NIRECO SERVOJET SJ2

Contents

GENERAL

The NIRECO Servojet is an industrial servo valve for converting electric signals (-200 to 0 to +200mA DC) into hydraulic signals, which is used mainly for EPC® in iron and steel plants. The NIRECO Servojet 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 to 14MPa.
- 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.

EPC is a registered trade mark of Nireco Corporation and stands for Edge Position Control. The EPC system automatically controls the edges of a product (strip) for uniform alignment in rolling, heat treatment, pickling, and surface treatment processes for thick and thin plates.

Applications of the EPC technology include the Center Position Control (CPC) system for centering control and the Line Follower Control (LFC) system for line or mark follow-up control used in various industries.

STRUCTURE

Controller

The NIRECO Servojet 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 a magnetic field. This relation can be expressed by the following formula.

Relation between input and output signals:

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

where, F = output(N)
W = input power(W)
I = current of moving coil(A)
R = resistance of moving coil(Ω)

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.

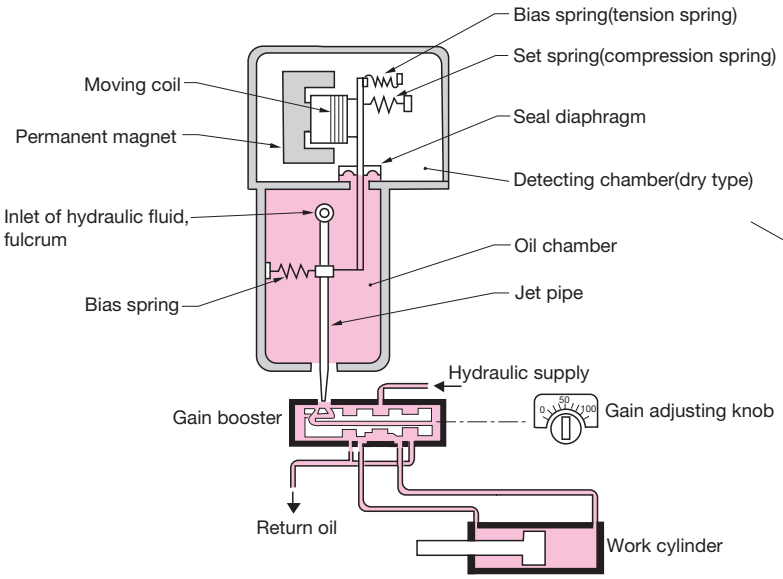

Fig. 1 Operating Principle of Servojet Controller

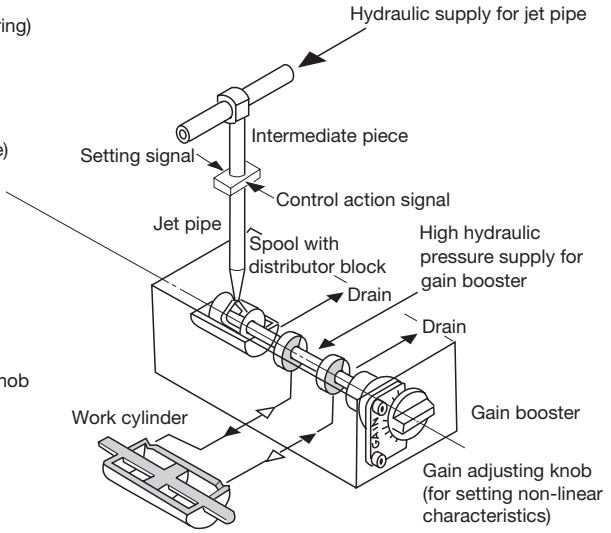

Fig. 2 Conceptual Diagram of Hydraulic Controller

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 NIRECO Servojet Controller

Input signal:	+200 to 0 to -200mA DC (zero balance)
Resistance of moving coil:	About 20 Ω
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 boosters 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 im-portant to improve the stability of the EPC system.

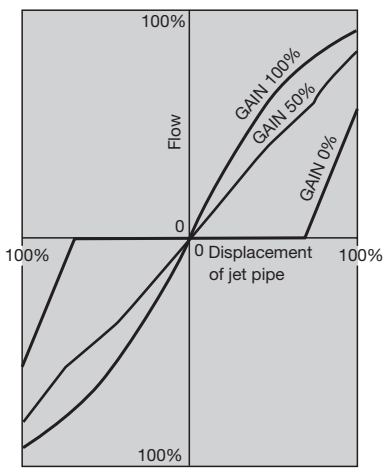

Fig. 3 Flowrate Characteristics of Gain Booster (Gain Adjustment)

MANIFOLD CONTROLLER M4SJ240, M5SJ240, M6SJ240

The manifold controller consists of a NIRECO Servojet 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 NIRECO Servojet 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	M4SJ240	M5SJ240	M6SJ240
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		

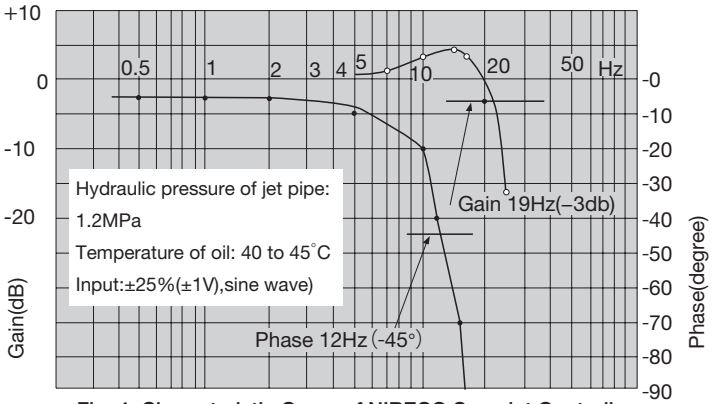

Fig. 4 Characteristic Curve of NIRECO Servojet Controller

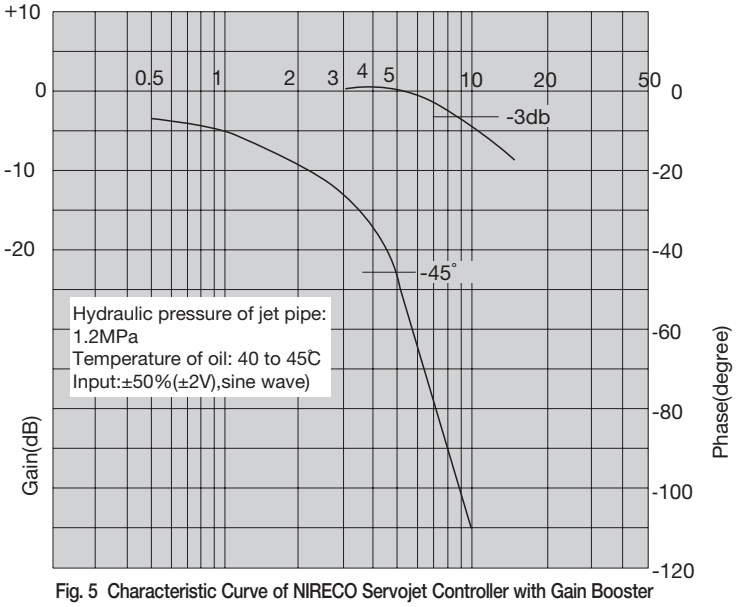

Fig. 5 Characteristic Curve of NIRECO Servojet Controller with Gain Booster

Photo 1 M4SJ240

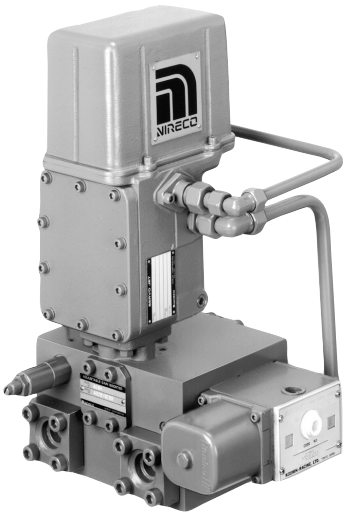

Photo 2 M5SJ240

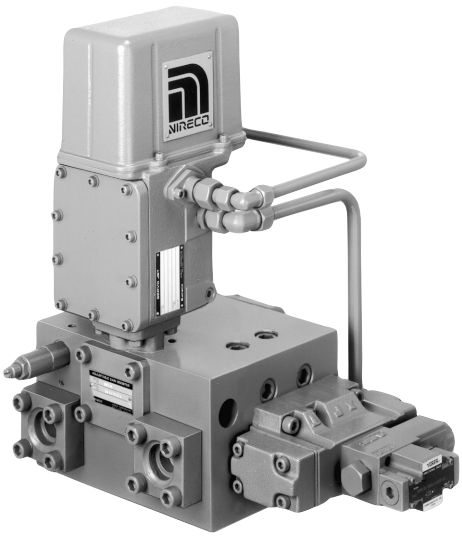

Photo 3 M6SJ240

M4SJ240, M5SJ240, M6SJ240

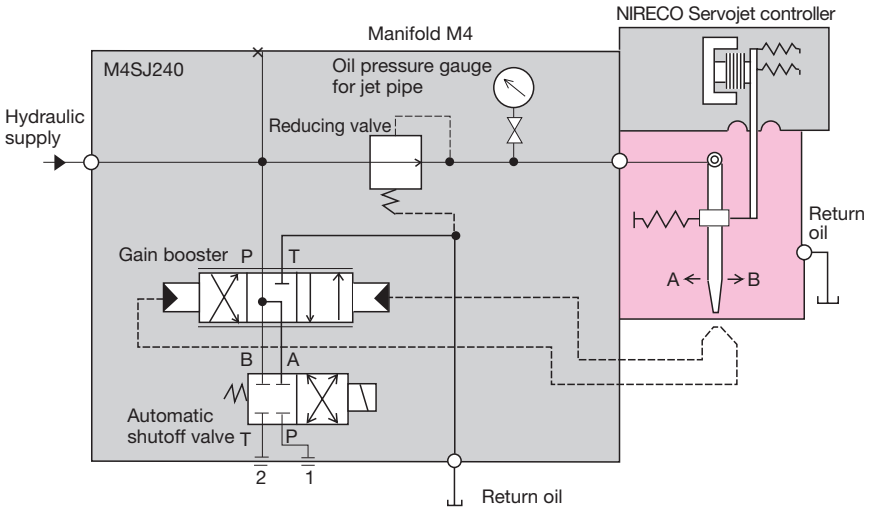

Fig.6 Hydraulic Circuit Diagram of M4SJ240

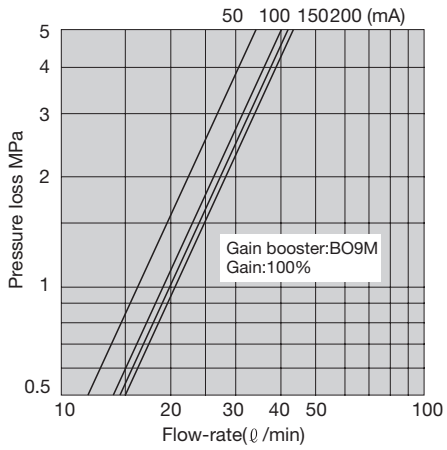

Fig.7 Flow-rate Characteristics of M4SJ240

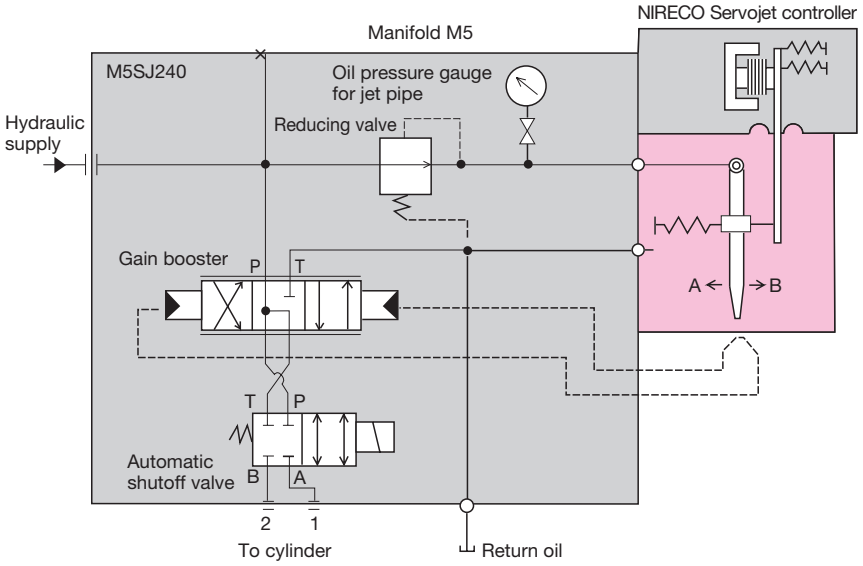

Fig.8 Hydraulic Circuit Diagram of M5SJ240

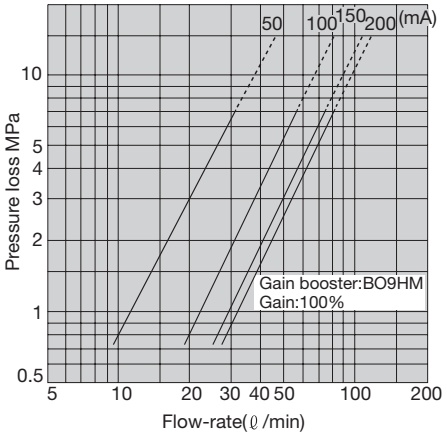

Fig.9 Flow-rate Characteristics of M5SJ240

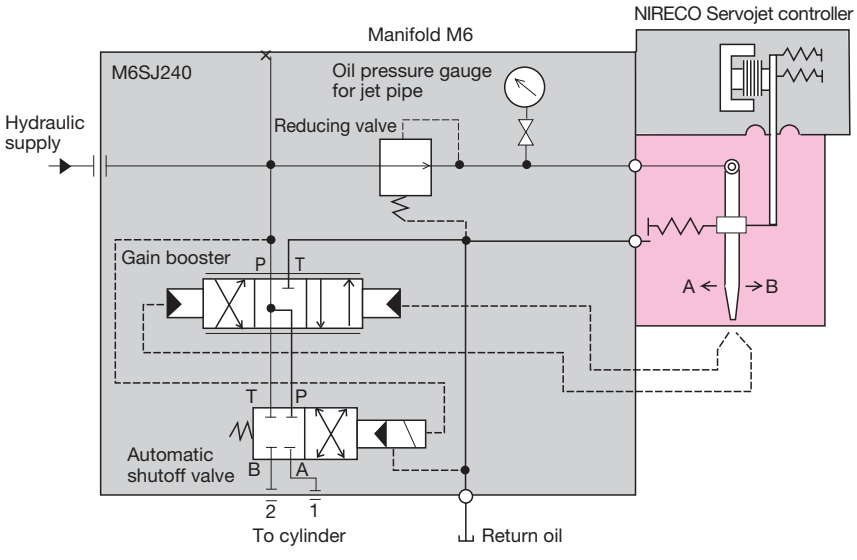

Fig.10 Hydraulic Circuit Diagram of M6SJ240

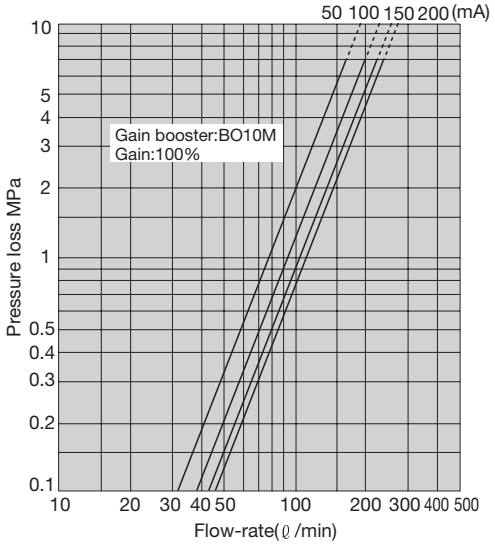

Fig.11 Flow-rate Characteristics of M6SJ240

Note: The flow-rate characteristics of integrated manifold controllers are shown.

EXTERNAL DIMENSIONS

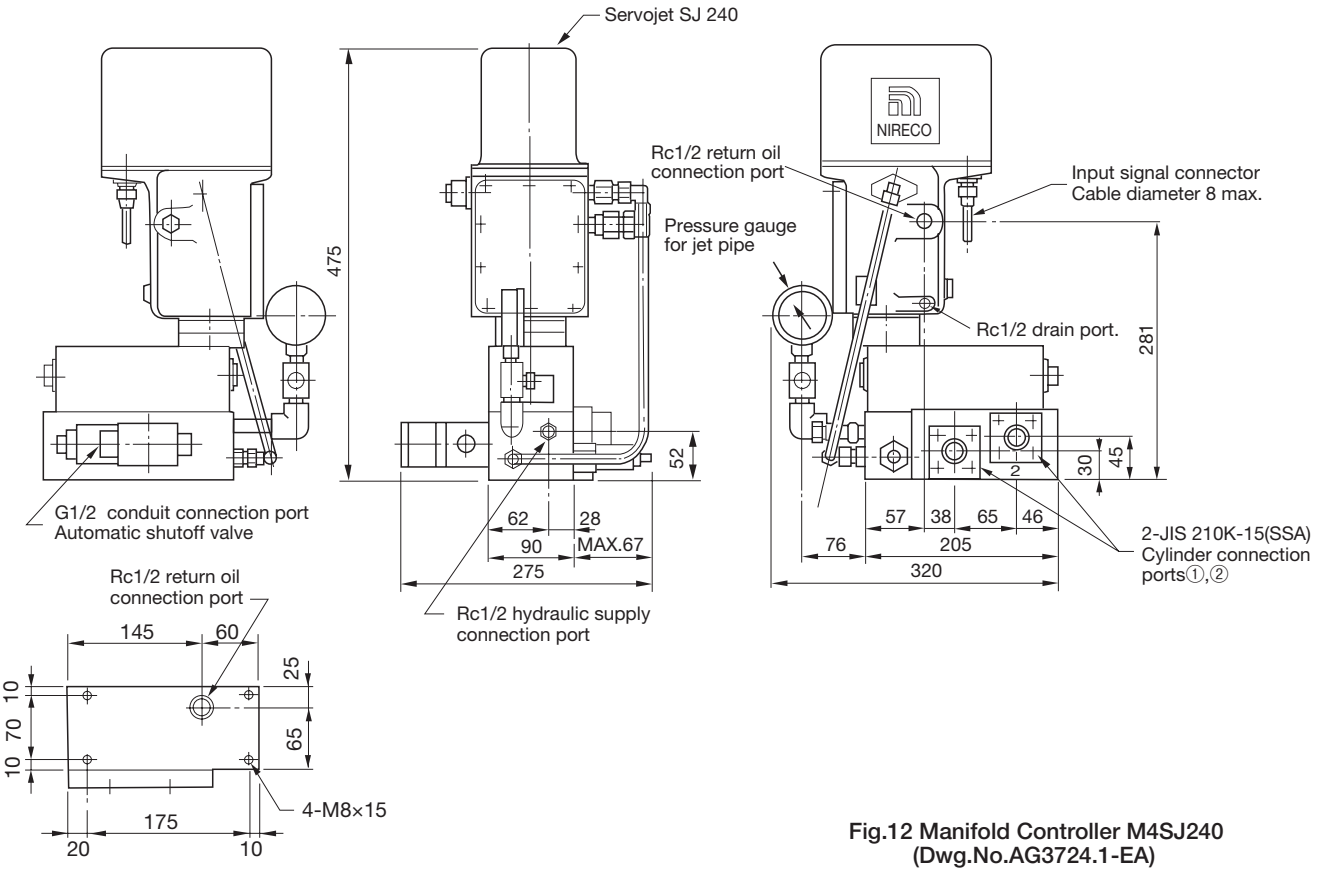

Fig.12 Manifold Controller M4SJ240 (Dwg.No.AG3724.1-EA)

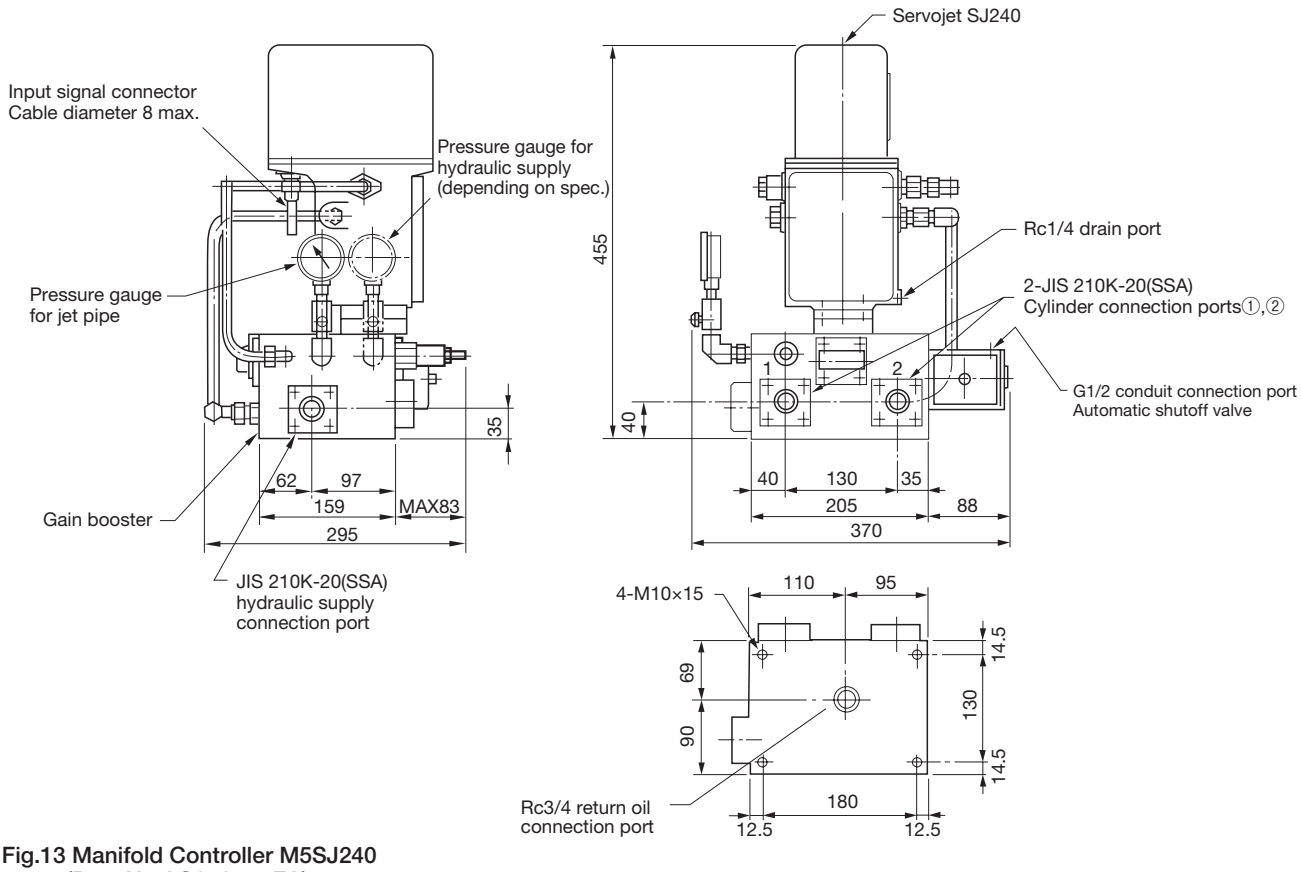

Fig.13 Manifold Controller M5SJ240 (Dwg.No.AG3725.1-EA)

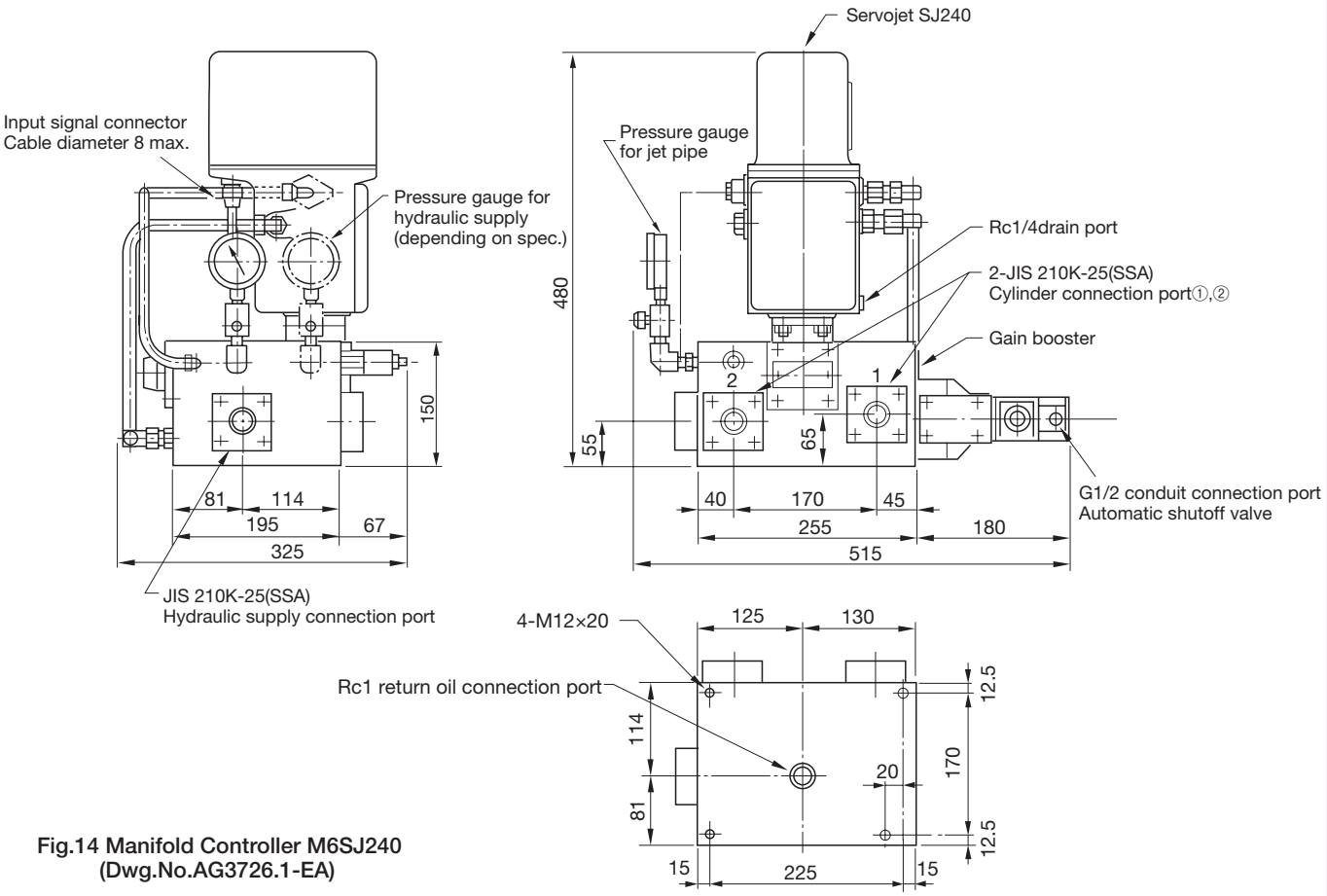

Fig.14 Manifold Controller M6SJ240
(Dwg.No.AG3726.1-EA)

MODEL CODES

MODEL SJ24 I

Model of manifold	Max hydraulic pressure [MPa]	Flow rate ☆1 [ℓ / min]	Gain booster combined
(none)	—	—	—
M4	5	32	BO9M
M5	14	80 (48) ☆2	BO9HM
M6	10	200	BO10M

0	Mineral	Types of hydraulic fluid
1	Phosphate - ester ☆3	
2	Water - glycol ☆3	
3	Fatty acid ester ☆3	

A	100V 50/60Hz, 110V 60Hz	Power supply for solenoid valve
C	200V 50/60Hz, 220V 60Hz	
P	110V 50Hz	
Q	220V 50Hz	
D	DC 12V	
E	DC 24V	
F	DC 48V	
G	DC 100V	

N	Not provided		Lock circuit
1	Provided		
1	M4	5MPa	Pressure of hydraulic supply
2	M5	~5MPa	
3		5~10MPa	
4		10~14MPa	
5	M6	~5MPa	
6		5~10MPa	
N	Not provided		Hydraulic pressure gauge
1	Provided		
N	Not provided		Throttle check valve
1	Provided		
N	Not provided		Stand
1	Provided		
N	Not provided		Oil sump
1	Provided		
N	Not provided		Terminal box
1	Provided		

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

APPLICATIONS OF NIRECO SERVOJET

1. Payoff reel system (unwinder)

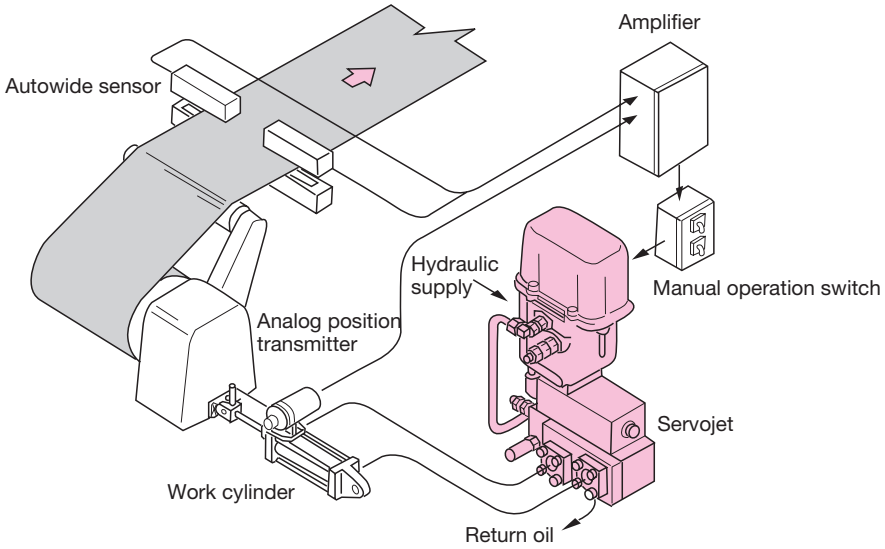

Fig.15

2. Steering roller system (intermediate guide roller)

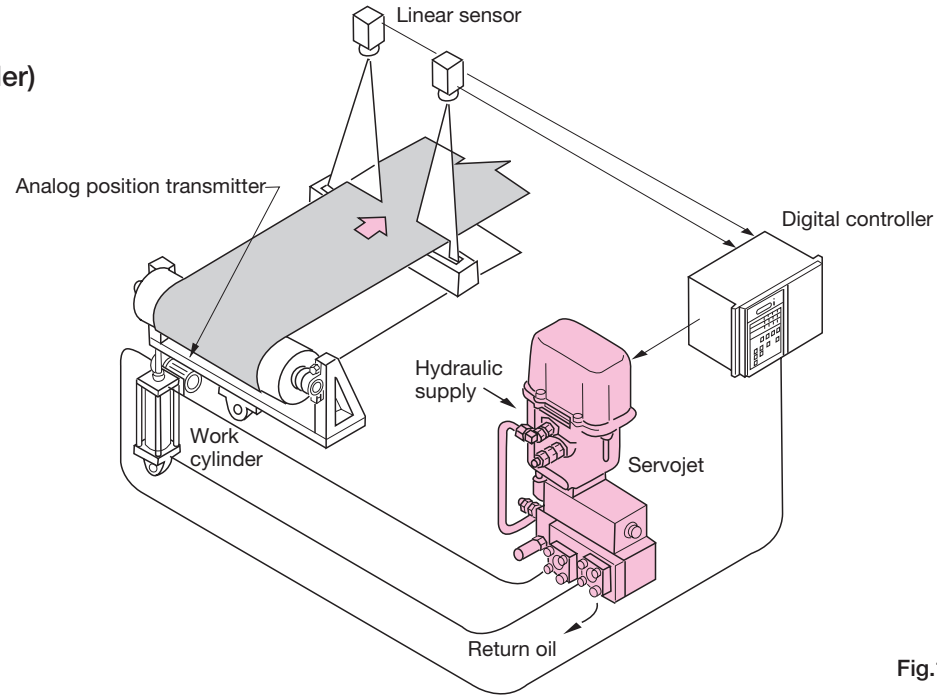

Fig.16

3. Tension reel system (winding reel)

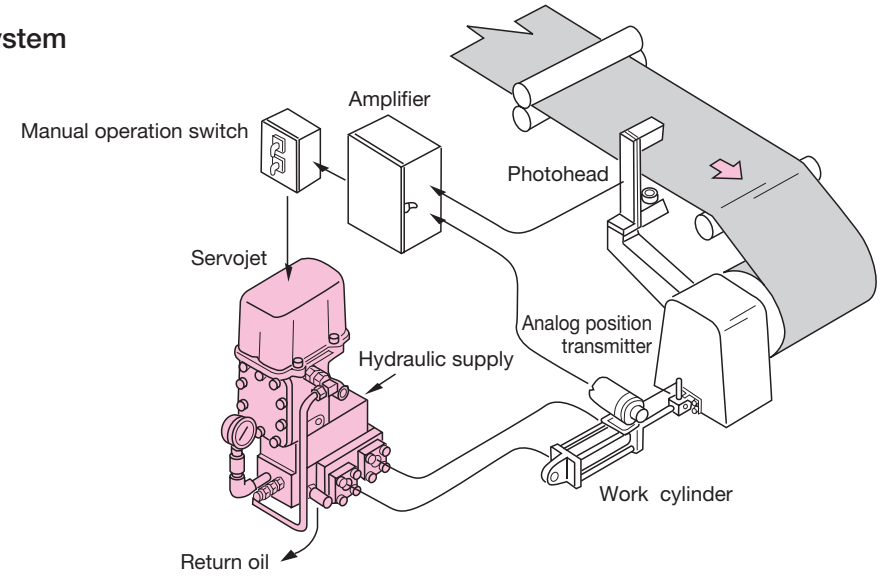

Fig.17

We reserve the right to change the specifications in this catalog without prior notice to improve and update our products.

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