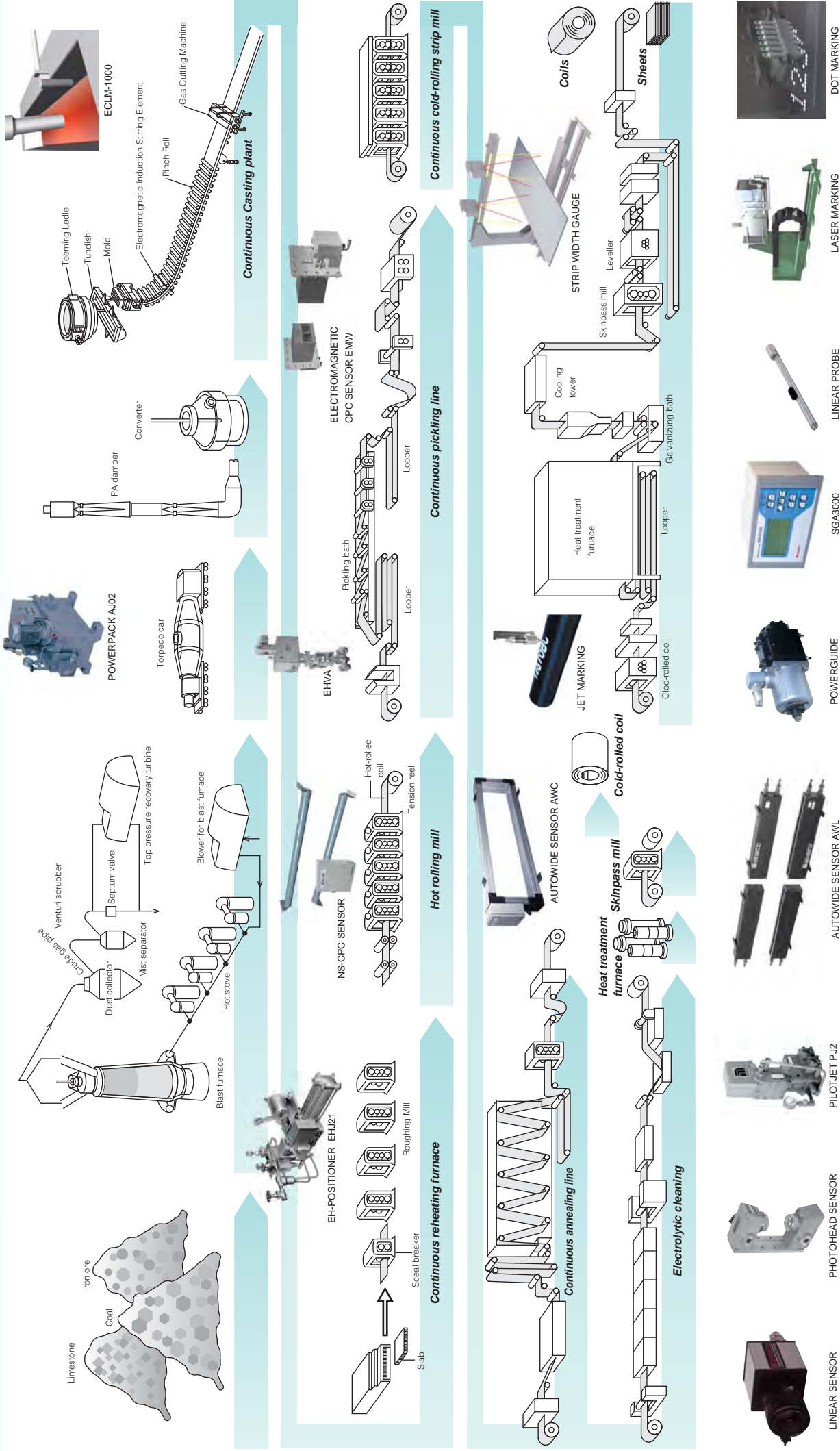




**GENERAL CATALOG  
OF  
STEEL PROCESS  
CONTROLS**

** NIRECO**

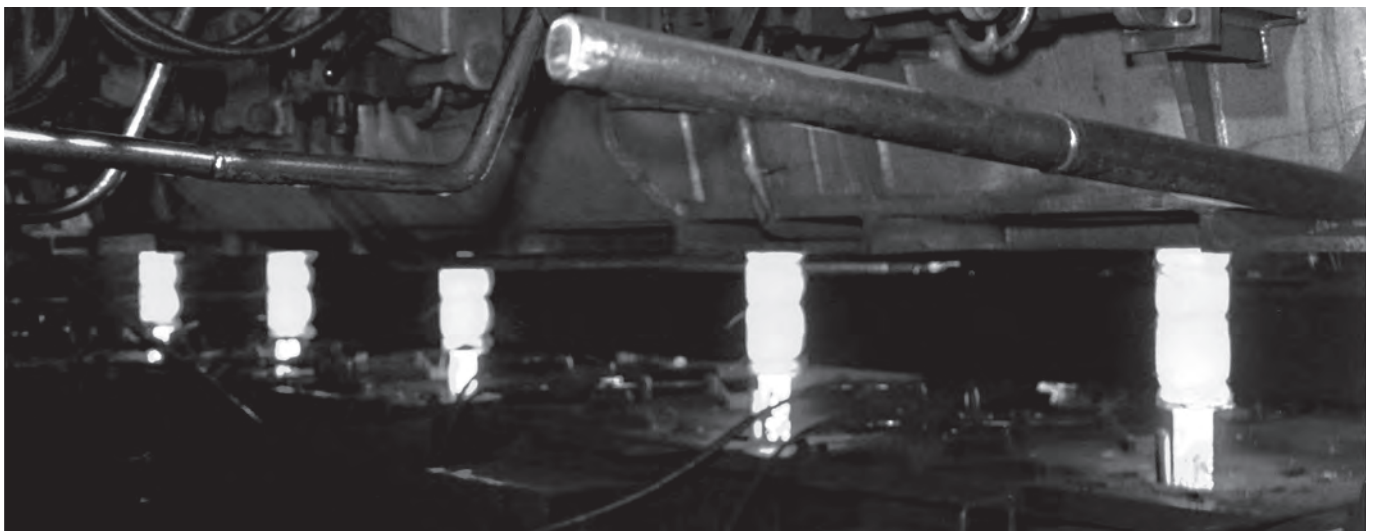
# NIRECO Iron & Steel Processing Map



# STEEL PROCESS CONTROLS

## Iron & Steel Processing Map

Electro-Hydraulic Positioner <b>EH positioner</b> .....	<b>1</b>	LED Autowide Sensor <b>AWL</b> .....	<b>36</b>
POWERPACK <b>AJ02/AJ03</b> .....	<b>5</b>	Position Transmitter <b>FW22/31, FW80</b> .....	<b>39</b>
POWERPACK <b>AJ11, AJ21, AJ41</b> .....	<b>9</b>	High-precision Position Transmitter <b>GYKM-LT</b> .....	<b>42</b>
Electro-Hydraulic Valve Actuator <b>EHVA EJ70</b> .....	<b>13</b>	Strip Guide Amplifier <b>SGA3000</b> .....	<b>43</b>
For Automatic Strip Guiding <b>EPC SYSTEM</b> .....	<b>17</b>	PILOTJET Controller <b>PJ2</b> .....	<b>46</b>
Electromagnetic CPC Sensor <b>EMW</b> .....	<b>23</b>	Industrial Servo Valves <b>Power Guide</b> .....	<b>51</b>
Electromagnetic Guidance <b>NS-CPC Sensor</b> .....	<b>25</b>	For quality assurance of thin strip products STRIP WIDTH GAUGE <b>WGL1000</b> .....	<b>53</b>
Linear Sensor <b>LSE4096</b> .....	<b>27</b>	Eddy-Current Level Meter <b>ECLM-1000</b> .....	<b>55</b>
Photohead <b>PH30, PH31</b> .....	<b>31</b>	Marking System <b>JET / DOT / LASER Marker</b> .....	<b>57</b>
Capacitance Autowide Sensor <b>AWC</b> .....	<b>33</b>		



## ELECTRO-HYDRAULIC POSITIONER

# EH-POSITIONER

## MODEL EHJ21

### INTRODUCTION

The EH positioner is a kind of electro-hydraulic actuator that has the ability to convert direct-current signals (4 - 20 mA DC) from an electronic controller to change the rotational angle of a work cylinder crank arm. It is integrally combined with a crank type work cylinder, and the main body is composed of electro-hydraulic converter and feedback mechanism.

The rotational angle of the crank type work cylinder is 90 degrees, and it is possible to adjust the angle over the whole span of DC input signals from 0 - 90 degrees.

### FEATURES

- Usable as an actuator for various electronic controllers.
- The actuating speed is high and a large actuating force can be obtained because actuation is performed by using hydraulic pressure on reception of an electrical signal.
- Maintenance is easy and reliability is high because of a moving coil system incorporating a hydraulic jet pipe and a stable permanent magnet.
- When installing multiple actuators in one location, it is

lower in cost, smaller in power consumption, and easier in maintenance to use several EH positioners with one hydraulic pump unit, rather than using actuators furnished with individual hydraulic pump units.

■ Since the interior of the jet pipe relay section is pressurized, the hydraulic pump unit can be freely located, either the higher position or lower position from the EH positioner is selectable. Other open type jet pipe controller brands have no such facility.

■ Various safety devices can be mounted.

(1) If the automatic signal becomes ineffective, the EH positioner can be operated by C-valve by manual operation or remote control.

(2) If the hydraulic source is down due to power failure or other trouble, the EH positioner can be driven with the safety device. (ie. accumulator)

(3) In case of emergency, the EH positioner can be run to the safe side, that is either to the open position or to the closed position, and can be fixed in the position.

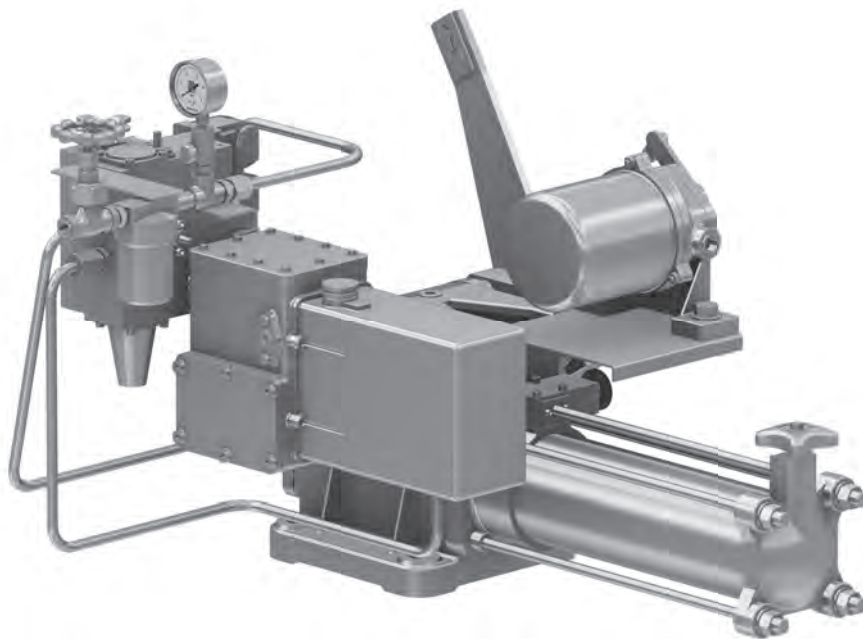


Fig. 1 EH-Positioner

**SPECIFICATIONS**

Input signal ..... 4 - 20 mA DC  
 Moving coil resistance ..... 470Ω(at 25°C)<sup>+0</sup><sub>-50</sub>Ω  
 Control action ..... Proportional action  
 Floating band ..... 15%  
 Hysteresis ..... 1% (without load)  
 Linearity ..... ±2%  
 Jet pipe hydraulic pressure ..... 0.6 - 1.2 MPa  
 Installation position ..... Horizontal  
 Ambient fluid temperature ..... -20° - +60°C  
 Hydraulic fluid temperature ..... +10° - +70°C  
 Color ..... Silver

Table 1 Specifications of EH positioner by work cylinder.

Model number		CY_90K5	CY_130K5	CYH_130K5
Operating torque (at differential pressure 0.1MPa)	N·m	0.595 - 0.9	1.23 - 1.83	1.23 - 1.83
Piston diameter	mm	90	125	125
Piston area	cm <sup>2</sup>	63.5	123	123
Piston stroke	mm	200	212	212
Crank arm rotation		90°	90°	90°
Max.booster pressuer	MPa	1.5	1.5	1.5
Mass.	kg	74	115	235

\* Front accessories aer excluded from the mass. For example, the mass of the C-valve is to be added to the above values in case of the positioner with C-valve.(EHJ alone:10kg)

**REQUIRED OIL FLOW (Hydraulic pump flow rate)**

The required oil flow for one EH positioner is determined by reference to the jet pipe bore of 2.0 mm in Table 2 where only the jet pipe is used.

Where a booster is attached, the required flow is the sum of the amount for jet pipe bore of 1.6 mm in Table 2 and the value determined from fig.2.

Table 2 Jet pipe flow

Hydraulic supply	MPa	6	12
Jet pipe bore	1.6mm	3.5ℓ/min	-
	2.0mm	5.5ℓ/min	8ℓ/min

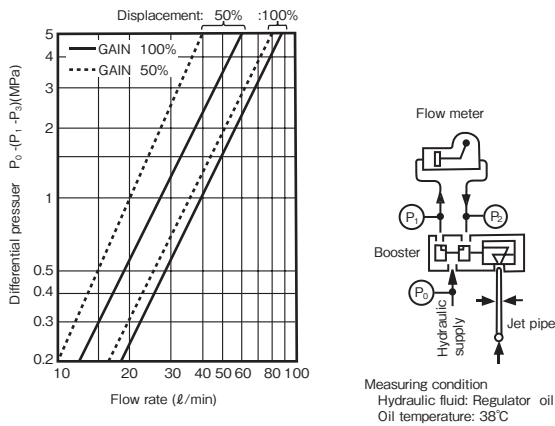


Fig. 2 Flow characteristic of C valve with booster

**MODEL NUMBER**

EHJ21	MODEL	2	4 - 20mA DC	Input signal
-------	-------	---	-------------	--------------

FO	OPEN (Port 1)	*Forward action		Action	
FG	CLOSE (Port 2)				
RO	OPEN (Port 1)	*Reverse action		Action	
RC	CLOSE (Port 2)				
1	CV1.A54SM1	With distributor brock	FO,RC	C valve	
2	CV1.A54SM2		FC,RO		
3	CV2.A54SM1	Less than 3MPa With distributor brock and booster	FO,RC		
4	CV2.A54SM2		FO,RC		
5	CV2.A54SH1	Less than 5MPa	FO,RC		
6	CV2.A54SH2		FC,RO		
N	None			Remote control	
★	Provided with solenoid valve			Additional equipment	
N	Less than 1.2MPa	-	-		-
1		-	-		ACC
2		MN3	HP		-
3	MN3	HP	ACC		
4	Over than 1.2MPa Under 5MPa	MN2	-		-
5		MN1	-		ACC
6		MN1	HP		-
7		MN1	HP	ACC	
1	Over 0.6 and under 1MPa	FH9MJ.G1		Hydraulic supply	
2	Over 1 and under 2MPa	FH9MF.G1			
3	Over 2 and under 5MPa	FH9ME.G2			

3	CY90K5	Piston Ø90 1.5MPa	Work cylinder
4	CY130K5	Piston Ø125 1.5MPa	
5	CYH130K5	Piston Ø125 5MPa	
0	None		Crank arm
1	Clank arm(Standard setting)		
N	None		Additional equipment
3	FM2C.01 □ - LS0	Synchro type position transmitter	
4	FM2C.01 □ - LS2	Synchro type position transmitter	
5	FM2C.11 □ - LS0	Synchro type position transmitter	
6	FM2C.11 □ - LS2	Synchro type position transmitter	
7	FPC - LS0	Potential type position transmitter	
8	FPE - LS2	Potential type position transmitter	
9	LSE. 2	Limit switch	
10	LSE. 3	Limit switch	

0	Except synchro type		Synchro power supply voltage
1	100V AC 50/60Hz , 220V AC 50/60Hz		
2	200V AC 50/60Hz , 220V AC 50/60Hz		

Y	Item to be designated specially shall be marked with "Y" and itemized.	
---	--	--

Note 1: \* Forward action . . . Crank arm rotates counterclockwise at Input signal increase to open valve.(coil terminal ①→②)  
 \* Reverse action. . . Crank arm rotates clockwise at input signal increase to open valve.(Coil terminal ②→①)  
 2: ★ Symbol of the soleoid valve.

## OPERATING PRINCIPLE

The operating principle of the EH positioner is shown in Fig. 3. As shown in the illustration, the moving coil is situated within a magnetic field, and the jet pipe relay is connected through a lever. Therefore, when a current signal is applied into the moving coil, the coil moves, the lever is displaced about the seal diaphragm, and the jet pipe moves. The jet pipe injects oil toward two adjacent orifices (distributor block). The orifices connect with their respective ends of the work cylinder.

When the jet pipe is located in the middle of these two orifices, the pressure is equalized at both ends of the cylinder, and the piston stands still in this position. When the input current signal varies from this balanced position, for example, When the moving coil moves upward, the

jet pipe injects oil toward the lower orifice. As a result, the piston moves, and the crankshaft rotates counterclockwise. This rotation moves the feedback lever, and the jet pipe is moved back to the central position by the feedback spring. Therefore, the piston stops at this position.

Since the electrical current and the force generated by the moving coil are proportional to each other and the cam has linear characteristics, the rotational angle of crank arm becomes proportional to the compression of the feedback spring. In other words, the crank arm rotational angle is proportional to the input electrical current.

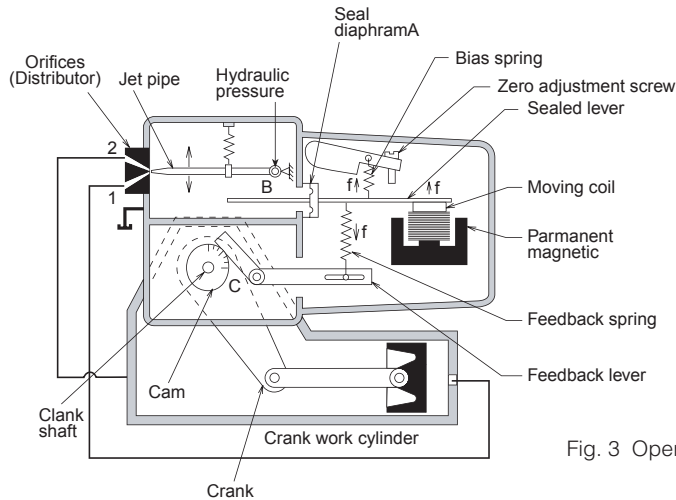


Fig. 3 Operating principle(1)

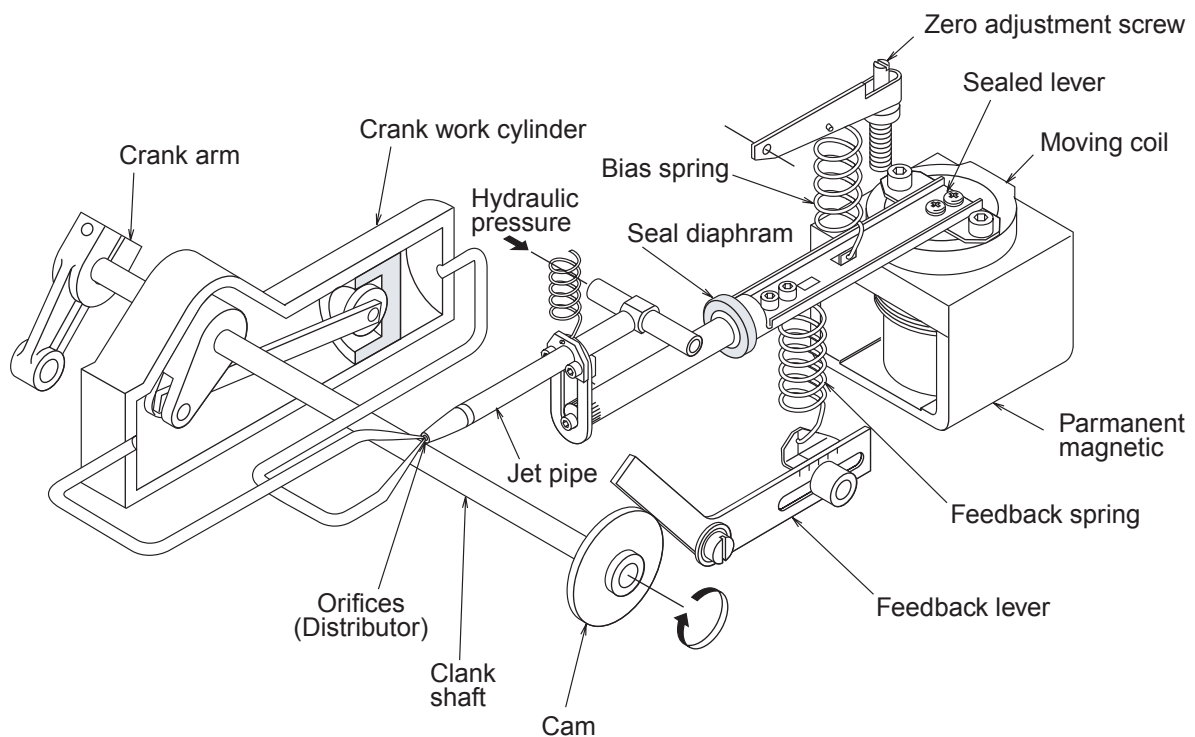


Fig. 4 Operating principle(2)

**DIMENSIONS**

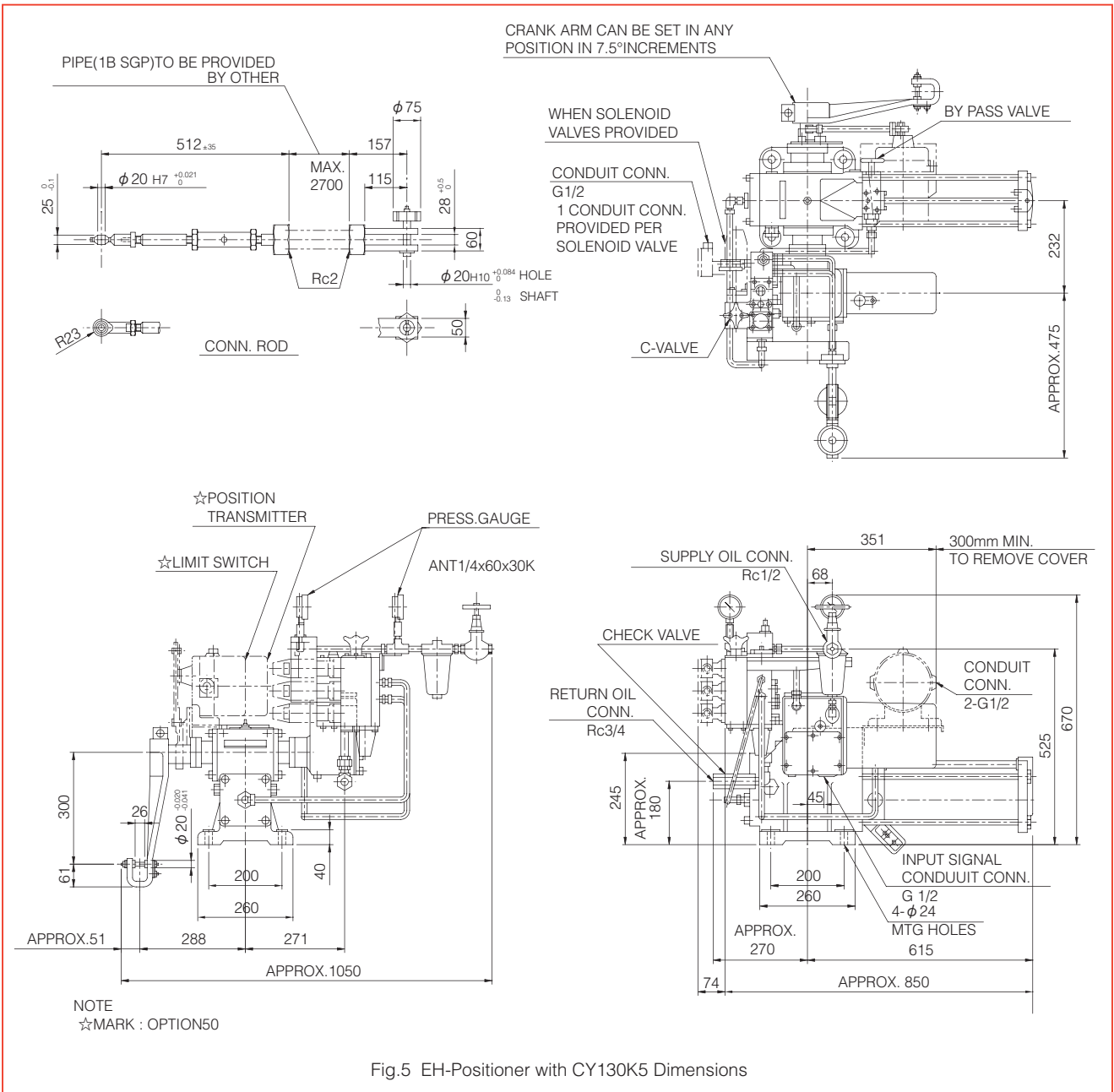


Fig.5 EH-Positioner with CY130K5 Dimensions

# POWERPACK

## MODEL AJ02/AJ03

### INTRODUCTION

The Powerpack is an electro-hydraulic actuator which converts DC signals (4 - 20 mA) into movements of a hydraulic work cylinder. A proportional positioning system is used to change the position of the work cylinder in proportion to electric signals.

The Powerpack is an ideal actuator for use in garbage incineration plants, sewage treatment plants, etc. Because its output shaft rotates, it is suitable for final control elements such as a butterfly valve.

### FEATURES

- High-speed, high-power operation can be obtained by hydraulic pressure converted from electric signals.
- Because a hydraulic servo valve is used in the control element, high response and easy maintenance assure high reliability.
- An electric feedback system is used.
- A power supply is required only for the motor. No power supply is needed for the amplifier because a transformer is incorporated.
- Manual local operation is available by changing over the switch.
- Opening output signals (4 - 20 mA) are available as standard.
- No oil leaks from joints because work cylinder and control elements are incorporated in the oil reservoir.
- No external piping is needed.
- Safety functions are provided.

The crank arm moves in the safety direction when input signals are abnormal (excessively low or high input) or the wiring of the feedback potentiometer is broken. The direction for safe movement can be changed as required.

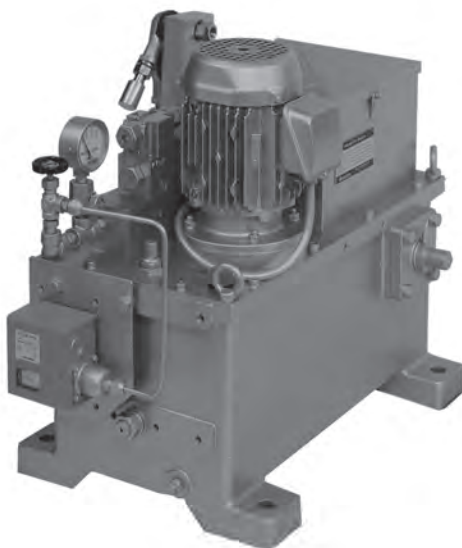


Fig.1 Powerpack AJ02

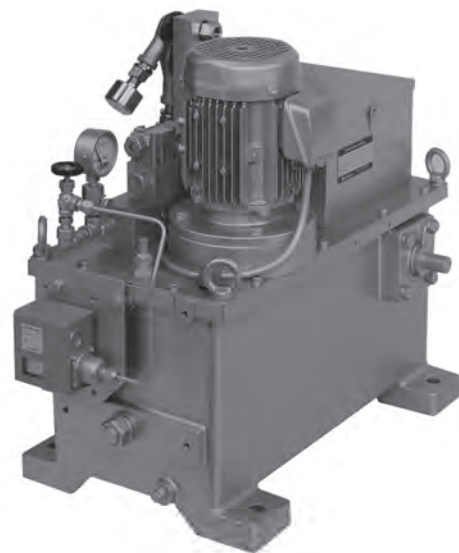


Fig.2 Powerpack AJ03



**SPECIFICATIONS / MODEL CODES**

**Specifications by model**

Model		AJ02	AJ03
Operating torque kN-m	Max	1.2 *	2.4
	Min	0.9 *	1.8
Maximum no-load speed (standard setting)	%/sec	4 - 5	3 - 4
Hydraulic pressure	MPa	2	2.2
Cylinder bore X stroke	mm	Ø80 X 120	Ø100 X 140
Length of crank arm	mm	250	300
Motor (3Ø, 4P)		0.4kW 3Ø 4P	0.75kW 3Ø 4P
Oil required	ℓ	18(21 for ACC)	28.5(35 for ACC)
Mass (excl. hydraulic fluid)	kg	115	150

Notes 1 : No explosion-proof specifications are available.  
 2 : The operating torque values are for 2.0 MPa in AJ02, and 22 MPa in AJ03.

**Common Specifications**

Input signal ..... 4 - 20mA DC  
 Input resistance ..... 250Ω  
 Opening output signal ..... 4 - 20mA DC (max. load 250Ω)  
 Control action ..... Proportional action  
 Operating direction ..... Can be changed to any direction  
 Linearity ..... 2%  
 Hysteresis error (no load) ..... 2%  
 Temperature drift ..... 5% (0 - 60°C)  
 Maximum crank rotation ..... 60°  
 Installation ..... Horizontal  
 Ambient temperature ..... -10 - +50°C  
 Temperature range of hydraulic fluid ..... +10 - +50°C  
 Paint ..... Silver  
 Manual operation function ..... AUTO/MAN,OPEN/CLOSE

**Model Code**

Type	02	AJ02	0.4kW	Model
	03	AJ03	0.75kW	

L	Normal arm	Crank arm
	Reverse arm	
F	Crank arm turns CCW when input signal increases.	Operation
	Crank arm turns CW when input signal increases.	
N	None	Accumulator (ACC)
	Provided (Crank arm turns CCW by ACC operation.)	
B	Provided (Crank arm turns CW by ACC operation.)	Manual operation switch
	Provided (Crank arm turns CCW when OPEN is selected.)	
1	Crank arm turns CCW when an error occurs.	Input signal or Feedback signal errors
	Crank arm turns CW when an error occurs.	
N	None	Valve opening signal
	Provided (Signal increases when crank arm turns CCW.)	
D	Provided (Signal decreases when crank arm turns CCW.)	

E1	Indoor type	Motor and control element case
	Outdoor type	
1	Indoor type	Control section
	Outdoor type	
1	200V 50/60Hz	Power supply
	200V 60Hz	
	400V 50/60Hz	
	440V 60Hz	
N	None	Pressure switch
	SPS-K225 (indoor type) provided	
	SPS-K225WQ (Class 3 water spray-proof) provided	
N	None	Limit switch
	1A 1(for counter-clockwise crank arm end position)	
	1B 1(for clockwise crank arm end position)	
2	Two switches provided	Manual operation lever
	None	
1	Provided	Power box for solenoid valves
	None	
N	None	Power box for solenoid valves
	Indoor type	
2	Outdoor type	

Y	Special specifications (described in detail)
---	--

CW : clockwise    CCW : counterclockwise

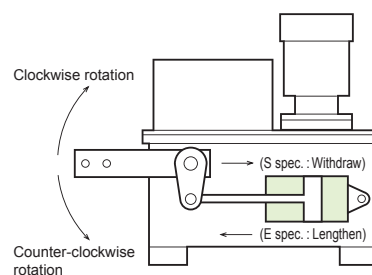
- Note 1. Input signal 4 - 20 mA  
 Valve degree-of-opening meter signal 4 - 20 mA (Fully closed to fully open)
- Note 2. "Signal faults" are defined as follows.  
 (1) Input signal too small (3.5 mA or less)  
 (2) Input signal too large (21 mA or more)  
 (3) Feedback signal loss
- Note 3. The standard settings for the pressure switch are as follows.  
 0.2 MPa  
 \* The range of pressure adjustment is from 0.05 - 0.6 MPa.  
 Select the outdoor settings even when using the pressure switch indoors.
- Note 4. Parts selection table when the accumulator (ACC) is used

	Operation by the ACC	Part to be selected
Forward arm (L)	Counterclockwise direction (A)	S specifications
	Clockwise direction (B)	E specifications
Forward arm (S)	Counterclockwise direction (A)	E specifications
	Clockwise direction (B)	S specifications

- Note 5. The direction the crank arm turns is the direction as viewed from the crank arm side.
- Note 6. ★ The following is an example of the kind of power box that is used for the solenoid valve. This is used when there are two systems supplying the power.

Example: 400 / 400 V and 100 V  
 Control element power supply  
 The power is reduced to 200-200 V by the power box, and then supplied to the solenoid valve.

- Note 7. The standard insulation class of electric motors is Class E.



**STRUCTURE**

The hydraulic unit of the Powerpack consists of a current-hydraulic converter (servo valve), hydraulic pump, and work cylinder. The compact cast-iron reservoir incorporates a work cylinder, pump, crank, and feedback mechanism, and it needs no external piping.

An amplifier and an AUTO/MAN switch are provided inside the box on the reservoir to simplify operation at the site.

Fig.3 and Fig.4 are a hydraulic circuit diagram and a structural diagram of the Powerpack, respectively. As shown in the figures, pressure oil from the hydraulic pump is introduced into the oil pressure gauge and the filter, and is supplied to the servo valve.

When electric current is applied to the moving coil, it moves, and the spool valve directly coupled with the moving coil also moves.

The oil is sent from port 1 or 2 to move the piston of the work cylinder and to rotate the crank shaft.

This moves the wire of the feedback mechanism directly, rotates the potentiometer via a pulley, and inputs a feedback signal into the amplifier.

The input signal and the feedback signal are operated in the amplifier. When a desired value is reached, the output signal becomes 0 mA, and the spool valve is balanced and stopped at the desired position.

The current signal is proportional to the force generated by the moving coil, and the rotating angle of the crank arm is proportional to the signal of the potentiometer. Therefore, the input current signal is proportional to the rotating angle of crank arm.

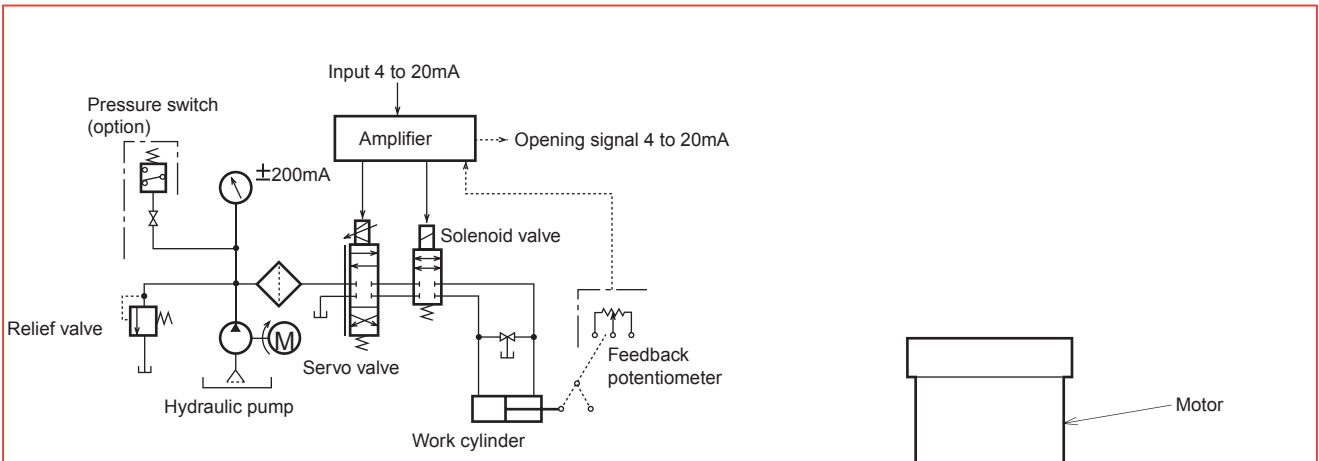


Fig.3 Hydraulic Circuit Diagram of Powerpack AJ02/AJ03

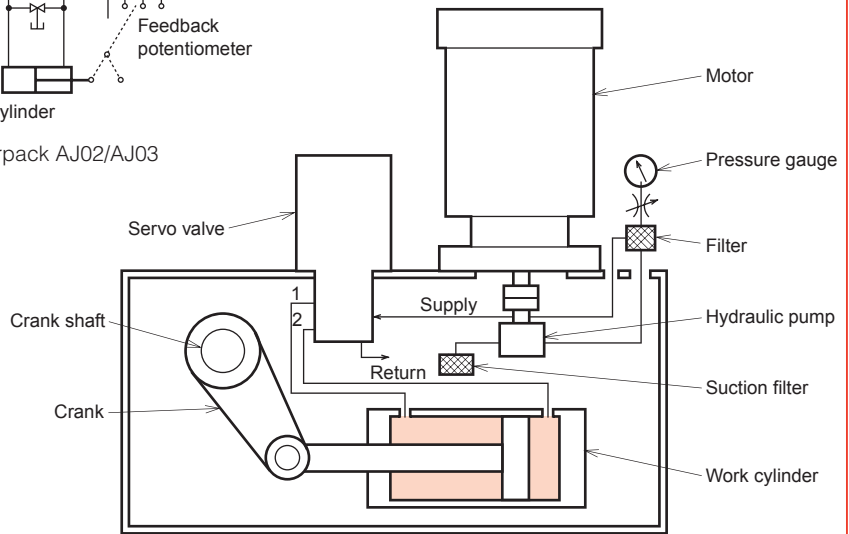


Fig.4 Structural Diagram of Powerpack AJ02/AJ03

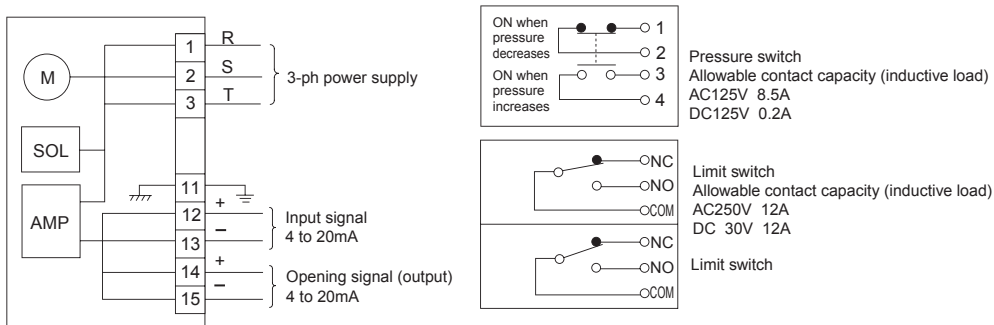


Fig.5 Wiring Diagram

EXTERNAL DIMENSIONS

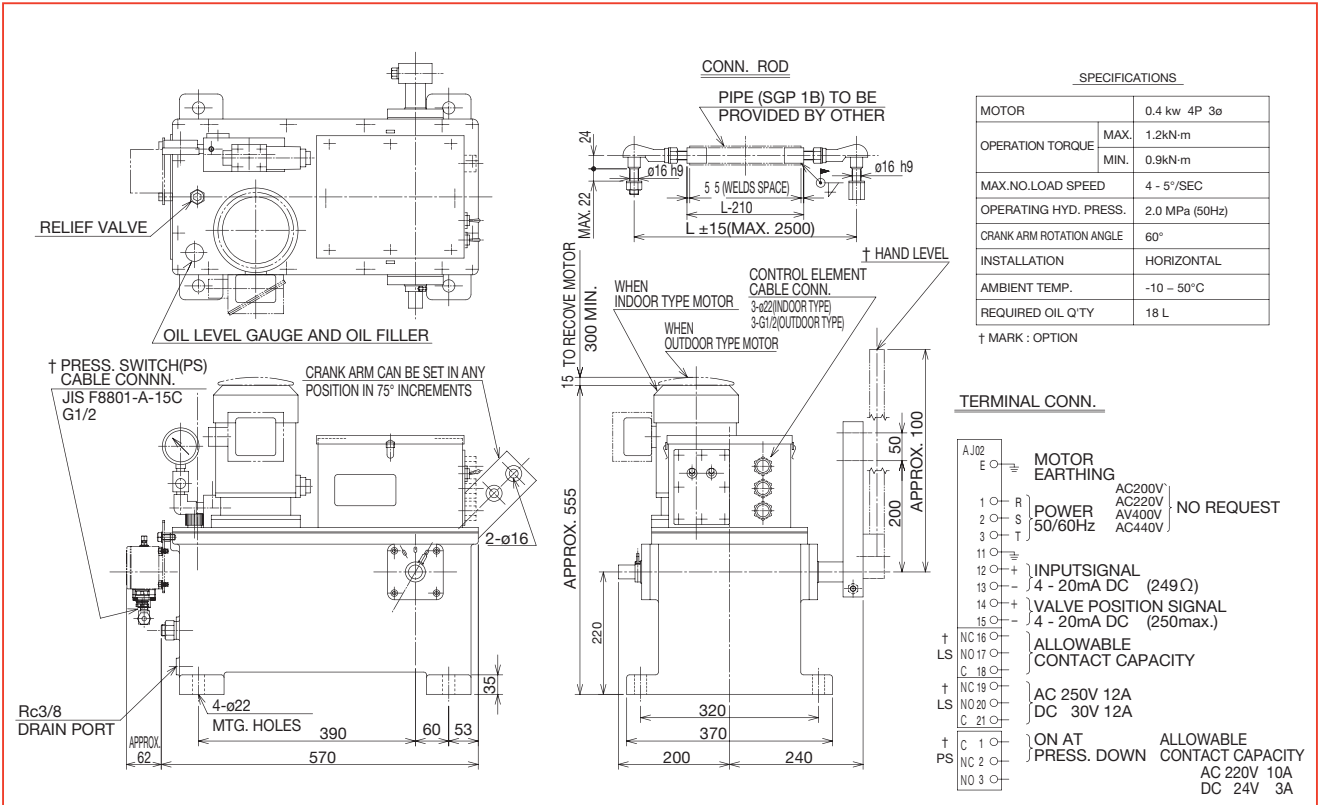


Fig.6 POWERPACK AJ02  
POWER : 200/220V, 400/440V, 50/60Hz  
Dwg.No. : AD1900.3

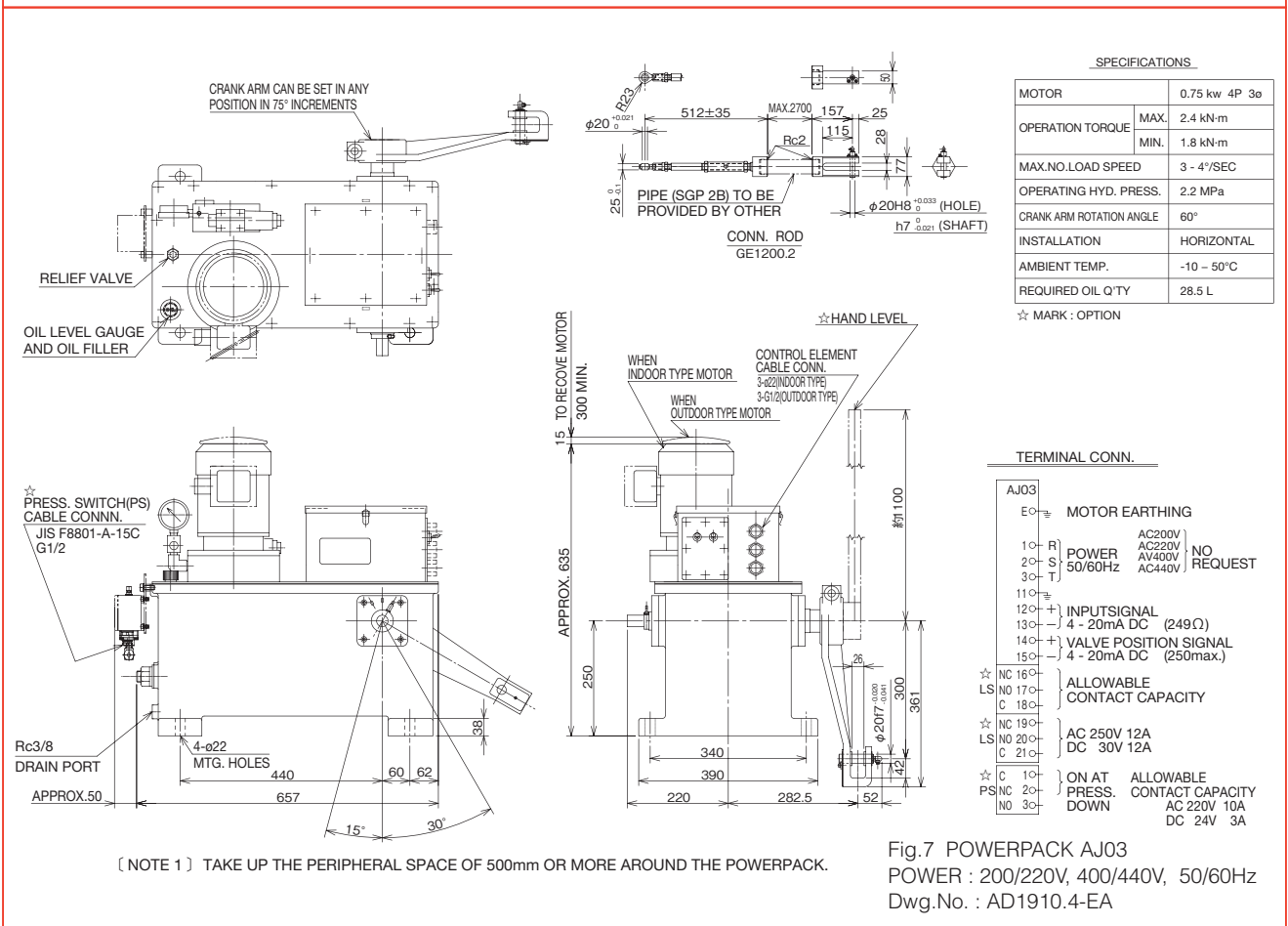


Fig.7 POWERPACK AJ03  
POWER : 200/220V, 400/440V, 50/60Hz  
Dwg.No. : AD1910.4-EA

# POWERPACK

## MODEL AJ11, AJ21, AJ41

The Powerpack is an actuator that controls a load such as a valve. As its output shaft performs rotary motions it is suitable for controlling a final control element of rotary type such as a butterfly valve.

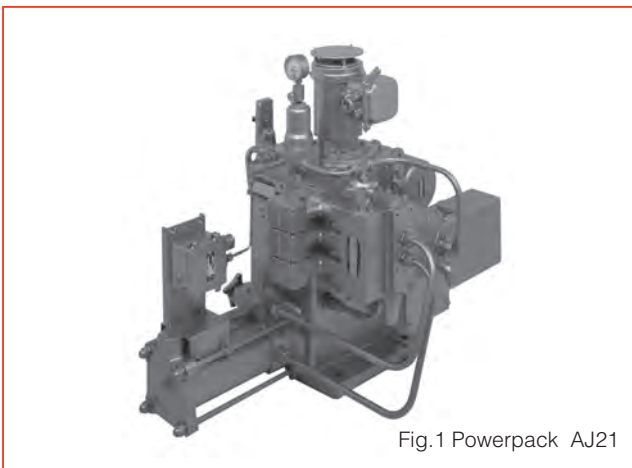
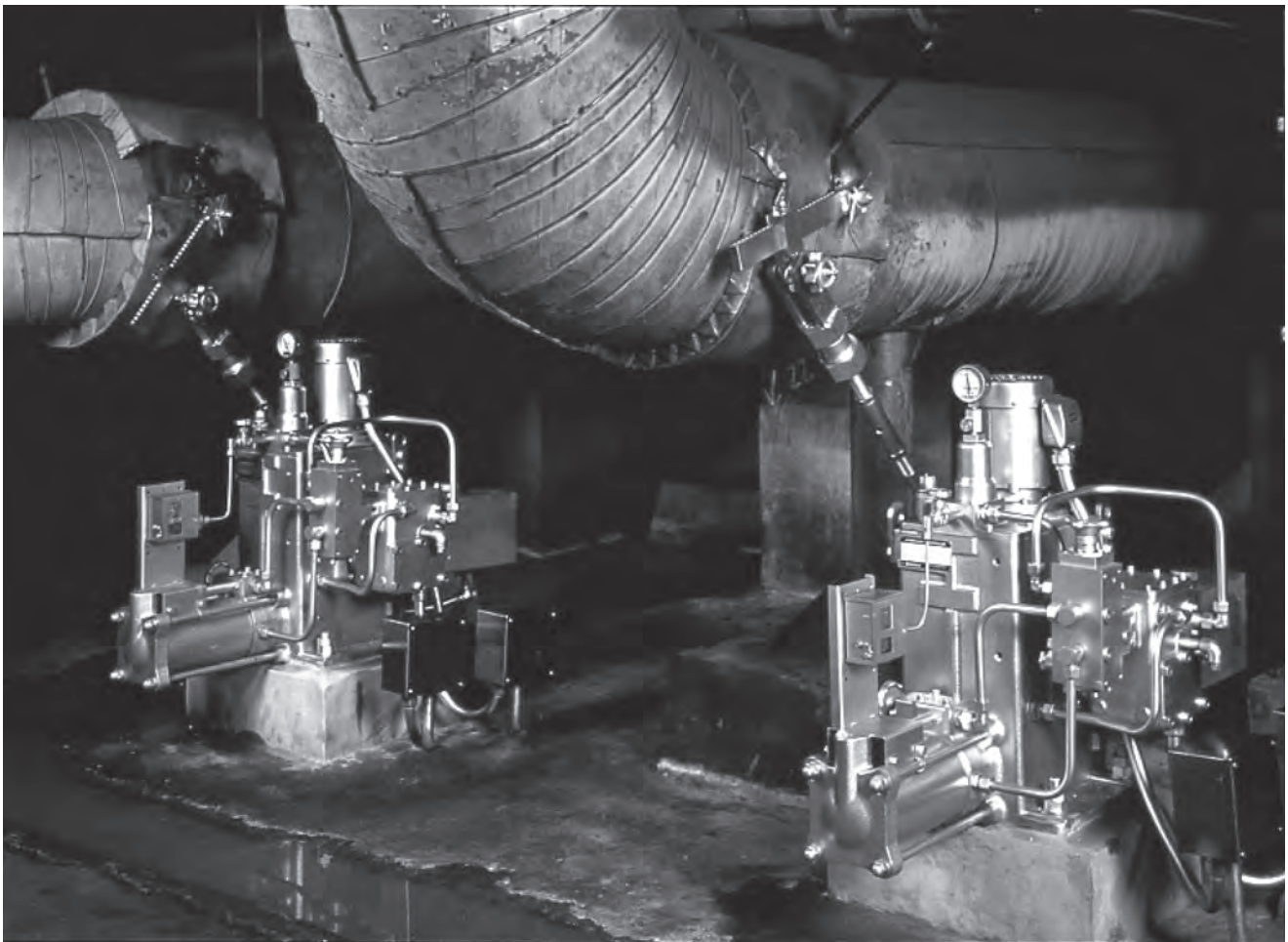


Fig.1 Powerpack AJ21

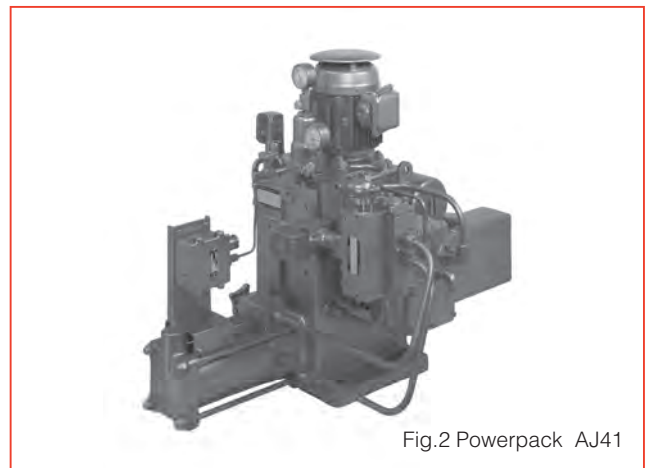


Fig.2 Powerpack AJ41

## INTRODUCTION

The Powerpack is a kind of an electro-hydraulic actuator. It is of the proportional positioning type and has a hydraulic work piston that is proportional to the electrical system, with the function of converting a DC electrical signal (DC 4-20mA) into a motion of the hydraulic work piston. The Powerpack is of a structure that unitizes the current-hydraulic pressure converter unit, the hydraulic pump and the work cylinder, and it does not require external piping.

## FEATURES

- Usable as an actuator for various electronic controllers.
- The actuating speed is high and a large actuating force can be obtained because actuation is performed by using hydraulic pressure on reception of an electrical signal.
- Maintenance is easy and reliability is high because of a moving coil system incorporating a hydraulic jet pipe and a stable permanent magnet.
- As the casing serves as an oil tank and all parts are contained in the interior, no external piping is required.

## SPECIFICATIONS

### General specifications

Input signal ..... 4 - 20mA DC  
 Resistance of moving coil ..... 470Ω+0Ω/-50Ω(at25°C)  
 Floating band ..... 1.5%  
 Linearity ..... ±2%  
 Maximum crank arm rotation ..... 60 degrees  
 Length of crank arm ..... 300mm  
 Control action ..... Proportional action  
 Operating direction  
 Normal: Crank arm turns counterclockwise with input signal up.  
 Reverse: Crank arm turns clockwise with input signal up.  
 Installation ..... Horizontal  
 Hydraulic oil temperature ..... +10 - +70°C  
 Paint color ..... Silver

### Specifications by model

Model		AJ11		AJ21	AJ41
		50HZ	60HZ		
Motor	kW	0.4		0.75	1.5
Max. Operating torque kN-m	Max	1.42	1.71	2.15	4.12
	Min	1.02	1.23	1.53	2.95
Max. speed with no load	degree /sec	2.4		7	8.5
Max. operating pressure	MPa	1	1.2	1.2	2.3
Jet pipe hydraulic pressure	MPa	1	1.2	1.2	0.8
Diameter of jet pip	mm	2.0		1.6	1.6
Auxiliary piston		None		With CV2	With CV2
Cylinder dia.x stroke	mm	Ø125x150		Ø125x150	Ø125x150
Hystresis error (no load)	%	1		1	1
Overshooting (no load)	%	1		1	1
Amount of oil required	ℓ	27(w/ACC:34)		27(w/ACC:34)	27(w/ACC:34)
Hydraulic pump type		Fixed		Fixed	Variable
Rotating direction of motor		Revers		Revers	Normal
Ambient temperature	°C	-20 - +55		-20 - +55	-20 - +60
Mass. (including hydraulic oil)	kg	175		180	195

## COMPOSITION AND OPERATING PRINCIPLE

The Powerpack consists of an electro-hydraulic converter, a hydraulic unit, a crank unit and a work cylinder. All of these components are installed in an oil tank made of cast iron.

Fig. 1 shows the structure and operating principle of the Powerpack. The oil under pressure from the hydraulic pump is directed to the jet pipe.

The moving coil is located in a magnetic field and is connected to the jet pipe relay through a lever. When a current signal enters the moving coil, therefore, the coil moves and the lever rotates with the seal film as the pivot and thus causes the jet pipe to rotate.

The jet pipe injects oil toward two adjacent orifices. Each of these orifices is connected to one side of the work cylinder.

The pressures applied to both ends of the cylinder are equal when the jet pipe is located in the center position between these two orifices and the piston is still in this position. When the input current signal changes in this equilibrium position, and if the moving coil moves upward, for instance, the jet pipe injects oil toward the orifice located on the lower side.

Accordingly, the piston is caused to move and the crank shaft rotates counterclockwise. This rotation of the crank shaft is directly transmitted to the cam, the cam causes the return lever to move, and the jet pipe is caused to return to the center position by the feedback spring.

Therefore, the piston remains in this position.

As the force generated by the moving coil is proportional to the current and the cam has a linear characteristic, the turning angle of the crank arm and the feedback spring compression rate are proportional each other. In other words, the turning angle of the crank arm is proportional to the input current.

# POWERPACK MODEL AJ11, AJ21, AJ41

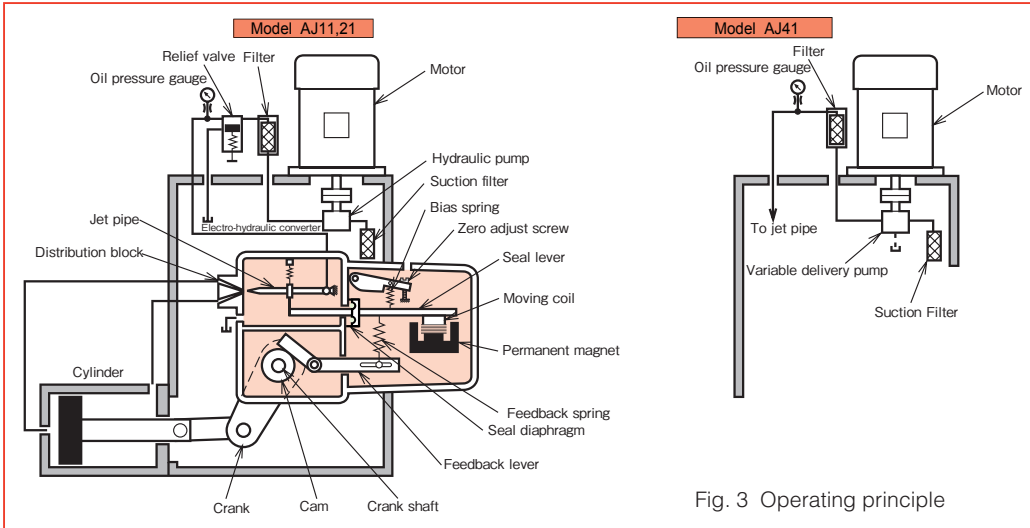


Fig. 3 Operating principle

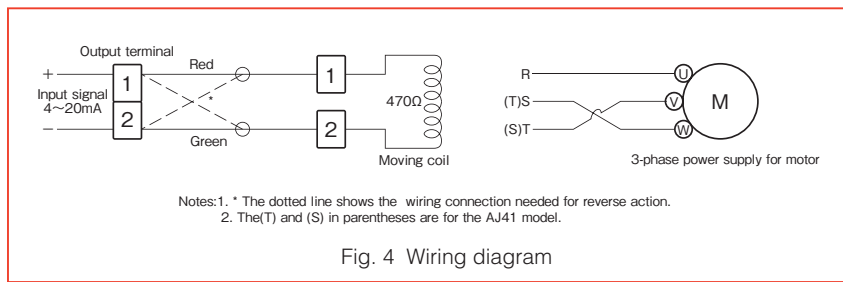


Fig. 4 Wiring diagram

## EXTERNAL DIMENSIONS

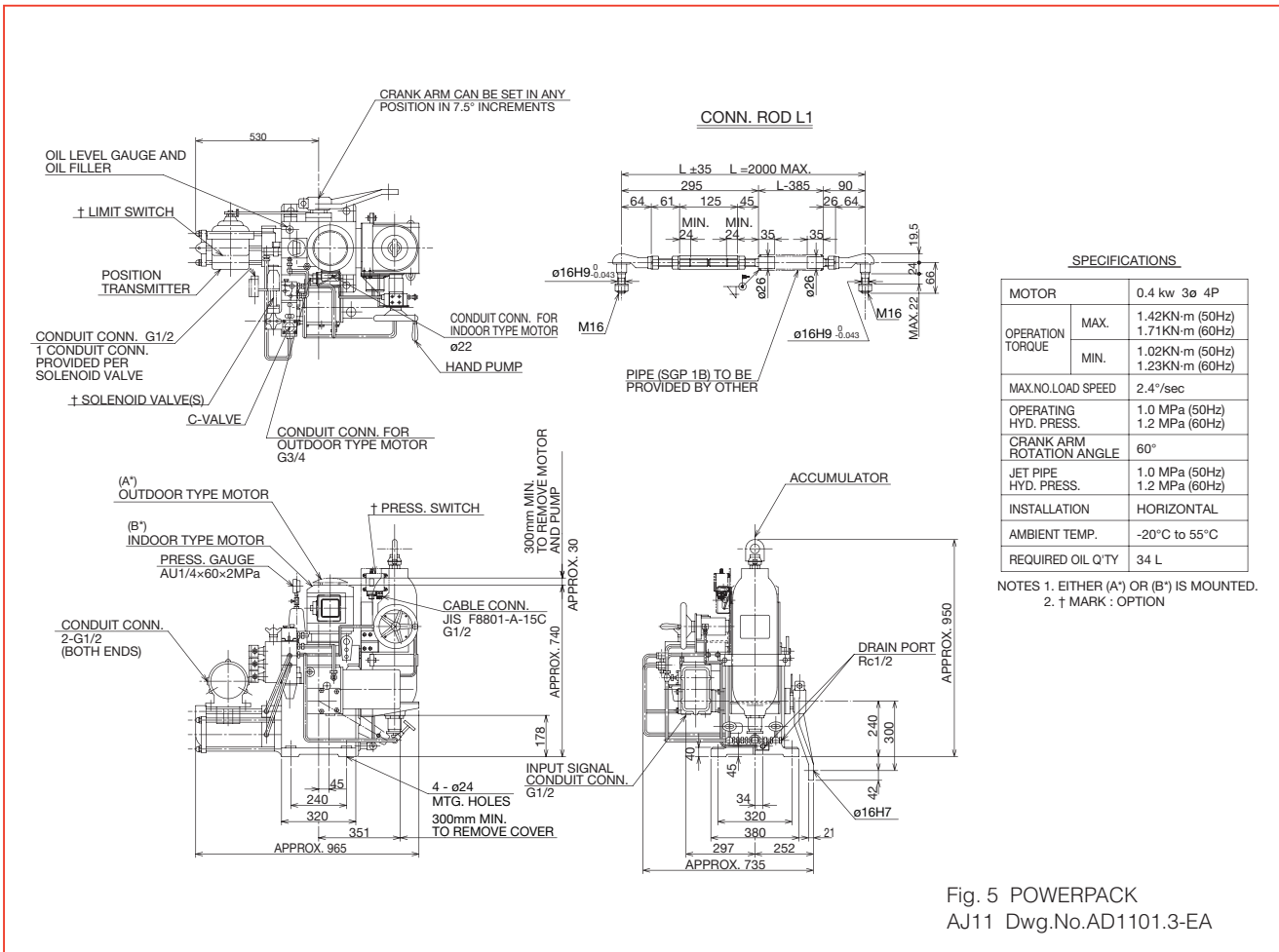
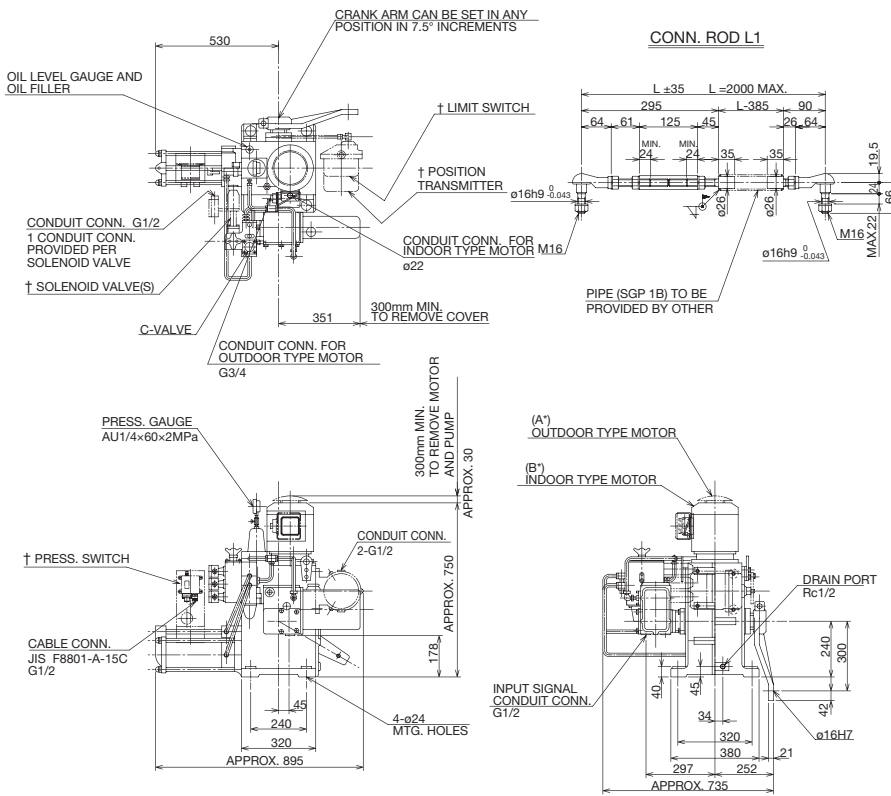


Fig. 5 POWERPACK AJ11 Dwg.No.AD1101.3-EA

# POWERPACK MODEL AJ11, AJ21, AJ41

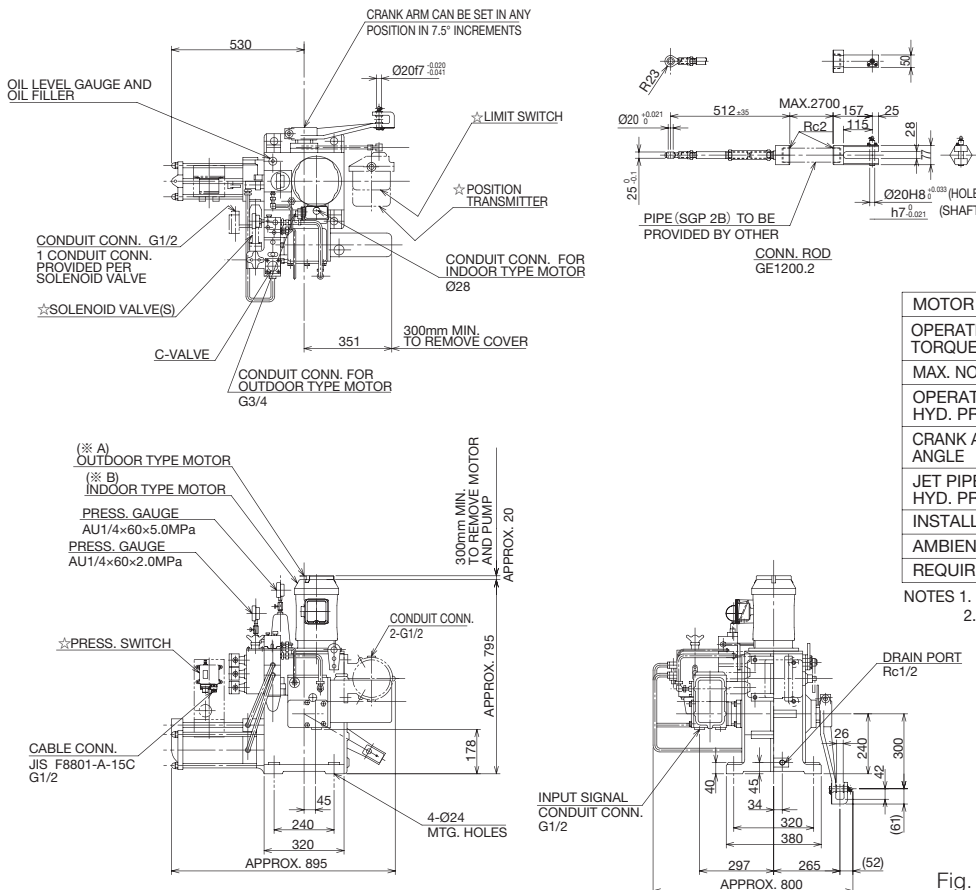


### SPECIFICATIONS

MOTOR	0.75KW 3ø 4 P	
OPERATING TORQUE	MAX.	2.15kN·m
	MIN.	1.53kN·m
MAX. NO. LOAD SPEED	7°/sec	
OPERATING HYD. PRESS.	1.2 MPa	
CRANK ARM ROTATION ANGLE	60°	
JET PIPE HYD. PRESS.	1.2 MPa	
INSTALLATION	HORIZONTAL	
AMBIENT TEMP.	-20°C to 55°C	
REQUIRED OIL Q'TY	27 L	

NOTES 1. EITHER(A\*) OR (B\*) IS MOUNTED.  
2. † MARK : OPTION

Fig. 6 POWERPACK AJ21 Dwg.No.AD1301.3-EA



### SPECIFICATIONS

MOTOR	1.5 kw 3ø 4P	
OPERATING TORQUE	MAX.	4.12 kN·m
	MIN.	2.95 kN·m
MAX. NO. LOAD SPEED	8.5°/sec	
OPERATING HYD. PRESS.	2.3 MPa	
CRANK ARM ROTATION ANGLE	60°	
JET PIPE HYD. PRESS.	0.8 MPa	
INSTALLATION	HORIZONTAL	
AMBIENT TEMP.	-20°C ~ 60°C	
REQUIRED OIL Q'TY	27 L	

NOTES 1. EITHER(※ A) OR (※ B) IS MOUNTED.  
2. ☆ MARK : OPTION

Fig. 7 POWERPACK AJ41 Dwg.No.AD1411.3-EA

## ELECTRO-HYDRAULIC VALVE ACTUATOR

# EHVA

## MODEL EJ70

### INTRODUCTION

EHVA is an electro-hydraulic valve actuator that is most suitable for various process controls. A piston position of the work cylinder is obtained with EHVA that is proportional to the DC current signal (4 - 20mA DC) from an electric controller, a manual controller, or a current converter.

The motor, hydraulic pump, moving coil, jet pipe relay, work cylinder and feedback mechanism are incorporated in the case, which also functions as an oil tank, and no external piping required. Thus, the EHVA is of a very compact structure.

The EHVA is used in combination with a final control element, such as a control valve with the characteristics of a straight type work cylinder fully utilized.

### FEATURES

- May be used as an actuator of electronic controllers of various types.
- As actuation is performed with the hydraulic force received from an electrical signal, the actuating speed is fast and a large actuating force can be obtained.
- Maintenance is easy and reliability is high thanks to the use of a hydraulic jet pipe and a moving coil system using a stable permanent magnet.
- As the case also functions as an oil tank and all parts are housed in the case, no external piping is required and no oil leakage will occur.
- Installation is easy, as the EHVA can be directly mounted to a final control element.

### SYSTEM DIAGRAM

#### SENSOR

Temperature  
Pressure  
Flow  
Level  
Displacement  
Force  
Speed  
Acceleration  
Calorie  
Composition  
pH

#### CONTROLLER

ELECTRIC                      4-20mA DC  
CONTROLLER



Fig. 1 EHVA



**SPECIFICATIONS**

Input signal ..... 4 - 20mA DC  
 Moving coil resistance ..... 470Ω (at 25°C)<sup>+0</sup><sub>-50</sub>Ω  
 Hysteresis error ..... 1.5% max. (without load)  
 linearity ..... ±2%  
 Ambient temperature ..... -20°C - +60°C  
 Hydraulic oil temperature ..... +10°C - +70°C  
 Max. actuating force ..... 6500 N·m  
 Max. speed without load ..... 6 mm/s  
 Max. working hydraulic pressure ..... 1.3MPa  
 Max. stroke ..... 12 - 64mm  
 Control action ..... Proportional  
 Acting direction ...

Direct action .....The piston moves downward when the input signal increases.  
 Reverse action .....The piston moves upward when the input signal increases.

Installation .....Horizontal  
 Coating color .....Silver  
 Mass. (including hydraulic oil) .....62kg  
 Motor .....3-phase, 400W, 4P, Class E insulation  
 Required hydraulic fluid volume ..... 16 liters

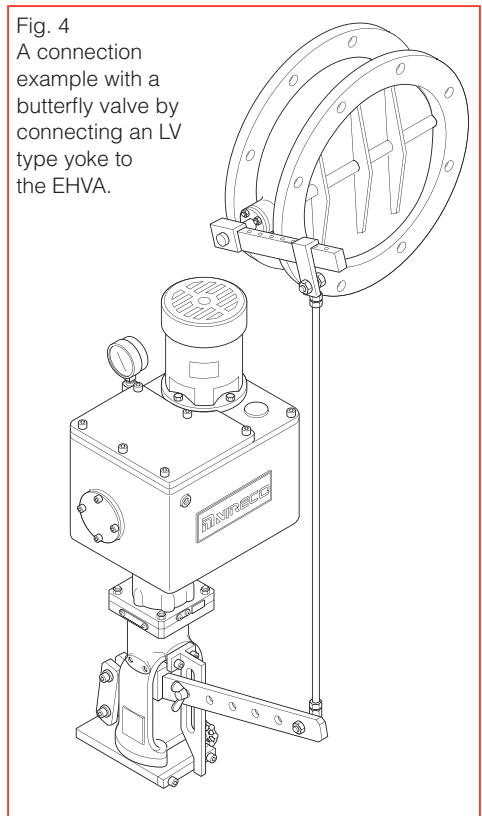
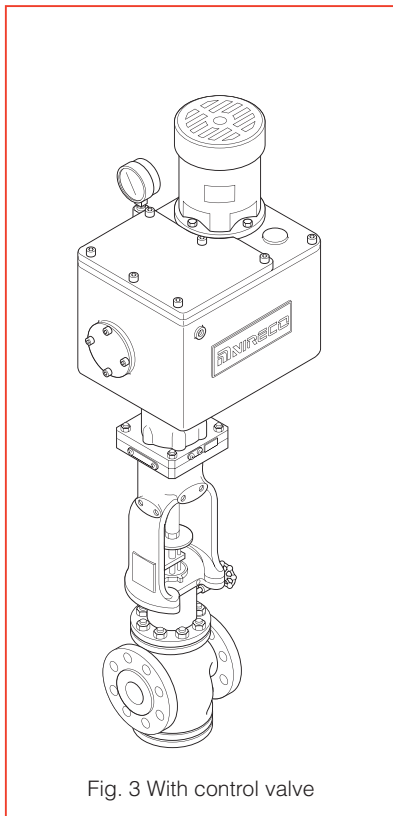
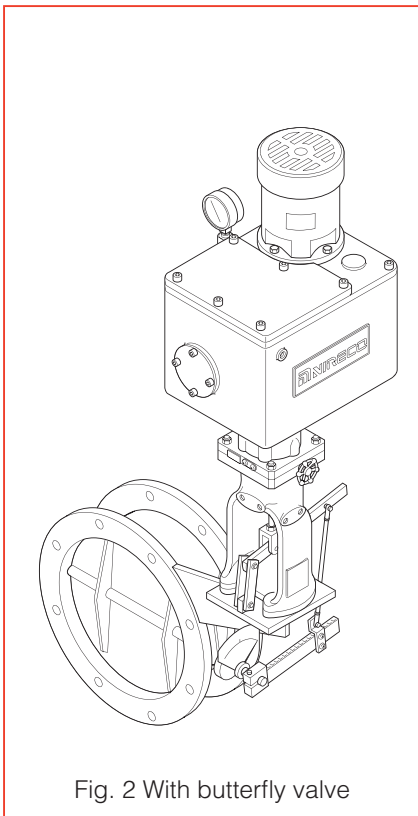
**NOTES**

- ↑ Direct Action...  
 Piston moves downwards at input signal increase. (Coil terminal 1-2)  
 † Reverse action...  
 Piston moves upwards at input signal increase. (Coil terminal 2-1)
- Item to be designated specially shall be marked with "Y" and itemized.

**MODEL NUMBER**

EHU70	MODEL				
	2	4 - 20mA DC		Input signal	
5	10 - 50mA DC				
DO	Open (valve)	Direct action	†	Action	
	DC				Close (valve)
	UO	Reverse action	†		
	UC				Close (valve)
	Stroke should be denoted "mm"unit			Stroke	
E1	Standard in-door type			Type of motor	
	E2	Standard out-door type			
2	None			Motor	
	4	Provided with solenoid valve for C valve			
	Y	Other power supply, frequency 3Ø			
N	None			Accumulator	
	1	Capacity 2.5liters			
N	None			Pressure switch	
	1	In-door type			
	2	Out-door type			
N	None			Yoke and handle	
	1	In-door type	Yoke		
	2	Out-door type			
	3	None			
	4	In-door type	Yoke with manual handle		
	5	Out-door type			
	6	None			
7	In-door type	Lever type yoke			
Y					

The EHVA can be combined with various final controlling element.



**OPERATION PRINCIPLE**

The operating principle of the EHVA is shown in Fig. 6. The moving coil is located in the magnetic field as shown and is directly coupled with the jet pipe relay.

When a current signal flows through the moving coil, therefore, the coil moves and causes the jet pipe relay to swing with the pivot as the center. The jet pipe injects oil into the adjacent two orifices. Each orifice is connected with one side of the work cylinder. The pressure at both ends of the cylinder is equal when the jet pipe is located at the center of these two orifices and the piston remains in this position.

When the input current signal changes in this equilibrium position, when the moving coil moves momentarily upwards, the jet pipe injects oil into the orifice on the moving coil side. Accordingly, the cylinder piston moves downward. This motion pulls the return spring and causes the jet pipe to return to the center position. The piston, therefore, stops at this position.

The force produced with the moving coil is proportional to the current, and the extent of pull of the feedback spring is proportional to the displacement of the cylinder piston. In other words, the displacement of the cylinder piston is proportional to the input current. This is so-called proportional action type (positioning type) principle.

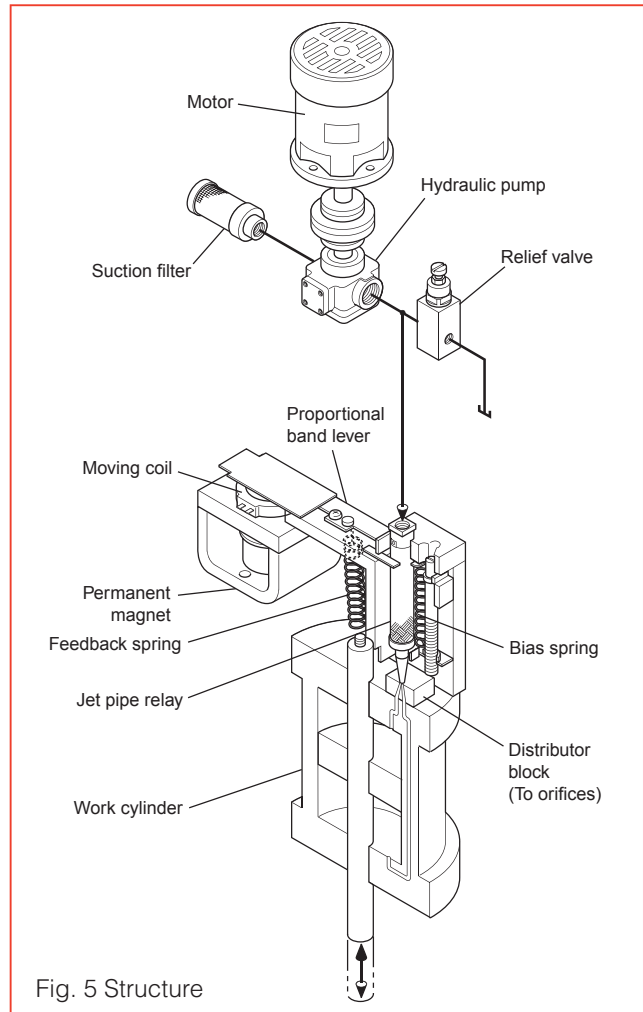


Fig. 5 Structure

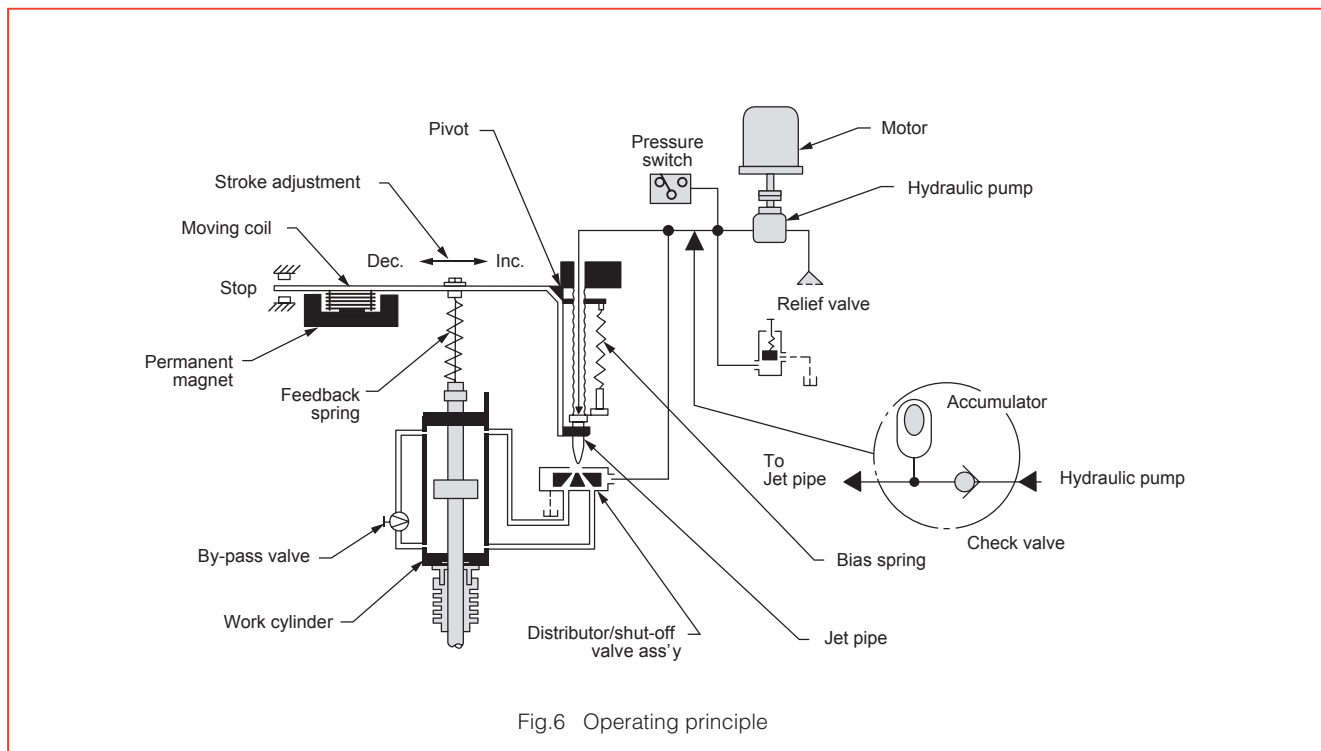


Fig.6 Operating principle



## FOR AUTOMATIC STRIP GUIDING

# Edge Position Control EPC SYSTEM

## INTRODUCTION

EPC is registered trade mark of Nireco Corporation and stands for Edge Position Control. The system is a control unit which performs strip (product) edge alignment in rolling processes, heat treatment, acid pickling, and surface finishing of thick and thin plates. As applications

of EPC technology, the Center Position Control System (CPC System) and the Line Follower Control System (LFC System) have also been developed and are used widely. These systems, including the EPC System, can be adapted easily to a new or existing plant.

## FEATURES

### ■ Precise control

The edge position or center line position of the strip can be controlled highly accurately.

### ■ Trouble-free and easy maintenance

Since the system has a simple and strong mechanical structure, it is trouble-free (One customer has been using it for more than 20 years continuously without any serious problem). Even if a problem occurs, trouble-shooting can be done easily at the installation site.

### ■ High sensitivity

Strip displacement to within  $\pm 0.05\text{mm}$  can be detected.

### ■ High stability

Since the system employs hydraulic technology, the influence of friction and inertia is negligible, so continuous control of the operation is possible and frequency response characteristics are excellent.

### ■ High speed with heavy load

An operating power of a little under 50 tons is available when using a  $\phi 300\text{ mm}$  work cylinder at a hydraulic pressure of 7 MPa.

A speed of up to 50 mm/sec is available within the safety limits. Correct operation is guaranteed at high speeds.

### ■ Employment of integral action

Since an integral action is employed as the basic action of the system, the operating speed is in proportion to deviation, so deviation offset is eliminated.

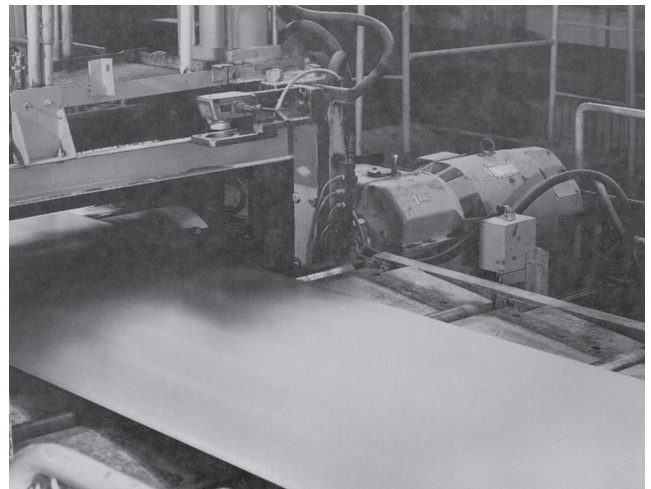


Fig.1 EPC System for Tension Reel (Photohead System)

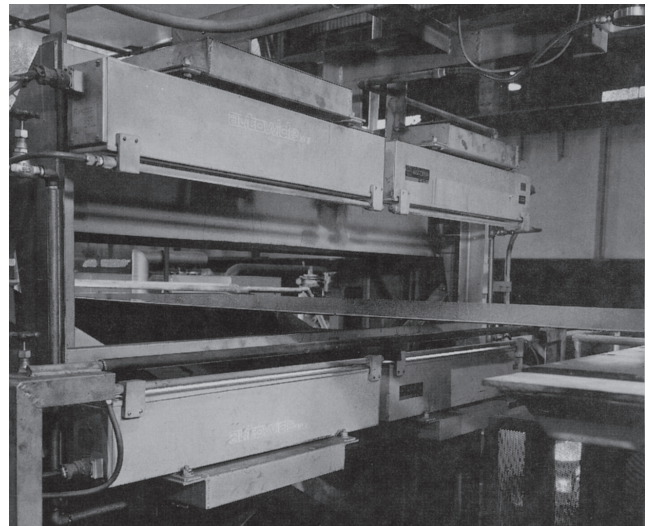


Fig.2 Steering Roll CPC (Autowide System)

**OUTLINE OF EPC SYSTEM**

EPC is used widely in the following industries:

- (1) Iron and steel industry,
- (2) Light metal industry,
- (3) Copper rolling industry,
- (4) Printing and bookbinding industry,
- (5) Plastic and film industry,
- (6) Rubber and chemical industry,
- (7) Paper industry,
- (8) Fiber and textile industry.

The description in this booklet applies only to the steel and metal industries to cover (1),(2) and (3) in the list above. With the introduction of the EPC system, the side trimming operation, which had previously been necessary to adjust the unevenness of the strip edge, will become unnecessary, and the lateral side of the coil will be protected. In addition, operations such as surface finishing, laminating, marking and cutting the strip can be performed at the desired position with minimal waste, so production and labor costs can be reduced. Recently, many plants have introduced continuous production lines with higher line speeds to increase productivity. The EPC system is indispensable for such plants.

The EPC system is an automatic control system of the feedback type. This means that it always compensates for the difference, if any, between the desired value and the measured value regarding the position of the object to be controlled, while observing and feeding back the results measured. Thus, a feedback system is established. In this type of automatic control system, the control object and control unit form a closed loop as shown by the block diagram in Fig.4.

The working principle of an EPC system for making the strip position constant is explained below with reference to Fig.5 and Fig.7.

- (1) Any deviation of the strip position from the desired position, which is caused by disturbance, is detected by the photohead.  
Deviation (displacement) → Electric current signal  
Strip edge displacement=Controlled variable
- (2) The detected signal in (1) is amplified to actuate the moving coil.  
Electric current signal → Amplified current signal
- (3) The amplified signal is converted into mechanical force to move the jet pipe of the moving coil (or spool of the servo valve).  
Electric current → Mechanical force  
Photohead, amplifier and moving coil constitute the main feedback route.

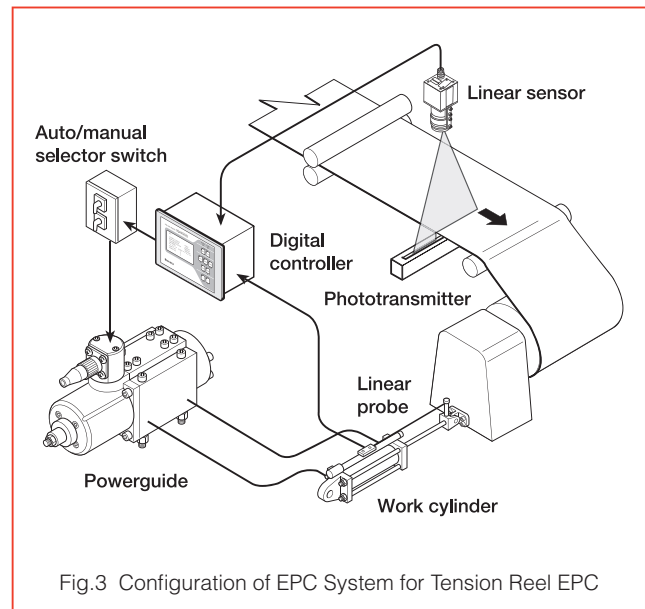


Fig.3 Configuration of EPC System for Tension Reel EPC

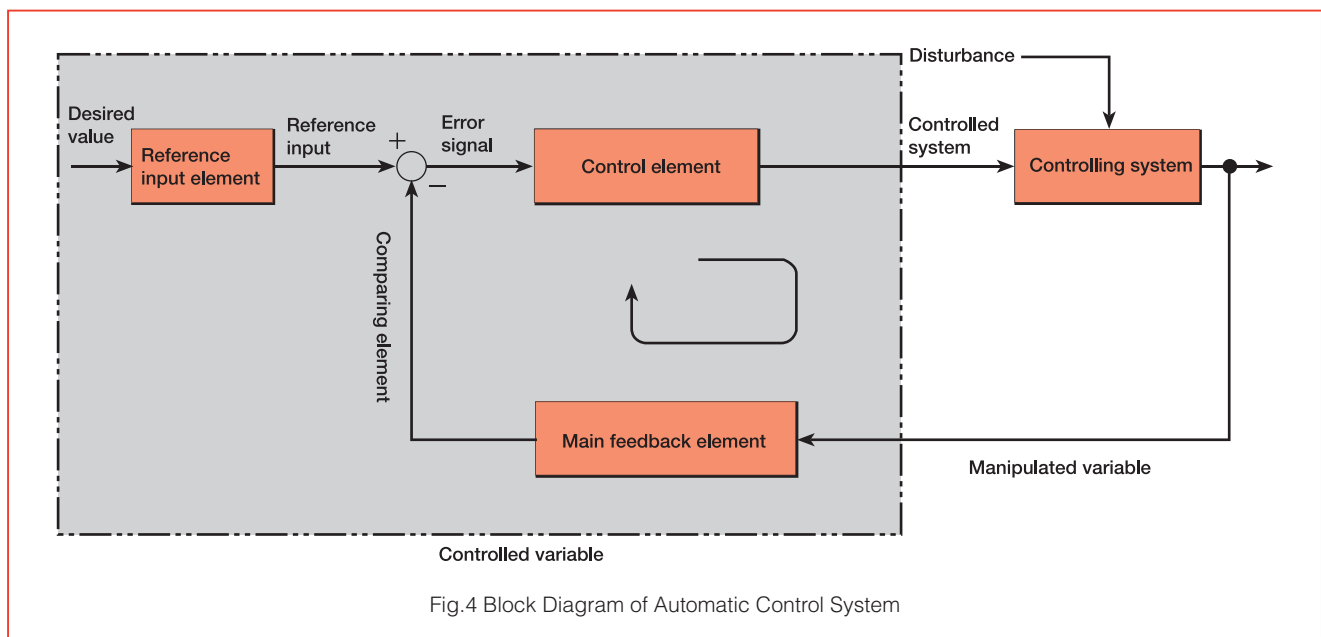


Fig.4 Block Diagram of Automatic Control System

(4) When the strip is passing the desired position, the force of the set spring and the output of the moving coil, which are determined by the signal detected at the middle point of the detection range of the photohead, are balanced at the standard input value, so that the position of the jet pipe is adjusted at the center.

Set spring=Standard input element

(5) The jet pipe (or spool) is moved laterally depending on the signal (operation control signal) indicating the deviation from the standard input of the strip edge position set in above (4).

(6) The displacement of the jet pipe causes a pressure difference on the piston of the work cylinder. The cylinder then moves to offset the pressure difference. As a result, edge position control is performed.

(7) The operation mode selection switch is installed for selecting automatic operation mode or manual operation mode.

The description above is intended to help you understand the working principles of the EPC System.

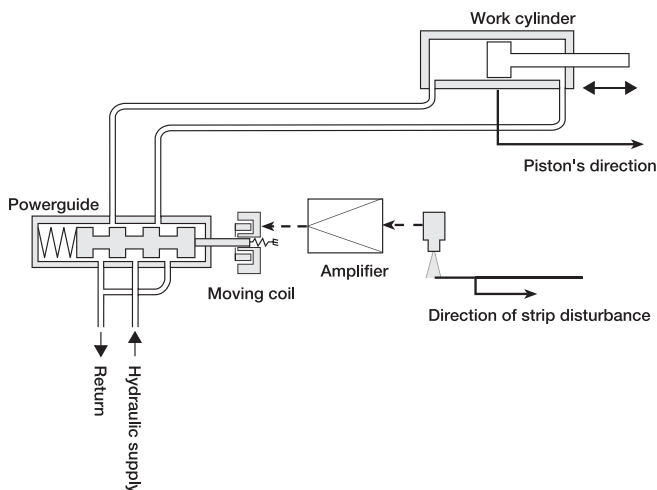


Fig. 5 Working Principle of an Electro-hydraulic EPC System



Fig.6 PILOTJET (Electro-hydraulic controller)

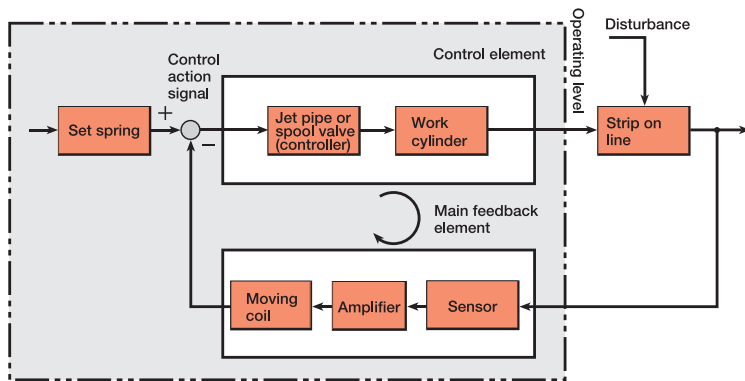


Fig.7 Block Diagram of EPC system

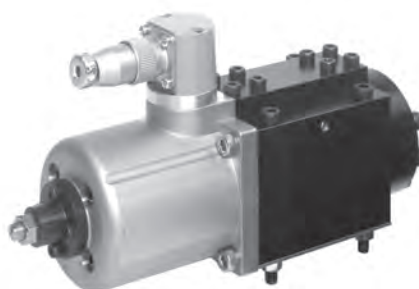


Fig.8 Powerguide (Spool type)

**BASIC CONTROL METHODS OF THE EPC/CPC**

The following three basic methods can be used to control the strip edge position according to the process:

- (1) Payoff reel method.
- (2) Steering roll method.
- (3) Tension reel method.

**1. Payoff Reel Method**

This method is used for feeding a strip whose edge is aligned in a straight line when a coil wound in telescopic form or an irregular form is fed to the subsequent operation such as an annealing line or a pickling line. In that case, the sensor's position is fixed and the whole reel unit is operated by the cylinder.

In such an application, it is important to install the sensor as close to the payoff reel as possible when the EPC system is installed. By doing so, the stability of the control system can be assured only by the control unit.

The centering method using two sensors is also used as an application of the payoff reel method where the strip width is irregular and the center position of the strip needs to be controlled precisely.

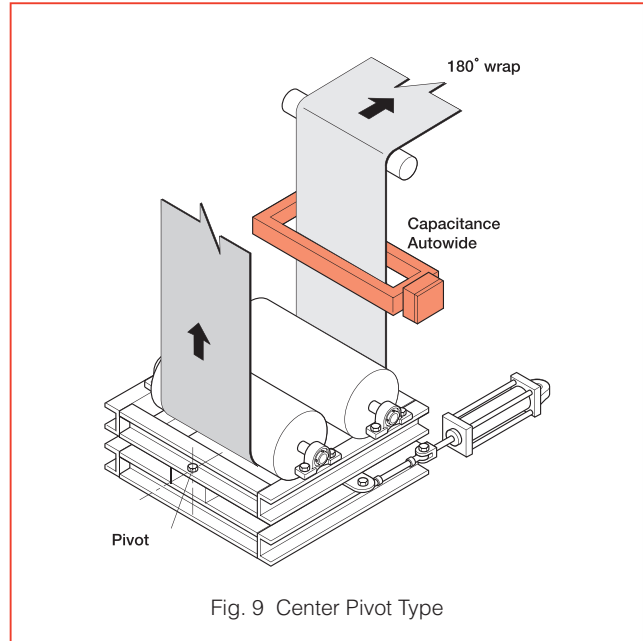


Fig. 9 Center Pivot Type

**2. Steering Roll method**

A steering roll is used when the strip edge needs to be aligned in a straight line in the middle of a process, or when it is difficult to move the position of the tension or payoff reel in the case of an existing machine for which a major modification is necessary.

The following types of guide roll classified by mechanism are available.

**(1) Center-pivot type guiding system(See Figs.9 and 10)**

As shown in Figs.9 and 10, the center pivot type can set the rotation center at the center point of the plane at the entry roll of the steering roll assembly. This type of steering roll is used for a strip made of a material which could be torn and/or deformed permanently when a difference in tension between both strip edges occurs.

The strip cannot slip when the steering roll moves because the strip wraps around 180 degrees of the steering roll. However, if it should slip, rolls with a rubber wrapped up are used.

The lateral displacement (correction volume) of the strip edge is obtained from the following relation :

Lateral displacement =

$$\text{Diameter of guide roll} \times \tan \theta$$

Where  $\theta$  : shift angle (This angle must be within the range of  $\pm 5$  degrees)

Wrinkles will not occur on free paths where the web length between the steering roll and the input entry/exit idler rollers, is twice as long as the strip width or more.

However, because it is necessary to leave enough space for the path line, it may be more costly compared to the case of the end pivot type when installed on an existing machine.

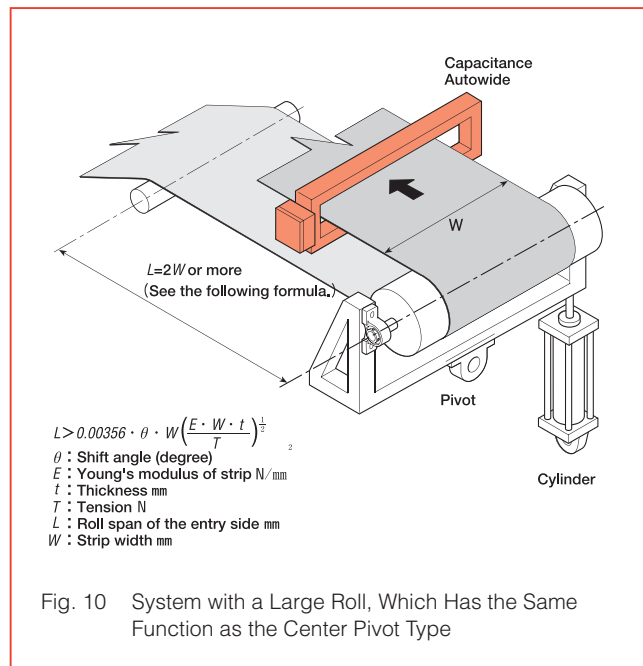


Fig. 10 System with a Large Roll, Which Has the Same Function as the Center Pivot Type

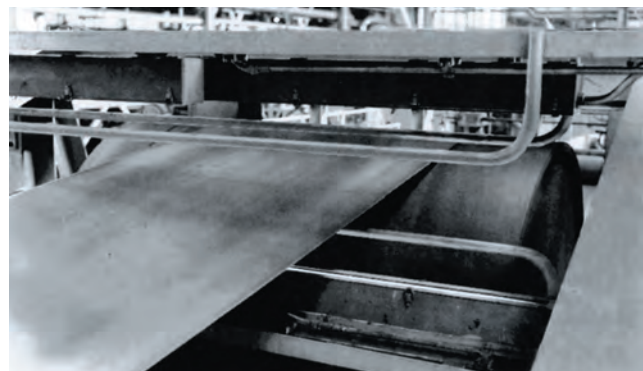


Fig. 11 Steering Roll

**(2) End Pivot-Type Guiding System**

Fig. 13 shows the structure of the end pivot type, which is used to feed the strip and change the direction of the strip. If the roll is moved while taking a large value for distance “ $r \leq L$ ” between the steering roll and the fulcrum which is the rotation center of the steering roll, the change in its tension and inclination will remain small for the same feed length so that the amount of twisting remains minimal for almost no strain. Consequently, use of this type of EPC system will bring better results.

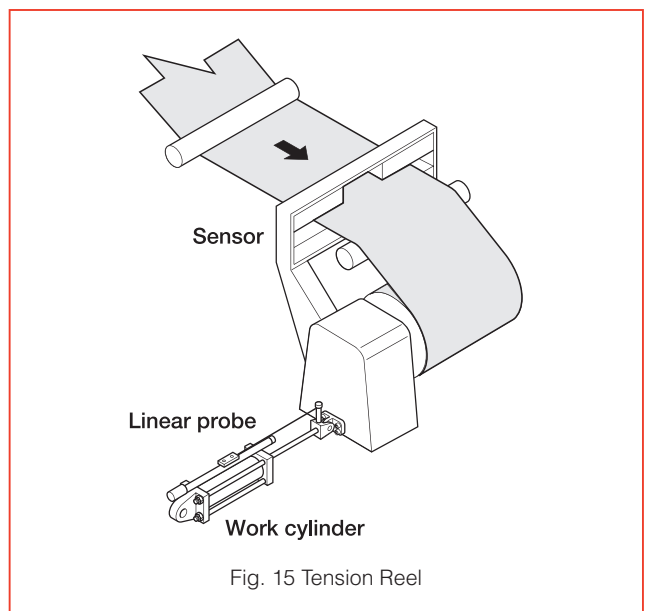
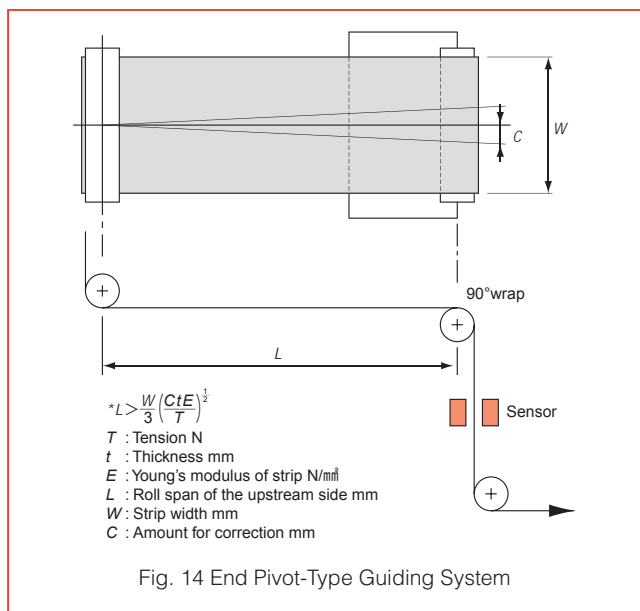
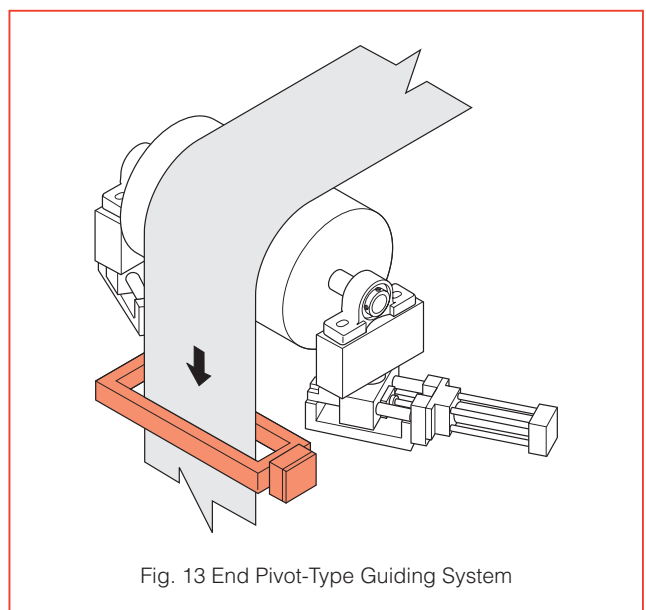
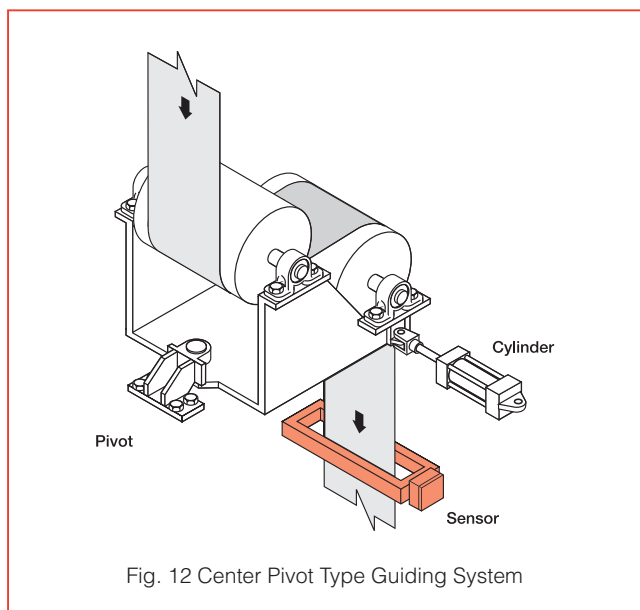
The important point using the end pivot type for the steering roll method is not to install an idler roll within the range of 5 times the strip width at the entry side of the steering roll and not to install a high-friction idler roll within the range of the strip width at the exit side of the steering roll.

It is also worth noting that the sensor should be installed as close to the steering roll at possible.

The end pivot type is useful when the work material absorbs the tension difference between strip edges, and a sufficient idler roll space is available in the entry and exit sides of the steering roll. This type is used more frequently than the center pivot type because it needs only one idler roll instead of two, less work space, and its mechanism is simple.

**3. Tension Reel Method**

Fig. 15 shows an EPC system using the tension reel method. In this case, the sensor moves with the tension reel. The sensor should be installed as close to the tension reel as possible. If it can be installed on the tension reel, the object can be controlled without a time lag so that the stability of the system can be assured using only the control unit, as in the case of the payoff reel method.



Note : Whatever method is used for the EPC system to be introduced, it is important to make the system time lag as small as possible. In practice there will be some restrictions such as the strip may be wrinkled depending on the manner of reel operation. Therefore, the best method and type should be selected considering the properties of the strip material and the plant conditions.



EPC/CPC SYSTEMS AND SENSORS

Payoff reel CPC

Autowide

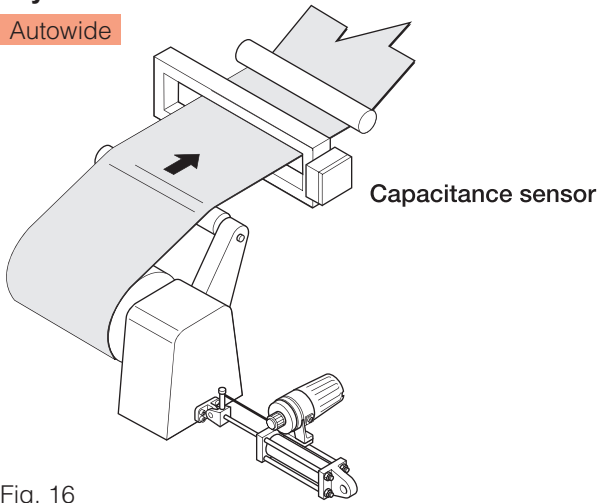


Fig. 16

Steering roll CPC (180°wrap)

Autowide

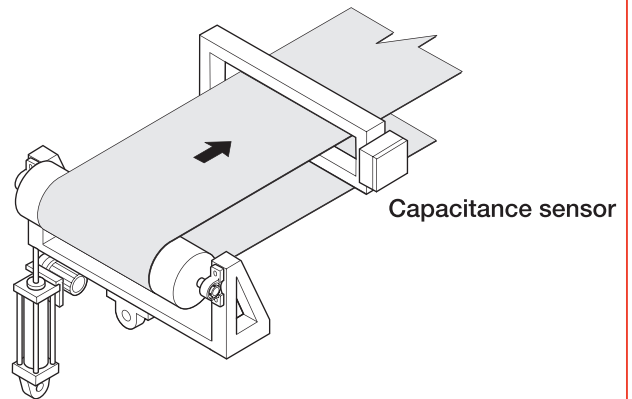


Fig. 17

Steering roll CPC (two rolls)

Linear sensor

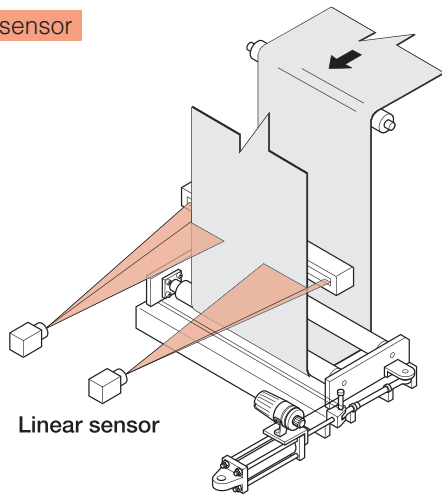


Fig. 18

Steering roll CPC

Autowide for furnace

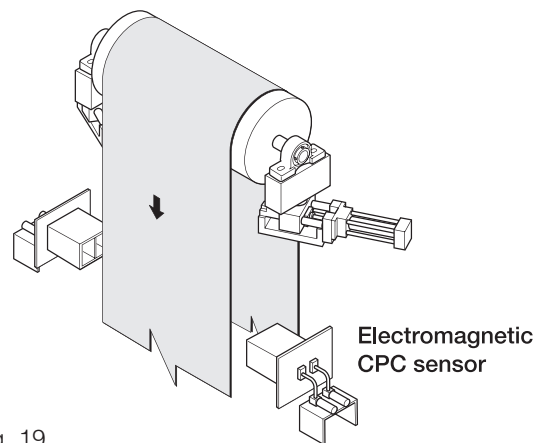


Fig. 19

Steering roll CPC

Capacitance sensor

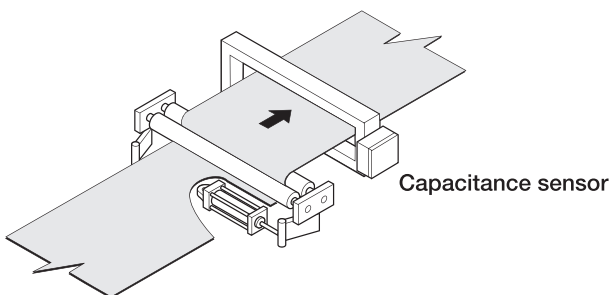


Fig. 20

Tension reel EPC (belt-wraper simultaneous drive)

Linear sensor

Armless method

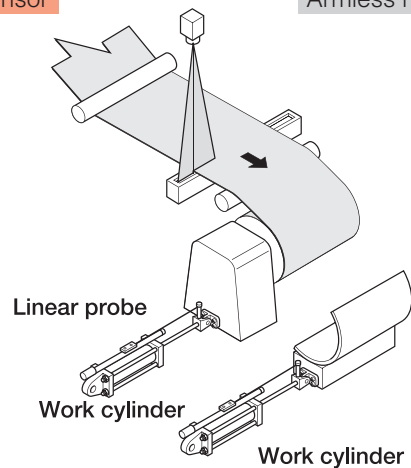


Fig. 21

for In-furnace Use

# Electromagnetic CPC Sensor

## MODEL EMW



***New Concept---***  
***Detection by Electromagnetic Wave.***

**The furnace can operate safely  
because there is no need for sensors or other structures inside it.**

### INTRODUCTION

Electromagnetic CPC sensors are new kind of sensor. They emit electromagnetic waves from antennae embedded in the furnace wall and use the transmission time taken for the waves reflected from the strip edges to return to the antennae to measure the strip position.

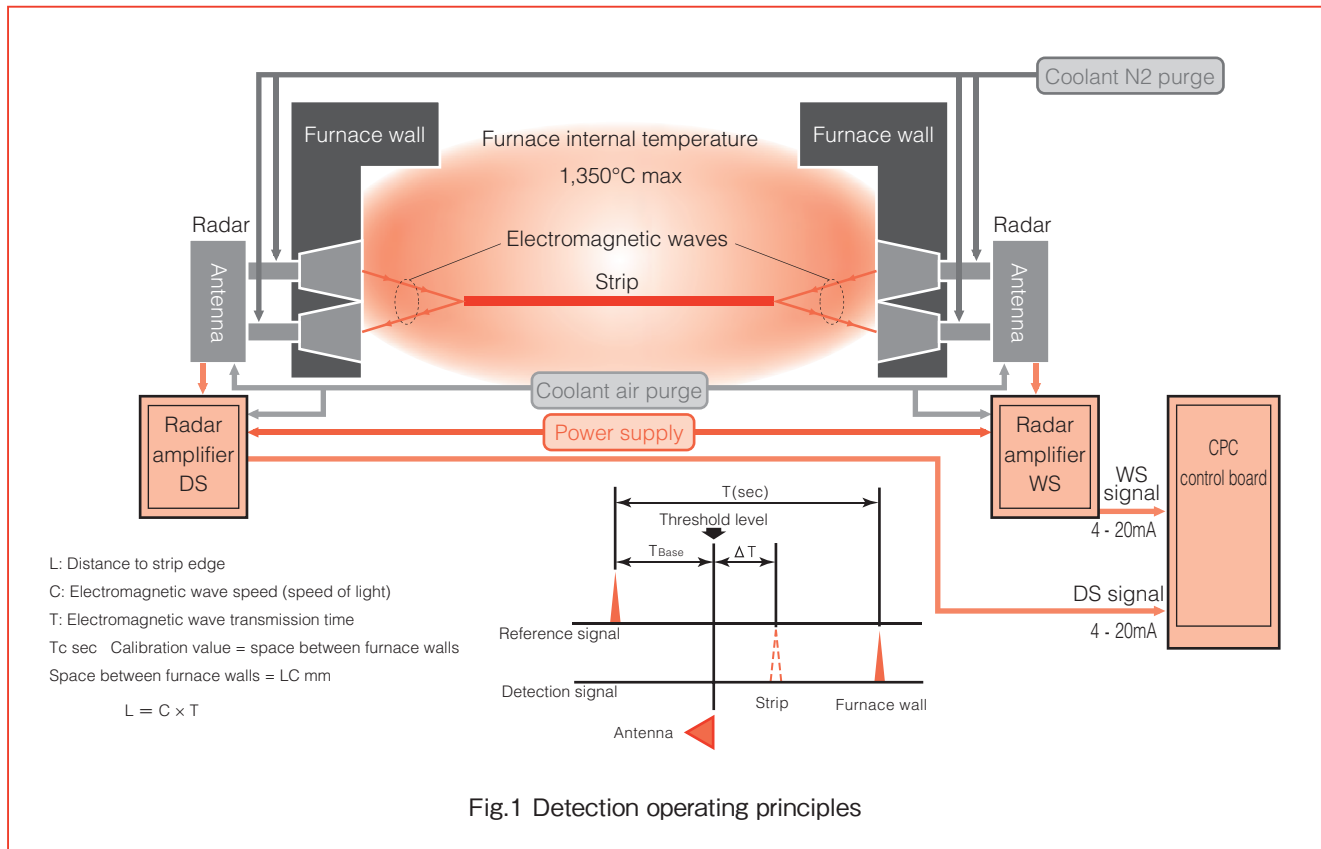
### FEATURES

- The system operates safely because there is no interference with the strip and equipment inside the furnace.
- No maintenance is required.
- Dirt (dust and fumes) in the atmosphere inside the furnace has no effect.  
There are no consumable parts.
- The sensors are compact and light, for easy installation in a small space.
- Construction costs are low.

## Detection operating principles and equipment configuration

Electromagnetic waves from the antennae are reflected from the strip edges and the transmission time taken for the waves to return is used to measure the strip position.

Even if dirt etc. reduces the reception sensitivity, the transmission speed of the waves does not change, so the measurement is unaffected.



## SPECIFICATIONS

Model	EMW
Carrier frequency	10GHz
Measurement range	40 - 1200mm
Linearity	±1mm or less
Reproducibility	±1mm or less
Resolution	0.2mm
Minimum strip thickness	12 μm
Antennae	Pyramidal horn antennae
	Installation aperture 280mm × 170mm
	Cooling Antenna N2 Q = 50NI / min , P = 7kPa
	Connector AIR Q = 120NI / min , P = 0.14MPa
	Ambient operating temperature 1,350°C (max)

Radar amplifier	Wall mounted
	Power supply 85 - 264VAC, 50/60Hz, 300VA
	Cooling AIR Q = 600NI / min , P = 0.6MPa
	Ambient operating temperature 0°C - 70°C
Microwave cable	Special type L=10m (max 200°C)
Radar amplifier output	DS edge position: Zero-span/4-20mA
	WS edge position: Zero-span/4-20mA
	ISO output, allowable load resistance 750 Ω or less
Warning outputs	Open collector output 24VDC / 40mA
	Healthy
	Trigger error
	Level error
	Roll out

# Electromagnetic Guidance NS-CPC Sensor



***A maintenance-free sensor  
which can be used long term in poor environments.***

## INTRODUCTION

The NS-CPC sensor continuously detects the strip (steel sheet and metal plate) edge positions using electromagnetic guidance and outputs any discrepancy in the strip center position as a deviation signal.

Because it uses electromagnetic guidance it is not affected by dust, steam, oil or other materials and its simple and robust structure allows for it to be used reliably over long periods.

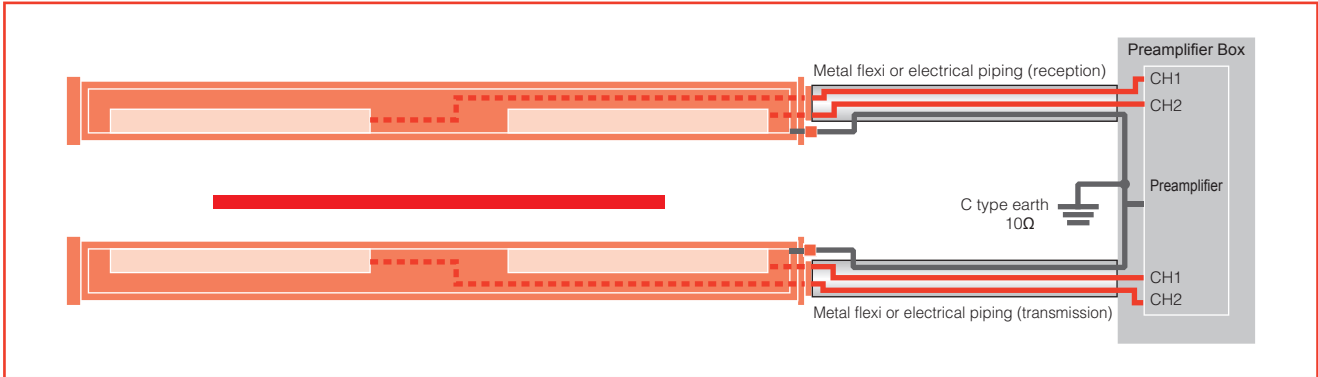
## FEATURES

- Electromagnetic Guidance The sensor does not use light.
- Not affected by adhesion of dust, steam, oil or other materials.
- Simple design and durable structure.
- Has no consumable parts.
- No changes in detection performance with time.
- The realization of a truly maintenance free device.

## Signal Circuit and Cable Specifications

The NS-CPC sensor consists of a preamplifier and sensor (including 1 transmission coil, 2 reception coils and a specialized cable). The sensor straddles and is positioned facing the strip and the high frequency magnetic field emitted from the transmission coil generates induced

voltage in the receiving coils. The induced voltage changes in with the strip position so the reception coil can calculate variances in the voltage to measure the strip center position.



## SPECIFICATIONS

Sensor	
Sensor Type Inspection plate width	NS-130A 500 - 1300mm
	NS-160A 500 - 1600mm
	NS-190A 500 - 1900mm
	NS-220A 500 - 2200mm
Cable length	25mMAX
Transmission reception interval	400mm(fixed)
Range of detection	±100mm
Installation air temperature	0 - 60°C
Case material	Hard vinyl chloride (PVC)

Drawing number	
Sensor	NS-130A MD0002520-EA
	NS-160A MD0002530-EA
	NS-190A MD0002540-EA
	NS-220A MD0002550-EA
Preamplifier	NSA-100 MP0000370-EA
Wiring connection diagram	MD0458.0-JC

Preamplifier *1	
Preamplifier type	NSA-100
Output signal	Strip variance ±5VDC/±100mm
Installation method	Attachment
Installation air temperature	0 - 40°C
Mass	10kg
Power supply	AC85 - 264V 200VA
Earthing	C type earth

Common items	
Detection type	Electromagnetic guidance type
Detection accuracy	within ±5mm
Responsiveness	5Hz

# LINEAR SENSOR

## MODEL LSE4096

### INTRODUCTION

The Linear Sensor is a product applying a one-dimensional image sensor that measures width,length,thickness,position ,shape,etc.highly accurately.

### APPLICATIONS

- Web width measurement
- Detecting sensor for EPC
- Detecting sensor for CPC

### FEATURES

#### ■ Simple Operation

- Operates on a single power line (DC+15V).
- Just connect the power supply and it outputs a voltage (0 - 5V) proportional to the measurement count (the number of illuminated pixels).
- The measurement count (the number of illuminated pixels) is displayed on an LED counter, so it is simple to check the operation status.

#### ■ Wide Scanning Time Range

- The scanning time setting can be changed in the range of 2 msec - 20 msec.

#### ■ Compact

- The volume of the device is approximately one third that of our previous models.

Note: Not including the lens tube.

#### ■ Long life and high reliability

Reliable detecting elements and electronic circuits can be used for a long time because semi-conductors are fully used.

#### ■ Environment-resistant

- Operates stably in an ambient temperature range of 0-50°C.



Fig.1 LINEAR SENSOR



Fig.2 LINEAR SENSOR(with mount)

**PRINCIPLE OF MEASUREMENT**

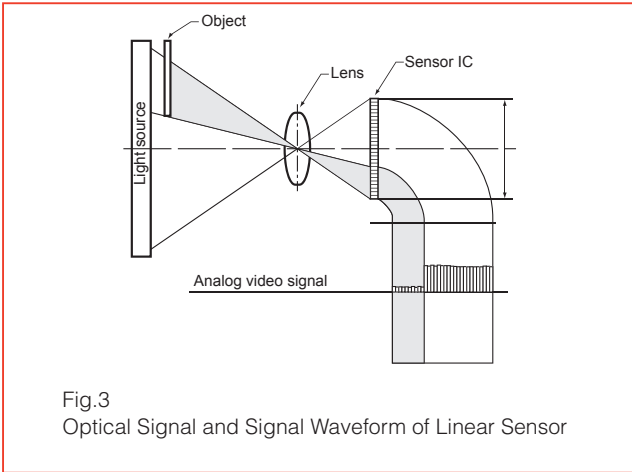


Fig.3  
Optical Signal and Signal Waveform of Linear Sensor

The receptor is a CCD linear image sensor with 4,096 pixels. It is a fixed imaging element with 4,096 photo cells arrayed in rows at intervals of 7µm. Light that is partially shaded by the measurement subject passes through the lens to form an image on the receptor. Pulse signals are output with varied levels proportional to the amount of light falling on each pixel. That is the video signal, and it is output as a time series of pulse signals. From that video signal, the number of pulse signals exceeding a certain level is measured, and an analog voltage (0 - 5V) proportional to that measurement count (equivalent to the bright portion that receives light) is output.

**SPECIFICATIONS**

Receptor	CCD linear image sensor	
Effective pixels	4,096 pixels	
Pixel spacing	7 µm	
Scan time	2-20 msec/line	
Data rate	3 MHz (2 msec/line - ) 750 kHz (7 msec/line - )	
Synch method	Switched between internal and external synchronization	
Output signals	Analog voltage DC0 - 5V Video signal Enable signal (TTL level)	Load resistance at least 2kΩ Load resistance 75Ω Load resistance 75Ω
Input signals	External sync signal (TTL level) Clock signal for external sync (TTL level)	Input resistance 75Ω Input resistance 75Ω
Power supply	DC +15V±10%, 0.3A	
Display unit	Decimal, four digit, seven-segment LED display	
Lens mount	Nikon F mount	
Operating ambient temperature range	0-50°C	

**TABLE OF MODEL CODES**

Linear Sensor			
MODEL			
4096	4,096 pixels (CCD)	No. of elements	Body
01	f = 35mm F2	Wide-angle lens	Lens
03	f = 50mm F1.8 (Standard)	Standard lens	
04			
05	f = 85mm F1.8	Telephoto lens	
06	f = 105mm F2.8		
10	f = 55mm F2.8 macro		
N	None		Close-up ring
1	12mm		
2	20mm		
3	36mm		
4	Special close-up ring		
N	None	Mounting base	
1	Provided	Mount fixture	
2	Provided		
N	None	Conversion cable	
1	Provided		
Y	Y is affixed. The details are listed.	Special specification	

Projector			
MODEL			
030A	AC100V 30W	Power capacity	
032A	AC100V 32W		
040A	AC100V 40W		
110A	AC100V 110W		
N	None	Air purge mechanism	
A	Provided		
5	50Hz	Conversion cable	
6	60Hz		
N	None	Connector	
C	Provided		
Y	Y is affixed. The details are listed.		

MODEL			
030A	AC100V 30W	Equivalent LED lamp	LED lamp
032A	AC100V 32W	Equivalent LED lamp	
040A	AC100V 40W	Equivalent LED lamp	
N	None		Air purge mechanism
A	Provided		
5	50Hz	Power supply frequency	
6	60Hz		
N	None	Connector	
C	Provided		
Y	Y is affixed. The details are listed.		

SYSTEM CONFIGURATION

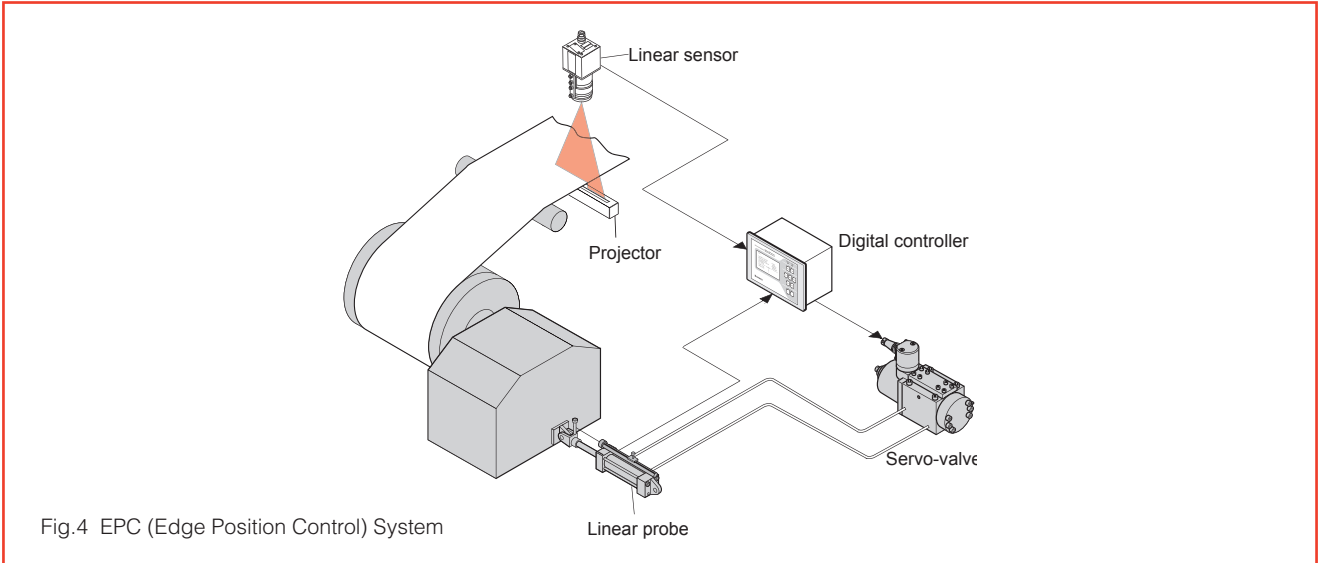


Fig.4 EPC (Edge Position Control) System

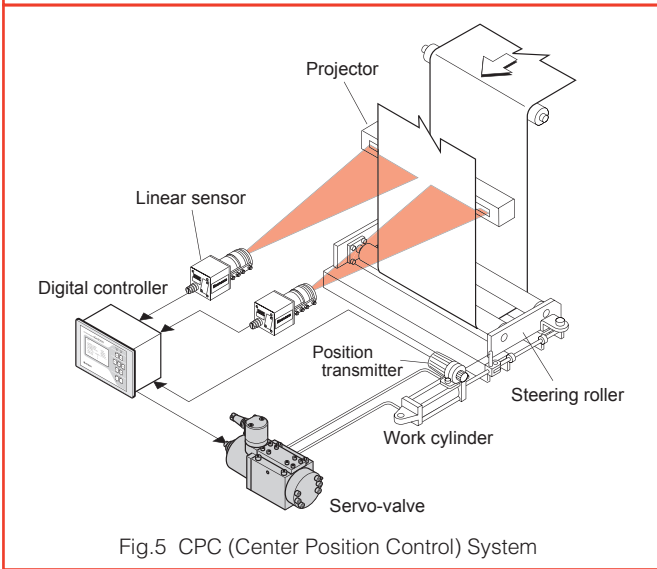


Fig.5 CPC (Center Position Control) System

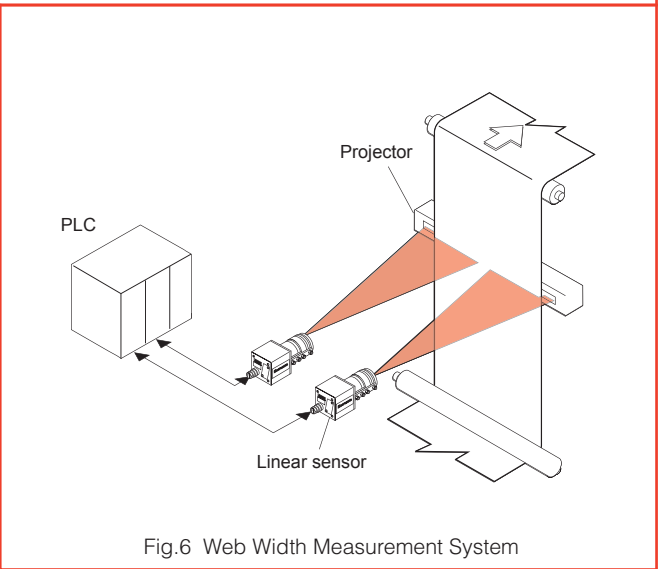
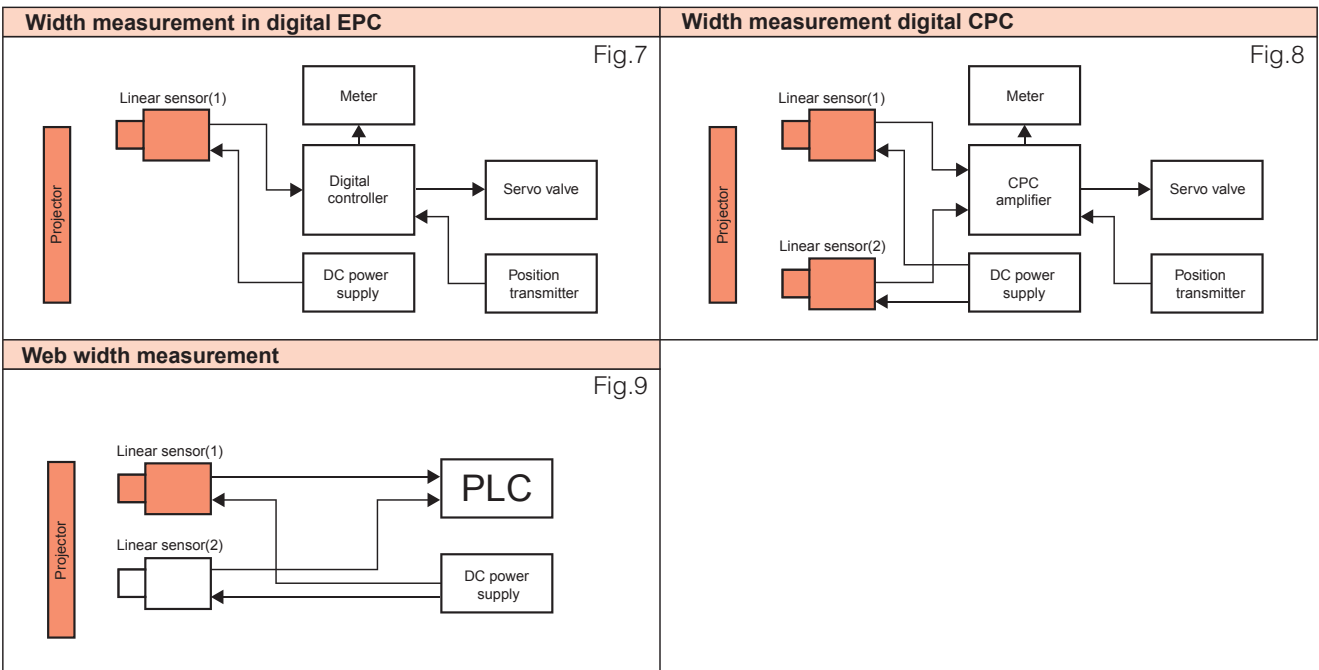


Fig.6 Web Width Measurement System

BLOCK DIAGRAM





EXTERNAL DIMENTIONS

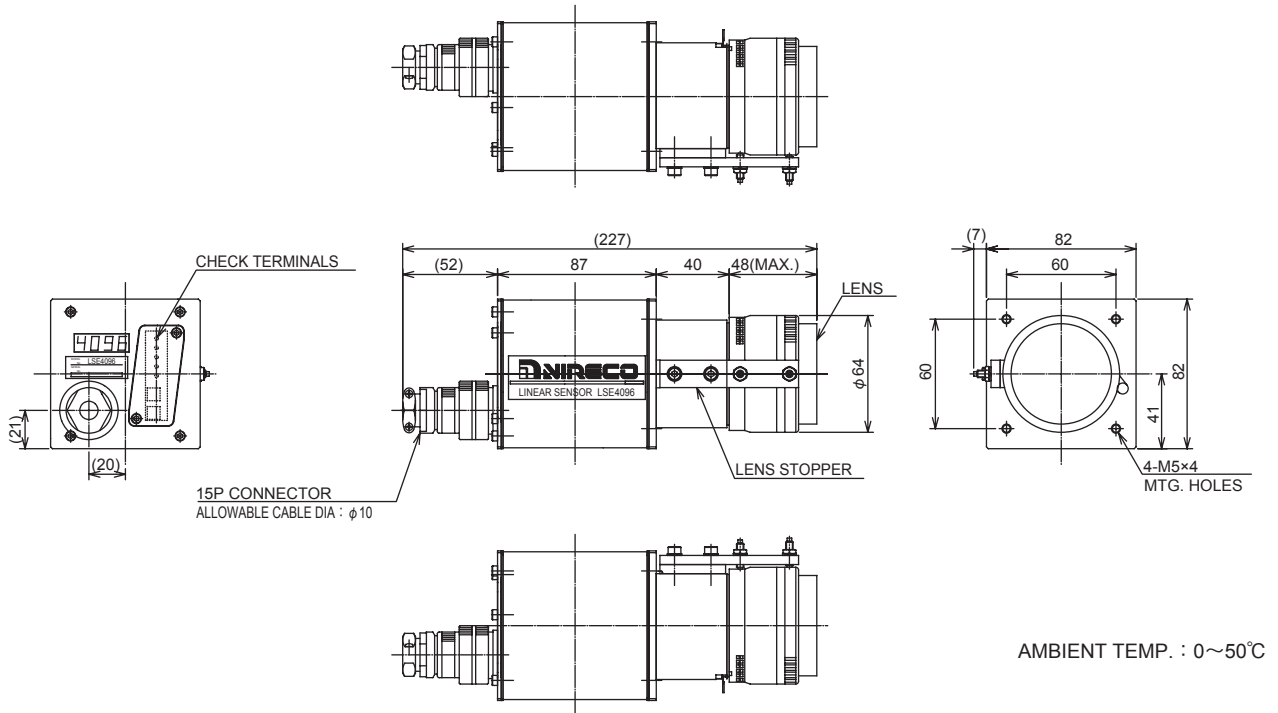


Fig.10 Linear Sensor LSE4096 Dwg.No. MD000110-EA

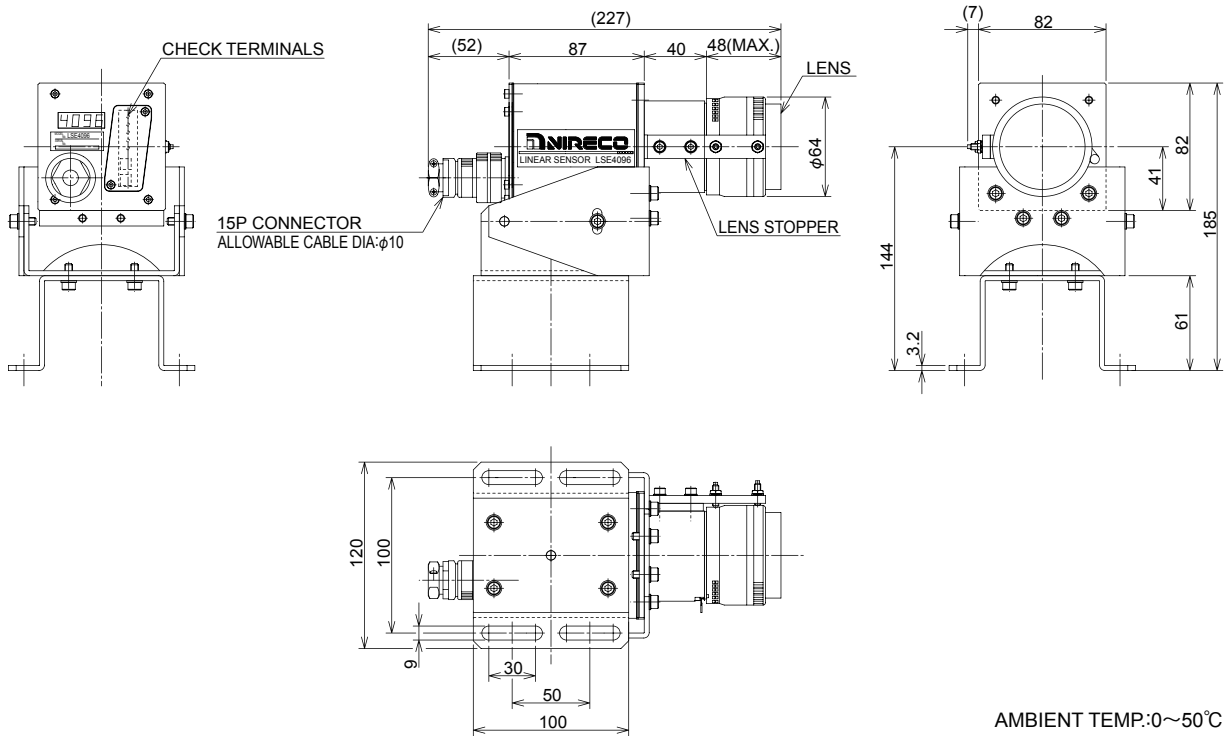


Fig.11 Linear Sensor (with mounting base) LSE4096 Dwg.No. MDMD000210-EA

# PHOTOHEAD

## MODEL PH30 and PH31

### INTRODUCTION

The Photohead utilizes parallel light flux and detects the edge position of a strip (web) electrically.

The two head blocks are independent: the lower block is composed of a projector consisting of a lamp and a lens and the upper block is composed of a detector incorporating a silicon photoelectric element. These blocks are of a cartridge type, and it is convenient to replace them when the lamp has blown or the photoelectric element has deteriorated.

As the edge position of a strip (web), which is present in the parallel light flux between both blocks, changes, the parallel light flux is interrupted and the electrical signal of the photoelectric element changes continuously.

Then, the signal is transmitted to the Universal Amplifier (or web guide amplifier) to activate the moving coil of the controller.

When the periphery of the Photohead mounted is dusty, it is important to purge air in order to protect the lens surfaces of the projector and the detector. It is easy to purge air if an air blower or a pressure-reducing device for purging air is installed using a Photohead provided with the air purge mechanism.

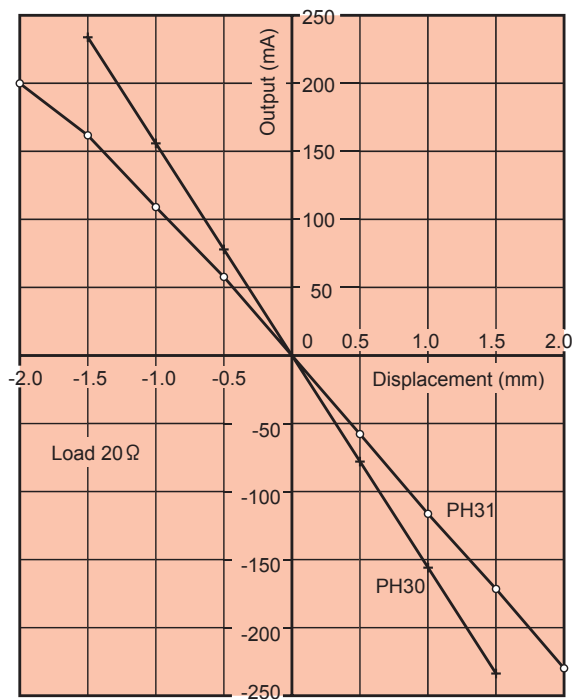


Fig. 3 Example of Characteristics of Photohead (Combined with Universal amplifier)



Fig. 1 Photohead PH30N



Fig. 2 Photohead PH31N

**SPECIFICATIONS**

Compatible amplifiers	1) EPC Amplifier	
	2) Universal amplifier UA1-4 * *	
	3) Web guide amplifier EH322B	
Power supply	PH30	Lump voltage 6 VDC max.
	PH31	Lamp voltage 12 VDC max.
Output	Voltage (in mV) proportional to change in amount of light of the silicon photodiode.	
Sensitivity	Capable of detecting a displacement of a strip or an opaque web of 0.1mm.	
Air consumption for air purging	400N ℓ /min	
Painted colo	Silver	
Ambient temperature	-10 - +60°C	
Mass	PH30:3kg, PH31:Refer to the External Dimensions.	
Effective detecting length	20mm	
Body material	Aluminum alloy casting	
Light souce	Tungsten-filament lamp	

**MODEL CODES**

↓ MODEL

PH	30	PH30	Type of Photohead	
	31	PH31		
	31G	PH31G (guarded)		
-	N	Not provided	Air purge machanism	
	P	Provided		
/	Non	75mm	PH30	Sensor gap (The values in parentheses show the gap of PH31G.)
	3	300 (250)mm	PH31 (PH31G)	
	4	400 (350)mm		
	5	500(450)mm		
	6	600 (550)mm		
	7	700 (650)mm		
	8	800 (750)mm		
	9	900 (850)mm		
	Y	Special specification		

**APPLICATIONS OF PHOTOHEAD EPC SYSTEM**

**Unwinding Reel EPC System**

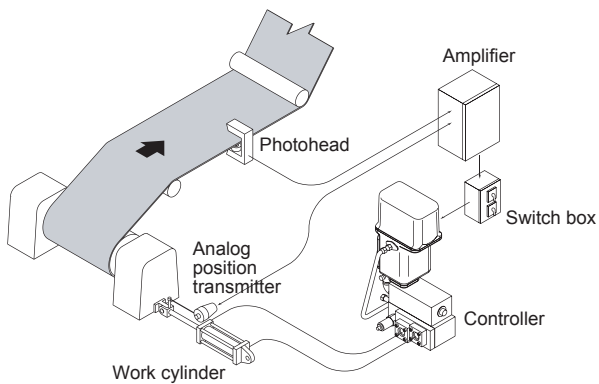


Fig. 4

**Winding Reel EPC System**

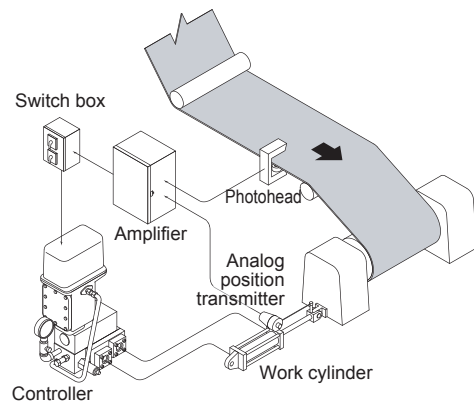


Fig. 6

**Intermediate Guide Roll EPC System**

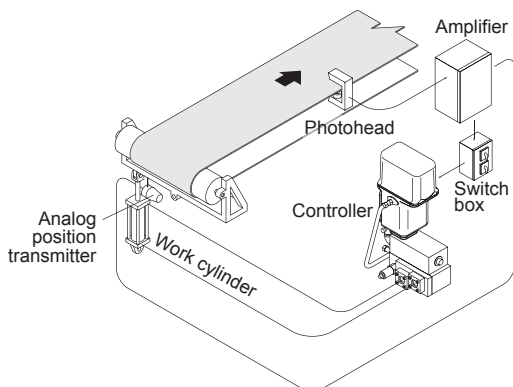


Fig. 5

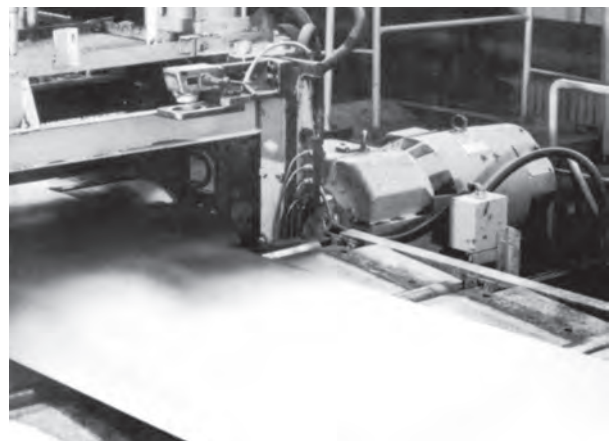


Fig. 7 Photohead PH31 Installation example

# AUTOWIDE CAPACITANCE

## MODEL AWC

### INTRODUCTION

#### Continuous maintenance-free operation

The Capacitance Autowide Sensor AWC is a sensor system that provides continuous, contactless detection of the center position of a strip moving on a line, for use in Center Position Control (CPC).

Like our previous sensors, the sensor is maintenance free and can be used continuously with no decline in sensitivity caused by wear over time, giving stable, long-term service. The sensor is now a far easier product to use, offering improvements such as taking away the need for on-field calibration\*.

\* If there are metal structural elements close to the sensor, some simple adjustment may be required.

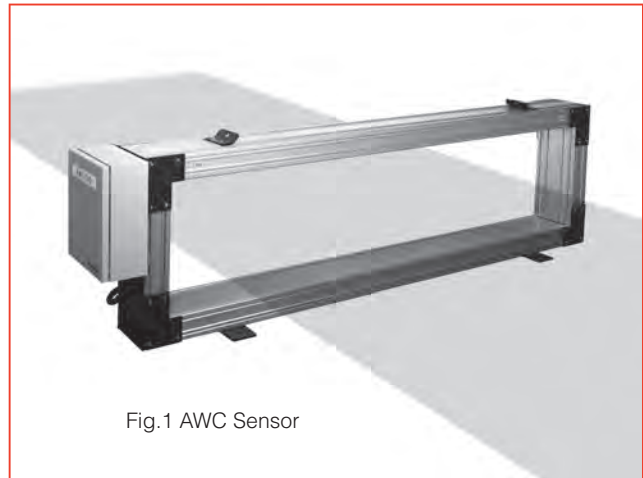


Fig.1 AWC Sensor

### FEATURES

#### Maintenance free

In contrast to optical sensors, capacitance sensors require no maintenance at all.

#### Safe operation

These sensors have no vertical frames, so there is no risk of strip damage due to impact.

#### Operates under harsh conditions

These sensors have no vertical frames, so there is no risk of strip damage due to impact.

#### Lightweight

Lighter than an optical sensor, and far lighter than the previous AWC series.

#### Interchangeable

Mounting dimensions match those of our Autowide optical sensors.

#### Stable detection ability

Even if the strip width changes, the sensor gain does not, so no readjustment is required.

#### Collision avoidance

The distance between electrodes is designed with a generous 300 - 500mm, avoiding collision with the strip.

### OPERATING PRINCIPLES

#### Principles of strip edge detection by the capacitance (electric flux) method

The Capacitance Autowide AWC Series generates lines of electric force between electrodes situated on each side of the strip, and calculates the position of the strip between the electrodes from the changing amount in the number of lines (see Figure 2). The sensor has two sets of transmission and reception electrodes that are installed opposite each other with the strip between them. The transmitter electrode generates electric force lines and the receiver receives them. When a strip enters between the transmitter and reception electrodes, the difference in the blocked transmitter electrodes causes a variation in the force lines received by the reception electrodes (see Figure 3). Therefore, by calculating the lines of electric force received by the reception electrodes, the position of the strip becomes apparent.

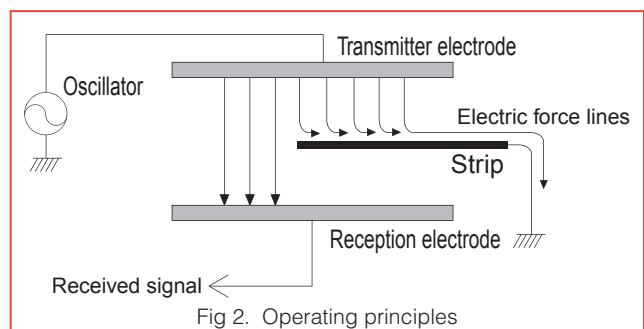


Fig 2. Operating principles

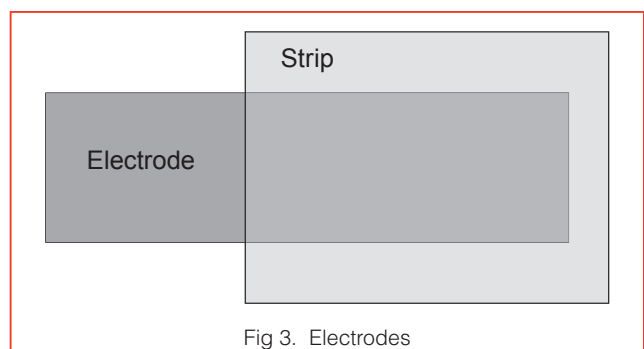


Fig 3. Electrodes

APPLICATION EXAMPLE

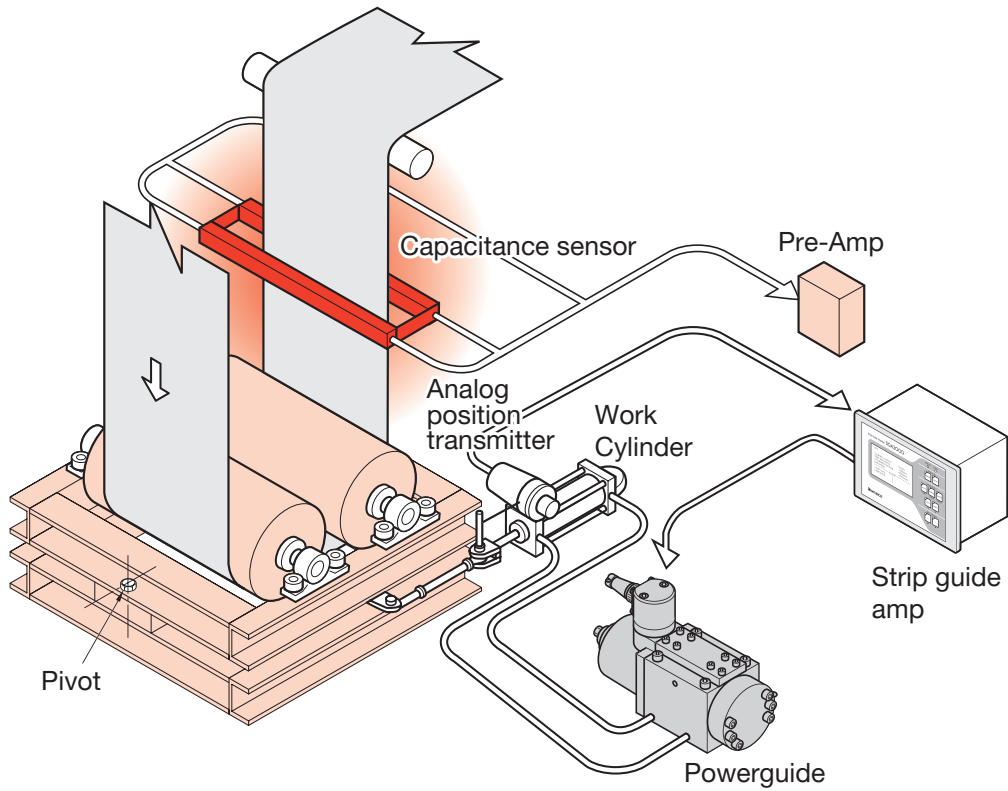


Fig 4. Steering roller system (with intermediate guide roller)

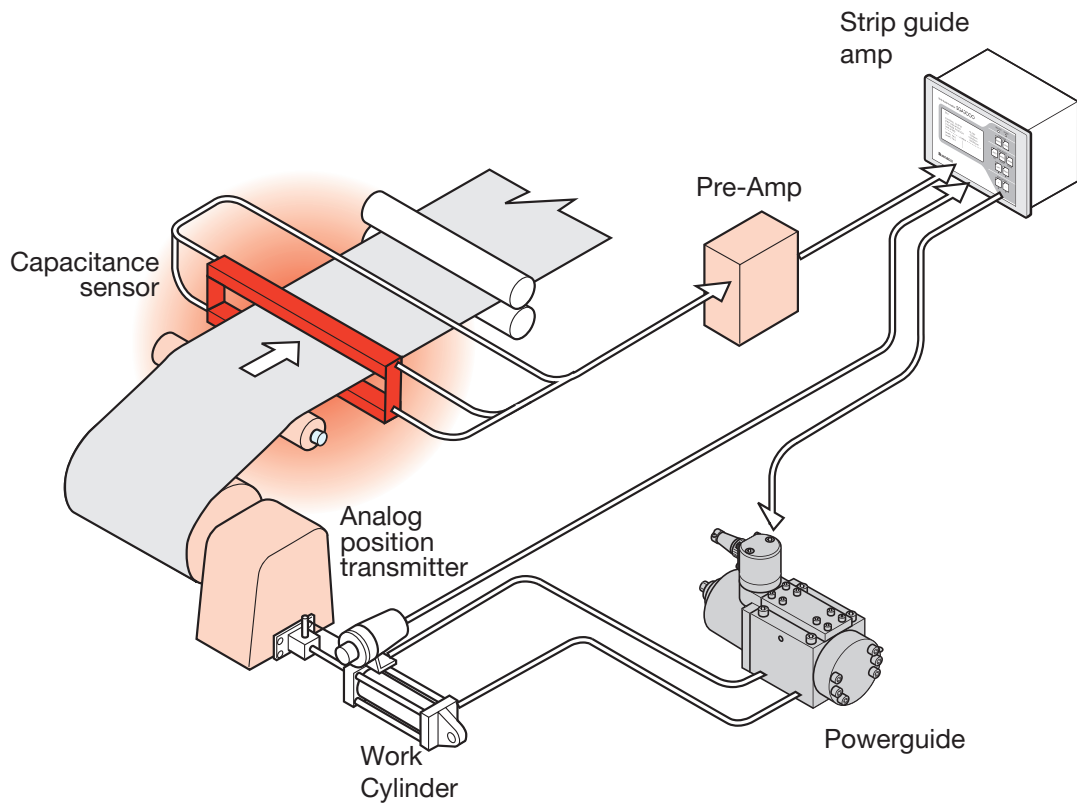


Fig 5. Payoff reel system (unwinder)

## SPECIFICATIONS

Ambient temperature	AWC***-*-P (With Pre-amp) (0°C - 50°C) AWC***-*-N (Without Pre-amp) (0°C - 60°C)	Frequency response	5Hz
Power supply	AC85V - AC264V, 50/60Hz	Output	Strip diviation $\pm 5V / \pm 200mm$ Alarm Healthy, Roll out, No strip
Sensor accuracy	Within $\pm 5mm$	Mass	63 - 79kg

## EXTERNAL DIMENTIONS

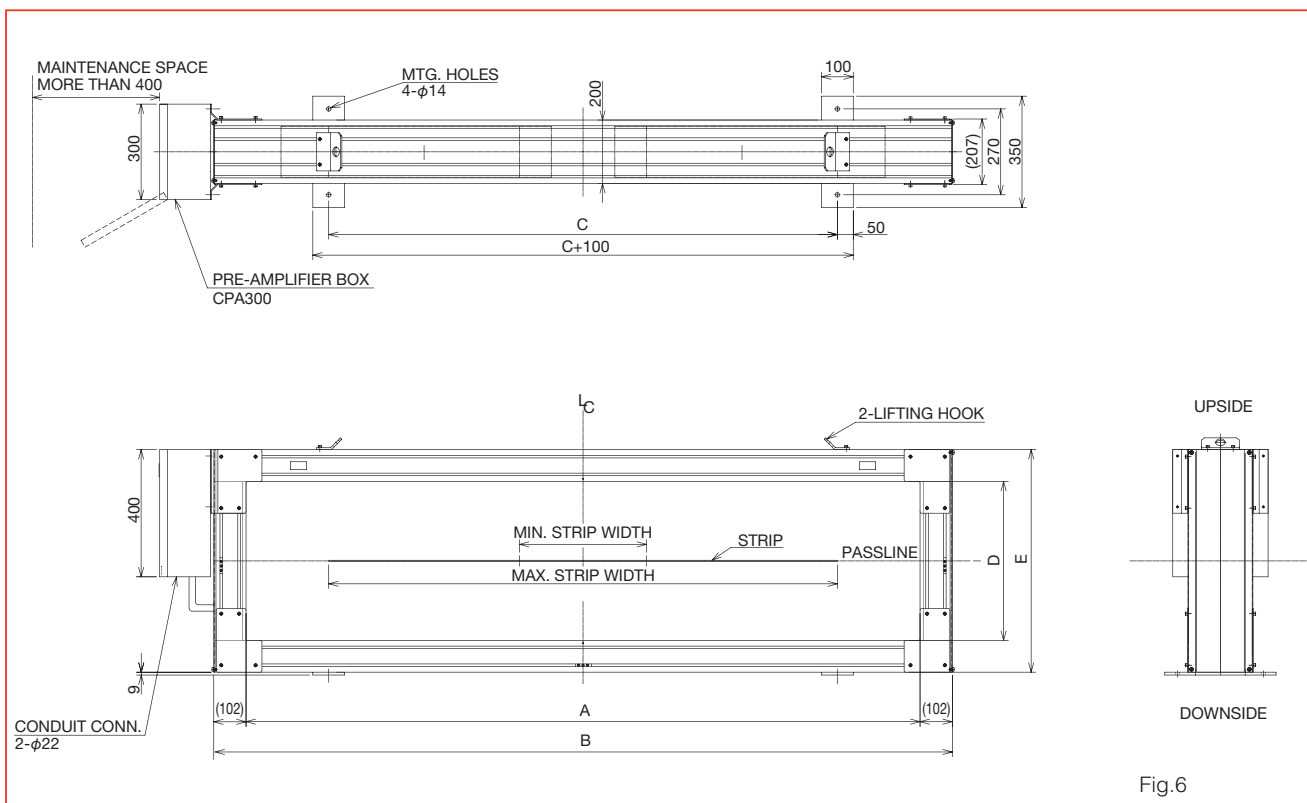


Fig.6

Mdel No.	Strip Width		A	B	C	D	E	Approx weight(kg)
	Min Width	Max Width						
AWC640-3	400	1300	1820	2020	1300	300	500	63
AWC640-4	400	1300	1820	2020	1300	400	600	65
AWC640-5	400	1300	1820	2020	1300	500	700	66
AWC790-3	400	1600	2120	2320	1600	300	500	67
AWC790-4	400	1600	2120	2320	1600	400	600	69
AWC790-5	400	1600	2120	2320	1600	500	700	70
AWC940-3	400	1900	2420	2620	1900	300	500	72
AWC940-4	400	1900	2420	2620	1900	400	600	73
AWC940-5	400	1900	2420	2620	1900	500	700	75
AWC1090-3	400	2200	2720	2920	2200	300	500	76
AWC1090-4	400	2200	2720	2920	2200	400	600	77
AWC1090-5	400	2200	2720	2920	2200	500	700	79

## LED Autowide Sensor

# AUTOWIDE SENSOR MODEL AWL

## INTRODUCTION

The Autowide Sensor AWL is used mainly for CPC (center position control) to detect the center line on a strip (web). It can continuously control the center line at a constant position without changing the position of the sensor each time the width of the strip changes (large changes such as seams etc.).

The AWL is a new generation of detector which uses a high-frequency LED as the projector and SPDs (silicon photo diodes) as the detector.

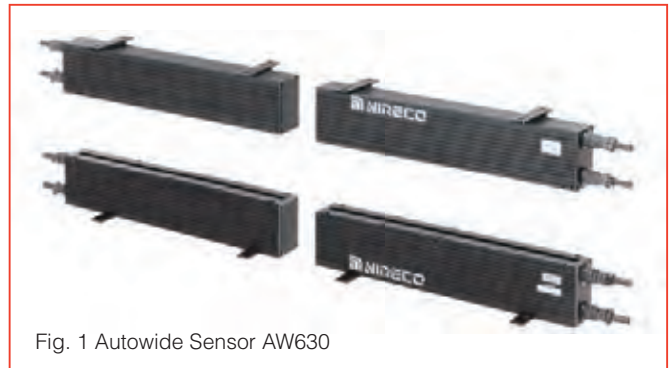


Fig. 1 Autowide Sensor AW630

## FEATURES

- The LED of the light source ensures a longer service life.
- The SPD of the detecting element ensures a higher response than conventional sensors.
- The light source is lit at a high frequency and is synchronized. There is almost no effect from peripheral light (less than 1/50, compared with a fluorescent lamp-type Autowide Sensor).
- The sensor gap can be fixed at any position.

## SPECIFICATIONS

Model	AWL631	AWL781	AWL931	AWL1081
Effective detecting length (mm)	450	600	750	900
Strip width (mm)	265 (305) or more	315 (355) or more		
Power consumption (VA)	28×2 = 56	30×2 = 60	32×2 = 64	34×2 = 68
Mass (1set) (kg)	(5.2+5.8)×2 = 22	(6.8+7.2)×2 = 28	(9.1+9.5)×2 = 37	(9.1+9.5)×2 = 37
Air consumption* m <sup>3</sup> /min	2	3	4	4
Sensor gap (mm)	Type T : 300 - 1200mm ; Type M : 1200 - 3000mm			
Detecting element	SPD (silicon photo diode)			
Light source	LED (Light emitting diode)			
Frequency response	15Hz			
Resolution	0.2mm			
Linearity	±1.5%			
Effect of peripheral light	Almost none			
Power supply	100/110 VAC ±10% 50/60Hz			
Ambient temperature	0 - +50°C			
Painted color	Black			

Note : 1. The values in parentheses are for model equipped with an air-purge mechanism.

2.\* : When an air-purge mechanism is provided, an air source is needed. The air consumption values listed are for 50kPa.

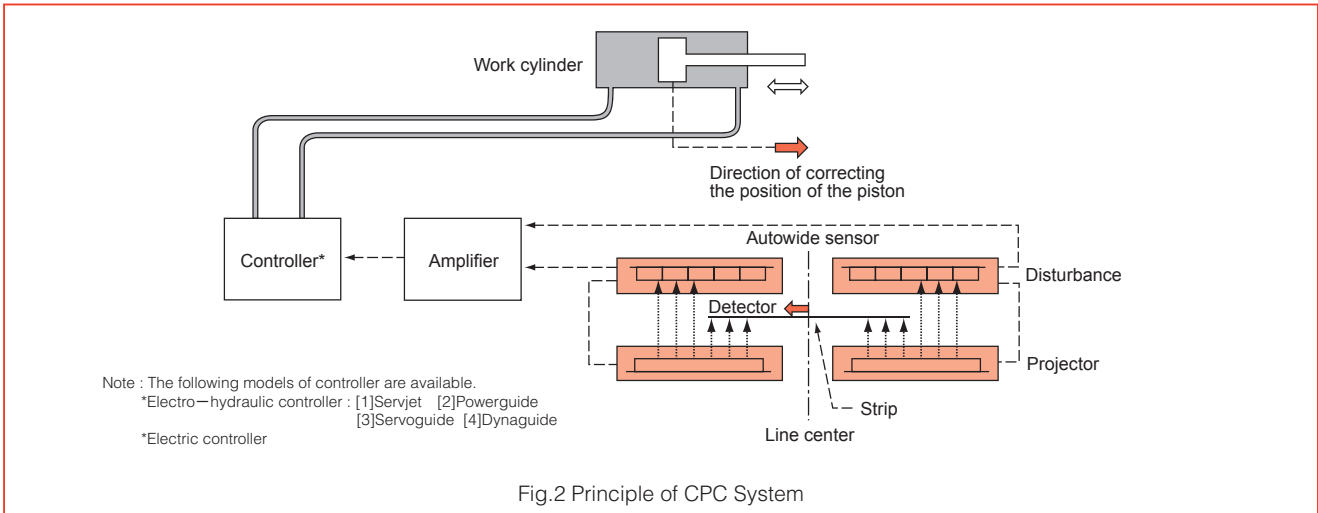
3. The weights in parentheses are shown in the order of projector and detector.

4. Use type M if the path line fluctuates greatly.

**PRINCIPLE OF OPERATION**

As illustrated in Fig. 2, the right and left detectors detect the deviation of the strip edges from the center line, and send signals to the amplifier. The amplifier amplifies the difference between the right and left signals and sends the signal to the hydraulic controller or electric controller to perform CPC. When a strip travels with its center coincident to the center of the line, the signal from the amplifier is zero. In this

state, the work cylinder is positioned at the center. When a strip deviates either to the right or to the left, the positive or negative signal, which is determined by the direction for correction, is transmitted to the controller, and the cylinder works in the direction to correct the displacement of the strip.

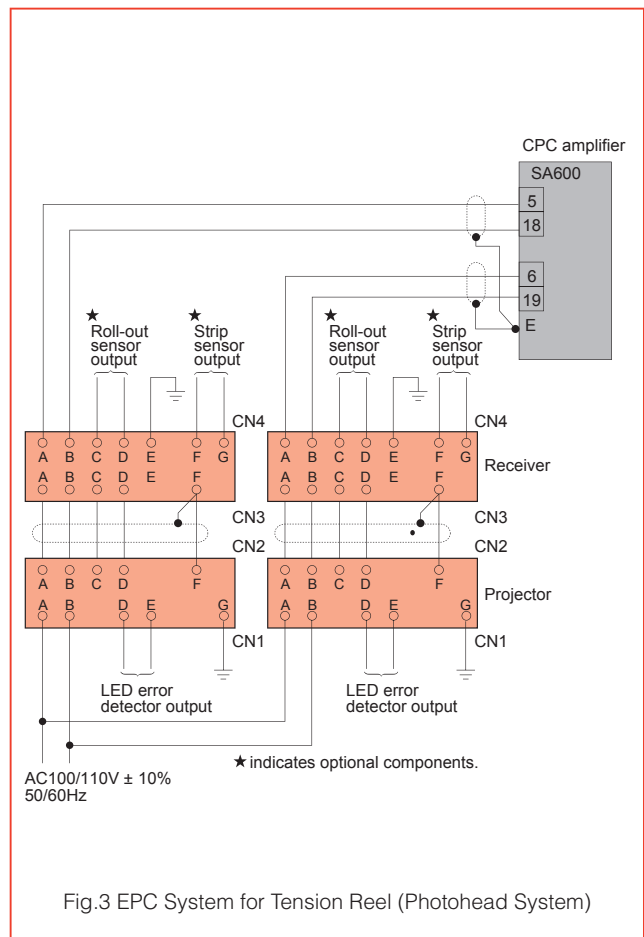


**MODEL CODE**

AWL		MODEL	
631	450mm	Effective detecting length	
781	600mm		
931	750mm		
1081	900mm		
T	300 - 1200mm	Sensor gap	
M	1200 - 3000mm		
N	Not provided	Air purged mechanism	
AA	Provided (Detector Projector)		
AD	Provided (Detector)		
AP	Provided (Projector)		
N	Not provided	Roll-out sensor	
R	Provided		
N	Not provided	Strip sensor	
S	Provided		
C	With connector	Connector	
Y	Special specification		

Note: The LED error detector, the roll-out sensor and the strip sensor are to be used in combination with the MW2010.1 alarm unit. (The alarm unit is optional).

**WIRING DIAGRAM**





APPLICATION EXAMPLE OF CPC SYSTEM

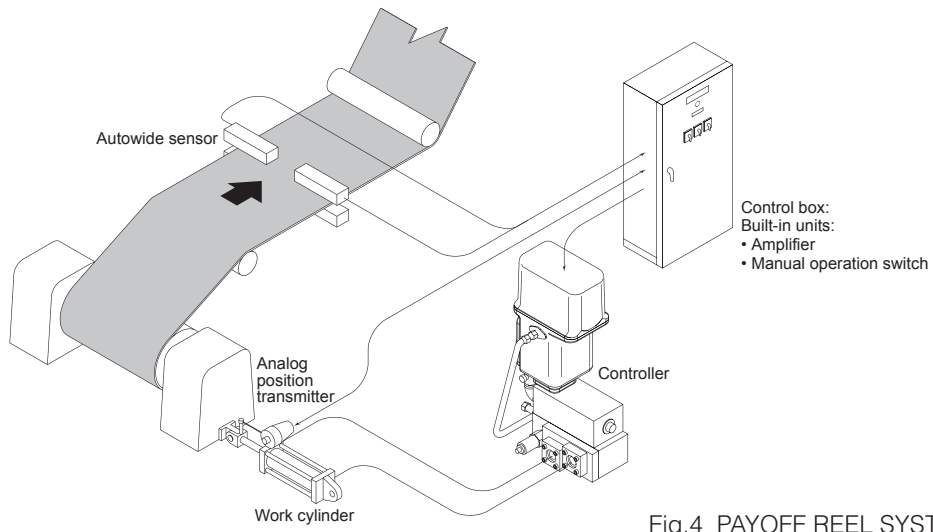


Fig.4 PAYOFF REEL SYSTEM (Unwinding)

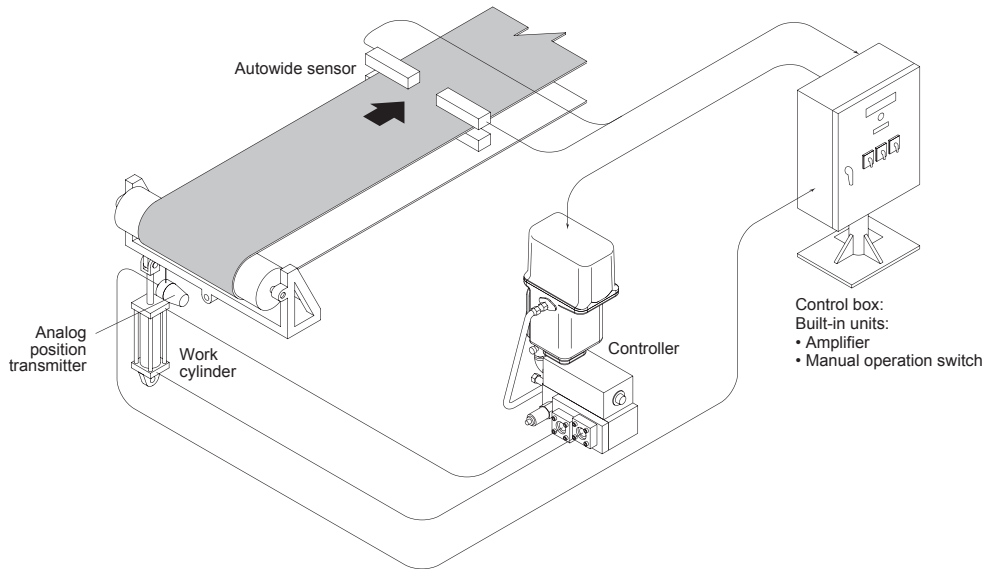


Fig.5 STEERING ROLL SYSTEM (Intermediate Guide Roll)

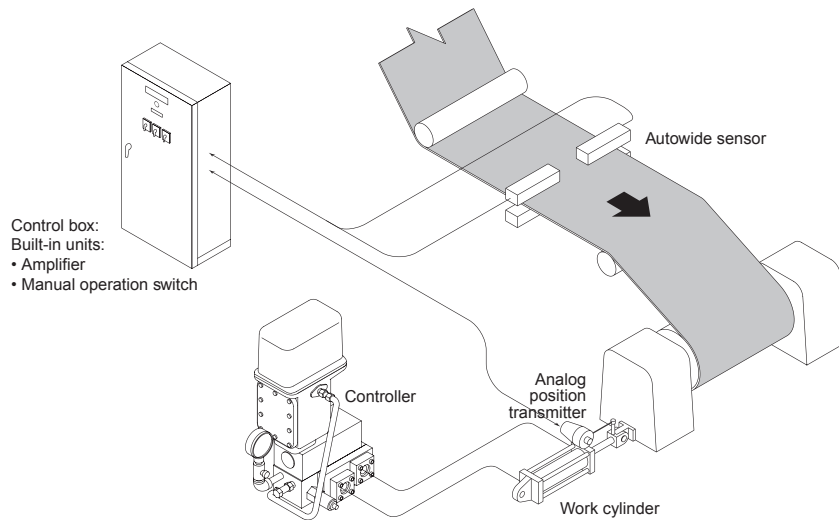


Fig.6 TENS10N REEL SYSTEM (Winding Reel)

# POSITION TRANSMITTER

## MODEL FW22/31 FW80

**CONVERTS POSITION, GATE, WIDTH, WEIGHT etc.  
into ELECTRICAL SIGNALS.**

- ① Analog Position Transmitters FW22/FW31
- ② Analog Position Transmitters FW80
- ③ Linear Potentiometer Position Transmitter LP

### 1 ANALOG POSITION TRANSMITTER FW22/FW31

#### Wire Position Sensor

The Analog Position Transmitter incorporates a precision potentiometer and converts the linear motion of an object to be measured into electric resistance proportional to its position. The construction drawing is shown in Fig.1. A

stainless steel wire is wound around a wire drum which incorporates a spring. The shaft of the drum is connected to the shaft of the potentiometer.

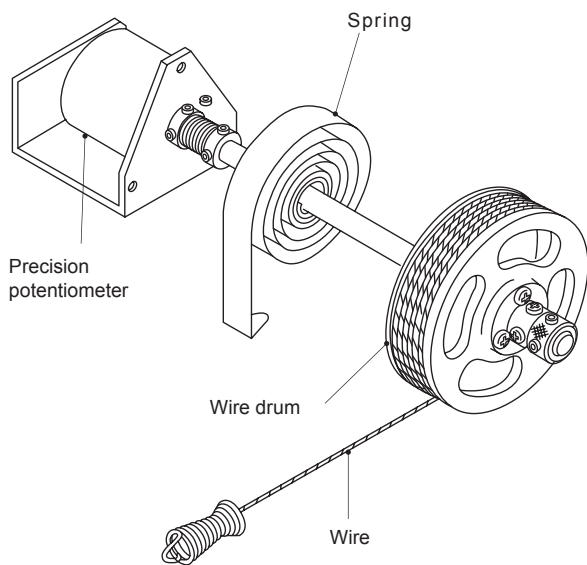


Fig. 1 Construction



Analog Position Transmitter FW22

**POSITION TRANSMITTER**

Output	0 - 2000Ω
Response speed	400mm/sec
Wire tension	7N (ave.)
Ambient temperature	-20°C - +60°C (standard) -20°C - +80°C (FW22 high-temp. specs only)
Painted color	JIS7.5BG4/1.5
Installation Location	FW22: Indoors only FW31: Flameproof Type Explosion-protection type: Flameproof: d2G4 Certification No.: 22828
Mass	FW22 : 2kg FW31 : 4.4kg

Model	Detecting length (mm)	Linearity (%)	Hysteresis (%)	Permissible power (W) (at 60°C)
FW22	270	±0.5 (Note)	0.2	3.3
	840			2
	1405			2.5
FW31	270	±0.5	0.2	3.3
	840			2
	1405			2.5
	270	—	1.5	

Note: Linearity of ultra-precision class is ±0.2%

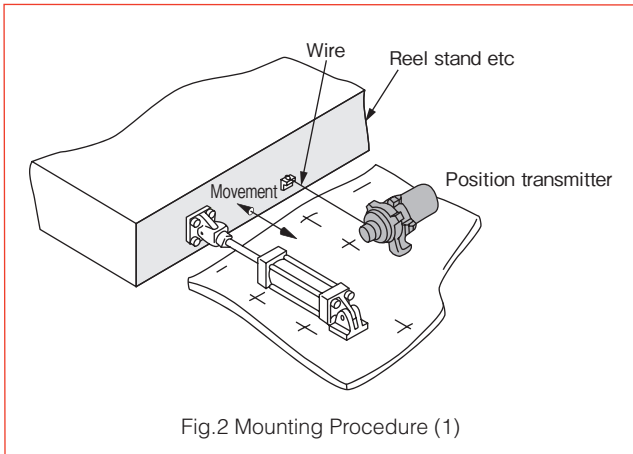


Fig.2 Mounting Procedure (1)

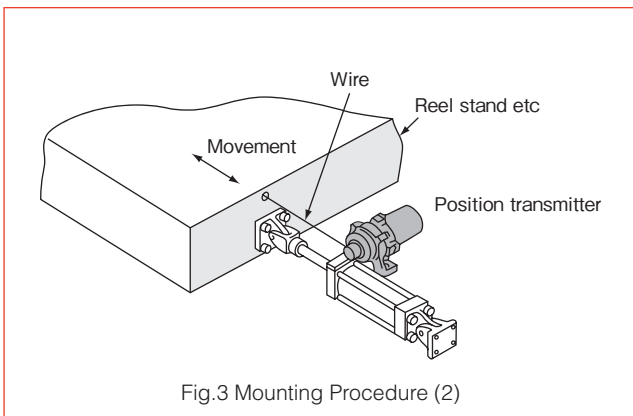


Fig.3 Mounting Procedure (2)

**MODEL CODES**

**Standard Type**

FW22. 01 / Y	Maximum Detecting Length	Potentiometer Type
01	270mm	Standard Potentiometer
02	840mm	
03	1405mm	
11	270mm	Oil-contained Potentiometer
12	840mm	
13	1405mm	
21	270mm	Ultra-precision class Potentiometer
31	270mm	High-temperature Potentiometer
32	840mm	
33	1405mm	
Y	If there are special specifications, values are clearly itemized using signal as Y	

**Flameproof Construction**

FW31. 01 0 / Y	Maximum Detecting Length	External wire lead-in type
01	270mm	Standard Potentiometer
02	840mm	
03	1405mm	
11	270mm	
0	Conduit tube thread connection (standard)	
1	Pressure-resistant packing (semi-standard)	
Y	If there are special specifications, values are clearly itemized using signal as Y	

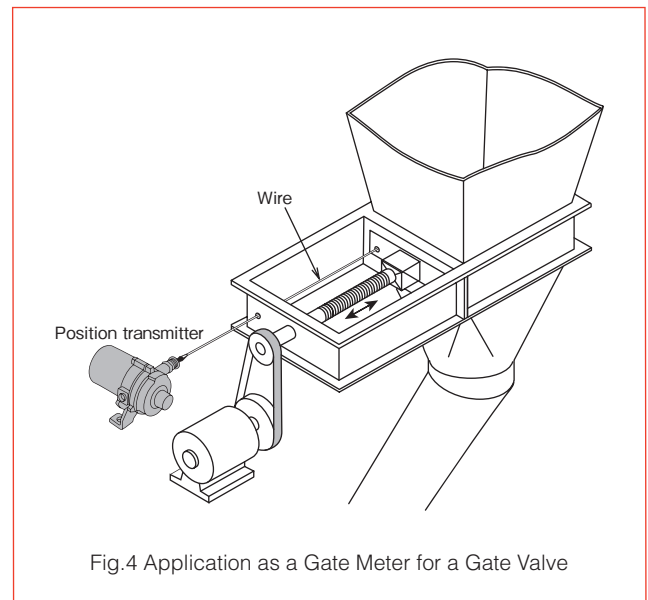


Fig.4 Application as a Gate Meter for a Gate Valve

## 2 ANALOG POSITION TRANSMITTER FW80

The FW80 analog position transmitter has two versions: a long-stroke type and an ultra-precision type. The position transmitter incorporates a precision potentiometer, and converts the linear motion of an object to be measured into electric resistance proportional to its position. A construction

drawing of this device can be found in Fig. 8. A stainless steel wire is wound around a wire drum, which incorporates a spring. The shaft of the drum is connected to the shaft of the potentiometer via the synchro-belt pulley.

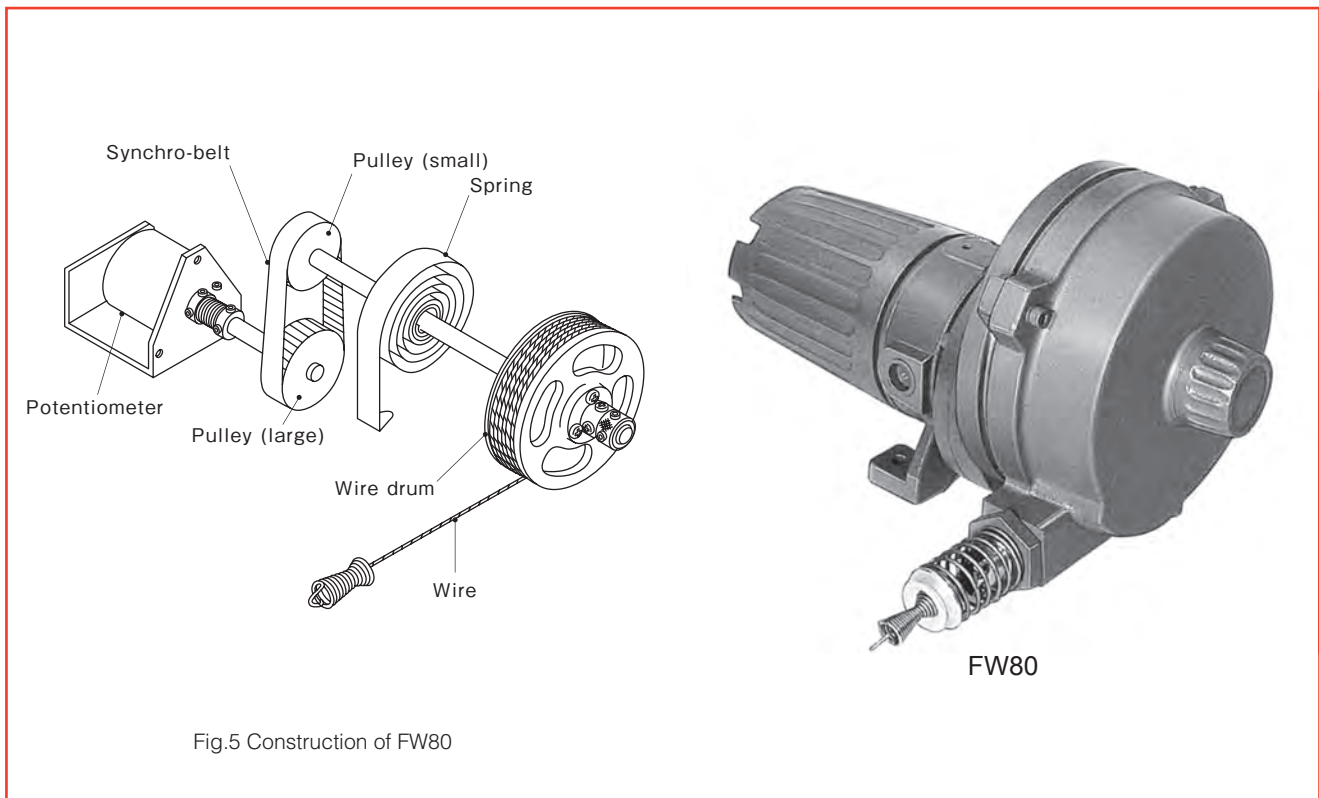
### SPECIFICATIONS

Output	0 - 2000Ω		
Response speed	400mm/sec		
Wire tension	45N (4.5kgf) max.		
Ambient temperature	-20°C - +80°C (standard)		
Painted color	JIS7.5BG4/1.5		
Mass	8.6kg		
Detecting length	970	3000	5000
Linearity (%)	±0.5	±0.5	±0.5
Hysteresis (%)	0.2	0.2	0.2
Permissible power (W) (at 60°C)	3.3	0.8	1.5

### MODEL CODES

FW80. 01 / Y

01	970mm	Standard Potentiometer	Maximum Detecting Length
02	3000mm		
03	5000mm		
11	970mm	Oil-contained Potentiometer	Special specification
Y	If there are special specifications, values are clearly itemized using signal as Y		



# High-precision Position Transmitter

## MODEL GYKM-LT

Converts position to an electrical signal with high precision

### FEATURES

1. There is no contact between the magnetostrictive wire and the slide magnet, so mechanical service life is maximized.
2. Resolution not exceeding 0.01%, linearity not exceeding 0.025%

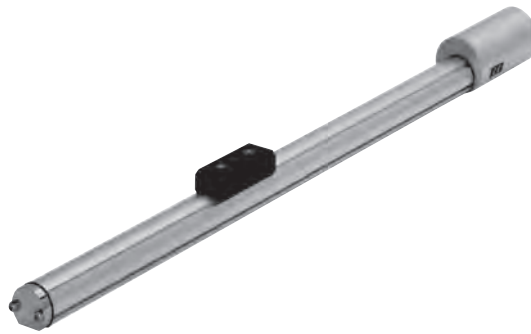


Fig.6 Linear probe GYKM-LT

### OPERATING PRINCIPLES

When a pulse signal flows in the magnetostrictive wire inside the transmitter of the high-precision position transmitter, a magnetic field is generated around the wire. Placing a magnet in this field causes mechanical vibration in the magnetostrictive wire, and the vibration propagates along the wires at the speed of ultrasound. The time of propagation is measured to gauge the position of the slide magnet.

### SPECIFICATION

Model	GYKM-LT
Stroke	350mm
Output	4~20mA Load resistance Max 500Ω
Resolution	Not exceeding 0.01% FS
Linearity	Not exceeding ±0.025% FS
Sampling frequency	1kHz
Power supply	24 ±2V DC, 0.05A
Operating temperature	0°C ~ +50°C
Storage temperature	-20°C ~ +60°C
Vibration resistance	3G
Protection standard	IP 65
Mass	3kg

High-performance EPC/CPC amplifier

# Strip Guide Amplifier

## MODEL SGA3000

### INTRODUCTION

The Strip Guide Amplifier is a high-performance, microprocessor-equipped EPC/CPC amplifier. It offers advanced EPC/CPC controls such as stagger winding and cascading which are unavailable from conventional analog amplifiers. Also, this product is one-ninth the volume and one-fourth the weight of previous products. Finding the installation space is no longer an issue.

### FEATURES

- The LCD screen makes it easy to check setting values and output signal status.
- All operations use the push buttons on the control panel for parameter settings.
- Control is possible by P, I or PI action.
- A line speed signal input enables automatic adjustment of control gain to compensate for changes in line speed. PLG signal input enables stagger winding.
- Sensor signals can be taken from up to two sensor systems, enabling cascading control operation.



Fig.1 Now more compact and lightweight

### CONFIGURATION

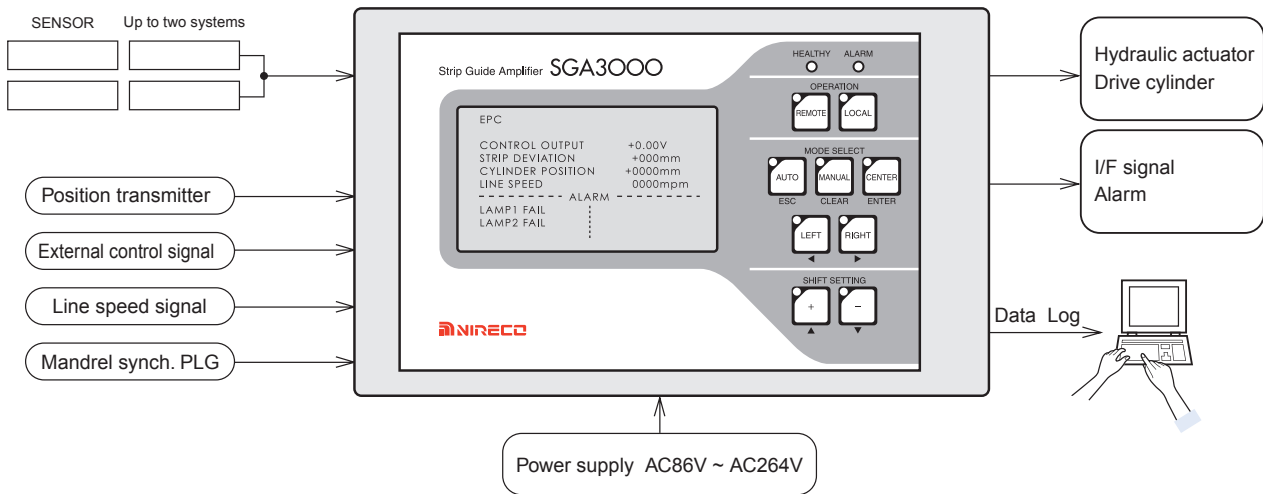


Fig.2 Configuration diagram

RELATED DEVICES

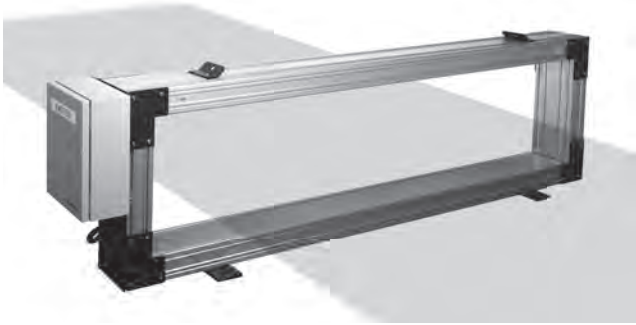


Fig.3 Capacitance Autowide sensor



Fig.4 Linear sensor



Fig.5 Position transmitter



Fig.6 Pilotjet



Fig.7 Powerguide

APPLICATION EXAMPLES

CPC

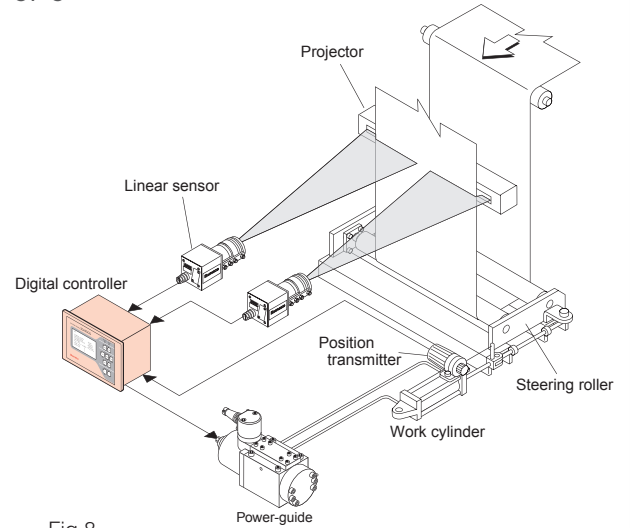


Fig.8

EPC

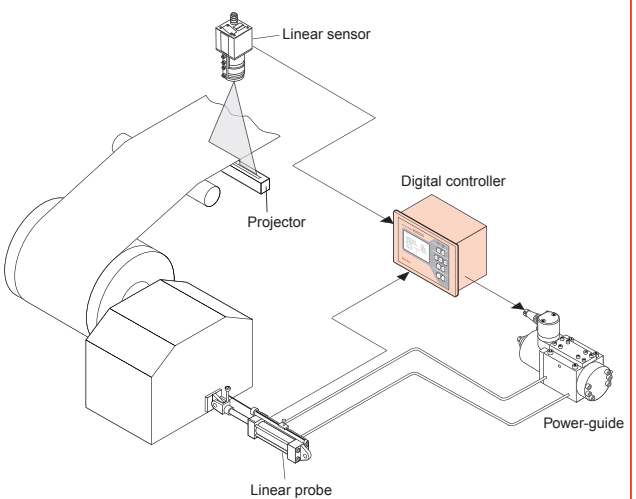


Fig.9

CPC / EPC

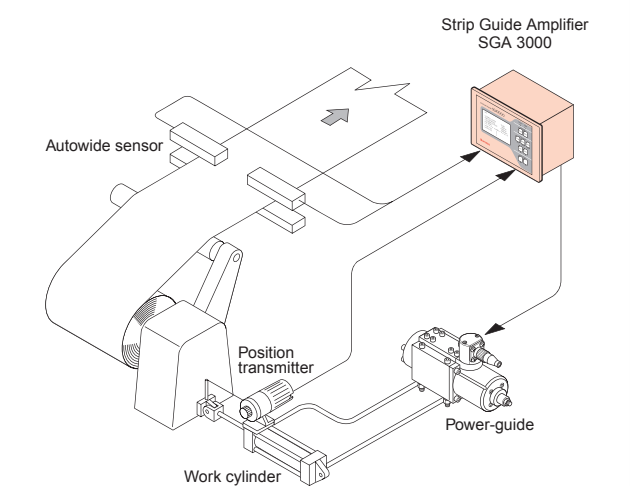


Fig.10

## SPECIFICATIONS

Connected sensor	Capacitance Autowide, Linear sensor, LED-type Autowide
No. of optical sensors	Two system
Display	LCD display (rated for five years of continuous lighting)
Operation	Push buttons on the control panel (common buttons for parameter setting and mode setting)
Input signals	Sensor signal, voltage, current, PSD Position transmitter signal 0 - 2 kW, linear probe signal 4 - 20mADC Line speed 0 - 10VDC or 4 - 20mADC PLG signal Photo coupler input 24VDC/7mA, 10kHz (max)
Control output	±250 mA (load 20W)
Analog output	Shift volume ±5VDC (load at least 1kW ) Cylinder position ±5VDC (load at least 1kW ) Strip deviation ±5VDC (load at least 1kW )
Warnings	System healthy, lamp failure, roll out, no strip, large deviation, oil pressure low, oil temperature high, oil level low, open collector output 24VDC/100mA (max)
Other Power supply	Data storage function (RS-232C connection) AC85V - AC264V 50/60 Hz
Power consumption	100VA
Operating temperature range	0 - 40°C
Mass	5kg

## EXTERNAL DIMENSIONS

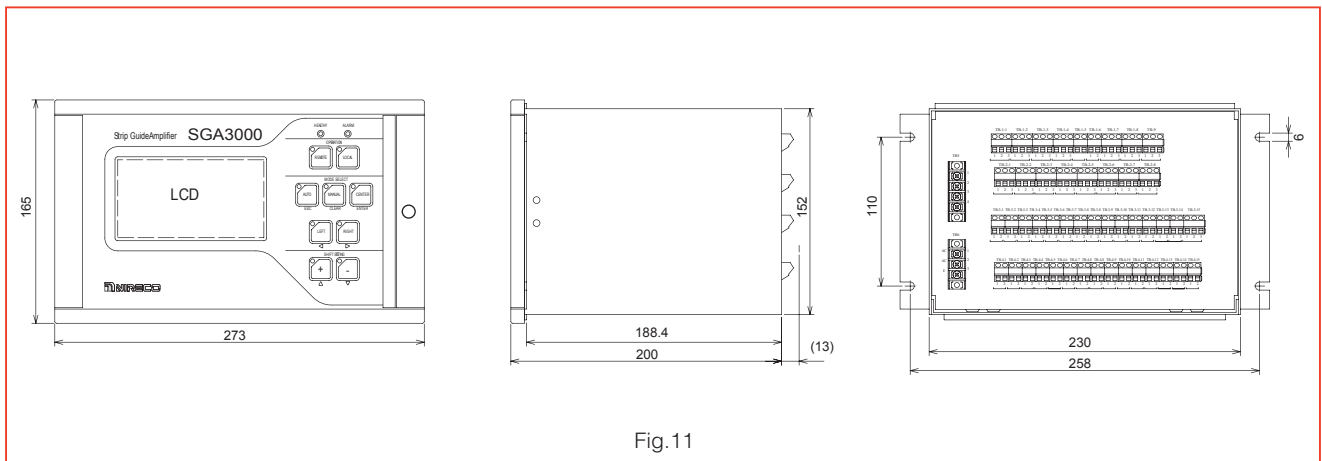


Fig.11



# PILOTJET

## MODEL PJ2

### INTRODUCTION

The PILOTJET is an industrial servo valve for converting electric signals (-200 - 0 - +200mA DC) into hydraulic signals, which is used mainly for EPC® in iron and steel plants. The PILOTJET uses a highly reliable jet pipe system with extensive experience of use to ensure high operability and easy maintenance.

### FEATURES

- A dry detecting unit that is not affected by magnetic dust in oil reduces periodic maintenance work .
- A jet pipe system with extensive experience of use provides hydraulic control.
- A servo mechanism for handling low to high flowrates is available in combination with a variety of gain boosters.
- A wide range of gain boosters is available with hydraulic pressures of 0.8(8) - 14 MPa.
- A simple structure allows for disassembly, reassembly, and adjustment in your plant.
- Easy operation and maintenance
- The amount of oil used by the jet pipe has been approximately halved compared to conventional models.



### STRUCTURE

#### Controller

The PILOTJET controller consists of a moving coil detecting element, a jet pipe control unit whose sides are supported by special bearings, a spring acting against the detecting element through the jet pipe, and a zero-point adjusting unit with bias adjusting springs.

The moving coil detecting element consisting a moving coil and a permanent magnet generates a force in proportion to a current according to Fleming's rule when an input current is applied to the moving coil in the magnetic field. This relation can be expressed by the following formula.

Relation between input and output signals:

$$F = 6.5 \sqrt{W} = 6.5 \sqrt{R \cdot I^2}$$

where, F=output(N)

W=input power(W)

I=current of moving coil(A)

R=resistance of moving coil( $\Omega$ )

This force counteracts that of the spring on the opposite side of the jet pipe. Thus, the jet pipe moves to a position where the force generated by the input current is balanced by the spring's force.

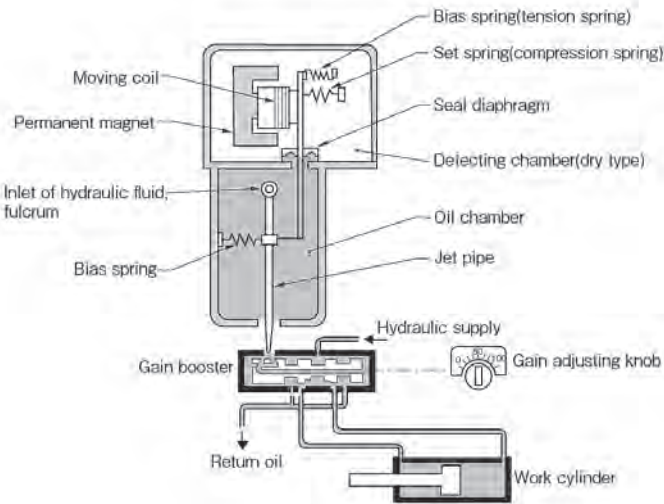


Fig. 1 Operating Principle of Pilotjet Controller

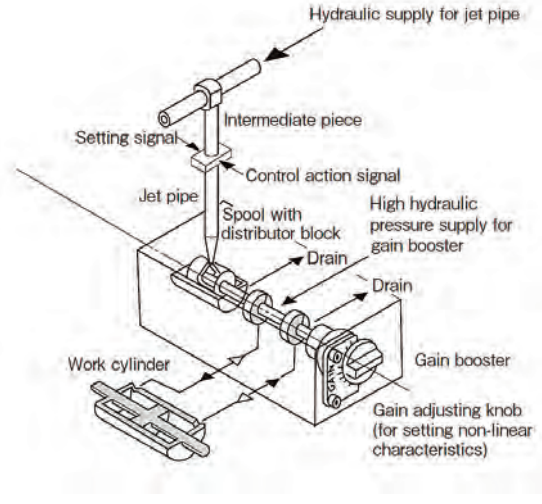


Fig. 2 Conceptual Diagram of Hydraulic Controller

**Gain Booster**

Hydraulic fluid supplied from the inlet is introduced into the jet pipe, and is discharged from the jet pipe nozzle toward the distributor block. The recovery pressures at both sides of the gain booster are balanced when the jet pipe nozzle faces the area mid-way between the two orifices of the distributor block.

When the jet pipe moves to either side, the oil pressure at one side of the gain booster rises and the oil pressure at the other side falls. As a result, a differential pressure is generated between the two detecting units of the gain booster. This differential oil pressure changes the amount of the main oil needed to move the work cylinder piston. Thus, the amount of oil supplied to the work cylinder is proportional to change in the input signal.

**Specifications of a Single Pilotjet Controller**

Input signal:	+200 - 0 - -200mA DC (zero balance)
Resistance of moving coil:	About 20Ω
Supply oil pressure:	1.2MPa
Jet pipe capacity*:	About 3.5 l /min (at 1.2MPa)
Hysteresis error:	Less than 2%
Fluctuation of neutral point:	Less than 2%

\*: For gain booster with a 1.2-mm diameter nozzle

Fig. 3 shows the characteristics of the gain booster. The 0% gain shows a dead zone, which is a characteristic found in pilot valves. The 100% gain shows a linear characteristic, and any gain between them shows a non-linear characteristic. This non-linear characteristic is important to improve the stability of the EPC system.

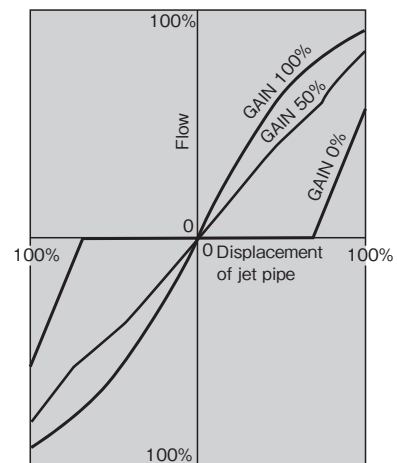


Fig. 3 Flow-rate Characteristics of Gain Booster (Gain Adjustment)

**MANIFOLD CONTROLLER M4PJ240, M5PJ240, M6PJ240**

The manifold controller consists of a PILOTJET controller, which receives a strip edge position signal from the sensors as an electric signal and converts it into hydraulic pressure (amount of oil); an adjustable gain booster, which amplifies the hydraulic signal; an automatic shut-off valve (solenoid controlled valve), which is automatically shut from a remote place; a reducing valve, which adjusts the hydraulic supply pressure to the PILOTJET controller; and an oil pressure gauge. These components are integrated into a manifold equipped with special hydraulic circuits.

**Specifications of Manifold Controller**

Model of manifold controller	M4PJ240	M5PJ240	M6PJ240
Gain booster	BO9M	BO9HM	BO10M
Maximum hydraulic pressure MPa	5	14	10
Flow-rate characteristics :	Fig. 7	Fig. 9	Fig. 11
Mass kg :	About 23	About 28	About 48
Hydraulic pressure of jet pipe	1.2MPa		
Permissible back pressure of return oil	0.1MPa		

**MODEL CODES**

MODEL	MODEL	Max hydraulic pressure MPa	Flowrate ☆ 1 ℓ / min	Gain Booster combined
PJ240	M4	5	32	BO9M
	M5	14	80 (48) ☆ 2	BO9HM
	M6	10	200	BO10M

PJ240			
-	0	Mineral oil	Kinds of hydraulic fluid
	1	Phosphate oil ☆ 3	
	3	Fatty acid ester oil ☆ 3	

-	A	100V 50/60Hz、110V60Hz	Power supply for solenoid valve
	B	200V 50/60Hz、220V60Hz	
	C	DC12V	
	D	DC24V	
	E	DC48V	
	F	DC100V	

-	Y	"Y" is suffixed for special specifications and is followed by details.	Special specifications
---	---	--	------------------------

- Notes ☆ 1 The values for flowrate are for the case in which the pressure loss is half the maximum hydraulic pressure.  
 ☆ 2 This value is the case where a pressure loss at 48 ℓ /min is 2.5 MPa  
 ☆ 3 Specify the manufacturer and brand of hydraulic fluid to be used.

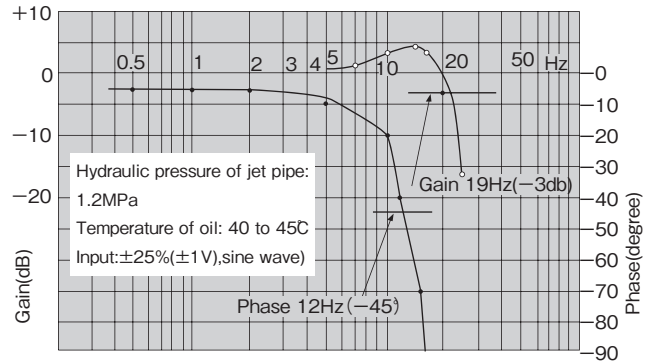


Fig. 4 Characteristic Curve of PILOTJET Controller

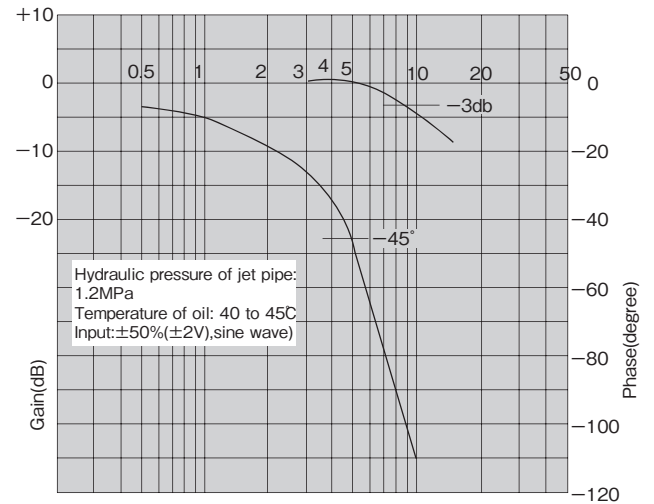


Fig. 5 Characteristic Curve of PILOTJET Controller with Gain Booster

M4PJ240, M5PJ240, M6PJ240

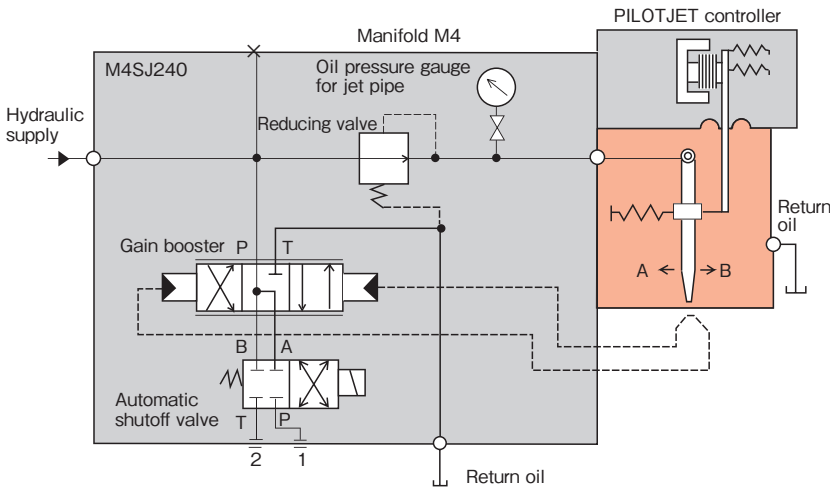


Fig.6 Hydraulic Circuit Diagram of M4SJ240

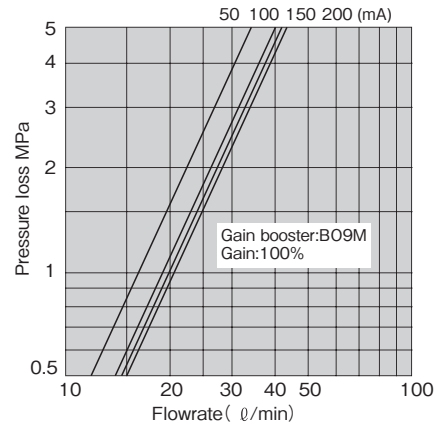


Fig.7 Flowrate Characteristics of M4PJ240

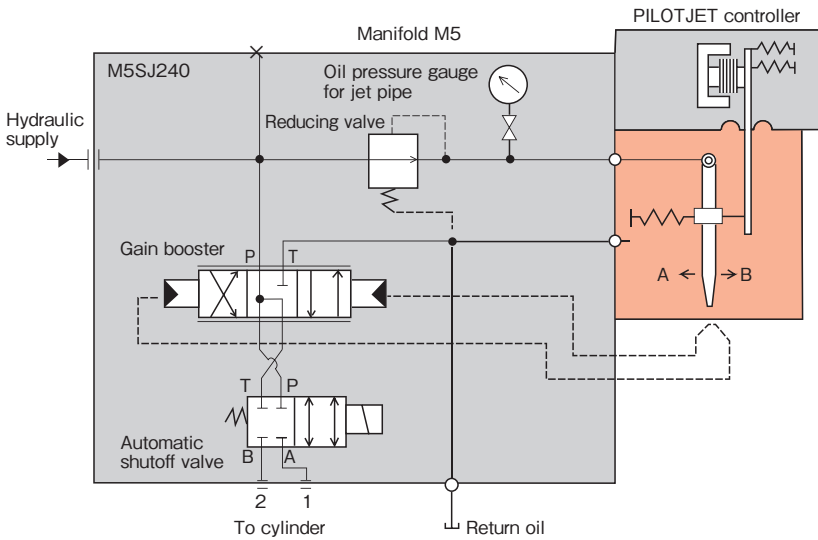


Fig.8 Hydraulic Circuit Diagram of M5PJ240

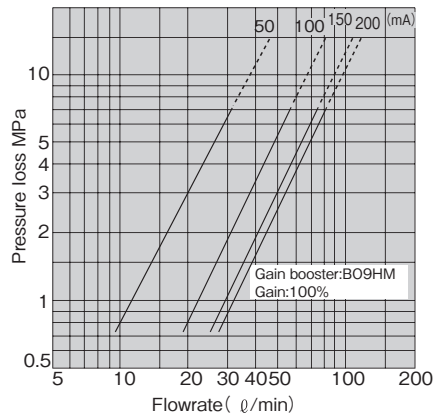


Fig.9 Flowrate Characteristics of M5PJ240

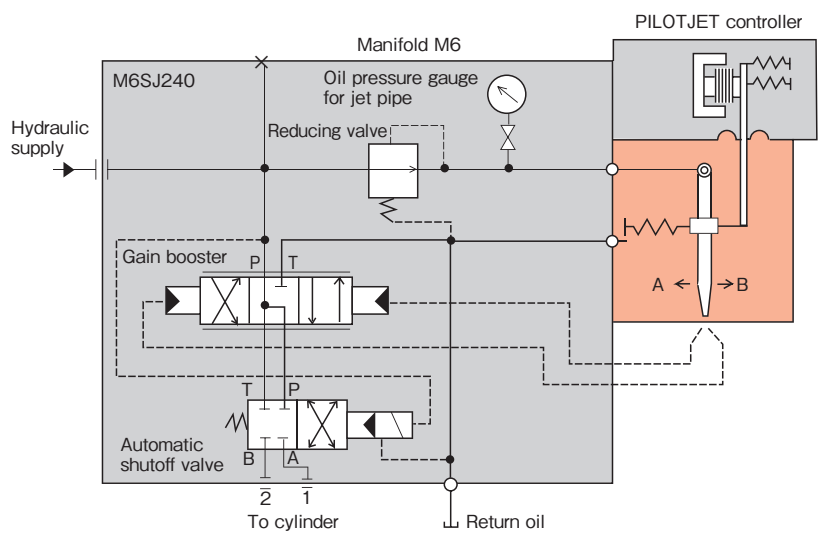


Fig.10 Hydraulic Circuit Diagram of M6PJ240

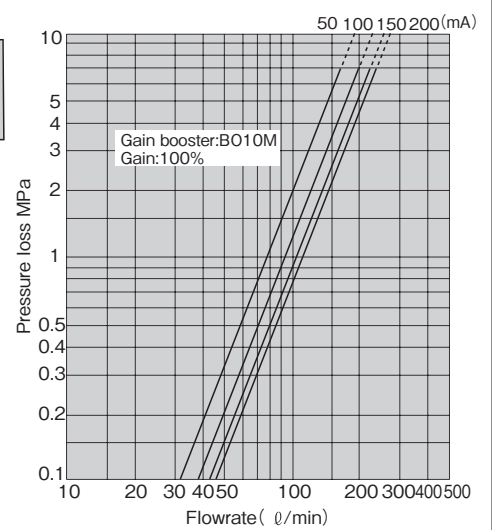


Fig.11 Flowrate Characteristics of M6PJ240

Note: The flowrate characteristics of integrated manifold controllers are shown.

APPLICATIONS OF PILOTJET

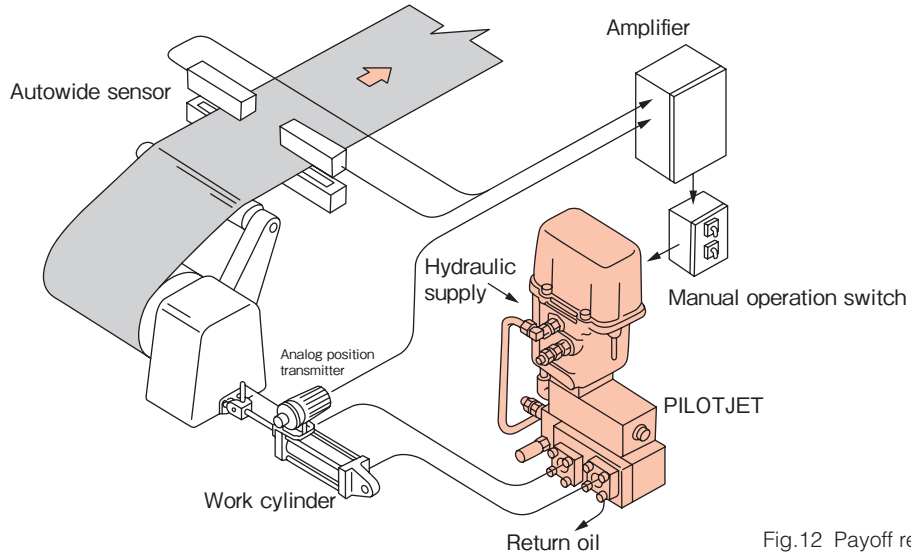


Fig.12 Payoff reel system(unwinder)

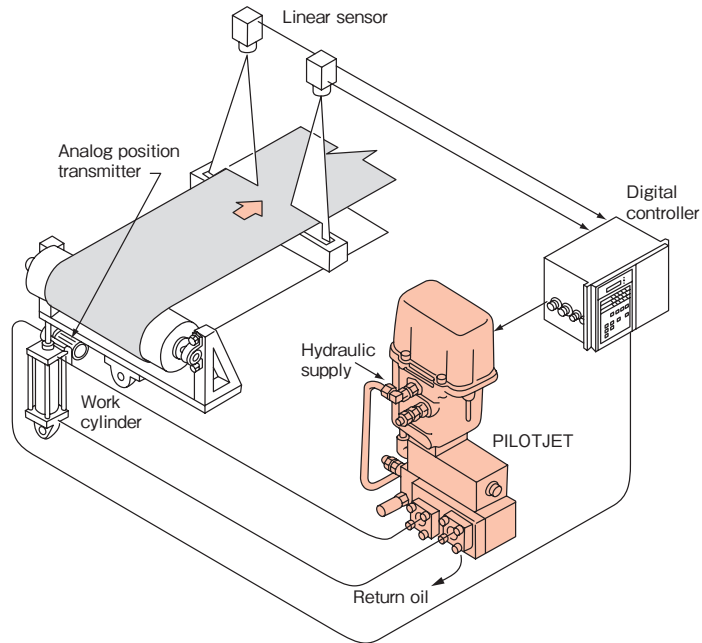


Fig.13 Steering roller system (intermediate guide roller)

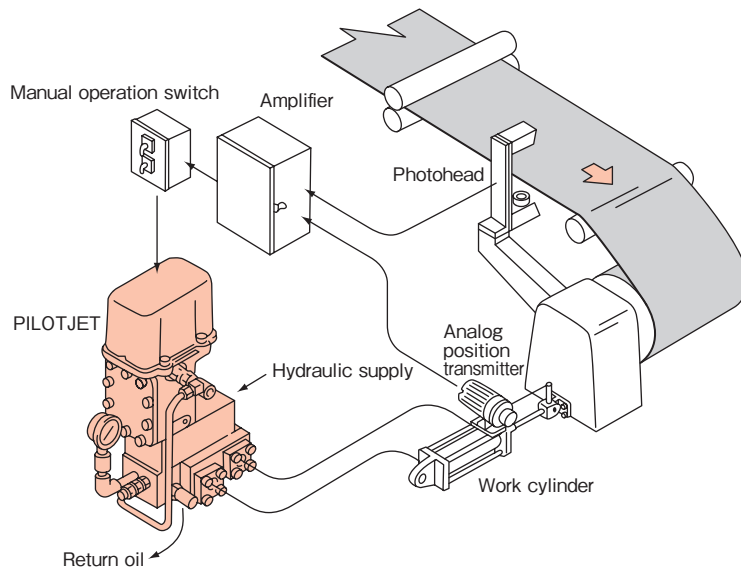
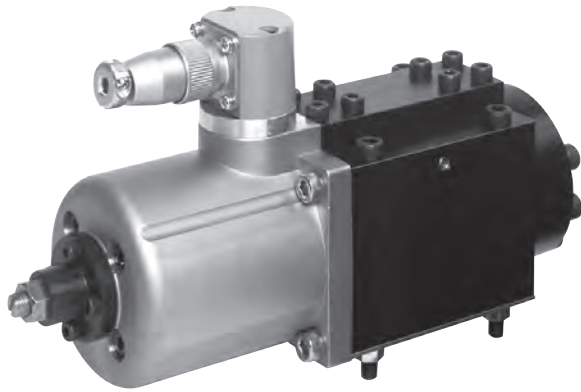


Fig.14 Tension reel system (winding reel)

# Power Guide PG300, 500, 800



**Enhanced Performance,  
Smaller and More Responsive!**

The Power Guide servo valve is back, lighter, and with even stronger performance than ever before.

Compatible with older models through a specialized adapter, and as easy to use as ever, Power Guide servo valves combine high performance and convenience with the toughness to work in dirty environments, changing the face of industrial servo valves.

## FEATURES

### Compact

Smaller and lighter, the unit has only one fifth the volume of previous models.

### High responsivity

45Hz/-3dB

Power Guide servo valves feature high responsivity and high gain, with low hysteresis, achieving high levels of precision in EPC and CPC.

### Maintenance

The structure uses a double pilot format proven over extended use. The simple servo valve structure is even usable with general hydraulic oil\*.

\*: Hydraulic oil of NAS11 grade may be used, but there may be problems with NAS11 or lower if there is a high concentration of debris of 5 $\mu$  or smaller.

Exterior view of the Power Guide valve

Comparison with the previous products

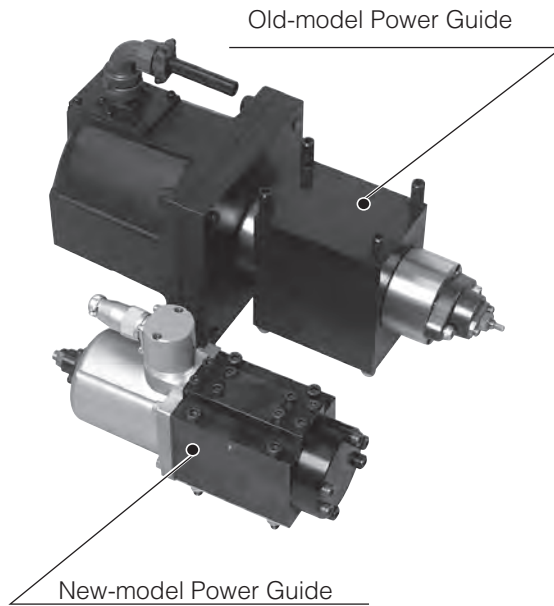


Fig.1

Specifications

Model	PG800	PG500	PG300
Dimensions	114×224×70		
Rated pressure	2~14MPa		
Rated flow L/min	80	50	25
Return-side pressure resistance Internal drain External drain	1MPa 3MPa		
Internal leakage L/min	4.5	3.5	3
Response of frequency	45Hz (-3dB)		
Hysteresis	1%		
Ambient operating temperature	0 - 50°C		
Hydraulic oil temperature	10 - 60°C (10 - 50°C)		
Hydraulic oil viscosity range	20 - 80 mm/S (cSt)		
Hydraulic oil contamination grade	NAS grade 11/Mass grade 103		
Line filter	10μm( $\beta_{10} \geq 200$ )		
Moving Coil resistance value	18.5Ω (20)		
Rated current	±200mA DC		
Recommended dither signal (100Hz)	2Vp-p		
Fixed orifice	φ 0.4mm (φ 0.45mm)		
Hydraulic oil	Mineral oil (water glycol under development) Fatty acid ester, mineral oil, phosphate ester and water-glycol types		

Numbers in brackets are for water-glycol hydraulic fluid. \* If you are using the PG300 on a PG5003, please set the dither signal to 4 Vp-p/100 Hz.

For quality assurance of thin strip products

# STRIP WIDTH GAUGE WGL1000

## Strip width gauge using image processing technology

### FEATURES

#### 2 Light Source Image Management

- Reduce variation (error) due to changes in strip pass line
- Sensor unit for detection with self-check function monitored and set on the amplifier panel.

#### Installation above the strip

- Flexible installation (all installation above strip)
- Easy maintenance due to accessibility
- Reduce adhesion of dirt in LED and sensor unit

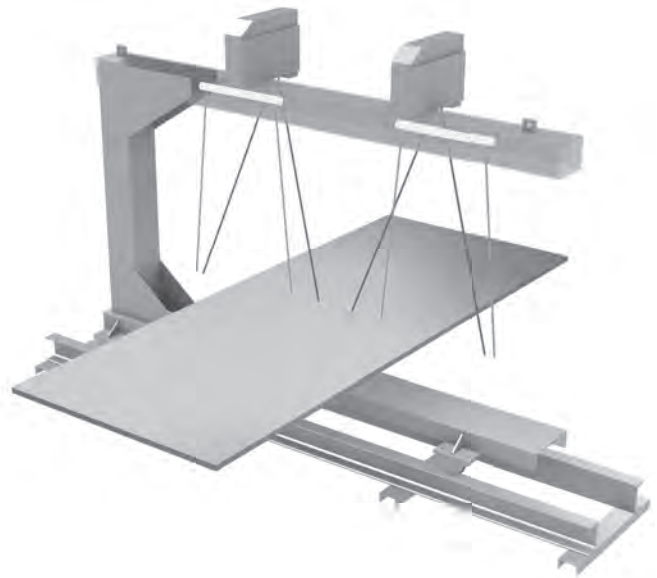


Fig.1 Strip Width Gauge WGL1000

### MEASUREMENT PRINCIPLE

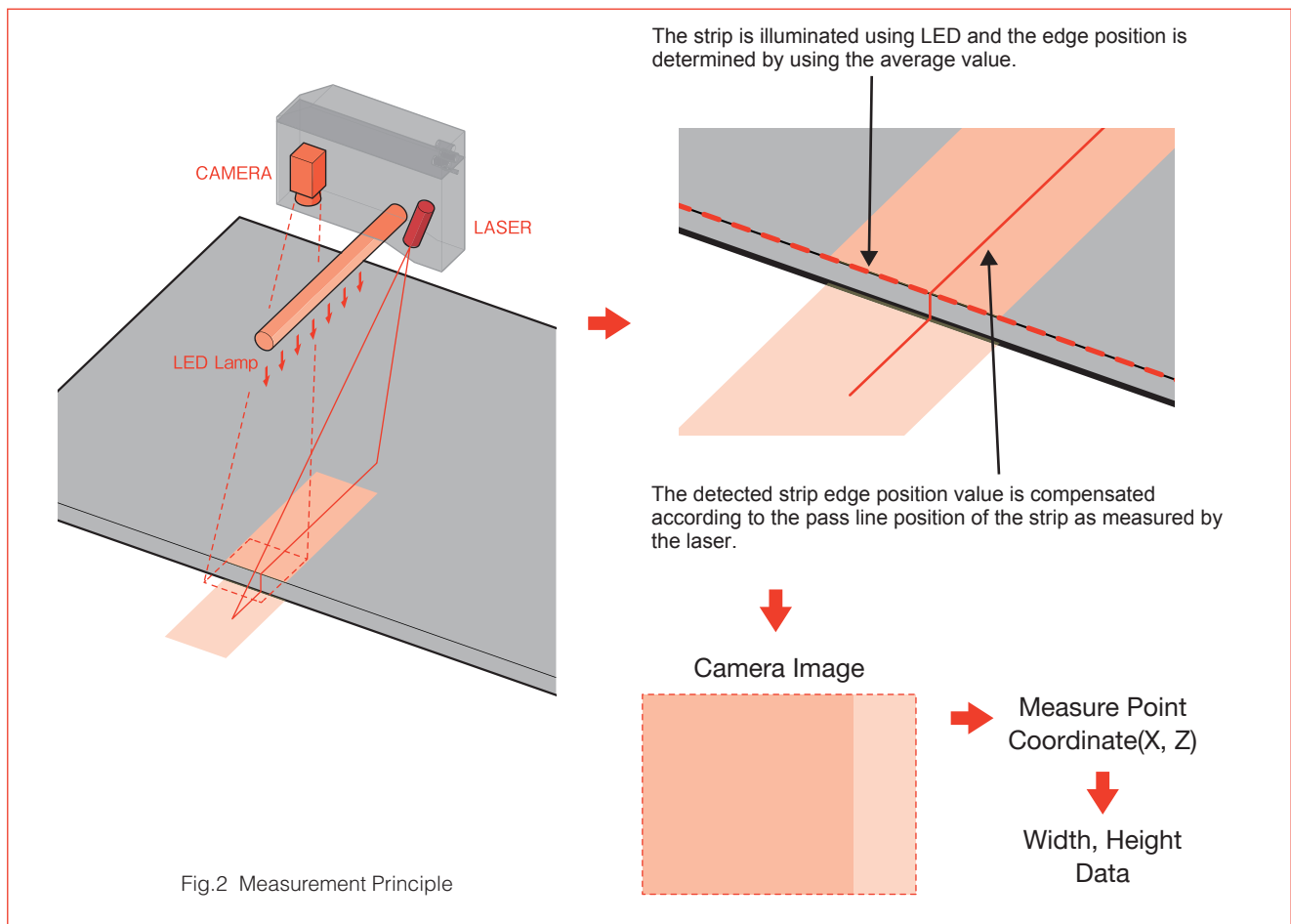


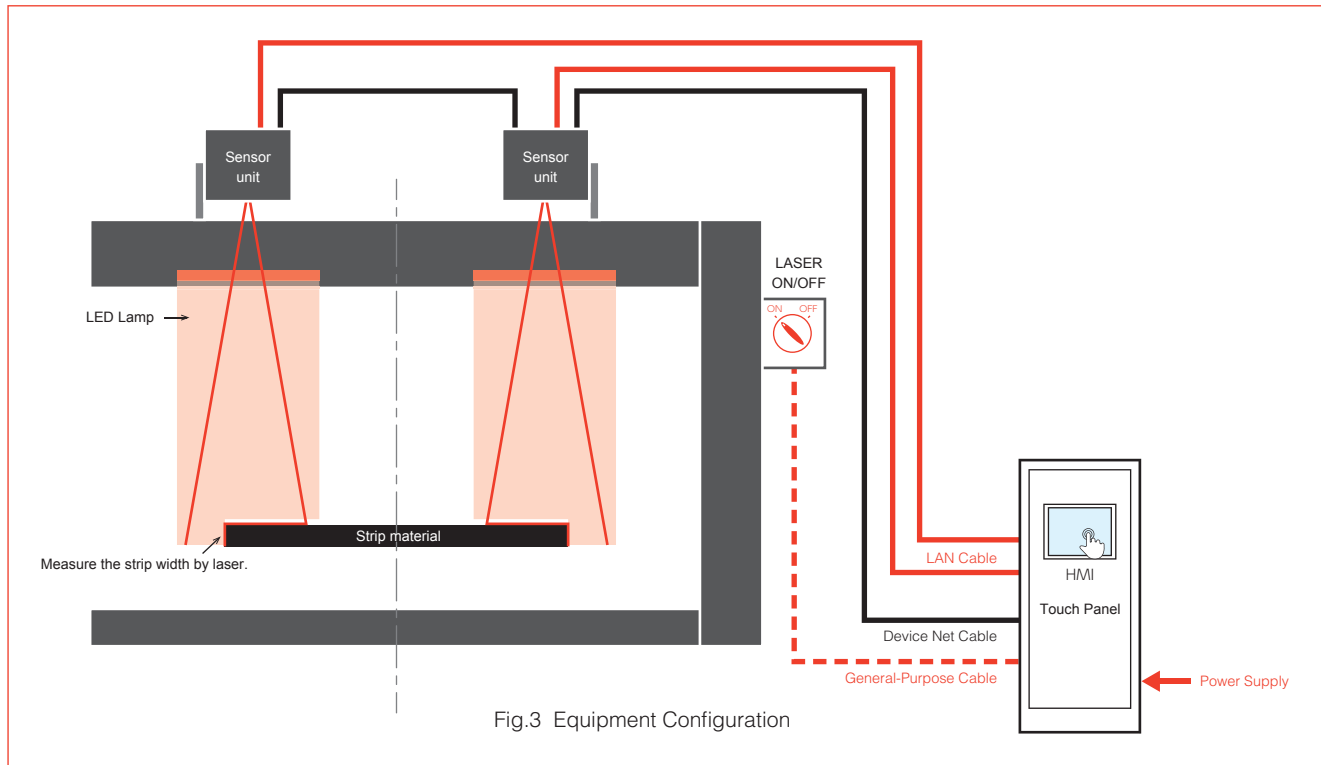
Fig.2 Measurement Principle



## EQUIPMENT CONFIGURATION

The system consists of LED light source for illumination, Sensor unit for detection of the strip and a specialize control panel with image processing unit for data analysis and I/O management. The sensor unit is connected to the specialize control panel using general purpose device net cable and LAN cable

The system uses the laser triangulation method wherein it uses a capture camera image of projected line laser to detect the edge position and surface profile of the strip. This data is then translated into spatial axis (X,Z) using predetermined parameters. The measurement data for strip width and deviation can then be outputted to a level 2 computer.



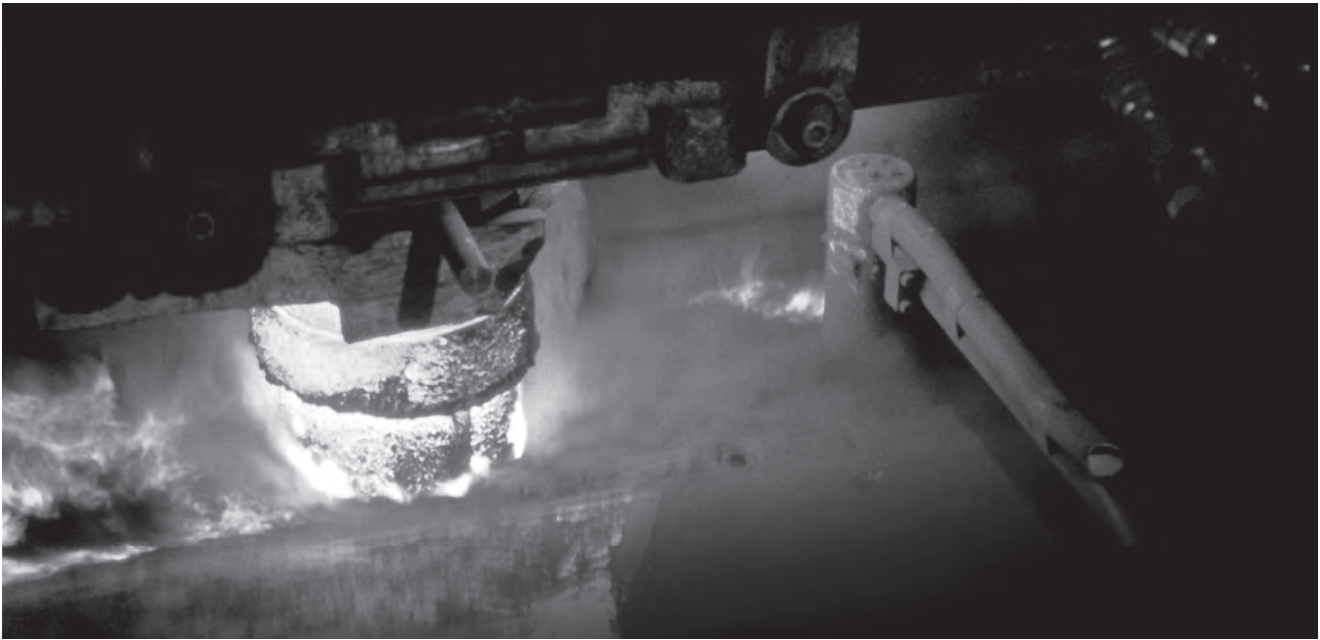
## SPECIFICATION

Sensor Unit		
Measurement Range	Passline direction	±30mm
	Lateral direction	800mm(standard)
Measurement Accuracy		±0.4mm
Applicable Material		Metal strip, others
Laser Light Source	Type	Semiconductor laser
	Wave length	660nm
	Output	30mW and below
	Laser Class	3R
LED Light Source	Output Rating	40W
Cable length		100m and below
Operating Environment	Temp. Range	0-40°C
	Protection Class	IP54
Approx. Weight		11kg
Size		H315 x W120 x D370

Control Panel		
Image Processing Unit		NIPU1000
Measurement Cycle		10ms
No. of Sensor unit that can be connected		2(standard) Max 4
Touch Panel Display	Display range	0-9999.9mm
	Size	10.5inch
External I/F	Strip Width Output	Ether-net, Analog
	Strip Deviation Output	Ether-net, Analog
	Edge Height Output	Ether-net
	I/O Contact	PIO
Utility	Power Supply	AC100-440V
	Current Rating	1.5kVA
Operating Environment	Temp. Range	0-40°C
	Protection Class	IP54
Approx. Weight		250kg
Size		H1800 x W100 x D675

## EDDY-CURRENT LEVEL METER FOR CONTINUOUS CASTING

# Eddy-Current Level Meter ECLM-1000



### INTRODUCTION

The ECLM-1000 series level meter has been designed for use as a molten-metal level control sensor within molds from the continuous casting equipment of iron manufacturing plants, and it comprises a detector, and amplifier, and a dedicated cable. The detector employs electrical induction technology in order that it may measure the molten-metal level in a non-contact fashion while maintaining a

compact size, and it features a wide measurement range in addition to excellent precision and response. Furthermore, by providing control results with little level deviation, it contributes to the improvement of casting quality. And thanks to the adoption of a digital amplifier and an LCD screen, both maintenance and workability have also been improved,

### SYSTEM CONFIGURATION

**Detector :** The coil is protected using fire-retardant material and the inside of the detector is air cooled, thus ensuring excellent durability. With respect to the molten-metal surface. Furthermore, a supporting holder (optional extra) can be used to easily install the detector on top of the mold.

**Amplifier :** The amplifier features a micro-computer, and it is also provided with a keyboard and display to realize an interface with excellent workability. Accordingly, the display of data and manipulation of adjustment parameters can be carried out easily.

**Dedicated cable :** This special cable is used to connect the detector and the amplifier.

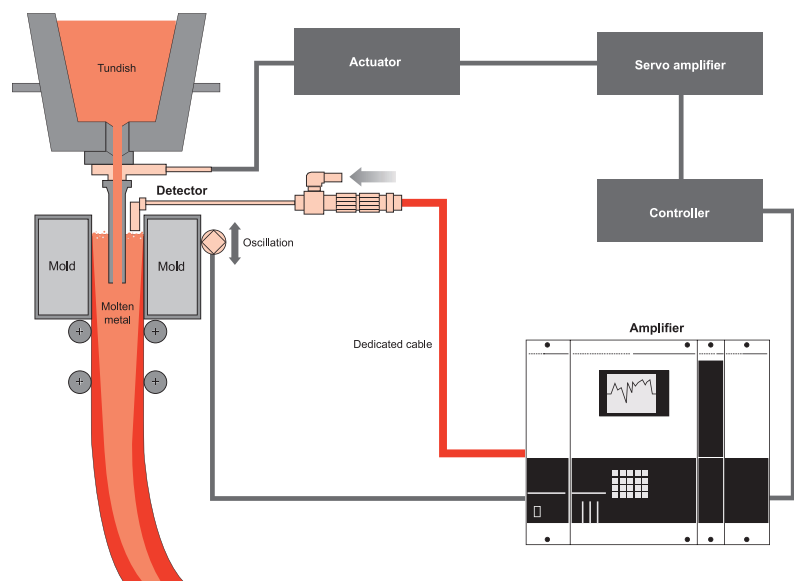
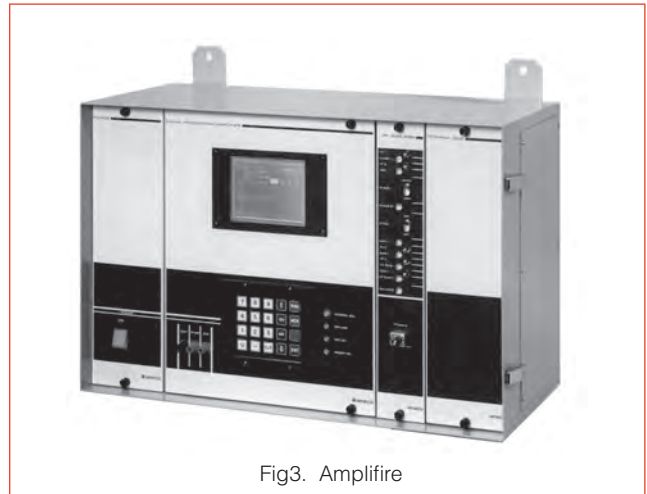


Fig.1 Configuration diagram



## FEATURES

- The molten-metal level is measured with high precision and fast response.
- The system is influenced little by electromagnetic interference and the like, thus ensuring that stable and consistent measurements may be made.
- The replacement of detectors may be easily carried out.
  - Lightweight for easier handling.
  - High level of compatibility
- A digital amplifier has been employed to ensure full functionality.
  - Linearizer function- Up to 10 types of linearizer characteristic may be stored.
  - Filter function- This function enables the automatic adjustment of the mold vibration-noise elimination circuit.
  - OPC operation function-OPC sequences are integrated into the amplifier.
  - Operation monitoring function-This function permits the monitoring of level output, OPC operations, and filter-adjustment operations.
  - LCD function-The linearizer tables and level-measurement condition may be displayed.

## SPECIFICATIONS

Detector	Model	SB-028	SB-3035A	SB-3050A	SB-060E
	Measurement range	0 - 100mm	0 - 150mm	0 - 200mm	0 - 150mm
	External dimensions	28 x 190mm	35 x 170mm	51 x 185mm	60 x 150mm
	Mass	0.5kg	0.6kg	0.9kg	1.0kg
	Applicable molds	Billet, Bloom, Slab	Billet, Bloom, Slab	Slab	Slab
Amplifier	Model	MA1000			
	Display	LCD			
	Level output	4 - 20mADC			
	Linearity	±1.0% (F.S)			
	Reproducibility	±0.5% (F.S)			
	Response speed	0.5 sec.			
	Power supply	Power supply: AC100, 110, 115, 120, 200, 220, 230, 240V ±10%, (by tap switching) 50/60Hz ±2%, 150VA			
	External dimensions	557mm(W) x 360mm(H) x 283mm(D)			
Mass	25kg				
Dedicated cable	20m MAX				

# MARKING SYSTEM

## JET Marker DOT Marker LASER Marker

### INTRODUCTION

Production lines for steel plate, coils, slabs, billets, shaped steel, pipes, and construction materials have become diversified and, accompanying the automation or streamlining of distribution, marking of information on actual articles is inevitable.

Human labor-dependent marking work is prone to problems related to the working environment, marking mistakes, work efficiency, and so forth; for this reason, automatic marking has become a universal practice.

Nireco provides marking systems, paint, and ink appropriate for various marking objects for application to distribution control and product marks. All of Nireco's safety-conscious marking systems can be linked to host PCs and are equipped with self-diagnosis functions.



Fig.1 Dot Marking on bloom



Fig.2 Marking on coils

### TYPE OF MARKING SYSTEMS

Nireco's marking are generally classified as follows.

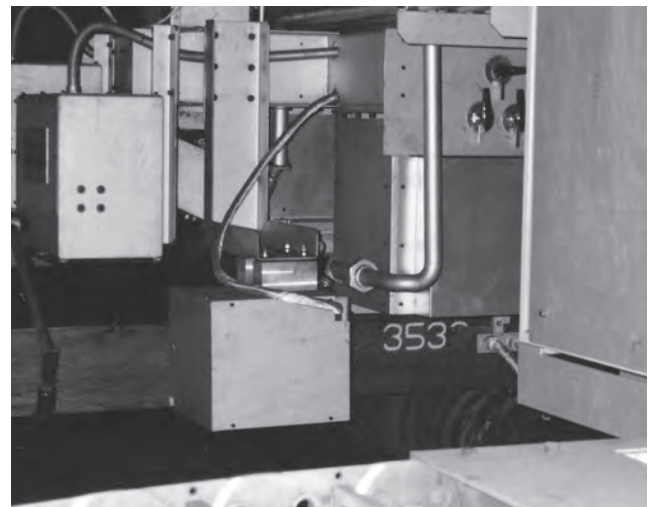
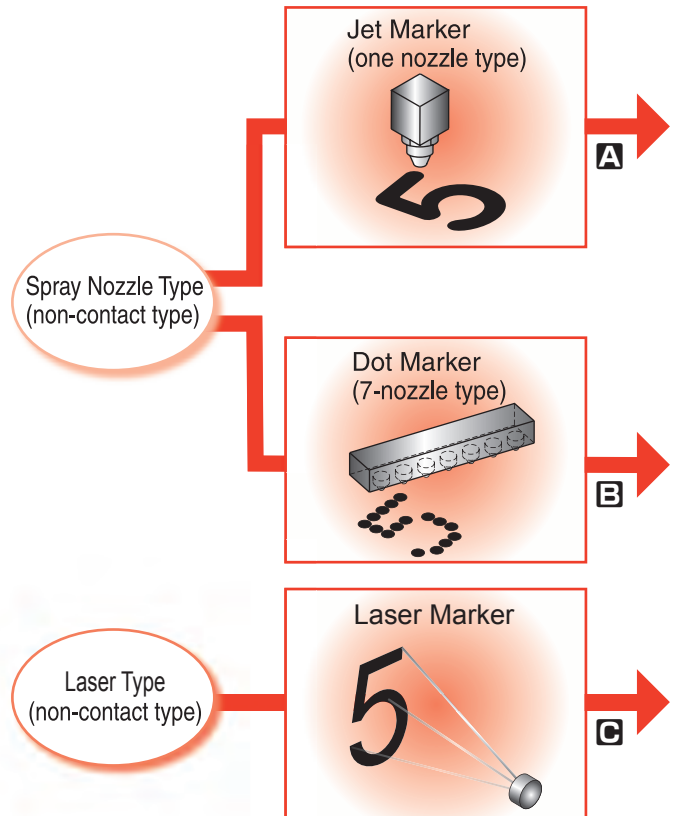


Fig.3 Marking on slabs

**TYPE OF MARKING SYSTEMS**

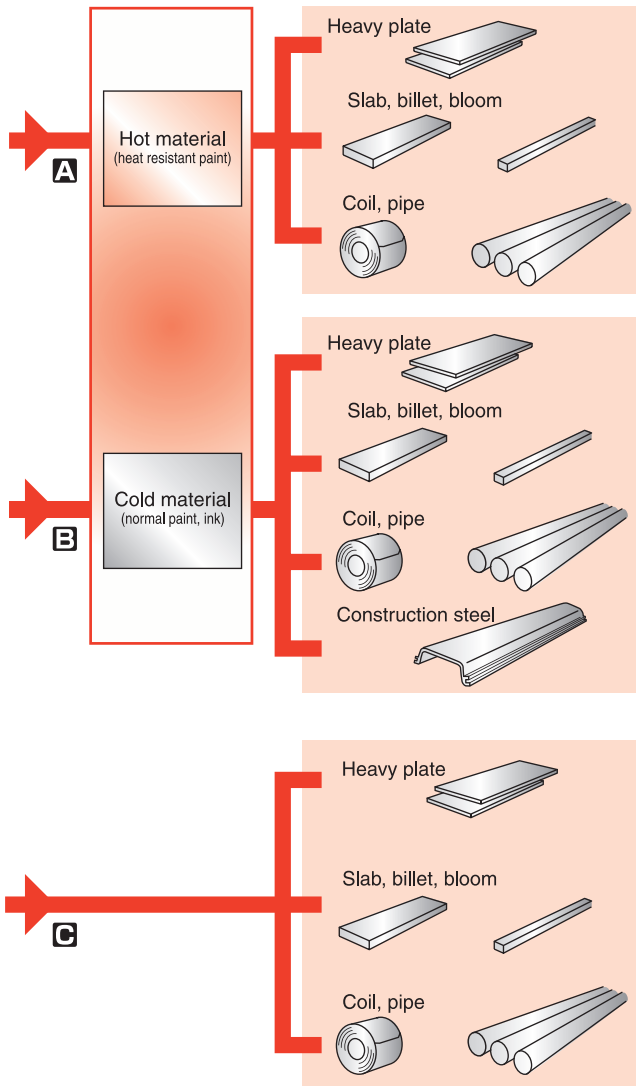


Fig.4 Marking on the side of 600°C - 1000°C slabs using JET MARKER



Fig.5 Marking on the side of 600°C - 800°C hot coils using JET MARKER



Fig.6 Marking on the side of 300°C - 1000°C slabs using DOT MARKER



Fig.7 Example of 2D code printed on edge of a steel bar with LASER MARKER



Fig.8 Example of bar code and number printed on steel pipe with LASER MARKER

## 1 JET MARKER

Marking is performed in such a way that the nozzle is moved along the character shape in the X-Y stage and paint is ejected each time the nozzle is opened and closed as it moves a specified distance. Shortening the ejection timing produces continuous line characters; lengthening it produces dot characters.

- Because one nozzle is moved in the X and Y direction to form characters, it is possible to paint any size or pattern of character or mark.
- Character shapes can be set or changed using a graphical display; when an automatic reading system is used to read characters; certain characteristics can be assigned to characters of similar shape.
- Marking of small characters can be performed. (20mm(H) x 15mm(W))
- Since an atomizing nozzle is used, paint consumption is reduced, even in hot material applications.
- The amount of paint ejected is controlled for the object according to the temperature information and characters having a certain thickness can be marked.
- Clog-free nozzle.



Fig.9 Appearance of Marking Nozzle

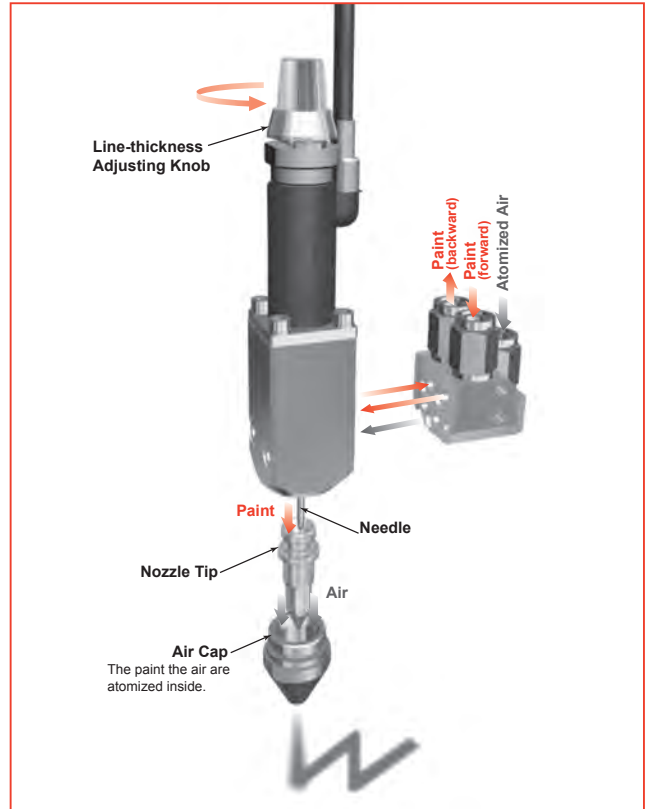


Fig.10 Internal Structure of Making Nozzle

## SPECIFICATIONS

Standard stage	A type	X-axis 600 mm x Y-axis 150 mm
	B type	X-axis 500 mm x Y-axis 150 mm
	C type	X-axis 400 mm x Y-axis 150 mm
	D type	300 mm x Y-axis 150 mm
Letter size	Any desired (character height: 20mm <)	
Marking speed	0.7 sec/character (H=30mm, P=30mm)	
Character thickness	3 - 10 mm	
Distance between characters	30mm ±5mm	
Material temperature	Normal temperature to 1100°C	
Paint	ink or water-based paint	
Tank capacity	15 L (standard) cold-rolling steel 50 L Hot-rolling steel	
Data setting method	Manual setting and auto linkage setting	
Power supply	200/220V or 400/440 V AC 50/60 Hz	
Air source	400 kPa or more	
Cleaning water	100 - 200 kPa	



Fig.11 The same marking head marks on billets arranged both vertically and horizontally



Fig.12 The same marking head marks on billets arranged both vertically and horizontally

## 2 DOT MARKER

Seven nozzles arranged in a row are moved parallel to the object; Gpaint is ejected in a previously-specified 7x5 matrix for each character to form dot characters.

### SPECIFICATIONS

Character size	Height (H)	55mm or more
	Width (W)	40mm or more
	Pitch (P)	47mm or more
Dot diameter	ø6 ~ ø12 mm	
Letter description	English letters	
	Arabic numerals	
	Other special symbols	
Marking speed	2 - 2.5 character/sec	
Material temperature	Normal temperature to 1000°C	
No. of characters and lines	Free selection	
Paint	Water-based paint	
Power supply	200/220 V or 400/440 V AC 50/60Hz	
Air source	400 kPa or more	
Descalig water	150 - 300L /min (at 1500 - 2000 kPa)	
Cleaning water	2 - 3L /min (at 100 - 200 kPa)	

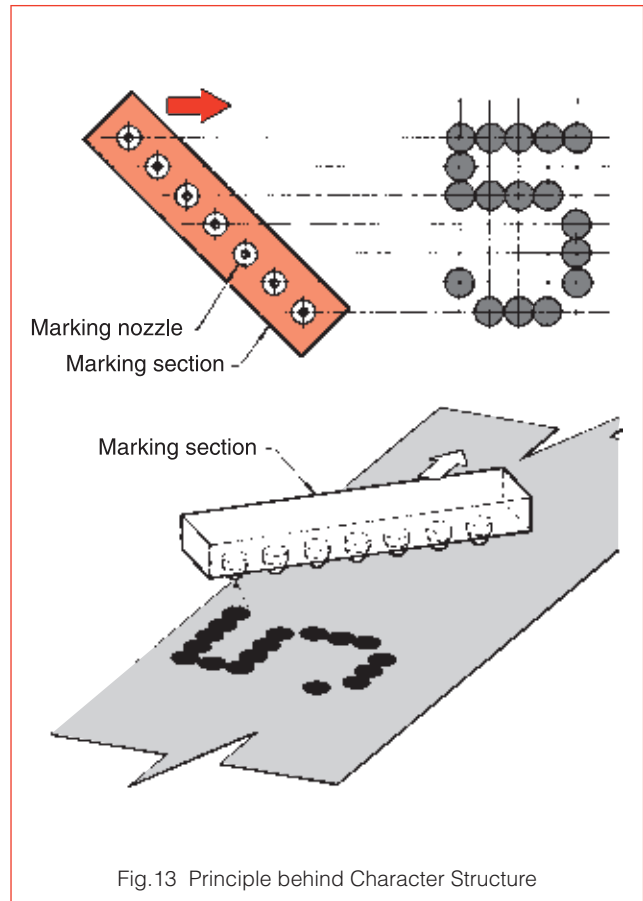


Fig.13 Principle behind Character Structure

## 3 LAZER MARKER

Nireco's laser marking system is capable of directly marking the sides and edges of thick plates in your production line. The Nireco laser marker is ideal for marking your products and materials with quality and inventory control information and is capable of printing barcodes as well. The Nireco laser marker will also help reduce your operating costs as it requires less consumables than conventional methods.

Drawing upon vast experience and expertise in the steel industry, Nireco has designed this laser marker to print accurately and rapidly on both hot and cold plates. The Nireco laser marker is also designed to be very durable in most work conditions to provide you with peace of mind for a long time to come.

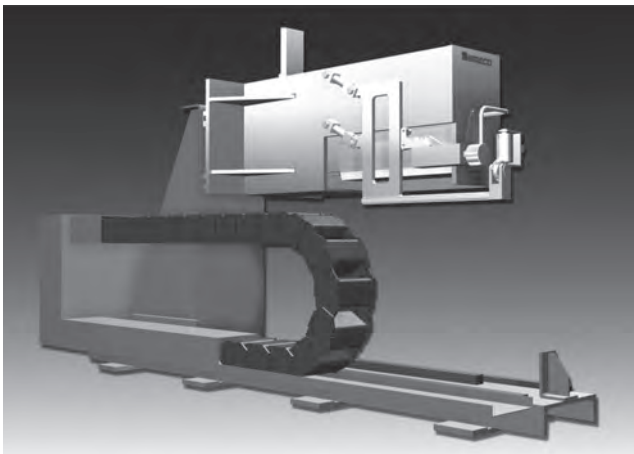


Fig.14 Lazer Marking System



Fig.15 Example of text and ber code on a 6mm think plate

## SYSTEM CONFIGURATION

### ◆1. Mechanical section of marking unit

This section moves the marking head to the marking position on the marking object ; the actual configuration varies depending on the object.

### ◆2. Local operation panel

Contains operation switches and LEDs used independently to operate the mechanical section from the local site. If the mechanism is simple, an operation device is provided on the front side of the terminal box. If the mechanism is complex, it is a post type panel.

### ◆3. Control panel

Contains the control devices used to control the entire system ; the content varies depending on the structure of the mechanical section. If the marking machine is configured for a simple application, the control panel is installed at the local site ; in this case it can also serve as the local operation control panel.

### ◆4. Paint supply unit

Depending on the type of marking object, there may be paint supply units for any combination of hot paint, cold paint, and ink. The paint tank is continually stirred and paint is also circulated inside the paint pipe using a paint pump.

### ◆5. Descaling unit

Descaling is applied as a pre-processing measure to materials that are likely to have scales on their surface. Descaling of heated objects is performed with high-pressure water ; mechanical shock is applied to cold objects.

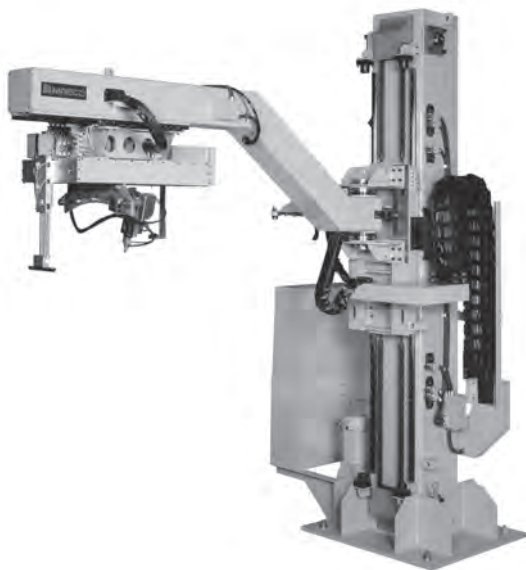
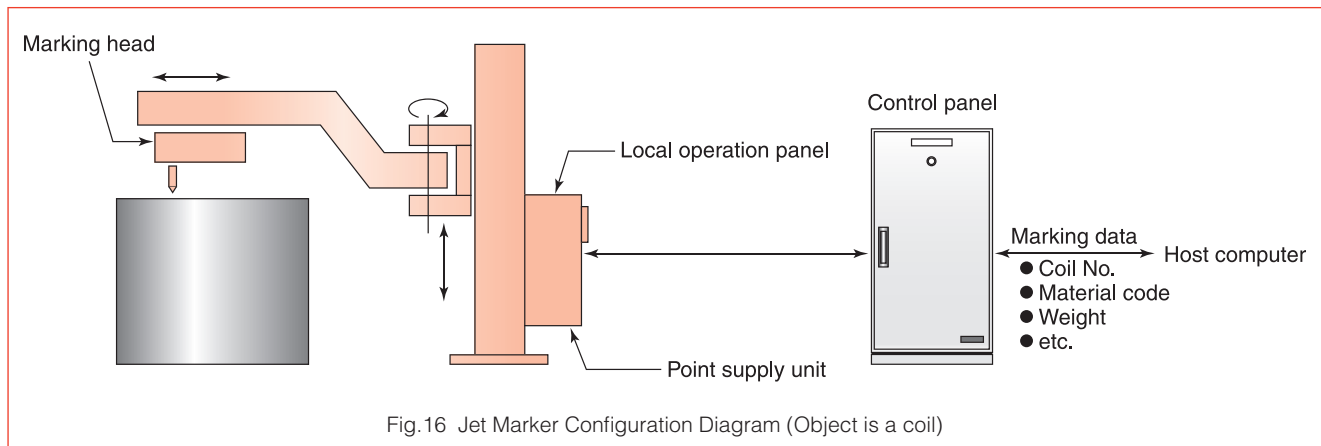


Fig.17 Making Machine



Fig.18 Local Operation Panel

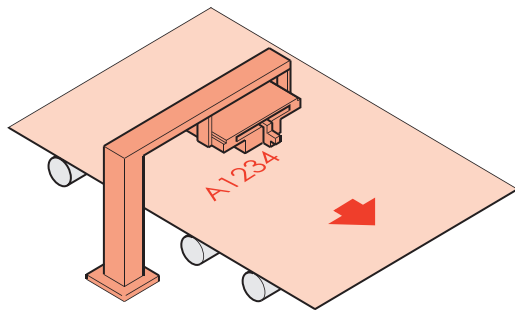


Fig.19 Control Panel

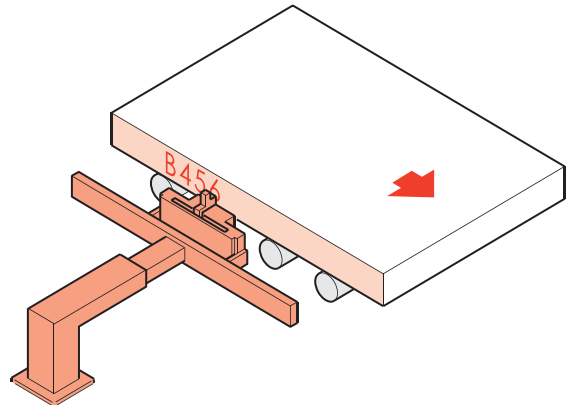


APPLICATIONS

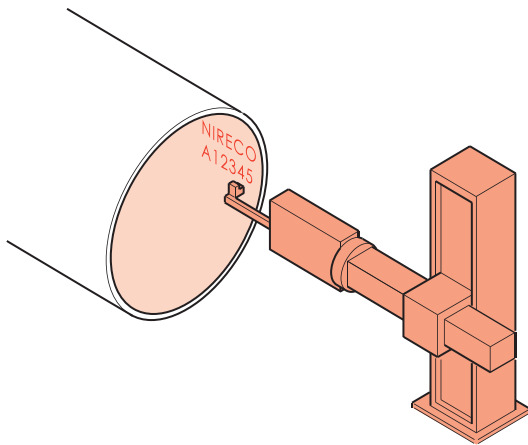
1 MARKING ON TOP



2 MARKING ON SIDE



3 MARKING ON INNER WALL



4 MARKING ON COIL

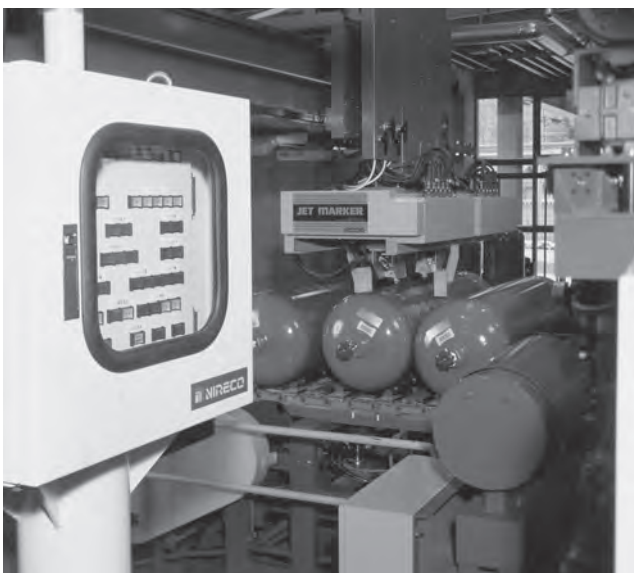
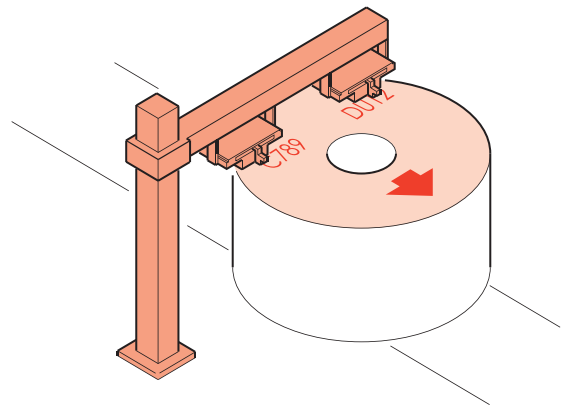


Fig.20 Marking on propane gas cylinders using JET MARKER



Fig.21 Actual markings performed by the left machine. The markings are customer coded. (Chinese, Hangul, and special characters available)

## 4 BAND LASER MARKER

The Strapping Band Laser Marker is the result of collaboration between strapping machine manufacturer Kohan Kogyo Co., Ltd. and iron & steel industry expert Nireco Corporation. The device improves the efficiency of both manufacturing & quality controls by simultaneously strapping the rolled steel coil and marking the strapping band with product management data. What's more, unlike conventional methods which directly mark the product, the Strapping Band Laser Marker only prints on the band so that the steel coil can be delivered in pristine condition. The Strapping Band Laser Marker is capable of printing at high speed and precision on both cold and hot-rolled sheets, while its outstanding durability ensures long-lasting stable operation even in the toughest operating environments.



Fig.22 Band Laser Marker

### PRODUCT FEATURES

**◆Low running costs**

Laser marker only consumes basecoat

**◆High-speed printing**

Clear & instantaneous printing

**◆Barcode printing**

Supports GS1 DataBar (formerly RSS) & 2D barcodes essential for manufacturing control

**◆Newly-developed basecoat nozzle**

Eliminates coating clogs for smooth operation

**◆Easy to install on existing strapping machines**

Simplified installation

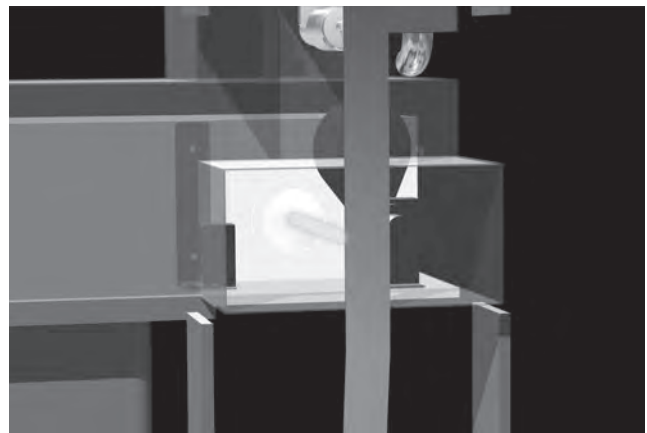


Fig.23 Illustration of laser marking

### SPECIFICATIONS

Laser output	40W
Laser type	CO2
Hazard class	Class 4
Product life	10 years or 50,000 hours
Print size	Height: 3mm – 100 mm; Width: 0.1mm -
Printing speed	5 seconds (based on size of print sample below)
Print types	Alphanumeric characters, Chinese characters, barcodes & QR codes
Print colors	Basecoat: white; Print: black
Coating consumption	Determined by print size & area
Strapping band sizes	Width: 25mm – 32mm
Strapping band types	Kohan Kogyo's proprietary bands etc.

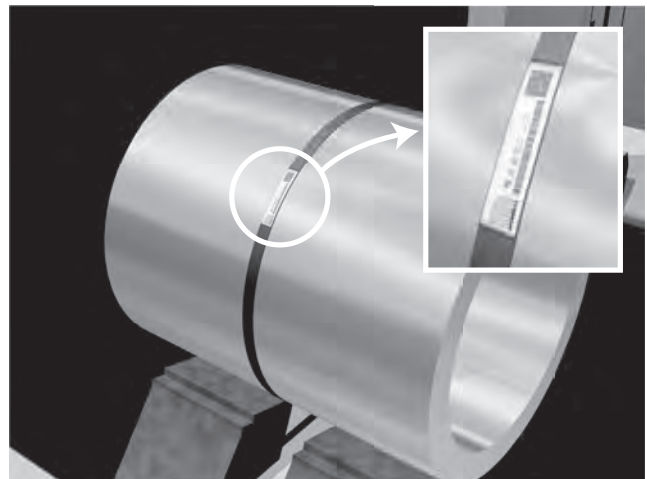


Fig.24 Close-up view of the printed area



Fig.25 Print sample



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