Mass ..... 33 kg

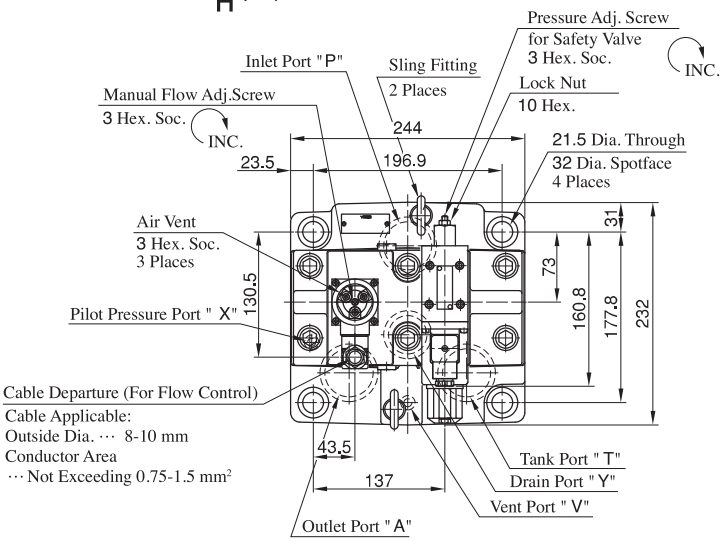
## Dimensions of Valve Mounting Surface

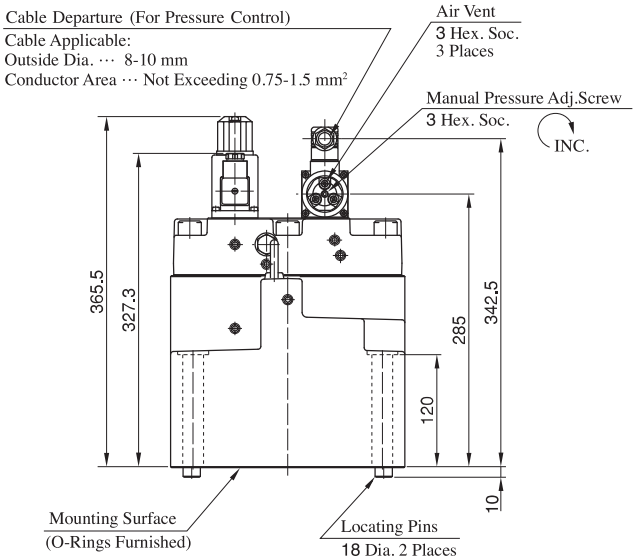
Prepare a mounting surface as shown to the right.
Also finish it finely. (1.6)



## Models with Proportional Pilot Relief Valve

**EFBG-10-1000-$\frac{C}{H}$(-E)-51**

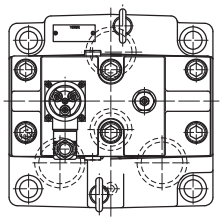


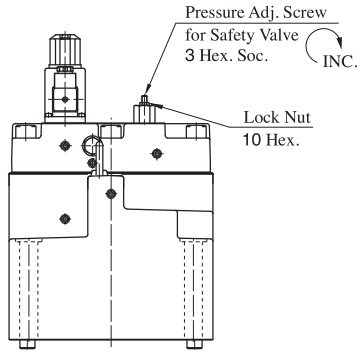




Approx. Mass ..... 76 kg

## Models without Proportional Pilot Relief Valve

**EFBG-10-1000(-E)-51**



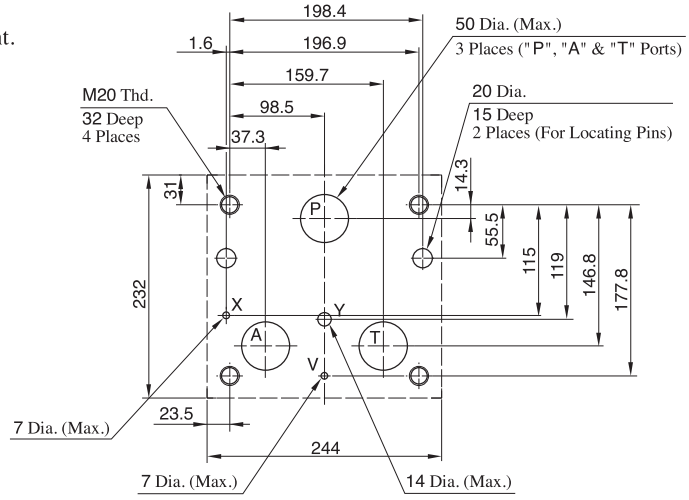



● For other dimensions, please refer to the models with Proportional Pilot Relief Valve.

Approx. Mass ..... 74 kg

## Dimensions of Valve Mounting Surface

Prepare a mounting surface as shown to the right.
Also finish it finely. (1.6▽)



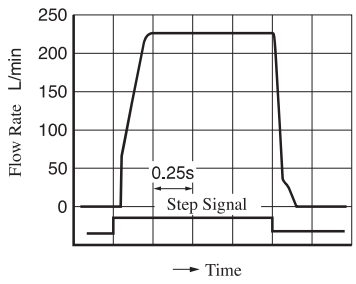
## Step Response

Viscosity: 30mm²/s

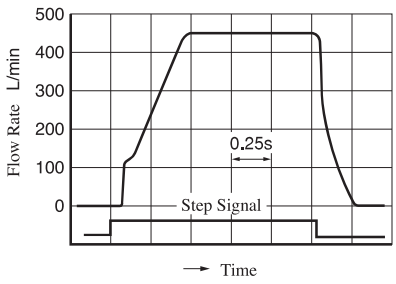
These characteristics have been obtained by measuring on each valve.
Therefore , they may vary according to a hydraulic circuit to be used.

### Flow Controls

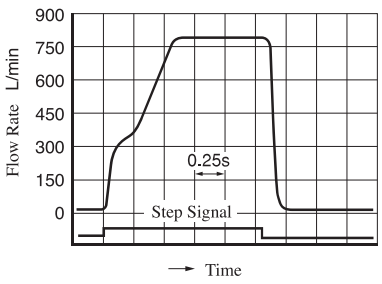
EFBG-03-250




EFBG-06-500

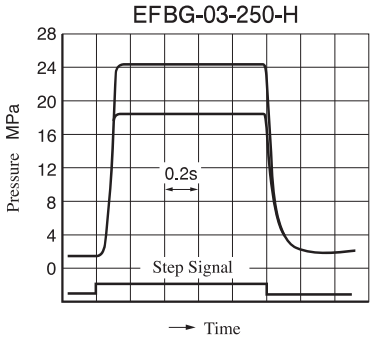



EFBG-10-1000

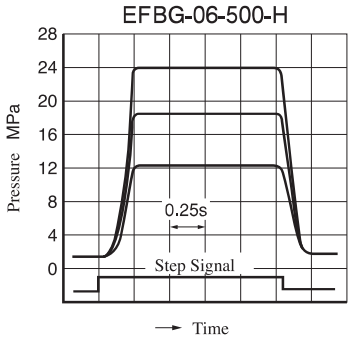



### Pressure Controls

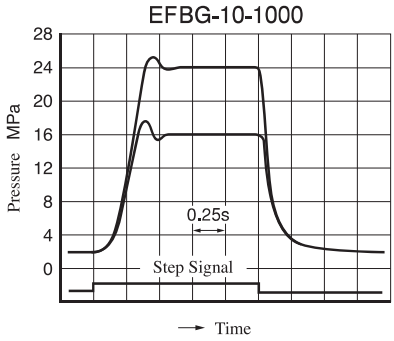
EFBG-03-250-H




EFBG-06-500-H



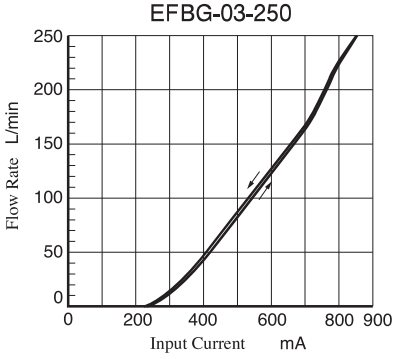

EFBG-10-1000



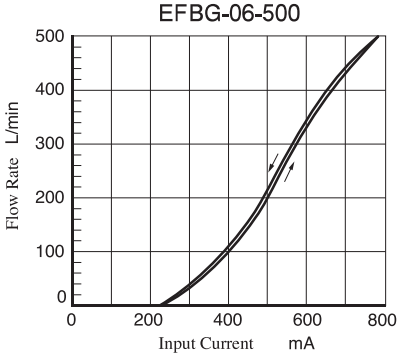

## Input Current vs. Flow

Viscosity: 30mm²/s

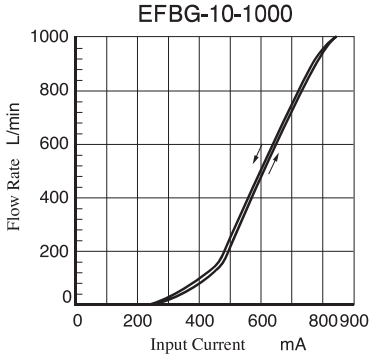
EFBG-03-250




EFBG-06-500



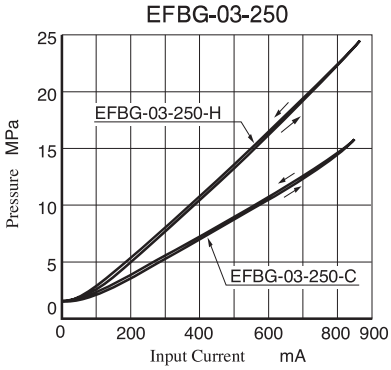

EFBG-10-1000



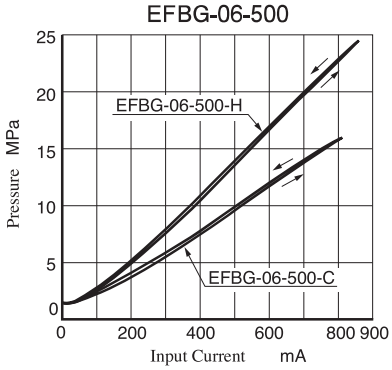

## Input Current vs. Pressure

Viscosity: 30mm²/s

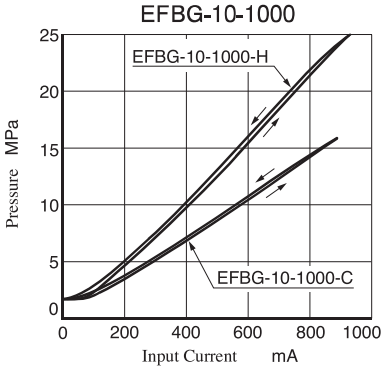
EFBG-03-250




EFBG-06-500

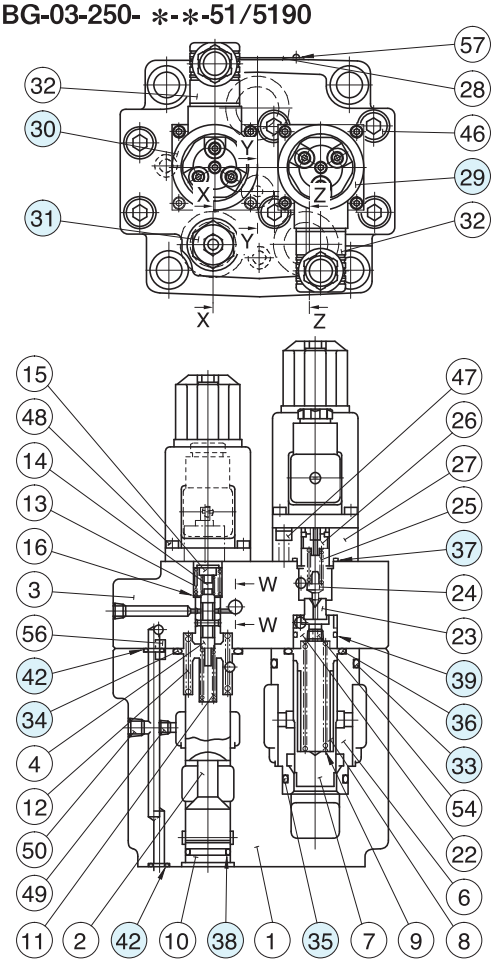


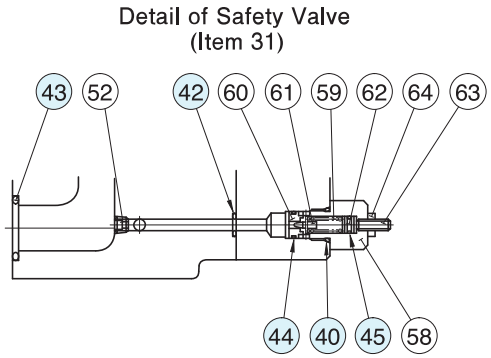

EFBG-10-1000



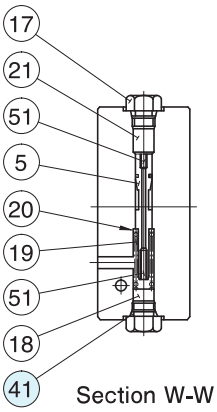
## List of Seals, Solenoid Ass'y and Safety Valve

### EFBG-03-250- ∗-∗-51/5190

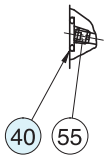


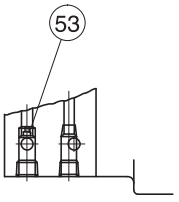

Section X-X




Section W-W




Section Y-Y




Section Z-Z

### List of Seals

| Item | Name of Parts | Part Numbers | Qty. |
|---|---|---|---|
| 33 | O-Ring | OR NBR-90 P42-N | 1 |
| 34 | O-Ring | OR NBR-90 P32-N | 1 |
| 35 | O-Ring | OR NBR-90 P30-N | 1 |
| 36 | O-Ring | OR NBR-90 P28-N | 1 |
| 37 | O-Ring | OR NBR-90 P22-N | 1★ |
| 38 | O-Ring | OR NBR-90 P21-N | 1 |
| 39 | O-Ring | OR NBR-90 P20-N | 1★ |
| 40 | O-Ring | OR NBR-90 P14-N | 2 |
| 41 | O-Ring | OR NBR-90 P11-N | 2 |
| 42 | O-Ring | OR NBR-90 P9-N | 6 |
| 43 | O-Ring | OR NBR-90 G30-N | 3 |
| 44 | O-Ring | AS568-013(NBR-90) | 1 |
| 45 | O-Ring | OR NBR-70-1 P6-N | 1 |

★O-rings, item 37 and 39, are used only with the proportional pilot relief valve (EFBG-03-250-C/H).

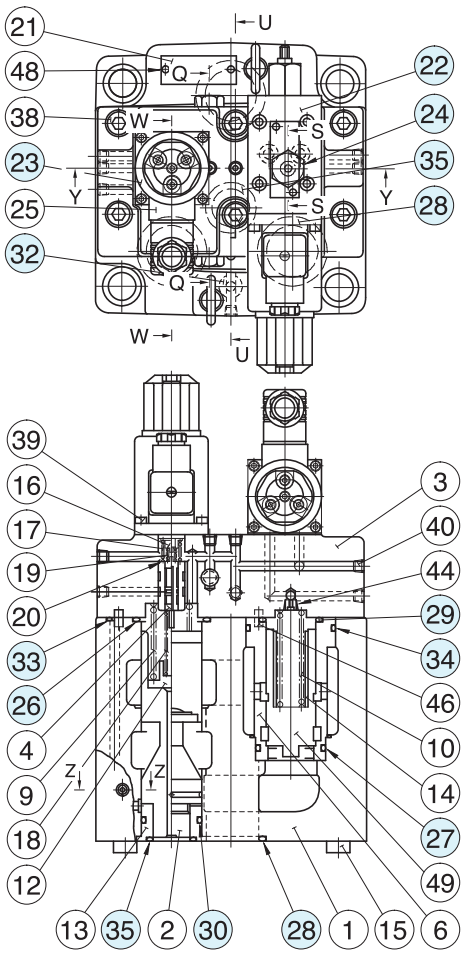
### Solenoid Ass'y and Safety Valve

| Valve Model Numbers | ㉙ Solenoid Ass'y Model No. | ㉚ Solenoid Ass'y Model No. | ㉛ Safety Valve Model No. |
|---|---|---|---|
| EFBG-03-250-C/H(-E)-51 | E318-Y06M1-04-61 | E318-Y06M1-28-61 | SB1094-2002 |
| EFBG-03-250(-E)-51 | — | | |

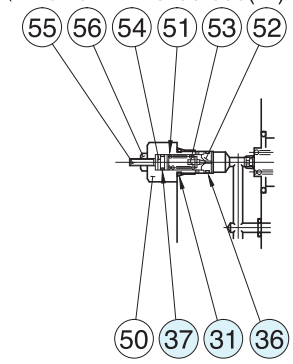
Note 1) For details on the solenoid ass'y, refer to proportional pilot relief valve (page H-97).
Note 2) The connector assembly GDM-211-B-11 (Item 32) is not included in the solenoid assembly.

## List of Seals, Pilot Valves, Solenoid Ass'y and Safety Valve

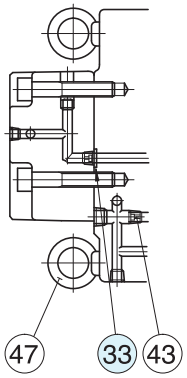
**EFBG-06-500- ∗-∗-51/5190**



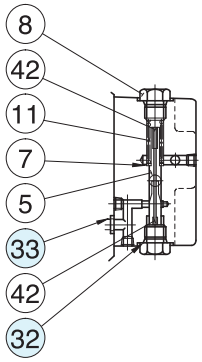

Detail of Safety Valve (Item 24)
( Models Without Pilot Relief Valve : EFBG-06-500(-E) )



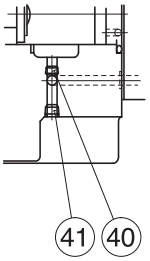

Section S-S



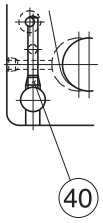

Section U-U




Section Q-Q




Section W-W




Section Z-Z

### List of Seals

| Item | Name of Parts | Part Numbers | Qty. |
|---|---|---|---|
| 26 | O-Ring | OR NBR-90 P46-N | 1 |
| 27 | O-Ring | OR NBR-90 P42-N | 1 |
| 28 | O-Ring | OR NBR-90 P40-N | 3 |
| 29 | O-Ring | OR NBR-90 P36-N | 1 |
| 30 | O-Ring | OR NBR-90 P34-N | 1 |
| 31 | O-Ring | OR NBR-90 P14-N | 1★ |
| 32 | O-Ring | OR NBR-90 P11-N | 4 |
| 33 | O-Ring | OR NBR-90 P9-N | 4 |
| 34 | O-Ring | OR NBR-90 G55-N | 1 |
| 35 | O-Ring | OR NBR-90 G30-N | 2 |
| 36 | O-Ring | AS568-013(NBR-90) | 1★ |
| 37 | O-Ring | OR NBR-70-1 P6-N | 1★ |

★O-rings, item 31, 36 and 37, are used only without the proportional pilot relief valve [(EFBG-06-500(-E)].

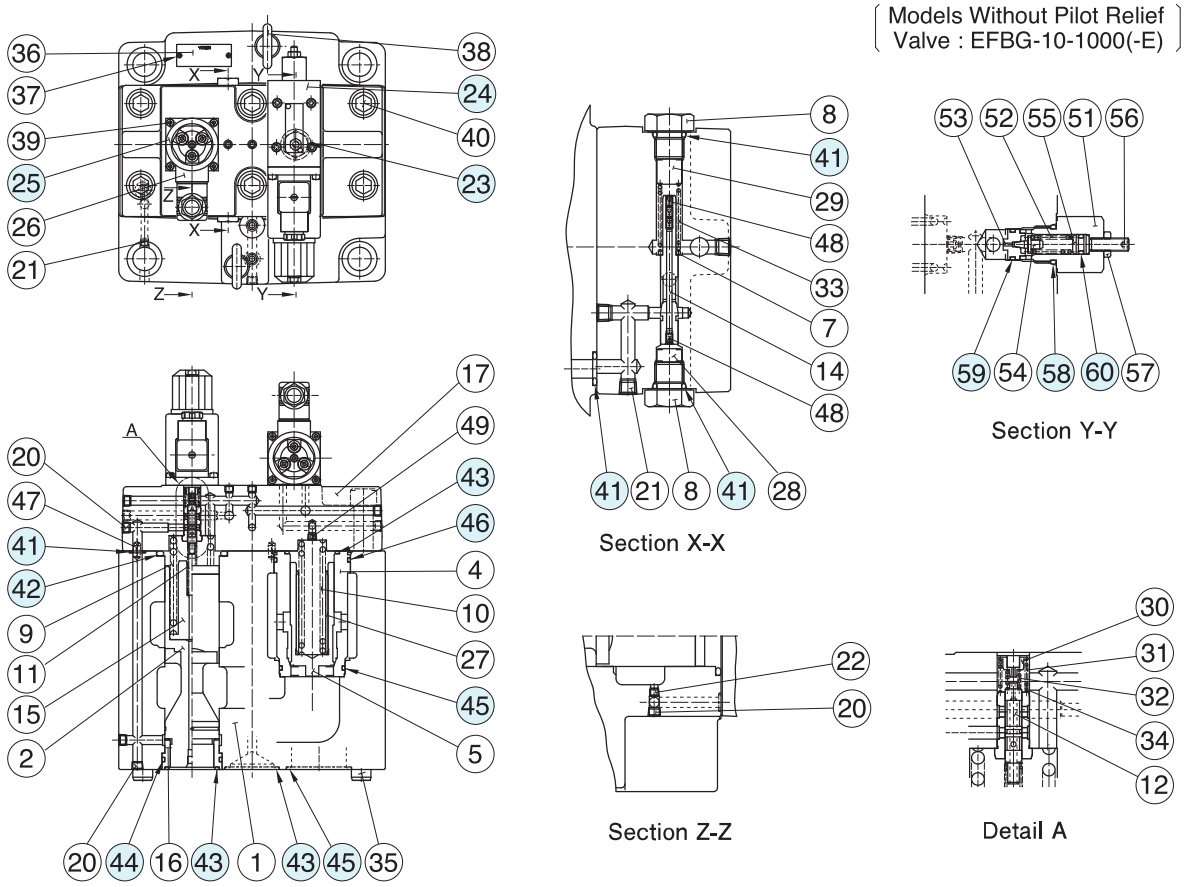
### Pilot Valve, Solenoid Ass'y and Sefety Valve

| Valve Model Numbers | ㉒ Pilot Valve Model Numbers | ㉓ Solenoid Ass'y Model No. | ㉔ Safety Valve Model No. |
|---|---|---|---|
| EFBG-06-500-C(-E)-51 | EDG-01V-C-1-PNT11-5103 | E318-Y06M1-28-61 | — |
| EFBG-06-500-H(-E)-51 | EDG-01V-H-1-PNT11-5103 | | — |
| EFBG-06-500(-E)-51 | — | | SB1094-2002 |

Note 1) For details on the pilot valves, refer to proportional pilot relief valve (page H-97).
Note 2) The connector assembly GDM-211-B-11 (Item 25) is not included in the solenoid assembly.

## List of Seals, Pilot Valves, Solenoid Ass'y and Safety Valve

### EFBG-10-1000-∗-∗-51




### List of Seals

| Item | Name of Parts | Part Numbers | Qty. |
|---|---|---|---|
| 41 | O-Ring | OR NBR-90 P11-N | 8 |
| 42 | O-Ring | OR NBR-90 P55-N | 1 |
| 43 | O-Ring | OR NBR-90 G45-N | 3 |
| 44 | O-Ring | OR NBR-90 G50-N | 1 |
| 45 | O-Ring | OR NBR-90 G55-N | 4 |
| 46 | O-Ring | OR NBR-90 G65-N | 1 |
| 58 | O-Ring | OR NBR-90 P14-N | 1★ |
| 59 | O-Ring | AS568-013(NBR-90) | 1★ |
| 60 | O-Ring | OR NBR-70-1 P6-N | 1★ |

★ O-rings, item 58, 59 and 60, are used only without the proportional pilot relief valve [EFBG-10-1000(-E)].

### Pilot Valve, Solenoid Ass'y and Safety Valve

| Valve Model Numbers | ㉔ Pilot Valve Model Numbers | ㉕ Solenoid Ass'y Model No. | ㉓ Safety Valve Model No. |
|---|---|---|---|
| EFBG-10-1000-C(-E)-51 | EDG-01V-C-1-PNT20-5197 | E318-Y06M1-28-61 | — |
| EFBG-10-1000-H(-E)-51 | EDG-01V-H-1-PNT20-5197 | | — |
| EFBG-10-1000(-E)-51 | — | | SB1094-2002 |

Note 1) For details on the pilot valves, refer to proportional pilot relief valve (page H-97).
Note 2) The connector assembly GDM-211-B-11 (Item 25) is not included in the solenoid assembly.

## Interchangeability between Current and New Design

EFBG-03/06/10 series valves have changed model from 50 to 51 design in line with the model change of solenoid ass'y.

### Specifications and Characteristics

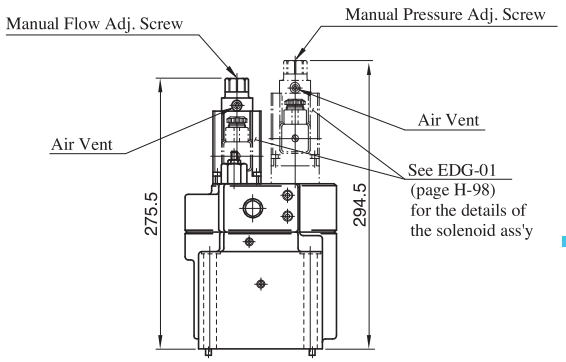
The input current and pressure–flow characteristics differ between the new and old models. Ask Yuken for details.
No changes in specifications and characteristics between current and new design.

### Mounting Interchangeability

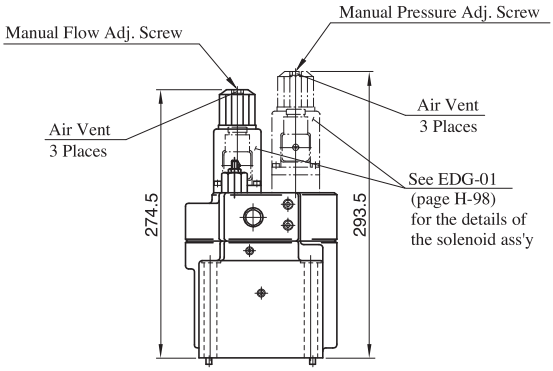
There is an interchangeability in the mounting dimensions between current and new design, however, note that because of improvements made on the solenoids, the overall shapes have been changed as shown below.

・EFBG-03

Current : Design 50

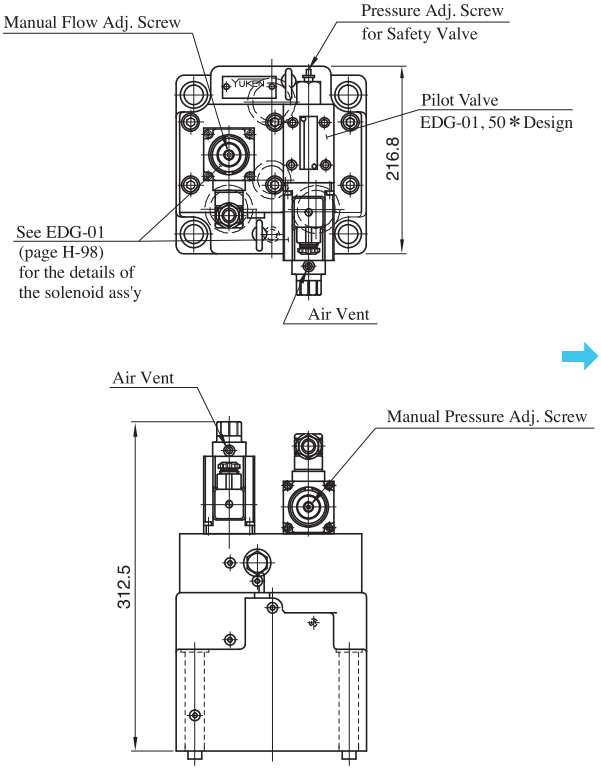



New : Design 51

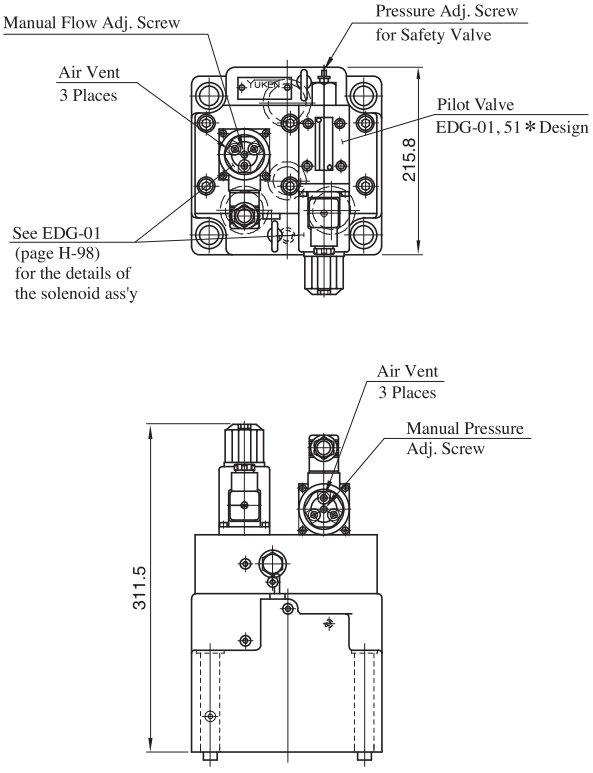



・EFBG-06/10

Current : Design 50

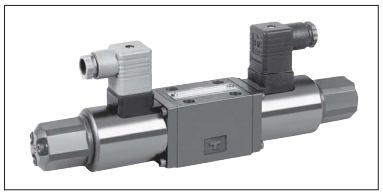


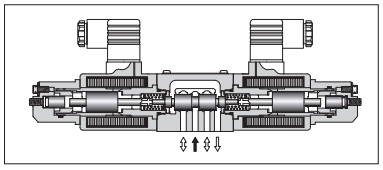

New : Design 51



# Shockless Type Proportional Electro-Hydraulic Directional and Flow Control Valves

These valves are well accepted by industrial users as shifting time adjustable type shockless valves. By employing the basic design concept of the "G series solenoid operated directional valves", we have been successful developing the shifting time adjustable shockless valves with high performance which makes the speed setting possible at any high speed operation.
In combination with the newly developed digital amplifiers, the further enhancement of maneuverability and repeatability of the valves can be realized.

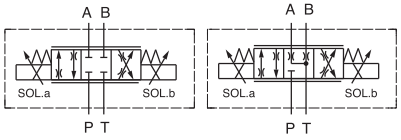




## Specifications

| Descriptions \ Model No. | | EDFG-01 |
|---|---|---|
| Max. Operating Pressure | MPa | 25 |
| Max. Flow | L/min | 30 |
| Max. Tank Line Back Pressure | MPa | 14 |
| Rated Current | mA | 1100 |
| Coil Resistance | Ω | 10.8 |
| Hysteresis | | 5% or less |
| Repeatability | | 1% or less |
| Step Response (Typical Rating) (0 ⇔ 100%) | | 100 ms or less |
| Frequency Response (50% ±25%) | Phase | 20 Hz (–90 degree) |
| | Gain | 25 Hz (–3 dB) |
| Approx. Mass | kg | 2.4 |

Graphic Symbols




## Model Number Designation

| EDF | G | -01 | -30 | -3C2 | -XY | -50 |
|---|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Rated Flow L/min | Spool Type | Direction of Flow | Design Number |
| **EDF:** Shockless Type Proportional Directional and Flow Control Valve | **G:** Sub-Plate Mounting | **01** | **30** | **3C2**  **3C40**  | **XY:** Meter - in Meter - out | **50** |

## Accessories

### Mounting Bolts

| Soc. Hd. Cap Screw | Qty. | Tightening Torque Nm |
|---|---|---|
| M5 × 45 L | 4 | 5~7 |

## Applicable Power Amplifiers

For stable performance, it is recommended that Yuken's applicable power amplifiers be used (for details see page H-186).

| Control Type | Model No. |
|---|---|
| Pattern Control | AMN-G-10 |
| Analog Control | AMN-W-10 |

## Sub-Plate

| Sub-Plate Model Numbers | Thread Size Rc | Approx. Mass kg |
|---|---|---|
| DSGM-01-31 | 1/8 | 0.8 |
| DSGM-01X-31 | 1/4 | |
| DSGM-01Y-31 | 3/8 | |

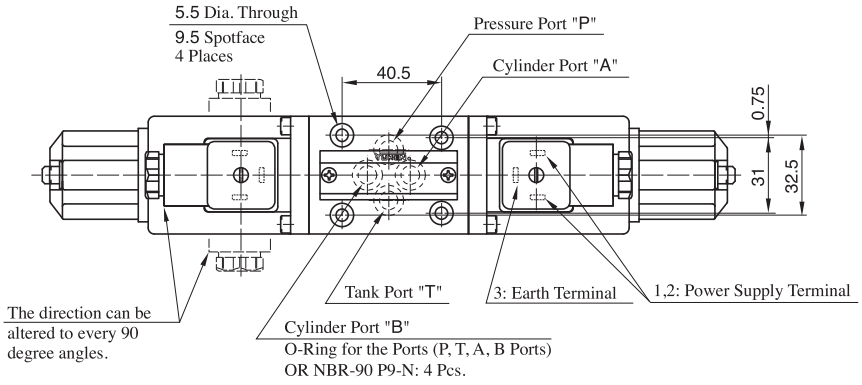
- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish. (▽)
- Sub-plates are those for 1/8 solenoid operated directional valves. For dimensoins, see page H-8.

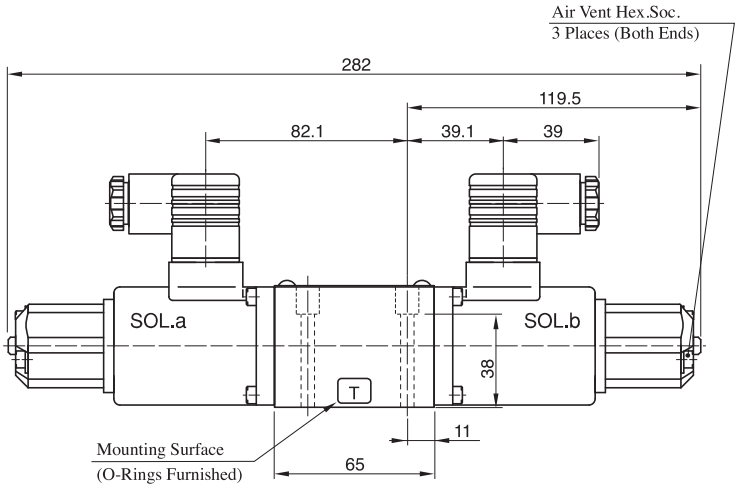
## Instructions

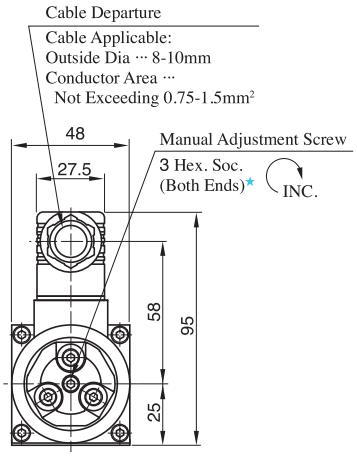
- During piping work, special care should be taken so that the tank port "T" is constantly filled with hydraulic fluid. Because back pressure is applied, using a check valve whose cracking pressure is about 0.04 MPa is recommended. Also, connect the tank port piping directly to the oil tank, but do not connect it other piping. For this reason, be sure to immerse the pipe end in fluid.
- In the event of an electrical failure or other emergency, the flow rate and oil flow direction can be switched by screwing in the manual adjustment screw. After operation, be sure to return the manual adjustment screw completely to the original position.

## EDFG-01-30-3C∗-XY-50

Mounting Surface
ISO 4401-03-02-0-05



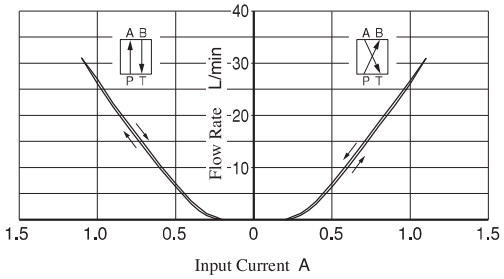




★ Under normal conditions, however, this screw must be kept in its original position.

Note) For valve mounting surface dimensions, see the dimensional drawings of sub-plates (page H-8) in common use.

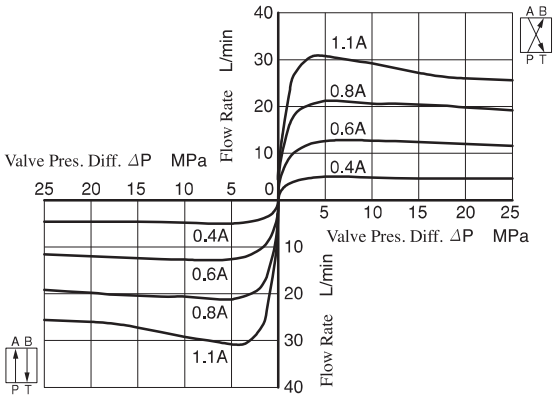
### Input Current vs. Flow

Viscosity: 30mm²/s
Valve Pres. Difference: 7 MPa




### Valve Pressure Difference vs. Flow

Viscosity: 30mm²/s



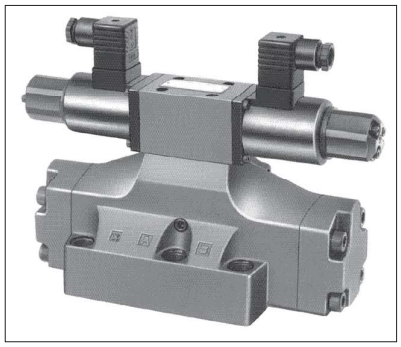
# Proportional Electro-Hydraulic Directional and Flow Control Valves

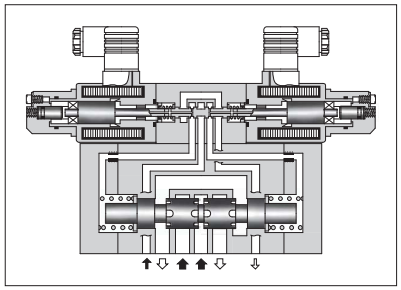
These valves are double-deck directional and flow control valves employing as their pilot the electro-hydraulic proportional pressure reducing valves with two proportional solenoids. The flow rate can be controlled by changing an input current to the solenoids and the direction of the flow can be controlled by providing the current to either solenoid of the two.
By combining the valves with the power amplifiers specially designed for the valves, the speed control, acceleration, deceleration and directional control can be done with a single valve, which eventually makes the hydraulic circuits simple and contributes the cost of the hydraulic systems.

## Specifications

| Descriptions \ Model No. | | EDFHG-03 | EDFHG-04 | EDFHG-06 |
|---|---|---|---|---|
| Max. Operating Pressure MPa | | 25 | | |
| Rated Flow ★1 L/min at Valve Pressure Difference: 1.0 MPa | | 100 | 140 | 280 |
| Pilot Pressure ★2 MPa | | 1.5 - 16 | | |
| Pilot Flow L/min | at Normal | 1 | 1 | 1 |
| | at Transition | 3 | 4 | 6 |
| Max. Tank Line Back Pressure MPa | | 16 | 21 | 21 |
| Max. Drain Line Back Pressure ★3 MPa | | 3.0 | | |
| Rated Current mA | | 800 | 980 | 900 |
| Coil Resistance Ω | | 10 | | |
| Hysteresis | | 5% or less ★4 | | |
| Repeatability | | 1% or less ★4 | | |
| Approx. Mass kg | | 11 | 12 | 15 |

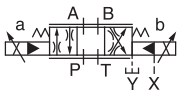
★1. The rated flow rate is valid at a differential pressure of 1.0 MPa of "P→A(B)" or "A(B)→T."
★2. Take care to keep the difference between the pilot pressure and drain port back pressure consistently greater than 1.5 MPa.
★3. To obtain stable performance, keep the drain port back pressure low and minimize its fluctuations.
★4. The hysteresis and repeatability values indicated in the specifications for each control valve are determined under the following conditions:
- Hysteresis Value: Obtained when Yuken's applicable power amplifier is used.
- Repeatability Value: Obtained when Yuken's applicable power amplifier is used under the same conditions.



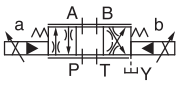


### Graphic Symbols

External Pilot Type




Internal Pilot Type




## Model Number Designation

| EDFH | G | -03 | -100 | -3C2 | -XY | -E | -31 |
|---|---|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Rated Flow L/min | Spool Type★1 | Direction of Flow | Pilot Connection | Design Number |
| **EDFH:** Proportional Electro-Hydraulic Directional and Flow Control Valves | **G:** Sub-Plate Mounting | **03** | **100** | **3C2**  **3C40**  | **XY:** Meter-in Meter-out | **E:** External Pilot **None:** Internal Pilot | **31** |
| | | **04** | **140** | | | | **31** |
| | | **06** | **280** | | | | **31** |

★1. Spool type shown in the column is for the center position.

## Accessories

### Mounting Bolts

| Model Numbers | Socket Head Cap Screw | Qty. | Tightening Torque Nm |
|---|---|---|---|
| EDFHG-03 | M6 × 35 L | 4 | 12 - 15 |
| EDFHG-04 | M6 × 45 L | 2 | 12 - 15 |
| | M10 × 50 L | 4 | 58 - 72 |
| EDFHG-06 | M12 × 60 L | 6 | 100 - 123 |

## Sub-Plate

| Valve Model Numbers | Sub-Plate Model Numbers | Thread Size Rc | Approx. Mass kg |
|---|---|---|---|
| EDFHG-03 | DHGM-03Y-10 | 3/4 | 4.7 |
| EDFHG-04 | DHGM-04-20 | 1/2 | 4.4 |
| | DHGM-04X-20 | 3/4 | 4.1 |
| EDFHG-06 | DHGM-06-50 | 3/4 | 7.4 |
| | DHGM-06X-50 | 1 | |

- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish. ($\frac{t6}{\nabla}$)
- Sub-plates are those for solenoid controlled pilot operated directional valves. For details, contuct us.

## Applicable Power Amplifiers

For stable performance, it is recommended that Yuken's applicable power amplifiers be used (for details see page H-188).
Model Numbers: SK1091-D24-10

## Instructions

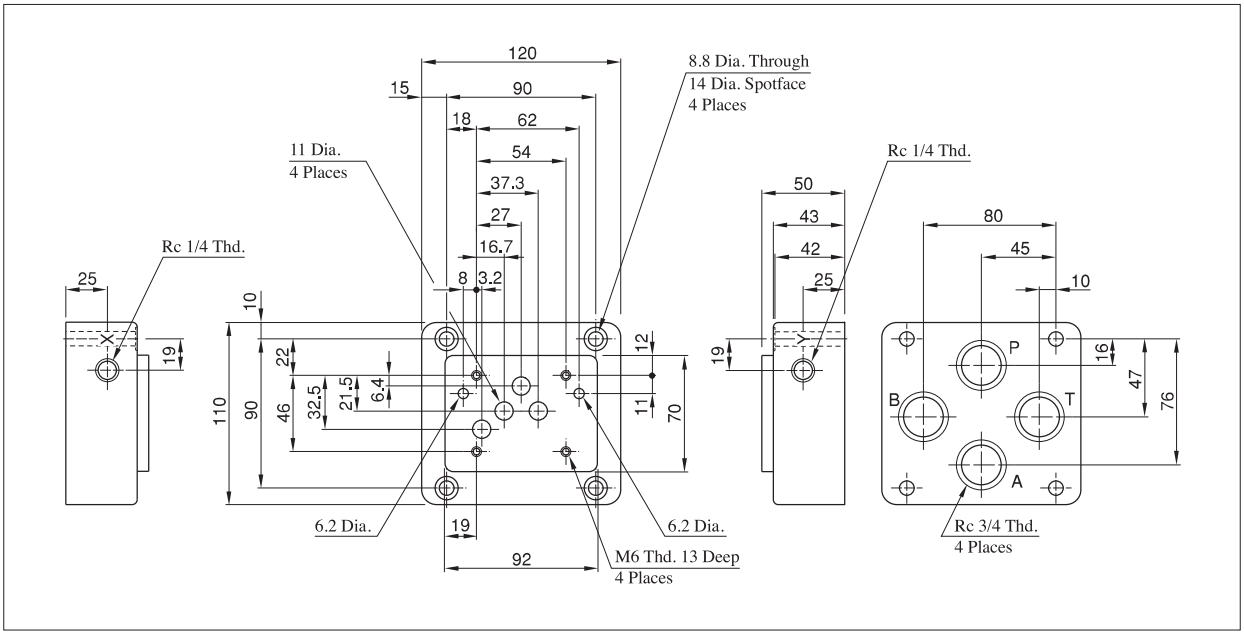
### Manual Adjustment

In the event of an electric fault or emergency, a manual shift can be made by screwing in the manual adjustment screw.
Take care, however, that this manual shift has no flows adjusting function.
For this operation, set the pilot pressure (or P-port pressure on an internal-pilot model) below 7 MPa.
After operation, be sure to return the manual adjustment screw completely to the original position.

### During Piping

During piping work, special care should be taken so that the tank port "T" is constantly filled with hydraulic fluid.
Because back pressure is applied, using a check valve whose cracking pressure is about 0.04 MPa is recommended.
Also, connect the tank port piping directly to the oil tank, but do not connect it other piping. For this reason, be sure to immerse the pipe end in fluid.

## Sub Plates: DHGM-03Y

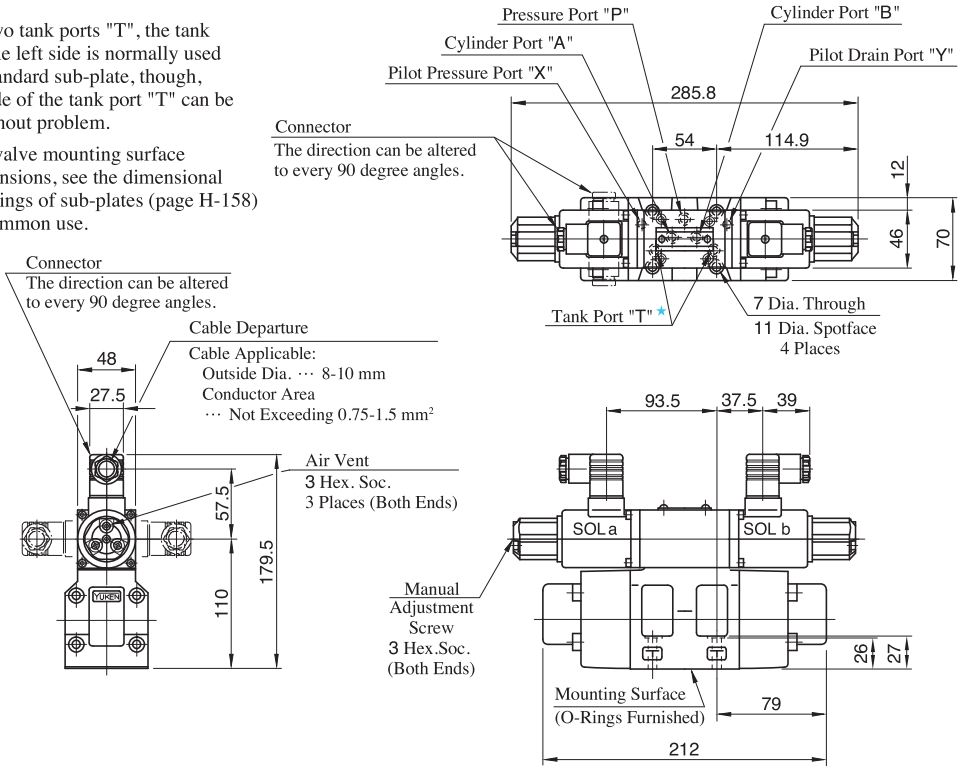


Mounting Surface: Conform to ISO 4401-05-05-0-05

## EDFHG-03

★ Of the two tank ports "T", the tank port in the left side is normally used in our standard sub-plate, though, either side of the tank port "T" can be used without problem.

Note) For valve mounting surface dimensions, see the dimensional drawings of sub-plates (page H-158) in common use.

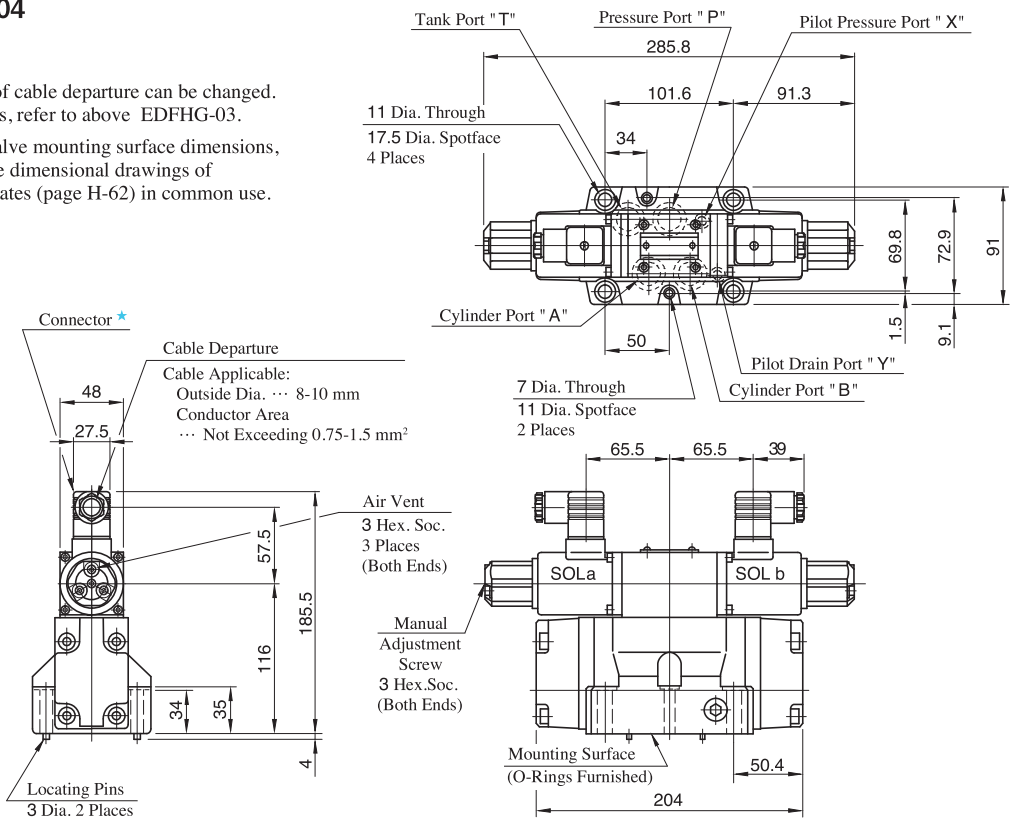



Mounting Surface: Conform to ISO 4401-07-07-0-05

## EDFHG-04

★ Position of cable departure can be changed. For details, refer to above EDFHG-03.

Note) For valve mounting surface dimensions, see the dimensional drawings of sub-plates (page H-62) in common use.

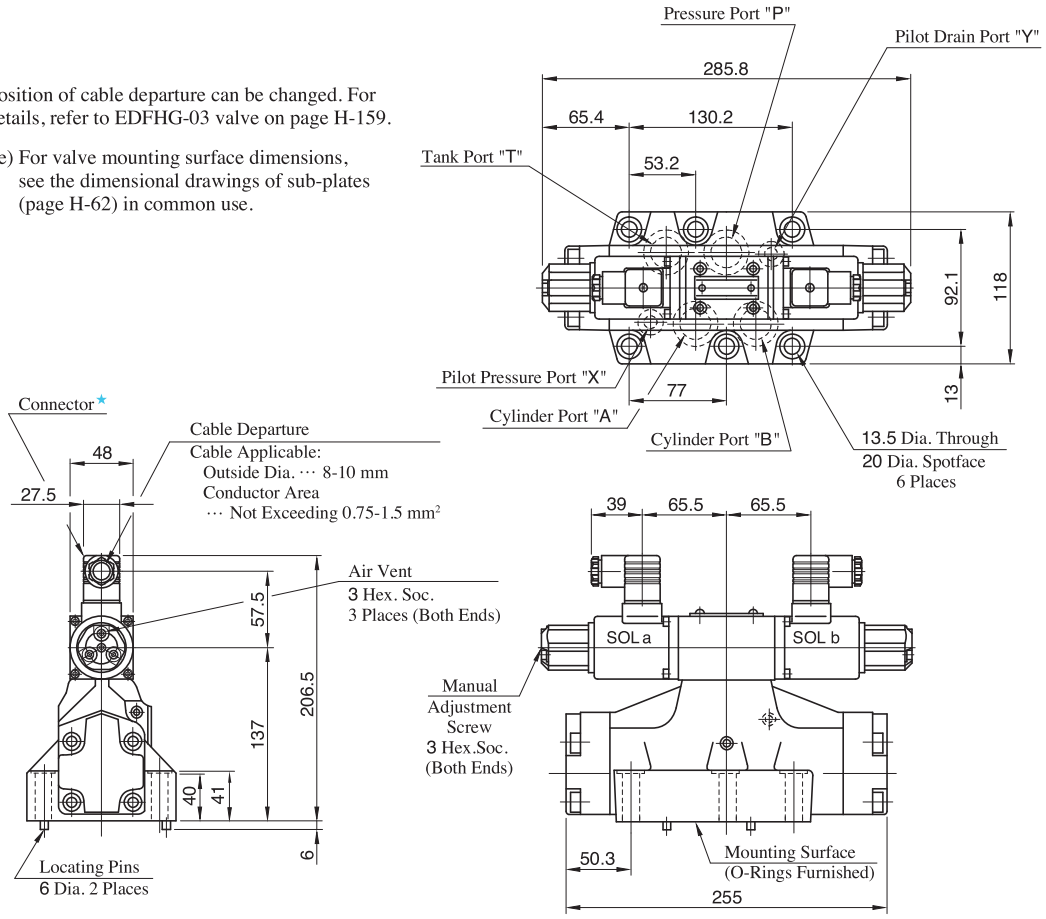


## EDFHG-06

**Mounting Surface: Conform to ISO 4401-08-08-0-05**

★Position of cable departure can be changed. For details, refer to EDFHG-03 valve on page H-159.

Note) For valve mounting surface dimensions, see the dimensional drawings of sub-plates (page H-62) in common use.



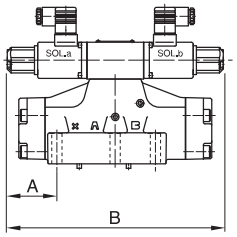

## Interchangeability between Current and New Design

### Specifications and Characteristics

The input current and flow characteristics differ between the new and old models. Consult Yuken for details.
Also, There is no change in specifications and characteristics between current and new design.

### Installation Interchangeability

There is an interchangeability in the mounting dimensions between current and new design, however, note that because of improvements made on the solenoids, the overall shapes and dimensions have been changed as shown below.

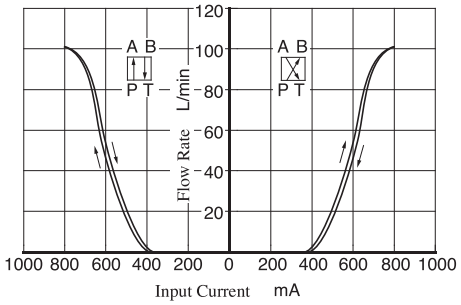



| Model Numbers | | A | B |
|---|---|---|---|
| (Current) | EDFHG-03-100-*-*-*-30 | 117.9 | 287.8 |
| (New) | EDFHG-03-100-*-*-*-31 | 116.9 | 285.8 |
| (Current) | EDFHG-04-140-*-*-*-30 | 93.9 | 287.8 |
| (New) | EDFHG-04-140-*-*-*-31 | 92.9 | 285.8 |
| (Current) | EDFHG-06-280-*-*-*-30 | 66.4 | 287.8 |
| (New) | EDFHG-06-280-*-*-*-31 | 65.4 | 285.8 |

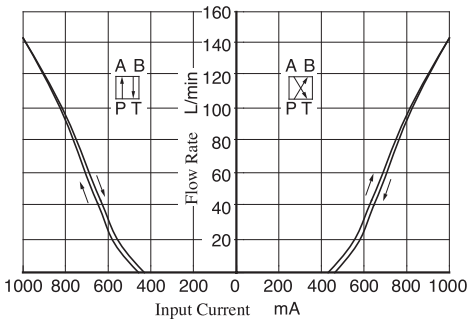
## Input Current vs. Flow

Viscosity : 30 mm²/s
Valve Pres. Difference : P→A (B), B (A) →T  1 MPa

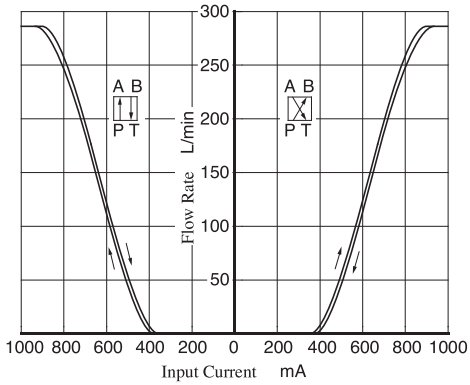
EDFHG-03




EDFHG-04



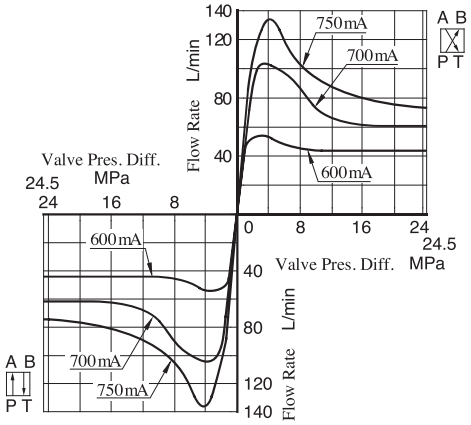

EDFHG-06



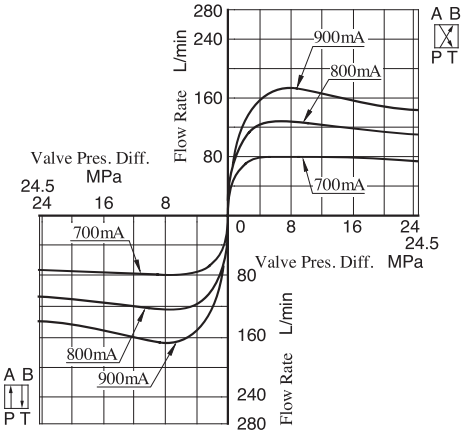

## Valve Pressure Difference vs. Flow

Viscosity : 30 mm²/s

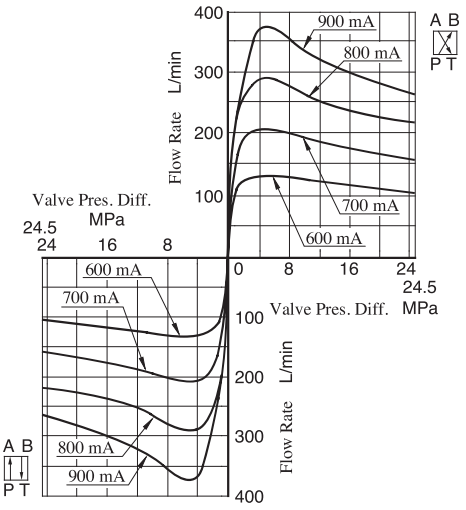
EDFHG-03




EDFHG-04

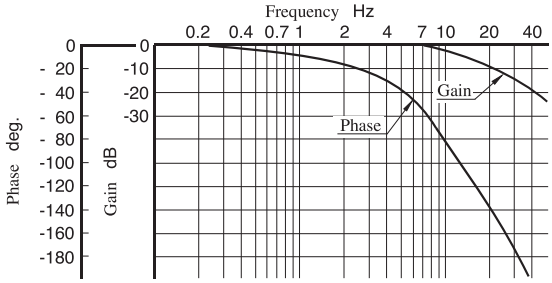



EDFHG-06



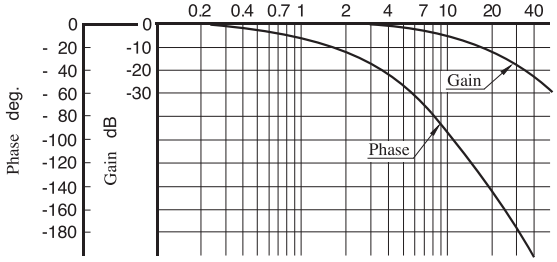
## Frequency Response

EDFHG-03



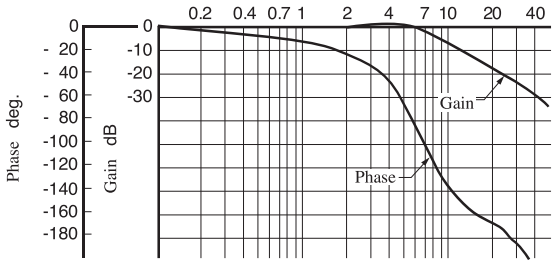

Model Number : EDFHG-03-100-3C2-E-31
Viscosity : 30 mm²/s
Pilot Pressure : 15.7 MPa
Travel of Spool : ±10% of Maximum Stroke

EDFHG-04




Model Number : EDFHG-04-140-3C2-E-31
Viscosity : 30 mm²/s
Pilot Pressure : 15.7 MPa
Travel of Spool : ±10% of Maximum Stroke

EDFHG-06



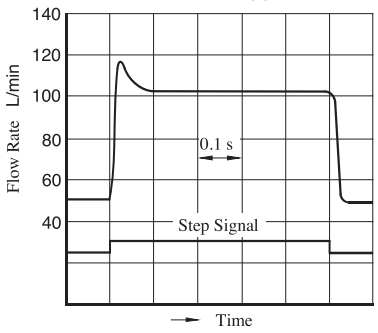

Model Number : EDFHG-06-280-3C2-E-31
Viscosity : 30 mm²/s
Pilot Pressure : 15.7 MPa
Travel of Spool : ±10% of Maximum Stroke

## Step Response

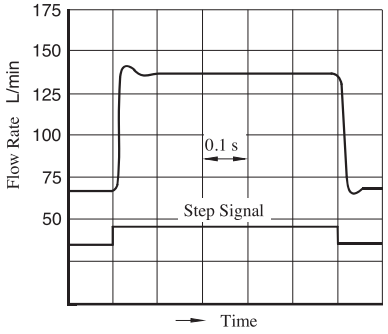
These characteristics have been obtained by measuring on each valve. Therefore, they may vary according to a hydraulic circuit to be used.

Viscosity : 30 mm²/s
Supply Pressure : 15.7 MPa

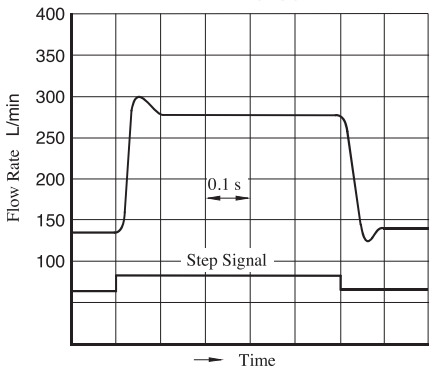
EDFHG-03




EDFHG-04




EDFHG-06



# High Response Type Proportional Electro-Hydraulic Directional and Flow Control Valves

High response, high precision and high reliability are achieved by a combination of a compact and powerful solenoid and a spool-position-detection LVDT.
Direct type ELDFG-01/03 and two stage type ELDFG-04/06 (which use the ELDFG-01 as a pilot) are available.

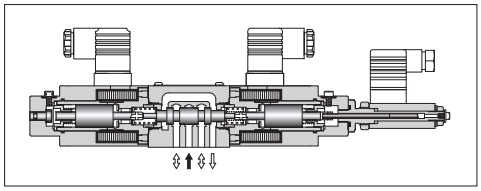
# Direct Operated Type Directional and Flow Control Valves

This product can be interchanged with the simplified servo valve to perform position control and pressure control.
Compared to nozzle flapper type servo valve, this product has excellent contamination-related problems.

## Specifications

| Descriptions \ Model No. | | ELDFG-01 | ELDFG-03 |
|---|---|---|---|
| Max. Operating Pressure MPa | | 31.5 | |
| Max. Tank Line Back Pressure MPa | | 21 | |
| Rated Flow L/min<br>Valve Pres. Diff. : 1.5 MPa | | 10: 10<br>20: 20<br>35: 35 | 40: 40<br>80: 80 |
| Hysteresis | | 0.5% or less | |
| Repeatability | | 0.5% or less | |
| Step Response (Typical Rating) | 0 → 100% | 30 ms | 3C2, 3C40: 29 ms<br>3C2P: 25 ms |
| | 100 → 0% | — | 3C2, 3C40: 26 ms<br>3C2P: 23 ms |
| Frequency Response (0 ± 25 %V) | Phase -90 degree | 48 Hz | 3C2, 3C40: 36 Hz<br>3C2P: 41 Hz |
| | Gain -3 dB | 52 Hz | 3C2, 3C40: 35 Hz<br>3C2P: 38 Hz |
| Rated Current A | | Max. 2.5 | Max. 3 |
| Coil Resistance [20°C] Ω | | 3.9 | 3 |
| Power Input W | | Max. 25 | Max. 27 |
| Approx. Mass kg | | 3.2 | 7.5 |

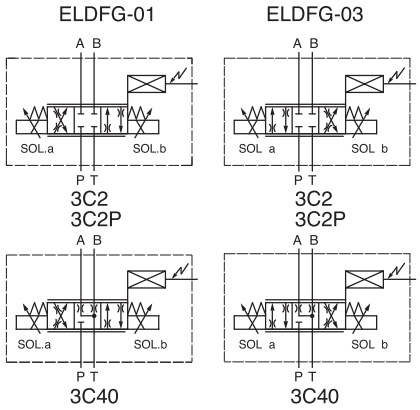




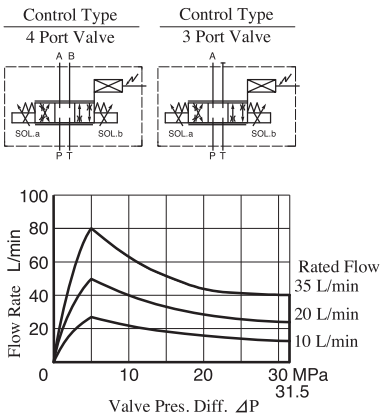
## Range of Flow Control

See “Valve Pres. Difference vs. Flow Rate” below charactristics for the appropriate range.

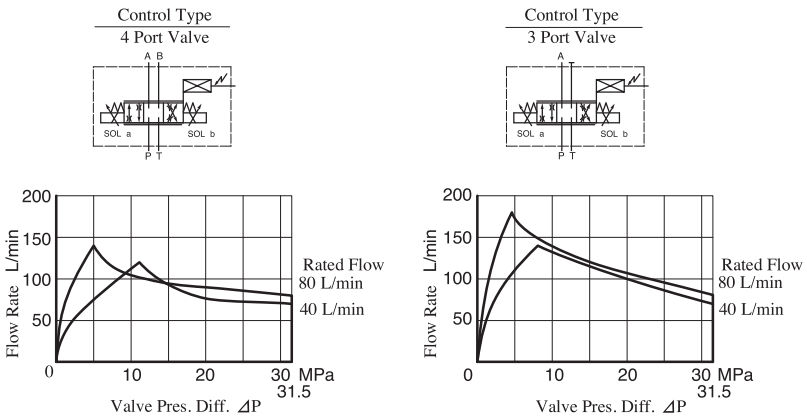
Graphic Symbols




ELDFG-01

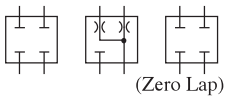



ELDFG-03




★ Valve pressure difference “⊿P” is reference by follows. In addition, “P”, “A”, “B”, “T”, are pressure of each port.
4 Port Valve: ⊿P = [(P–A) + (B–T)] or [(P–B) + (A–T)]
3 Port Valve: ⊿P = (P–A) or (A–T)

## Model Number Designation

| ELDF | G | -01 | -35 | -3C2 | -XY | -10 |
|---|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Rated Flow L/min | Spool Type | Direction of Flow | Design Number |
| **ELDF:** High Response (Direct) Type Proportional Electro-Hydraulic Directional and Flow Control Valves | **G:** Sub-Plate Mounting | **01** | **10** **20** **35** | 3C2 3C40 3C2P  (Zero Lap) | **XY:** Meter-in Meter-out | **10** |
| | | **03** | **40** **80** | | | **10** |

## Accessories

### Mounting Bolts

Four socket head cap screws in the table below are included.

| Model No. | Socket Head Cap Screw | Qty. | Tightening Torque |
|---|---|---|---|
| ELDFG-01 | M5 × 45 L | 4 | 5 - 7 Nm [Applicable to working pressure more than 25 MPa: 6 - 7 Nm] |
| ELDFG-03 | M6 × 35 L | 4 | 12 - 15 Nm |

## Sub-Plate

| Valve Model Numbers | Sub-Plate Model Numbers | Thread Size Rc | Approx. Mass kg |
|---|---|---|---|
| ELDFG-01 | DSGM-01-31 | 1/8 | 0.8 |
| | DSGM-01X-31 | 1/4 | |
| | DSGM-01Y-31 | 3/8 | |
| ELDFG-03 | DSGM-03-40 | 3/8 | 3.0 |
| | DSGM-03X-40 | 1/2 | |
| | DSGM-03Y-40 | 3/4 | 4.7 |

- Sub-plates are available. Specify the sub-plate model number from the table above.
  When sub-plates are not used, the mounting surface should have a good machined finish. (1.6▽)
- The Sub-plates are those for 1/8 and 3/8 solenoid operated directional valves. For dimensions, see pages H-8 and H-53.

## Applicable Power Amplifiers

For stable performance, it is recommended that Yuken's applicable power amplifiers be used (for details see page H-190).

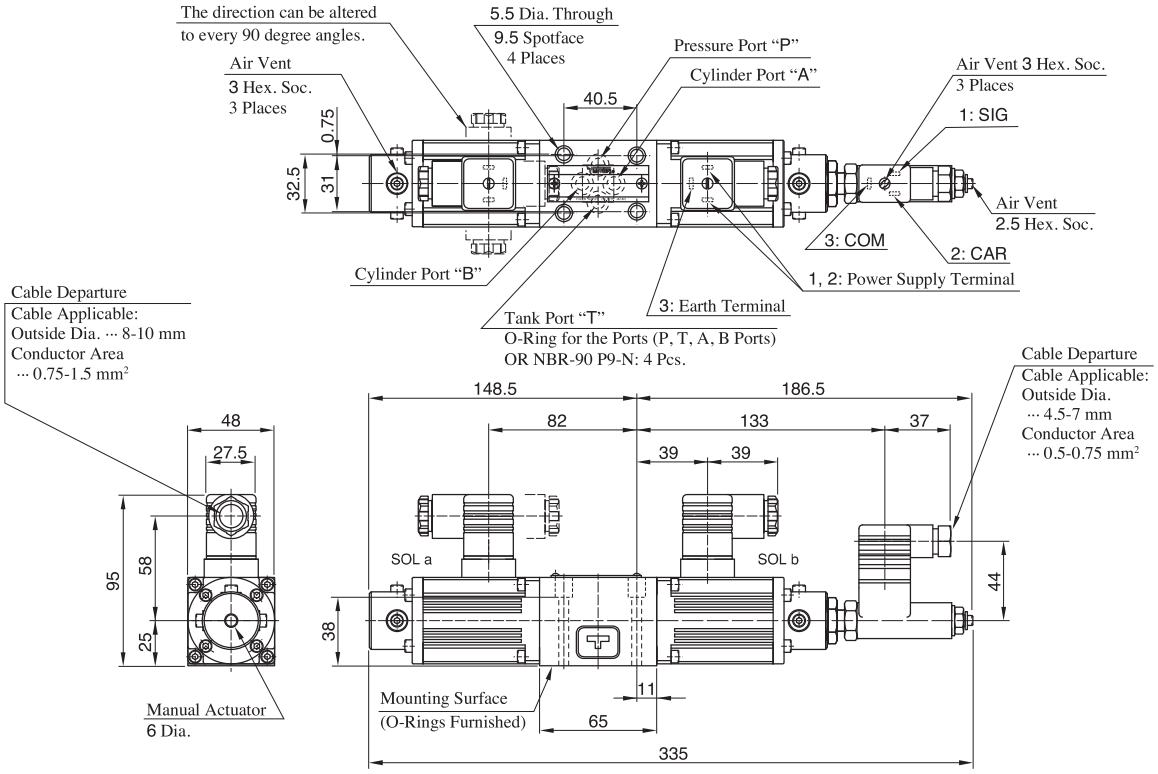
| Valve Model Numbers | Power Amplifier Model Numbers |
|---|---|
| ELDFG-01-*-3C2 3C40 | AMN-L-01-1-10<br>AMB-EL-01-★-*-20 |
| ELDFG-01-*-3C2P | AMN-L-01-3-2P-10<br>AMB-EL-01-2P-★-*-20 |
| ELDFG-03-*-3C2 3C40 | AMB-EL-03-1-*-20 |
| ELDFG-03-*-3C2P | AMB-EL-03-2P-1-*-20 |

## Instructions

During piping work, special care should be taken so that the tank port "T" is constantly filled with hydraulic fluid. Because back pressure is applied, using a check valve whose cracking pressure is about 0.04 MPa is recommended. Also, connect the tank port piping directly to the oil tank, but do not connect it other piping. For this reason, be sure to immerse the pipe end in fluid.

## ELDFG-01-∗-∗ -XY-10

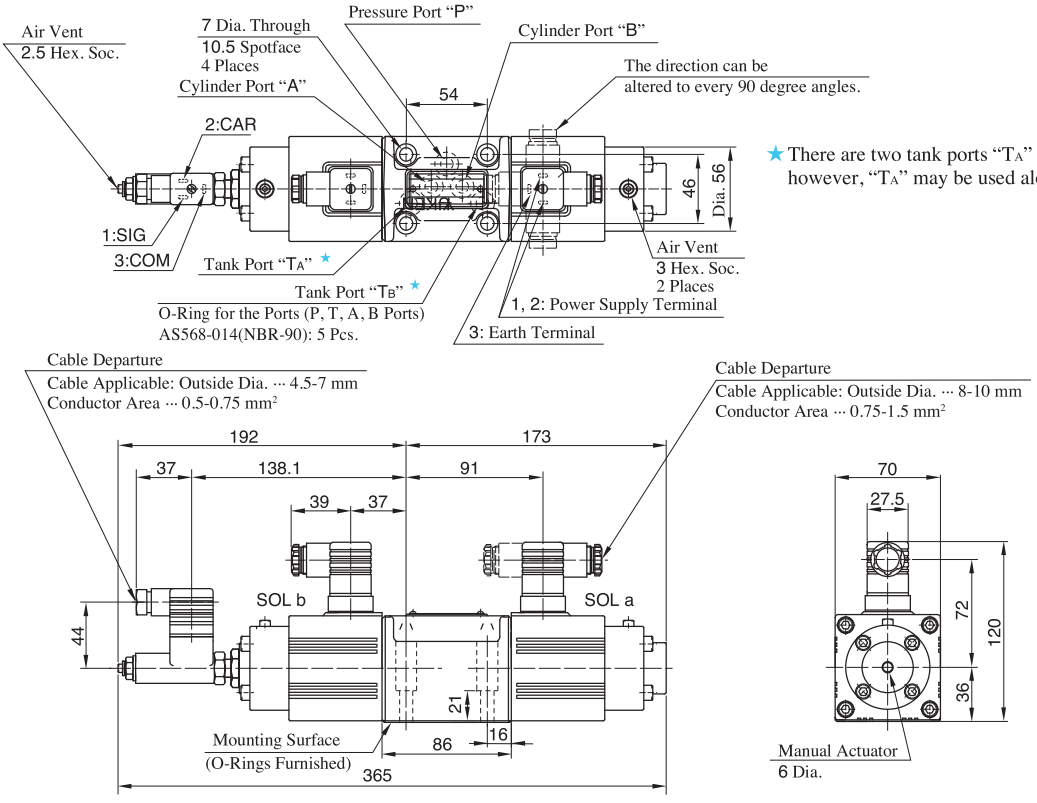
**Mounting Surface: Conform to ISO4401-03-02-0-05**




Note) For valve mounting surface dimensions, see the dimensional drawings of sub-plates (page H-8) in common use.

## ELDFG-03-∗-∗ -XY-10

**Mounting Surface: Conform to ISO4401-05-04-0-05**

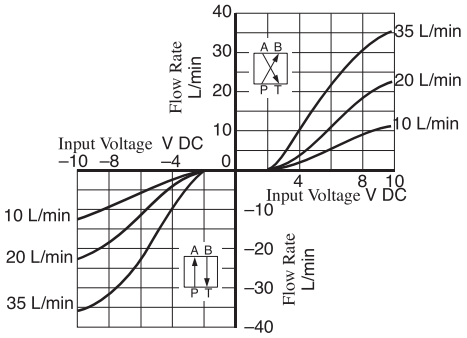



Note) For valve mounting surface dimensions, see the dimensional drawings of sub-plates (page H-53) in common use.

## Input Voltage vs. Flow Rate

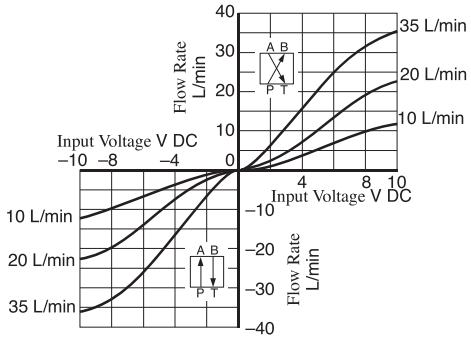
### ELDFG-01-∗-3C2/3C40

Valve Pres. Diff. : 1.2 MPa
Viscosity : 30 mm²/s



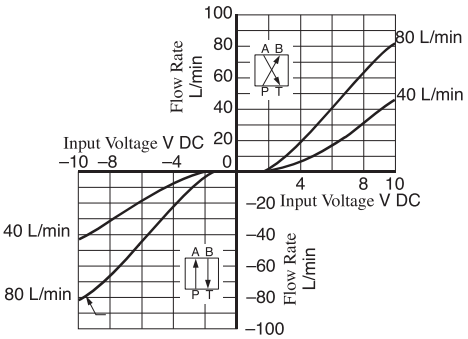

### ELDFG-01-∗-3C2P

Valve Pres. Diff. : 1.2 MPa
Viscosity : 30 mm²/s



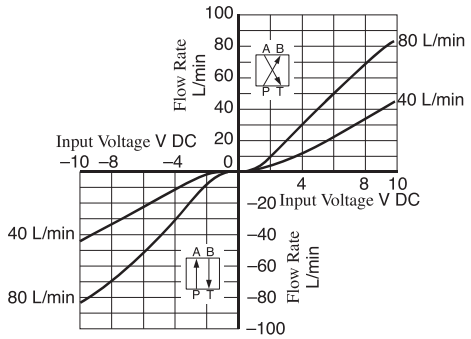

### ELDFG-03-∗-3C2/3C40

Valve Pres. Diff. : 1.5 MPa
Viscosity : 30 mm²/s



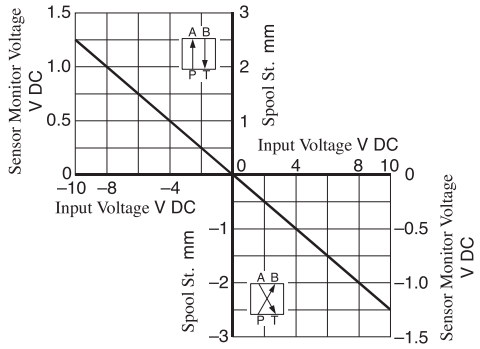

### ELDFG-03-∗-3C2P

Valve Pres. Diff. : 1.5 MPa
Viscosity : 30 mm²/s

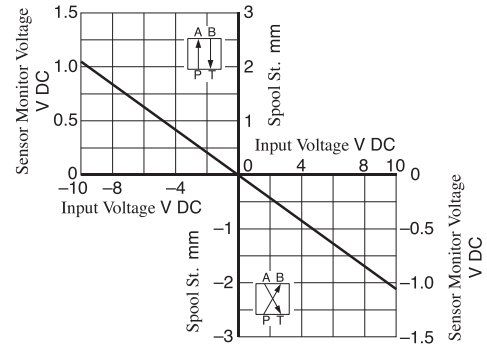



## Input Voltage vs. Spool St.

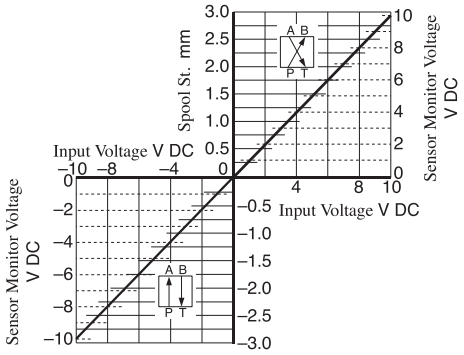
### ELDFG-01-∗-3C2/3C40



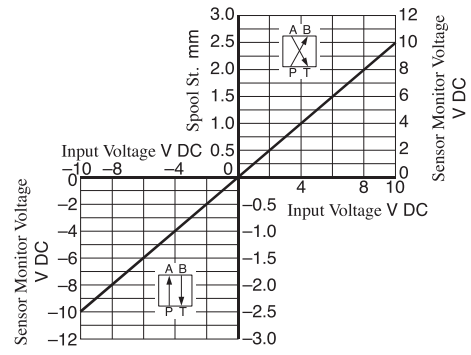

### ELDFG-01-∗-3C2P




### ELDFG-03-∗-3C2/3C40




### ELDFG-03-∗-3C2P



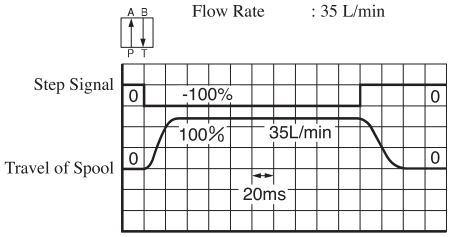
## Step Response (Example)

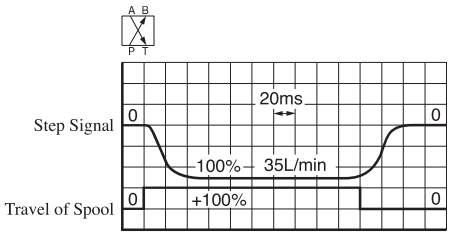
Viscosity : 30 mm²/s

The values were measured on independent valves. They vary by circuit.

### ELDFG-01-35-3C2/3C40

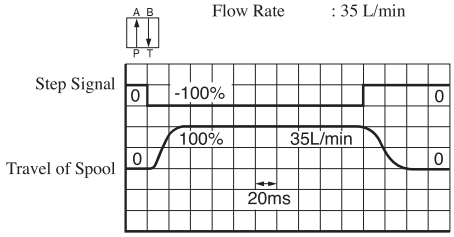
Supply Pressure : 2 MPa
Flow Rate : 35 L/min

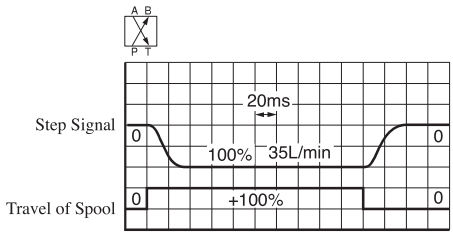



### ELDFG-01-35-3C2P

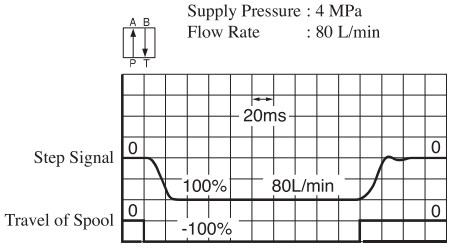
Supply Pressure : 2 MPa
Flow Rate : 35 L/min

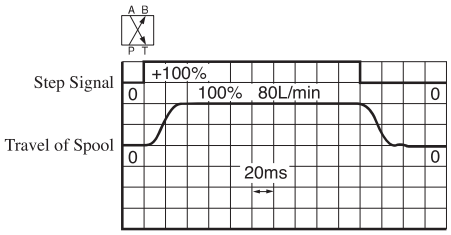



### ELDFG-03-80-3C2/3C40

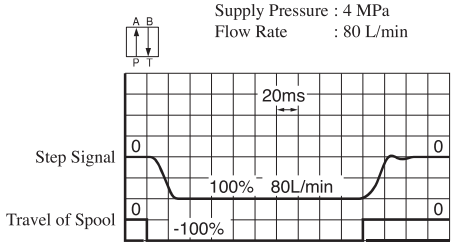
Supply Pressure : 4 MPa
Flow Rate : 80 L/min

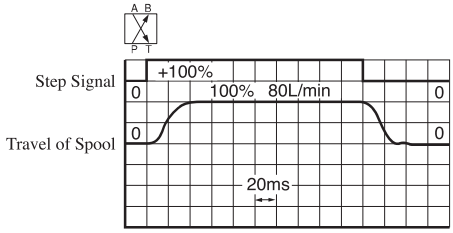



### ELDFG-03-80-3C2P

Supply Pressure : 4 MPa
Flow Rate : 80 L/min

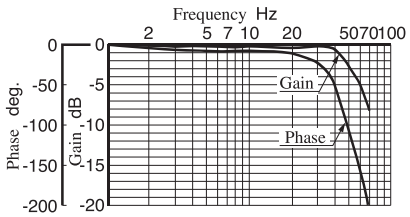


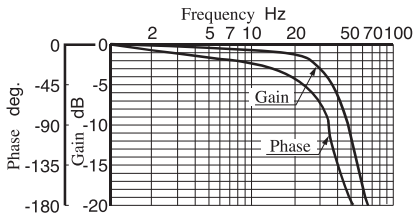

## Frequency Response

Input Signal : 0 ± 25 %V
Primary Pressure : 14 PMa
Viscosity : 30 mm²/s

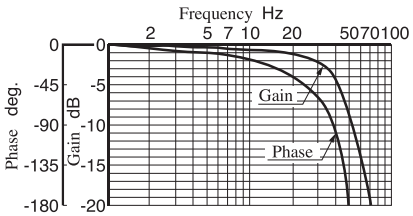
### ELDFG-01-35-3C2/3C40/3C2P




### ELDFG-03-80-3C2/3C40




### ELDFG-03-80-3C2P

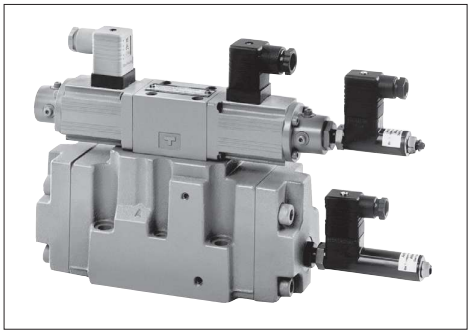


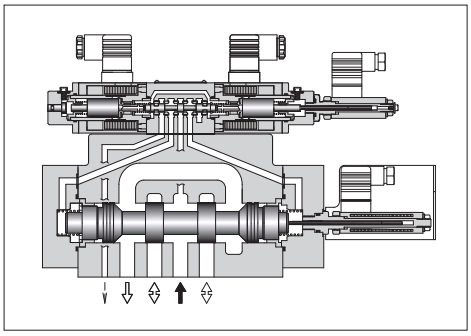
# Two Stage Type Directional and Flow Control Valves

## Specifications

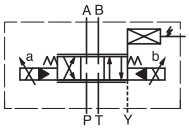
| Descriptions \ Model No. | | ELDFHG-04 | ELDFHG-06 |
|---|---|---|---|
| Rated Flow Valve Pres. Diff. : 1 MPa | L/min | 280 | 350<br>500 |
| Max. Operating Pressure | MPa | 35 | 350: 35<br>500: 31.5 |
| Proof Pressure at Return Port ★1 (External Drain) | MPa | "T" Port : 31.5<br>"Y" Port : 21 | 350<br>"T" Port : 35<br>"Y" Port : 21<br>500<br>"T" Port : 25<br>"Y" Port : 21 |
| Proof Pressure at Return Port (Internal Drain) | MPa | 21 | |
| Pilot Pressure ★2 | MPa | 1.5-31.5 | |
| Pilot Flow ★3 | | 16 L/min or more | 350: 16 L/min or more<br>500: 19 L/min or more |
| Null Leakage ★4 | Ps=14 MPa, Pp=14 MPa | 3C2: 3 L/min or less<br>3C2P: 10 L/min or less | 3C40: 4 L/min or less |
| Step Response (0↔100%) | (Typical Rating) Pp=14 MPa | 13 ms | 350: 15 ms<br>500: 18 ms |
| Frequency Response (0±25%V, Phase) | Pp=14 MPa | 46 Hz (–90 degree) | 350: 40 Hz (–90 degree)<br>500: 39 Hz |
| Water - Proofness | | IP64 | |
| Operating Temperature Range | | –15 - +60 °C | |
| Spool Type | | 3C2: 3C2P: (Zero Rap) 3C40: | |
| Approximate Spool Stroke to Stops | | ±5 mm | 350: ±5 mm<br>500: ±7 mm |
| Main Spool End Area | $cm^2$ | 7.1 | 8 |
| Rated Current | A | Max. 2.5 | |
| Coil Resistance [20 °C] | Ω | 3.9 | |
| Approx. Mass | kg | 10 | 350: 18<br>500: 19 |

★1. Return pressure should be less than the actual supply pressure.
★2. Pilot pressure should be between 1.5 MPa and 31.5 MPa, and should exceed 60% of the actual supply pressure to main valve.
★3. Pilot flow is calculated with the above step response time at pilot pressure 14 MPa.
★4. Added up leakage of main and pilot spools are stated.

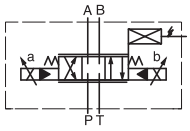




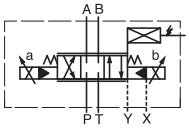
### Graphic Symbols



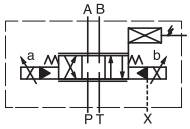
Internal Pilot / External Drain Type



Internal Pilot / Internal Drain Type



External Pilot / External Drain Type



External Pilot / Internal Drain Type

## Model Number Designation

| ELDFH | G | -04 | -280 | -3C2P | -XY | -E | T | -10 |
|---|---|---|---|---|---|---|---|---|
| Series Number | Type of Mounting | Valve Size | Rated Flow L/min | Spool Type | Direction of Flow | Pilot Connection | Drain Connection | Design Number |
| **ELDFH**: High Response (Two Stage) Type Proportional Electro-Hydraulic Directional and Flow Control Valves | **G**: Sub-Plate Mounting | **04** | **280** | **3C2** **3C40**<br>**3C2P**<br>(Zero Lap) | **XY** : Meter-in Meter-out | **None**: Internal Pilot<br>**E**: External Pilot | **None**: External Drain<br>**T**: Internal Drain | **10** |
| | | **06** | **350**<br>**500** | | | | | **10** |

## Applicable Power Amplifiers

For stable performance, it is recommended that Yuken's applicable power amplifiers be used (for details see page H-190).

| Model Numbers | Power Amplifier Model Numbers |
|---|---|
| ELDFHG-04-280-$^{3C2}_{3C40}$ | AMB-EL-04-2-∗-20 |
| ELDFHG-04-280-3C2P | AMB-EL-04-2P-2-∗-20 |
| ELDFHG-06-350-$^{3C2}_{3C40}$ | AMB-EL-06-3-∗-20 |
| ELDFHG-06-350-3C2P | AMB-EL-06-2P-3-∗-20 |
| ELDFHG-06-500-$^{3C2}_{3C40}$ | AMB-EL-06-4-∗-20 |
| ELDFHG-06-500-3C2P | AMB-EL-06-2P-4-∗-20 |

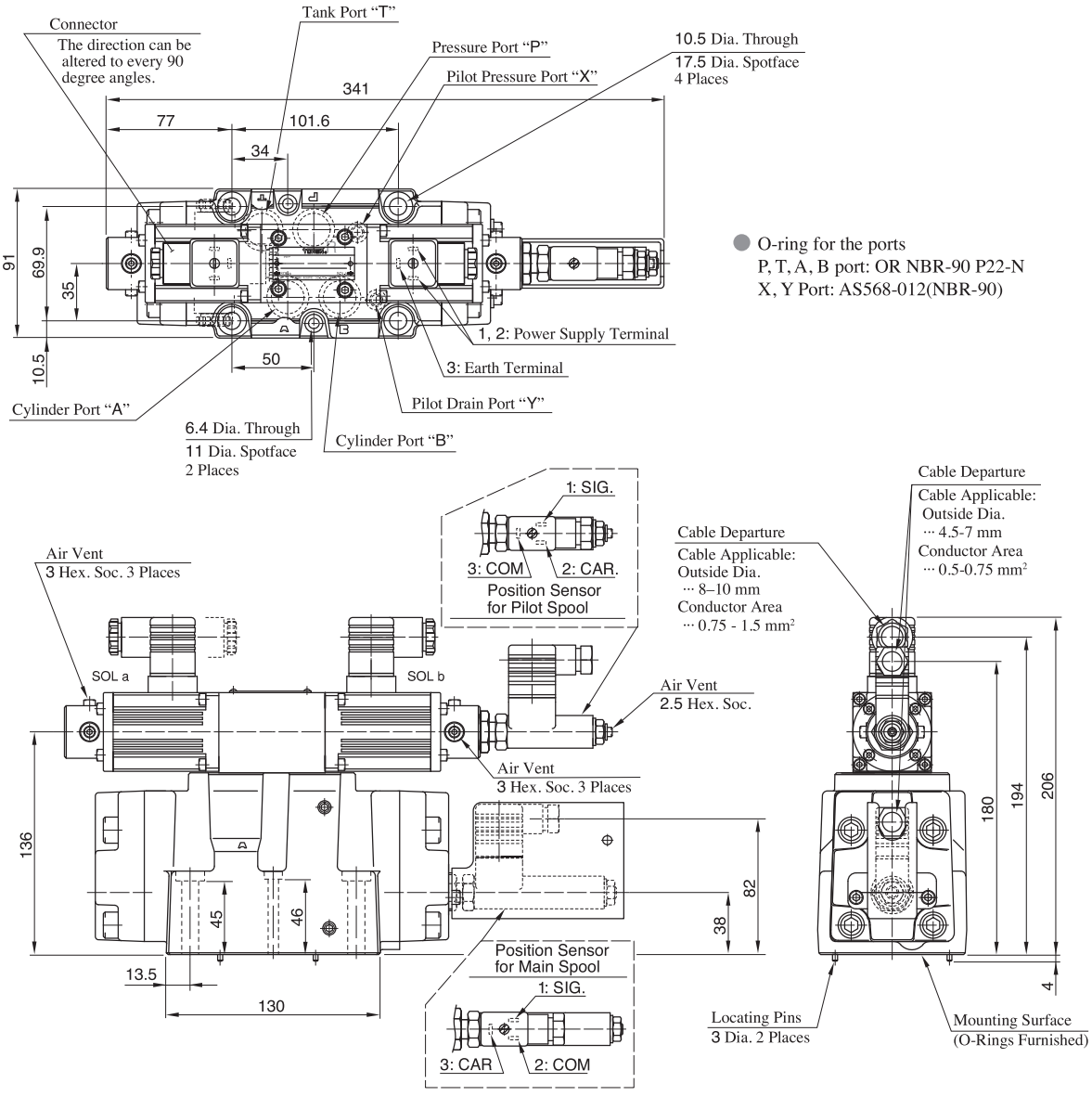
## Accessories

### Mounting Bolts

| Model Numbers | Socket Head Cap Screw | Qty. |
|---|---|---|
| ELDFHG-04 | M6 × 55 L<br>M10 × 60 L | 2<br>4 |
| ELDFHG-06 | M12 × 85 L | 6 |

### ELDFHG-04-280-∗-XY-∗-∗ -10

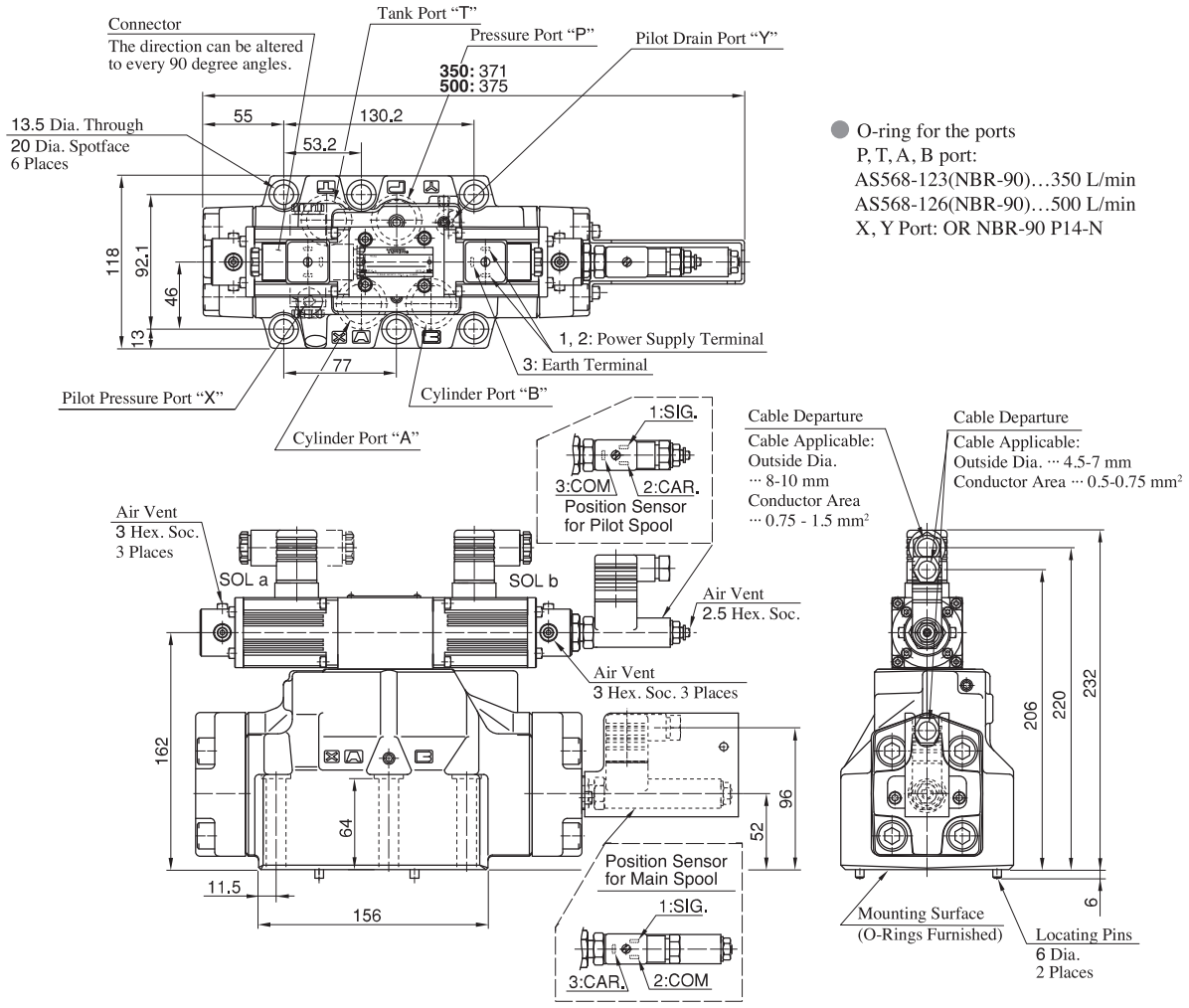
**Mounting Surface: Conform to ISO4401-07-07-0-05**




Note) For valve mounting surface dimensions, refer to page H-170.

## ELDFHG-06-∗-∗-XY-∗-∗-10

**Mounting Surface: Conform to ISO4401-08-08-0-05**

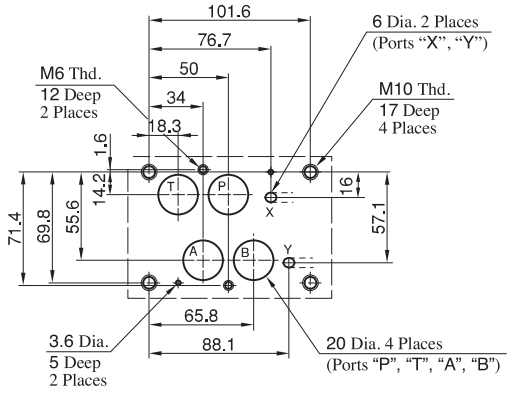



- O-ring for the ports
  P, T, A, B port:
  AS568-123(NBR-90)…350 L/min
  AS568-126(NBR-90)…500 L/min
  X, Y Port: OR NBR-90 P14-N

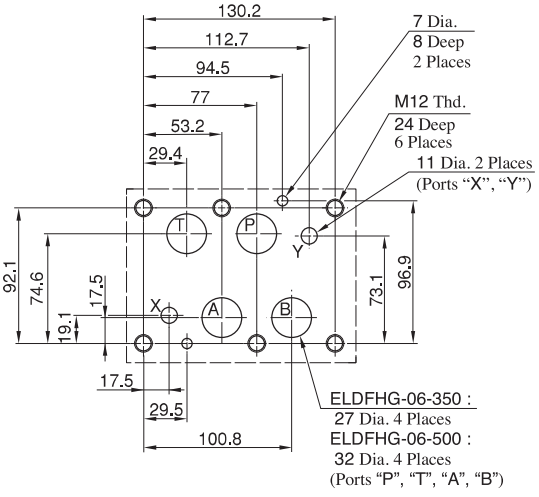
## Dimensions of Valve Mounting Surface

Prepare a mounting surface as shown to the below.
Also finish it finely.

### ELDFHG-04



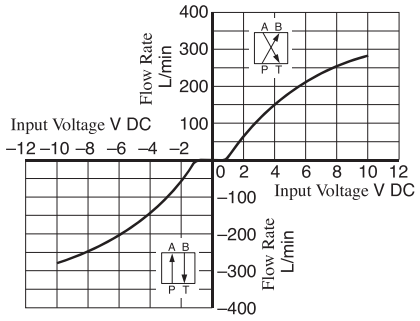

### ELDFHG-06



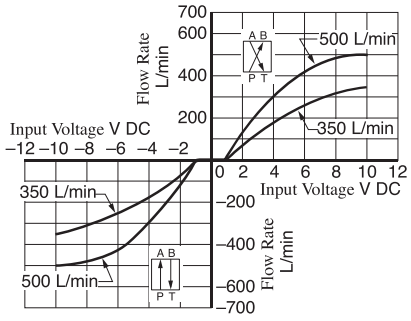
## Input Voltage vs. Flow Rate

Valve Pres. Diff. : 1 MPa
Viscosity : 30 mm²/s

ELDFHG-04



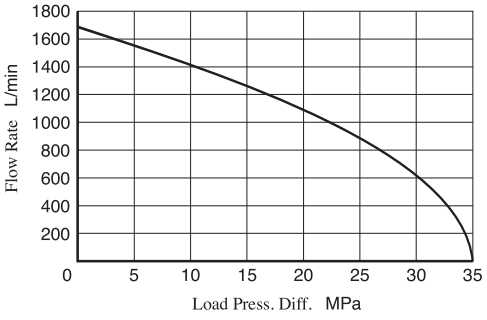

ELDFHG-06



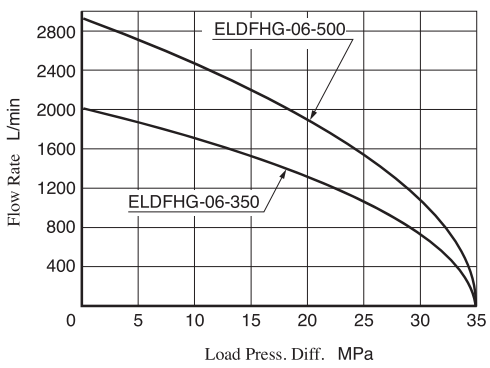

## Load Flow Characteristics

Viscosity : 30 mm²/s

ELDFHG-04



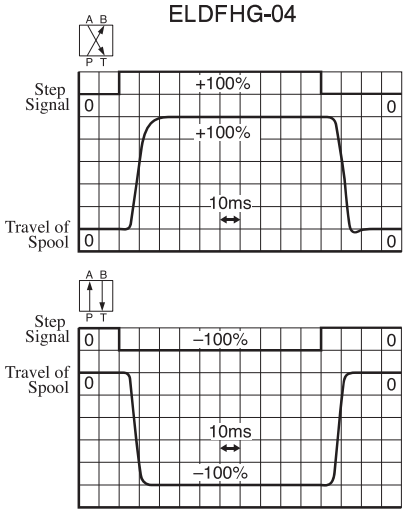

ELDFHG-06



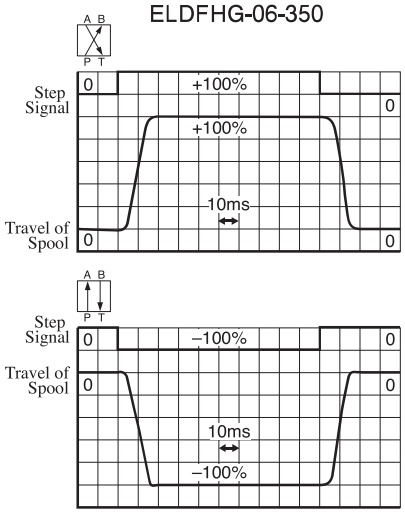

## Step Response (Example)

Viscosity : 30 mm²/s

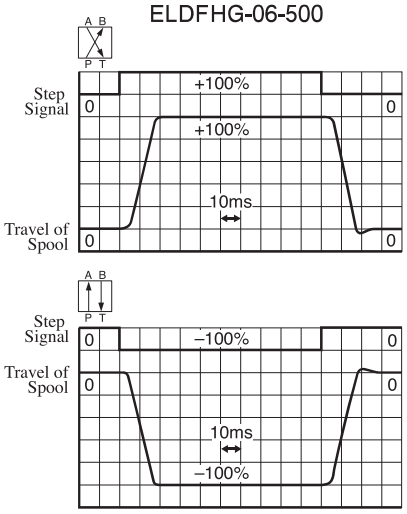
ELDFHG-04




ELDFHG-06-350



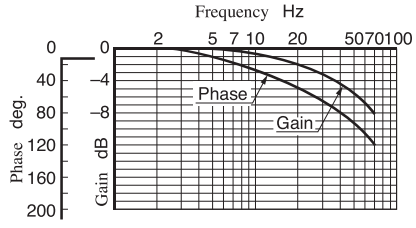

ELDFHG-06-500



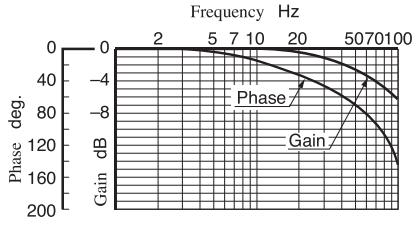

## Frequency Response

Input Signal : 0 ± 25 %
Hydrauric Circuit : Port A/B Closed
Supply and Pilot Pressure : 14 PMa
Viscosity : 30 mm²/s

ELDFHG-04




ELDFHG-06-350




ELDFHG-06-500

