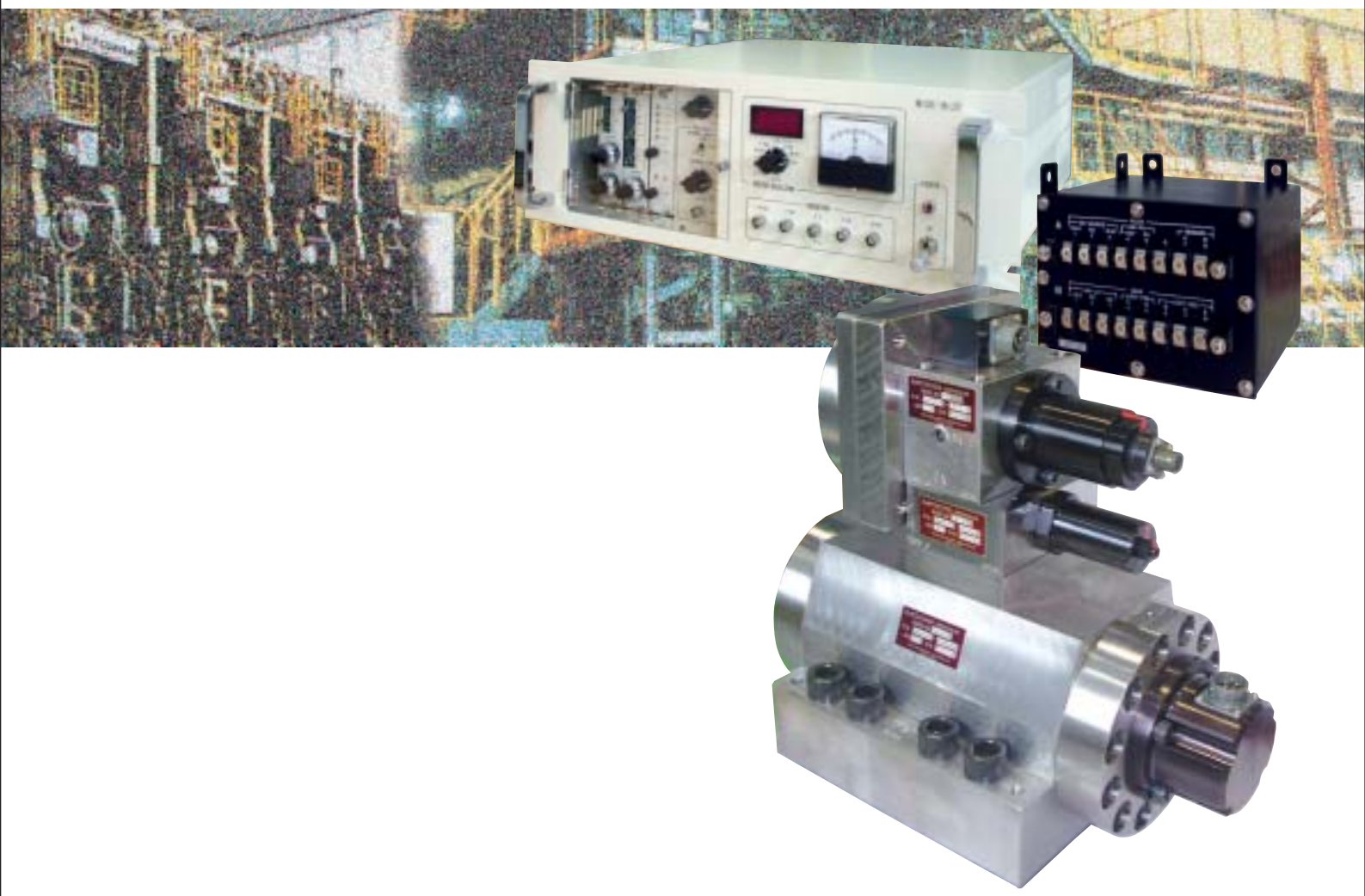
MOOG

# MK SERVOVALVE

## Electro-Hydraulic Direct Drive Series



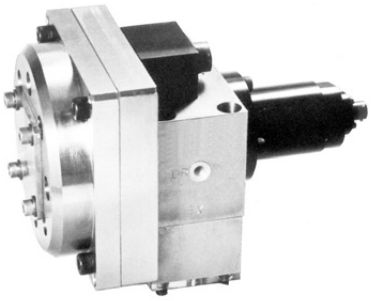
# Direct Drive Servovalves (MK-1.5, MK-5, MK-15)

## ■ OUTLINE

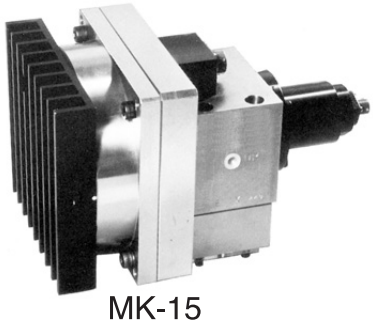
The DIRECT DRIVE SERVOVALVE consists of a force motor, a spool valve and a displacement detector. All the electric parts have have completely dry structure. The movement of moving coil is directly transmitted to the spool, and the movement of the spool is fed back as an electric signal to the operational amplifier through the displacement detector. The DIRECT DRIVE SERVOVALVE is superior to the others in its simple structure and high reliability.

## ■ FEATURES

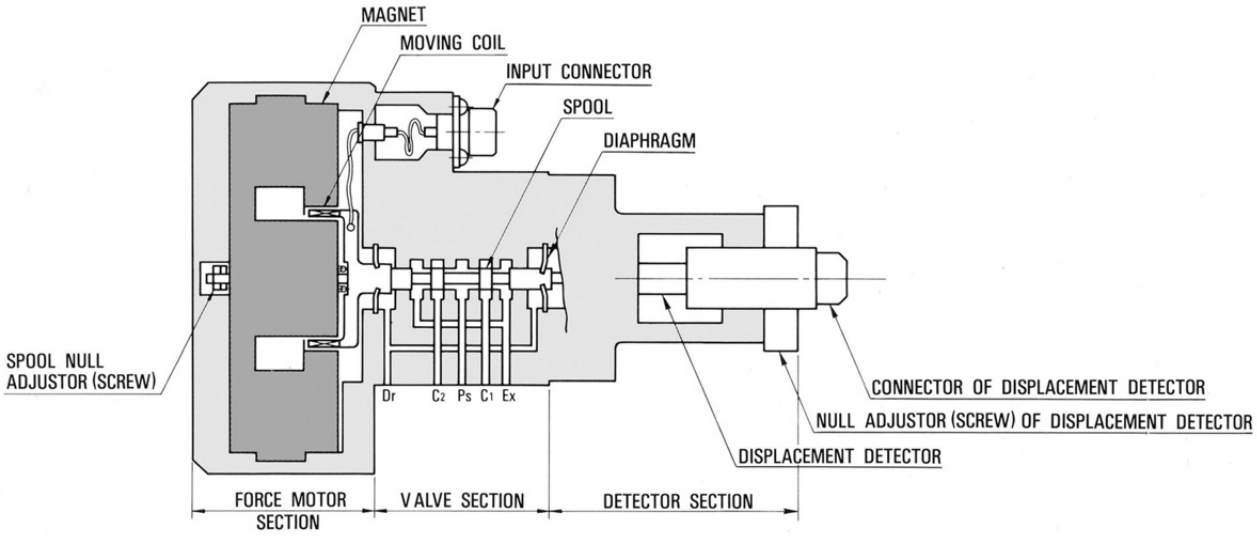
- High frequency response
- Small threshold and good repeatability
- Good stability and high reliability
- Small null drift due to variations in supply pressure and fluid temperature.
- Applicable to various kinds of fluids (Mineral oil, Water-glycol ,Polyol ester ,Phosphate ester)
- Easy and economical maintenance.



MK-1.5,MK-5



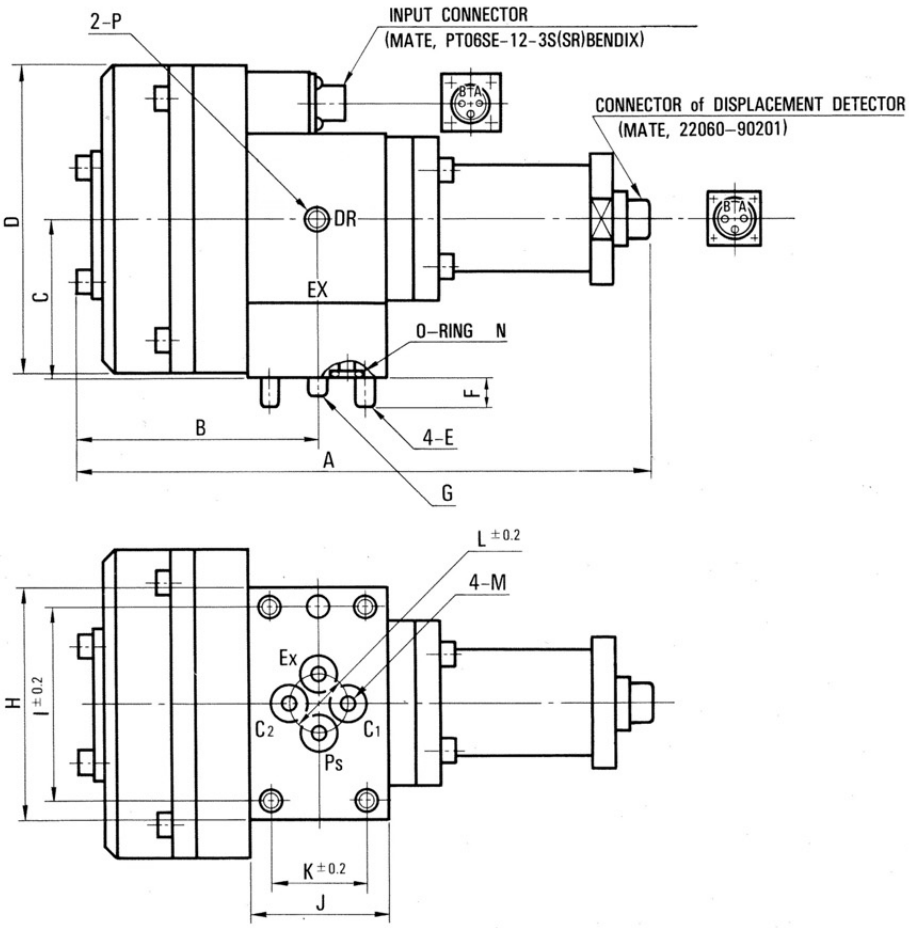
MK-15



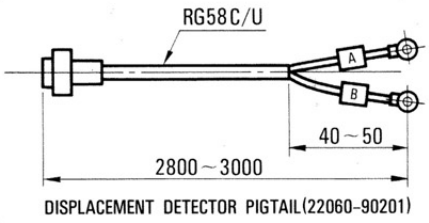

## ■ SPECIFICATIONS

| MODEL | | MK-1.5 | MK-5 | MK15 |
|---|---|---|---|---|
| Rated Flow | (ℓ/min) at 6.87 MPa | 7.8 | 18.9 | 56.7 |
| Rated Input | (A) | 3.5 | | |
| Operating Pressure | (MPa) | 0.3～34.3 | | |
| Supply Proof Pressure | (MPa) | 51.5 | | |
| Return Proof Pressure | (MPa) | 20.6 | | |
| Hysteresis | (%) | ＜3 | | |
| Threshold | (%) | ＜0.5 | | |
| Pressure Gain | (%ΔP/1% Input) | ＞15 | | |
| Null Shift | vs.Supply Pres. (%/3.4 MPa) | ＜1 | | |
| | vs.Fluid Temp. (%/30℃) | ＜2 | | |
| Internal Leakage | (ℓ/min) at 6.87 MPa | 0.8 | | 2.1 |
| Freq. Response (Hz) | Amplitude −3dB | ＞300 | | |
| | Phase Lag 90 deg. | ＞300 | | |
| Mass | (kg) | 10 | | 19 |

## ■ INSTALLATION DIMENSIONS

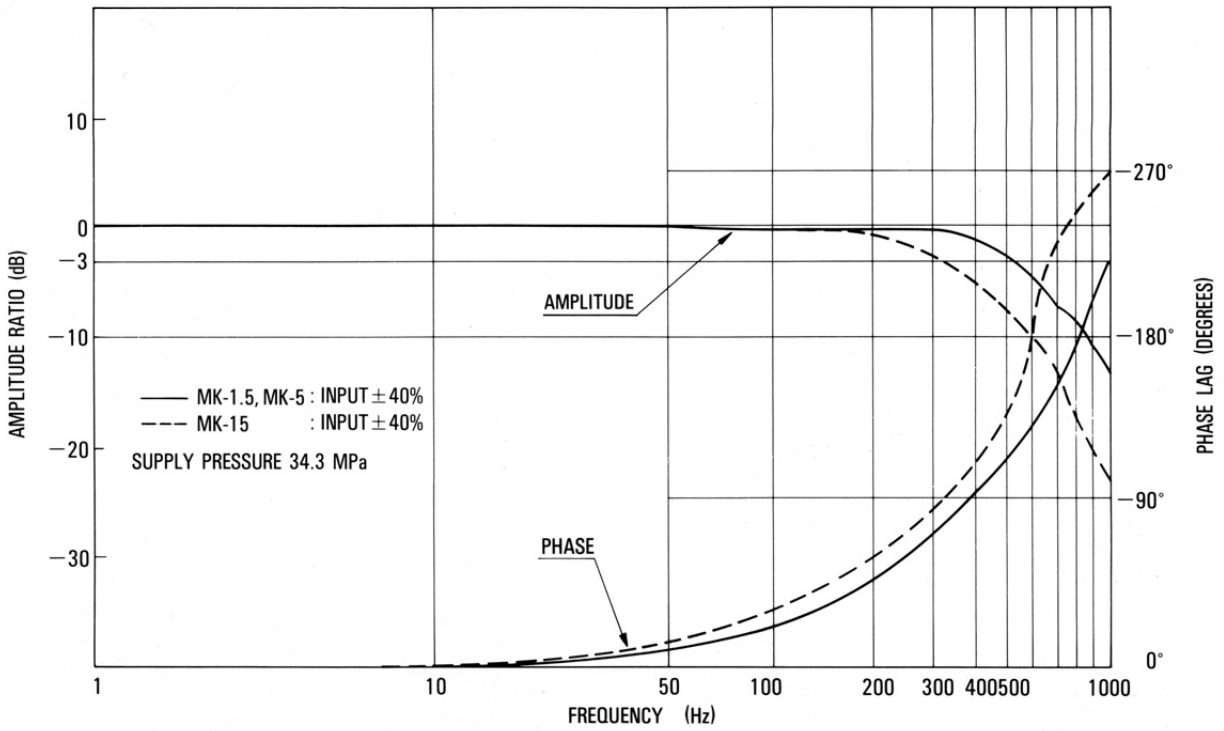



| MARK \ MODEL | MK-1.5/5 | MK-15 |
|---|---|---|
| A | 212 | 282 |
| B | 101 | 140 |
| C | 75 | 83 |
| D | □128 | □156 |
| E | M8×1.25×70L | |
| F | 13 | |
| G | $\phi 8^{0}_{-0.015} \times 7$ | |
| H | 96 | 100 |
| I | 80 | |
| J | 58 | 72 |
| K | 40 | |
| L | $\phi$23.8 | |
| M | $\phi$6 | $\phi$9 |
| N | P11 | |
| P | PT1/8 | |




DISPLACEMENT DETECTOR PIGTAIL(22060-90201)

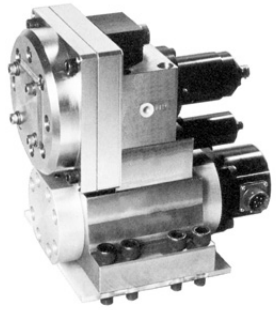
## ■ FREQUENCY RESPONSE



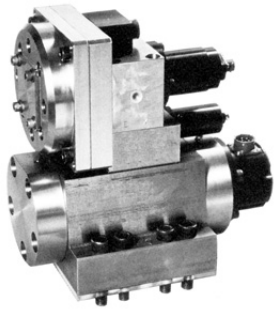
# Two-Stage Direct Drive Servovalves
## (MK-30, MK-40, MK-60, MK-100, MK-200, MK-250)

## ■ OUTLINE

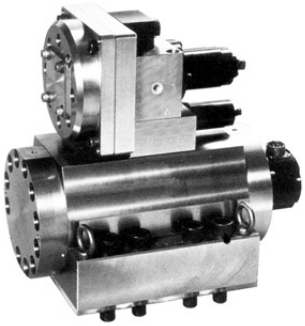
The two stage servovalve is constructed so that the DIRECT DRIVE SERVOVALVE used as a pilot valve, will drive a main spool valve on the downstream side of it. The main spool is moved by a fluid signal from the pilot valve. The main spool valve is also equipped with a displacement detector.



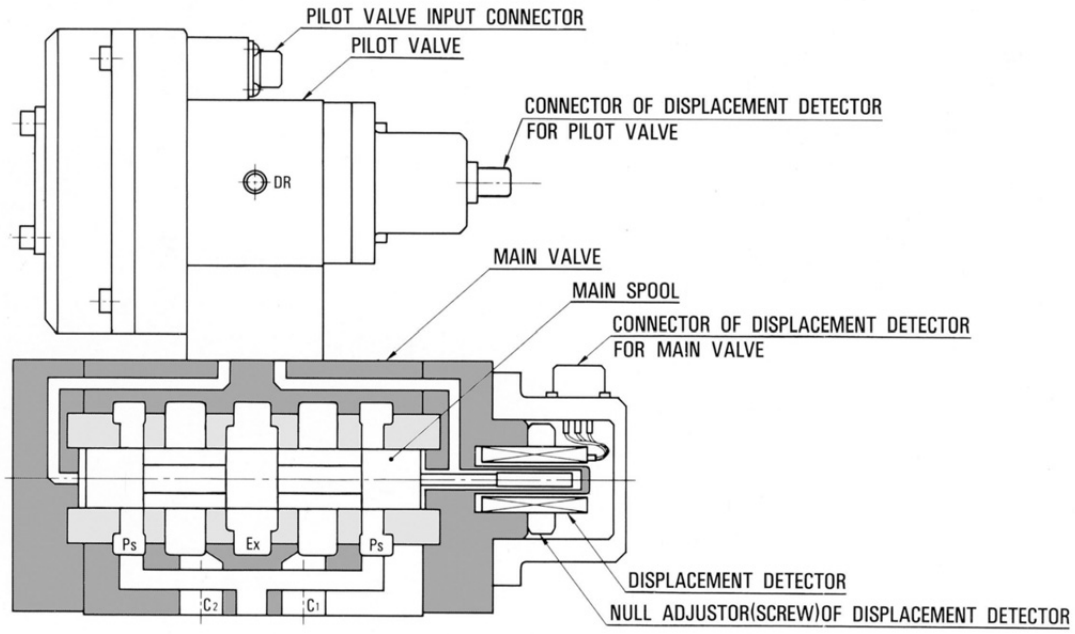
MK-30,MK-40



MK-60,MK-100



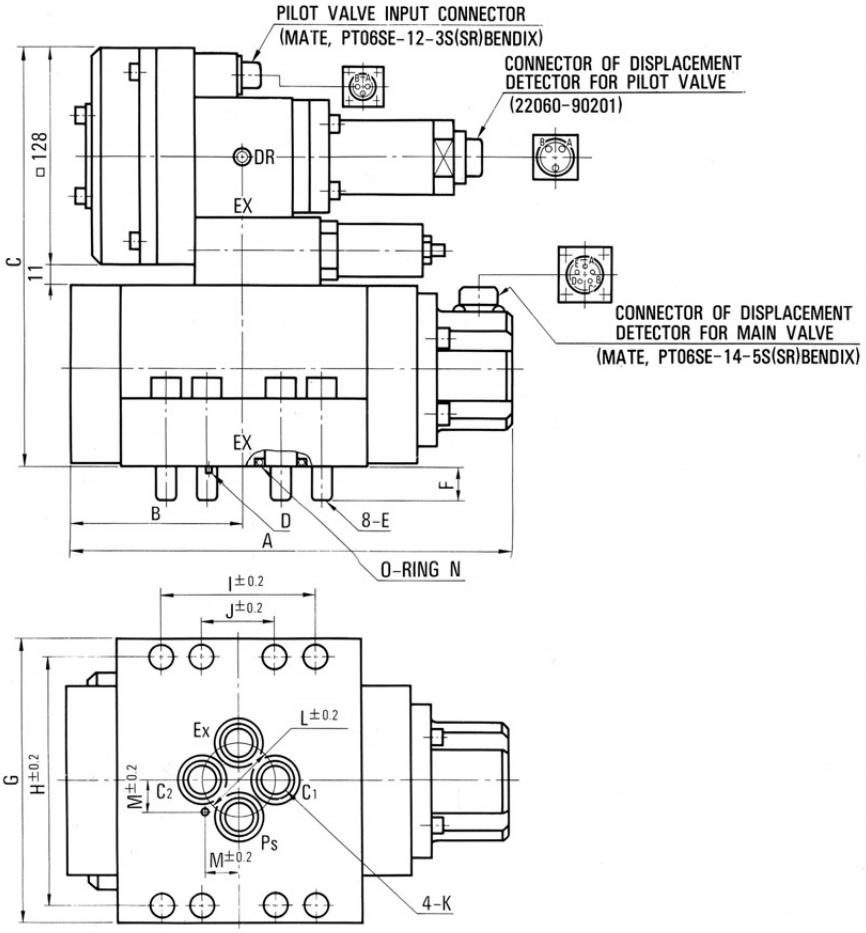
MK-200,MK-250



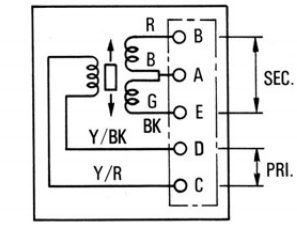

## ■ SPECIFICATIONS

| MODEL | | | MK-30 | MK-40 | MK-60 | MK-100 | MK-200 | MK-250 |
|---|---|---|---|---|---|---|---|---|
| Rated Flow | | ( ℓ / min) at 6.87 MPa | 114 | 151 | 227 | 378 | 756 | 945 |
| Rated Input | | (A) | 3.5 | | | | | |
| Operating Pressure | | (MPa) | 1.3～34.3 | | | | | |
| Supply Proof Pressure | | (MPa) | 51.5 | | | | | |
| Return Proof Pressure | | (MPa) | 20.6 | | | | | |
| Hysteresis | | (%) | ＜1 | | | | ＜0.5 | |
| Threshold | | (%) | ＜0.5 | | | | ＜0.2 | |
| Pressure Gain | | ΔP/1% Input | ＞40 | | | | ＞60 | |
| Null Shift | vs.Supply Pres. (%/3.43 MPa) | | ＜0.5 | | | | | |
| | vs.Fluid Temp. (%/30 ℃) | | ＜3 | | | | | |
| Internal Leakage | | ( ℓ / min) at 6.87 MPa | 3.1 | 3.1 | 4.5 | 4.5 | 8.3 | 8.3 |
| Freq. Response (Hz) | Amplitude −3dB | | ＞200 | ＞200 | ＞200 | ＞100 | ＞100 | ＞100 |
| | Phase Lag 90 deg. | | ＞200 | ＞200 | ＞200 | ＞100 | ＞100 | ＞100 |
| Mass | | (kg) | 22 | 22 | 31 | 31 | 49 | 49 |

## ■ INSTALLATION DIMENSIONS

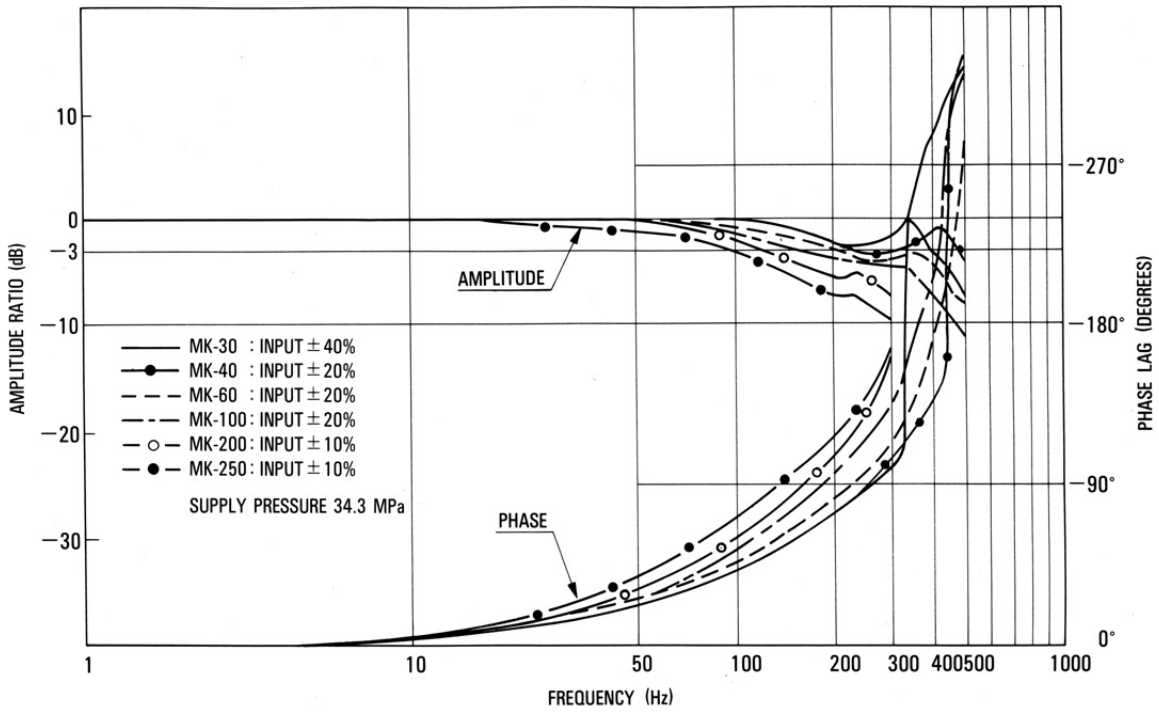



| MARK \ MODEL | MK-30 40 | MK-60 100 | MK-200 250 |
|---|---|---|---|
| A | 220 | 263 | 323 |
| B | 80 | 103 | 133 |
| C | 217 | 246 | 279 |
| D | $\phi 3\times 3^{L}$ | $\phi 3\times 3^{L}$ | $\phi 5\times 3^{L}$ |
| E | M12×1.75×45$^{L}$ | M12×1.75×60$^{L}$ | M16×2×80$^{L}$ |
| F | 18 | 20 | 24 |
| G | 168 | 168 | 200 |
| H | 146 | 146 | 170 |
| I | 92 | 92 | 130 |
| J | 44.4 | 44.4 | 60 |
| K | $\phi 14$ | $\phi 19$ | $\phi 32$ |
| L | $\phi 44.4$ | $\phi 44.4$ | $\phi 76$ |
| M | 20.6 | 20.6 | 38 |
| N | G25 | G25 | G40 |




MAIN VALVE WIRING DIAGRAM

## ■ FREQUENCY RESPONSE



# Servo-Amplifier (MK-G)

## ■ OUTLINE

MK-G is a servo amplifier designed for controlling the DIRECT DRIVE SERVOVALVES. The amplifier consists of seven circuits.

- ＊DC stabilized power source
- ＊Power amplifier circuit
- ＊Pilot valve circuit
- ＊Main valve circuit
- ＊Summing circuit
- ＊Test signal circuit
- ＊Supervising circuit

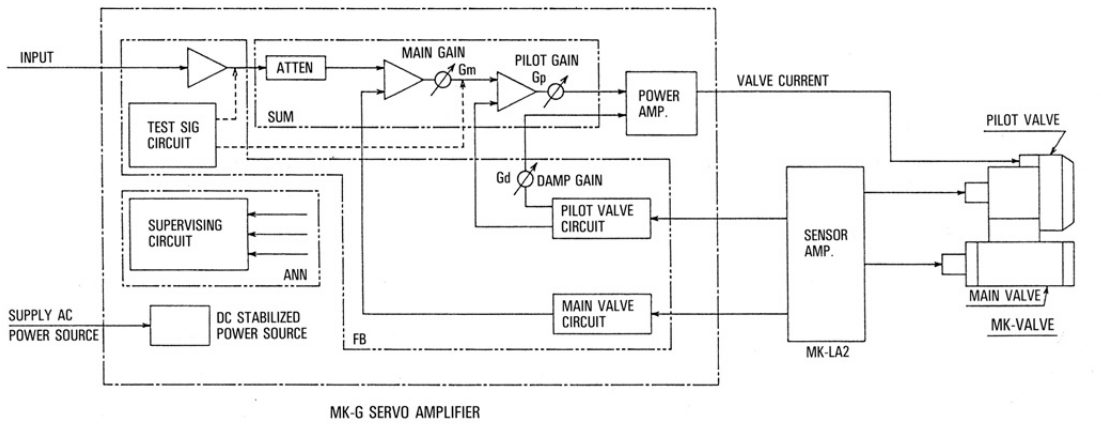
## ■ FEATURES

- The MK-G amplifier has a built-in DC converter; so it can get power directly from AC power source.
- The valve current has good control stability owing to a current control method.
- High response, accuracy and stability can be achieved because the amplifier is composed of circuits suitable for sensors in a direct drive servovalve.
- Easy adjustment and maintenance owing to benefits from an analog meter, a digital meter, adjustment dials and test input signals, and further from monitoring outputs and lighting of LED in abnormal conditions.
- Good anti-noise characteristics owing to current transmission of output signal from the sensor amplifier.

MK-SERVO AMPLIFIER

SENSOR AMPLIFIER

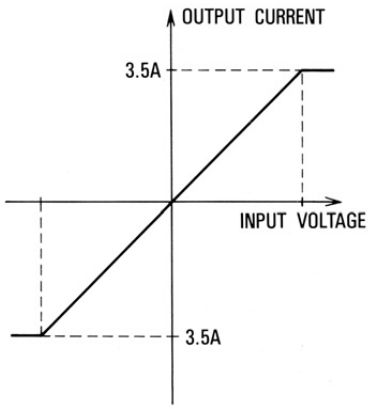
## ■ SYSTEM BLOCK DIAGRAM




## ■ SPECIFICATION

| MODEL | MK-G |
|---|---|
| APPLICABLE FOR MK-VALVE | MK-1.5～MK-250 |
| POWER SUPPLY | AC100V CLASS 50/60Hz : 85～132VAC |
| | AC200V CLASS 50/60Hz : 170～265VAC |
| POWER CONSUMPTION | AC100V CLASS : 500VA（AT FULL LOAD） |
| | AC200V CLASS : 560VA（AT FULL LOAD） |
| OPERATING TEMPERATURE RANGE | 5～45℃ |
| OPERATING HUMIDITY RANGE | 30～85%RH |
| INPUT IMPEDANCE | 40kΩ |
| INPUT SIGNAL VOLTAGE RANGE | −10～＋10V |
| MAXIMUM OUTPUT CURRENT | −3.5～3.5A |
| TEMPERATURE DRIFT | ＜0.1%FS/℃ |
| LINEARITY | ＜1% |
| ACCURACY | ＜1% |
| MASS | 13kg |
| FINISH COATING | MUNSEL2.5Y9/2 |

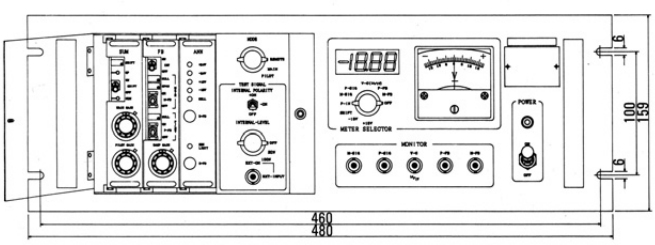
## ■ CHARACTERISTICS

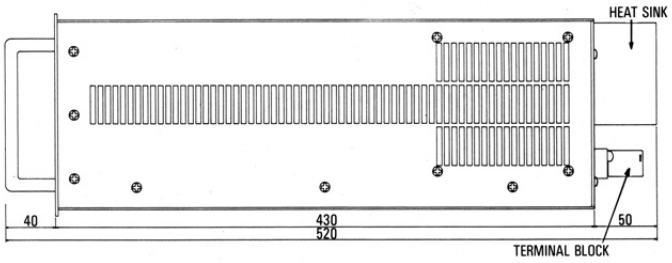



Note: The slope of the above oblique line which shows a proportion of output current to input voltage is variable according to main gain and pilot gain of the summing circuit.

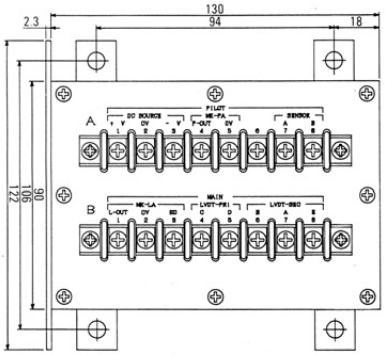
## INSTALLATION DIMENSIONS

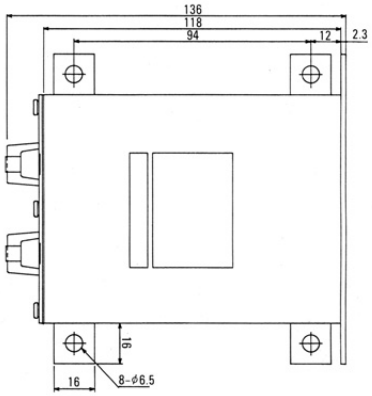
● MK-G SERVO AMPLIFIER




● SENSOR AMPLIFIER

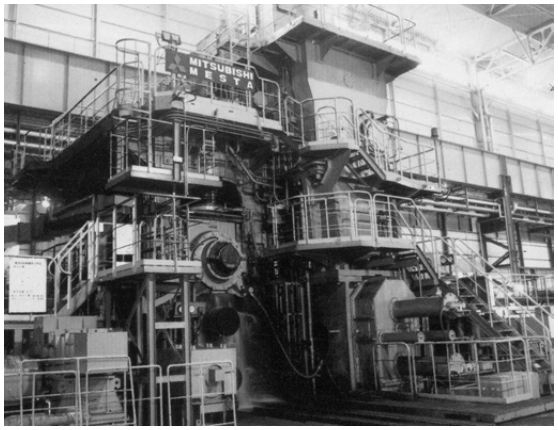


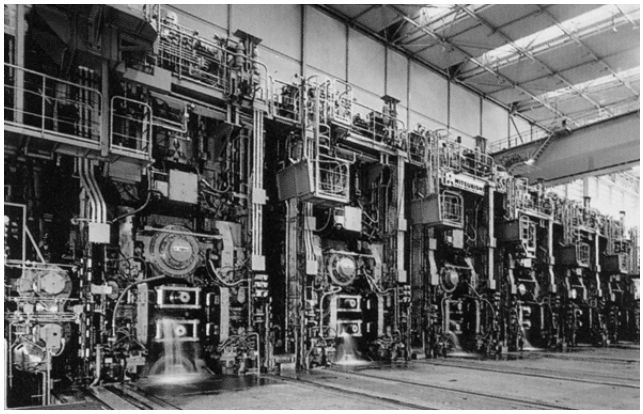

The distinctive features of DIRECT DRIVE SERVOVALVES provide great advantages in the field of rolling mill equipment. In the hot strip mill, as an example, the Electro-Hydraulic Servo System is applied in various control systems of rolling operation such as:

Automatic Width Control at vertical edges
Automatic Gauge and Shape Control at roughing and finishing trains.
Unit roll Position Control at down coiler

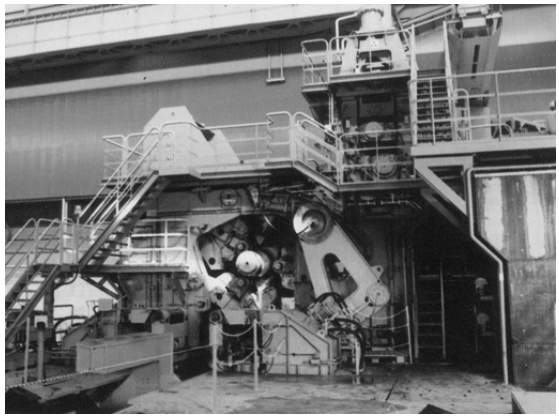
DIRECT DRIVE SERVOVALVES serve these systems to improve the total performance, increase reliability and facilitate maintenance work.



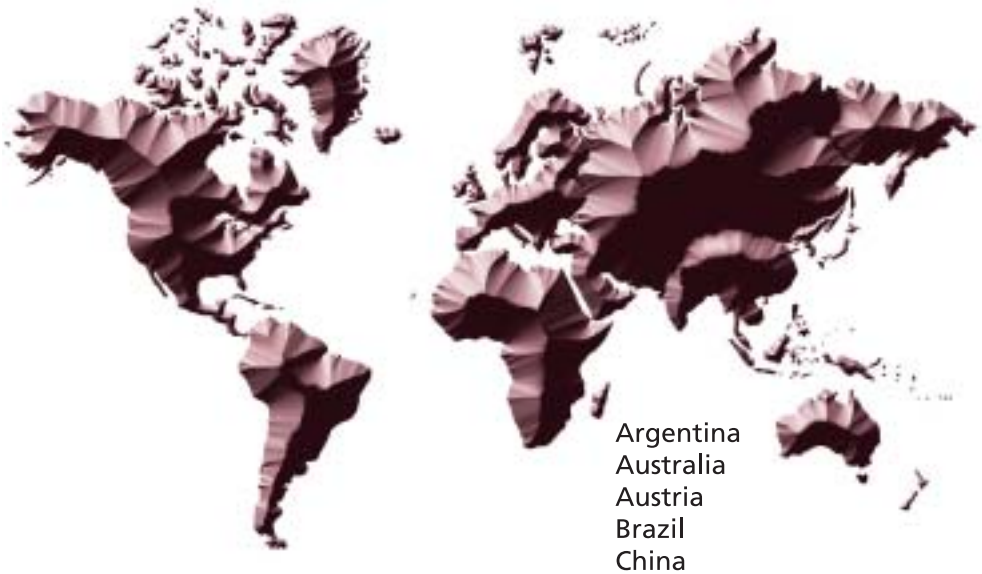

● Automatic Width Control at vertical edges



● Automatic Gauge and Shape Control at roughing and finishing trains



● Unit roll Position Control at down coiler



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MOOG

Moog Japan Ltd.
1-8-37 Nishi Shindo, Hiratsuka
Kanagawa Japan 254-0019
Tel : (0463) 55 3615
Fax: (0463) 54 4709
For the location nearest you, contact
www.moog.com

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