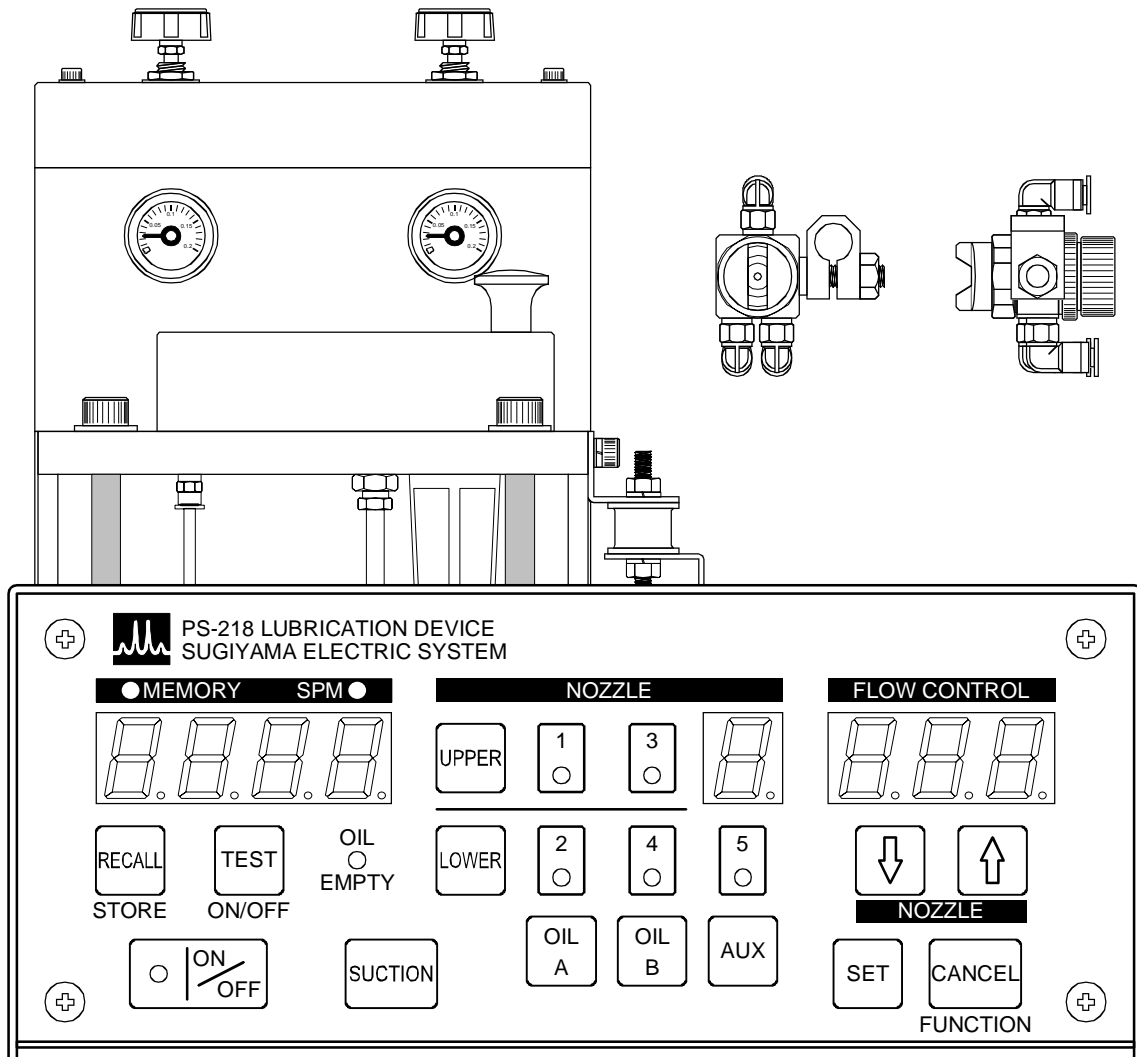


LUBRICATION DEVICE

PS-218

INSTRUCTION MANUAL

Program version 1.0x



SUGIYAMA ELECTRIC SYSTEM INC.

Notes to users

Before operating this equipment, you should first thoroughly read this manual.

Specification and equipment are subject to change without any obligation on the part of manufacturer.

DANGER

Do not use inflammable liquid.

The use of the inflammable liquid causes a fire and the explosion.

It is necessary to prevent the ignition by the fire and static electricity from being when you use the inflammable liquid.

PROHIBITION

Do not use the oil that makes the metal and the resin be corroded.

The metal such as the aluminum and brass and the resin are used to piping.

Never use the oil that corrodes the metal and the resin.

CAUTION

Supply AC100-120V or AC200-240V to the controller power

The controller does not operate normally when the controller is used excluding a specified voltage.

Turn off the power supply and disconnect using when the smell, strange sound, and smoke are generated.

Prevent the liquids such as water and liquid from splashing to the controller.

When the liquid splashes, causes controller's breakdown and fire.

Do not touch the metal portion of the terminal block

A high voltage generated in the metal portion of the terminal block. There is danger gotten an electric shock when touching.

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1. Introduction

The lubrication device PS-218 is a device that thinly spreads the processing oil on the material in the press metalworking.

PS-218 is composed of the controller, the oil distribution device, and the nozzle.

The controller takes charge of the solenoid valve control for the nozzle control and the spraying amount adjustment of the oil.

The oil distribution device is composed of the solenoid valve, the air regulator, and the pressurizing tank. The oil distribution device distributes the oil in the pressurizing tank to the nozzle by the controller's instruction.

Adjust the amount of spraying by opening the installed solenoid valve of each nozzle for timing and the time decided in the oil control mode.

Five nozzles or less can be connected with the oil distribution device. The number of nozzles that can be connected with the oil distribution device is different depending on the model of PS-218.

1-1. Feature

(1) The amount of the oil spraying can be operated remotely

Set up the oil distribution device near the spraying nozzle. However, the controller can set it up by separating from the nozzle.

(2) Self adjustment of amount of oil spraying

Even if strokes per minute of the press change, the amount of the material of the oil for each unit area spraying can be kept constant by connecting timing from the press machine with the controller.

(3) The consumption of the processing oil can be reduced

A high adhesion rate and an intermittent spraying have the effect to decrease the consumption of the oil.

(4) A precise adjustment of the amount of spraying can be done.

The digital controller controls operation time of the solenoid valve in precision.
Operation time is set to the digital controller by the unit of 0.01ms.

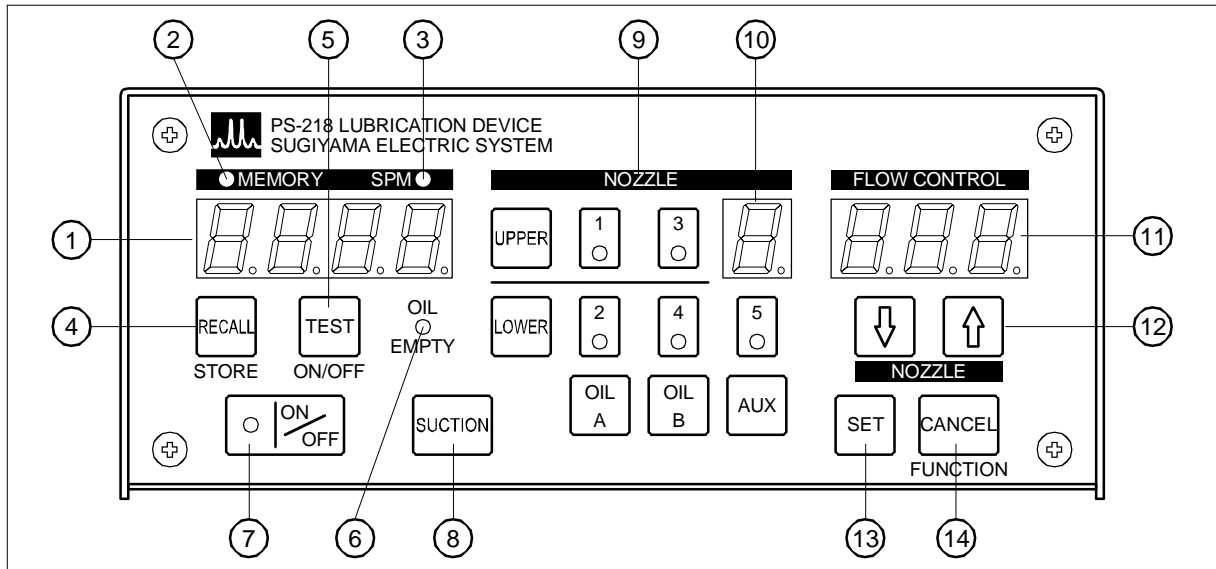
(5) PS-218 is congenial with Die-height detector PS-464

PS-218 improves the detection ability of the Die-height detector by the precise press processing.

In the conventional lubrication, the shift in the amount of the oil adhesion concealed the blotted slug generation. A level spraying of PS-218 can show 0.1 μ m resolution of PS-464 and improving of the detection ability.

2. Description

2-1. Controller front panel



- | | |
|-----------------------------------|-----------------------------------|
| (1) Memory number and SPM display | (8) SUCTION button |
| (2) MEMORY lamp | (9) Nozzle control part |
| (3) Test SPM lamp | (10) Nozzle number / Mode display |
| (4) RECALL button | (11) Set value display |
| (5) TEST button | (12) UP and Down arrow button |
| (6) OE lamp | (13) SET button |
| (7) Device ON/OFF button | (14) CANCEL button |

2-1-1. Memory number and SPM display

Digital display (1) displays Memory number and test SPM value. The memory number is displayed to two high rank digits. Test SPM value is displayed in all digits of a digital display.

Display the memory number in digital display (1) when MEMORY lamp (2) lights. Display test SPM value when turned off MEMORY lamp (2).

MEMORY lamp (2) lights red while operating the memory storage.

When the spraying test is enabled, SPM lamp (3) lights green.

Push the RECALL button (4) to the memory operation beginning.

Push TEST button (5) to change test SPM value.

2-1-2. OE lamp

OE lamp (6) blinks red when the oil in the tank is lost. When the OE lamp blinks red, the stop relay outputs the stop signal.

2-1-3. Device ON/OFF button and lamp

Push device ON/OFF button (7) to change of the device operation enable and disable. The lamp lights green when the device operation is enabled. When the device operation becomes disabled, the lamp blinks red. The continuous inhibition relay is turned on while the lamp is lighting green.

2-1-4. SUCTION button

SUCTION button (8) is used for the ventilator of piping.

2-1-5. Nozzle control part

In nozzle control part (9), there are nozzle state lamps and nozzle ON/OFF buttons.

A yellow lamp (number lamp) lights to the nozzle of being enabled to operate. A green lamp under a yellow lamp displays the state of solenoid valve ON.

UPPER, LOWER, OILA, OILB, and the AUX button are used for nozzle ON/OFF.

2-1-6. Nozzle number / mode display

Nozzle number/mode display (10) displays the nozzle number when adjusting it at the spraying time and the spraying control mode.

When the up and down arrow button is pushed, this display is changed. The spraying mode and the display are shown below. The nozzle number is not displayed for the solenoid valve not to be connected with the controller.

	Nozzle number					Spraying control	
Mode P	1	2	3	4	5	P	
Mode R	1	2	3	4	5	r	
Mode C	1	2	3	4	5	C	I
Mode D	1	2	3	4	5	d	

2-1-7. Set value display

Set value display (11) displays spraying time of the nozzle and a set value of the spraying control.

2-1-8. Up and down arrow button

Up and down arrow button (12) is a button for various set value changes. Nozzle number/mode display (10) is changed when pushing with the set value display has not blinked.

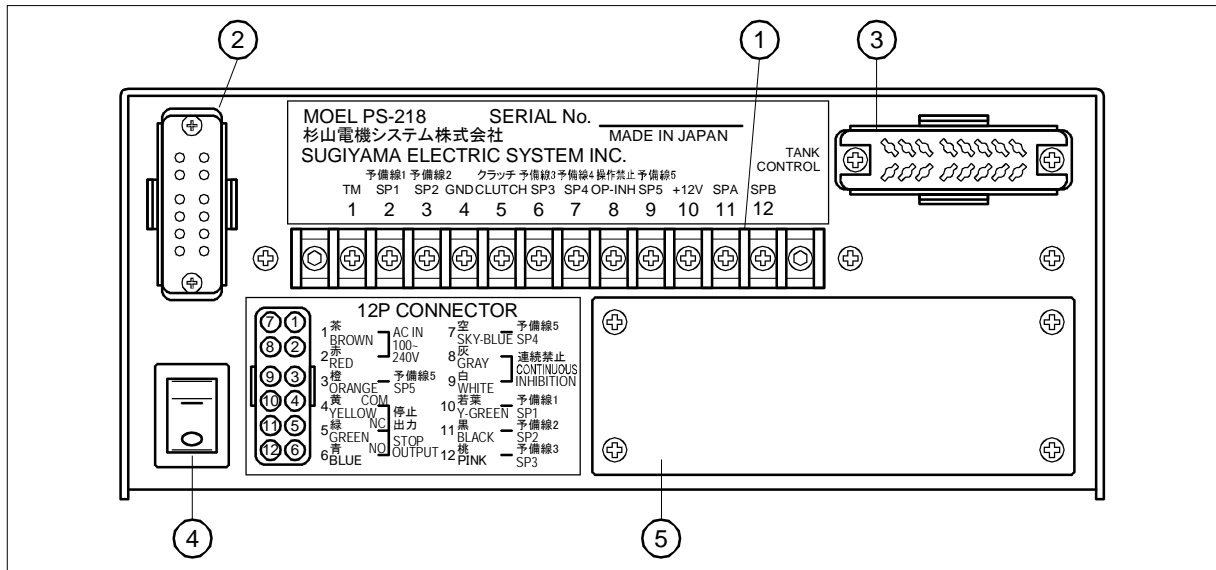
2-1-9. SET button

Push SET button (13) to the change beginning and the setting change end of a set value.

2-1-10. CANCEL button

Use CANCEL button (14) as set interruption, error reset, and FUNCTION buttons.

2-2. The controller back panel



- (1) Terminal block
- (2) Output connector
- (3) Valve control output connector
- (4) Power on/off switch
- (5) Option unit space

2-2-1. Terminal block

The terminal block connects the control signal to the device.

TM is a basic signal input for spraying. Connect timing from the press machine with the input.

The CLUTCH is the input for spraying air control signal of nozzle. Connect the clutch signal of the press machine with the CLUTCH input.

The OP-INH is an input to inhibit the operation of the controller.

Connect the signal of a no-voltage contact or no-voltage semiconductor switch with TM, CLUTCH, and OP-INH.

From SPARE1 to SPARE5 of the terminal block is connected from SPARE1 to SPARE5 of the output connector respectively in the device. Use the SPARE line to connect the signal from the press machine with TM and CLUTCH by way of the output cable.

GND is connected with the case and 0V of an internal circuit in the device

+12V is the outputs of DC power. It is possible to use it as a sensor power supply. Use the load current by 100mA or less.

SPA and SPB are connected with the valve control output connector. It is possible to use it as a spare line when the valve control output cable is 16 core.

2-2-2. Output connector

The output connector is for connection of the power supply to device and for connection of the contact output of the output relay. Connect a special connector with the cable.

2-2-3. Valve control output connector

It is an output for the solenoid valve drive of the oil distribution device.

2-2-4. Power on/off switch

It is a power on/off switch.

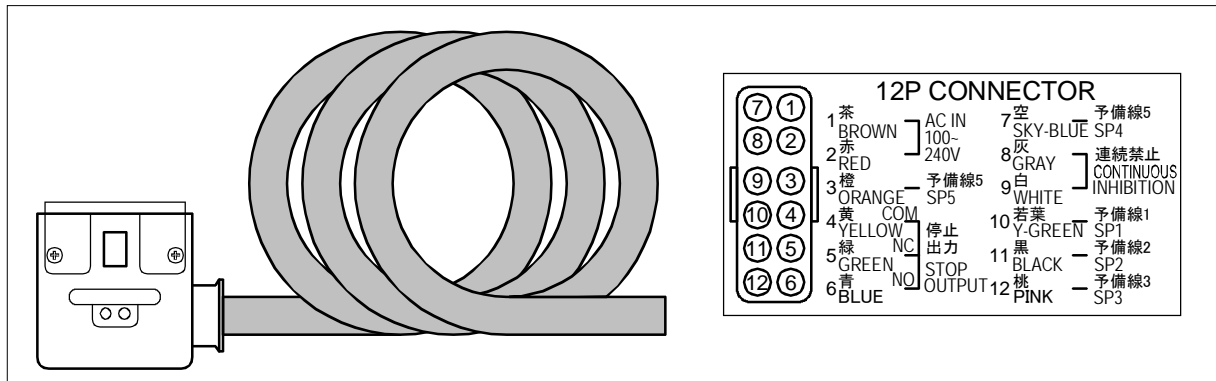
2-2-5. Option unit space

The option unit (undecided) only for the PS218 controller can be added.

2-3. Appended goods

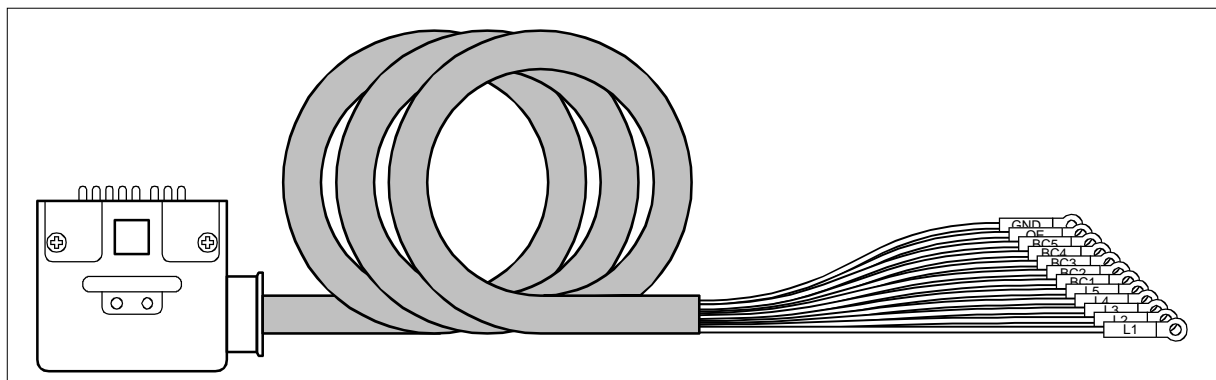
2-3-1. Output cable

The output cable is used for the connection of the press machine and the controller.

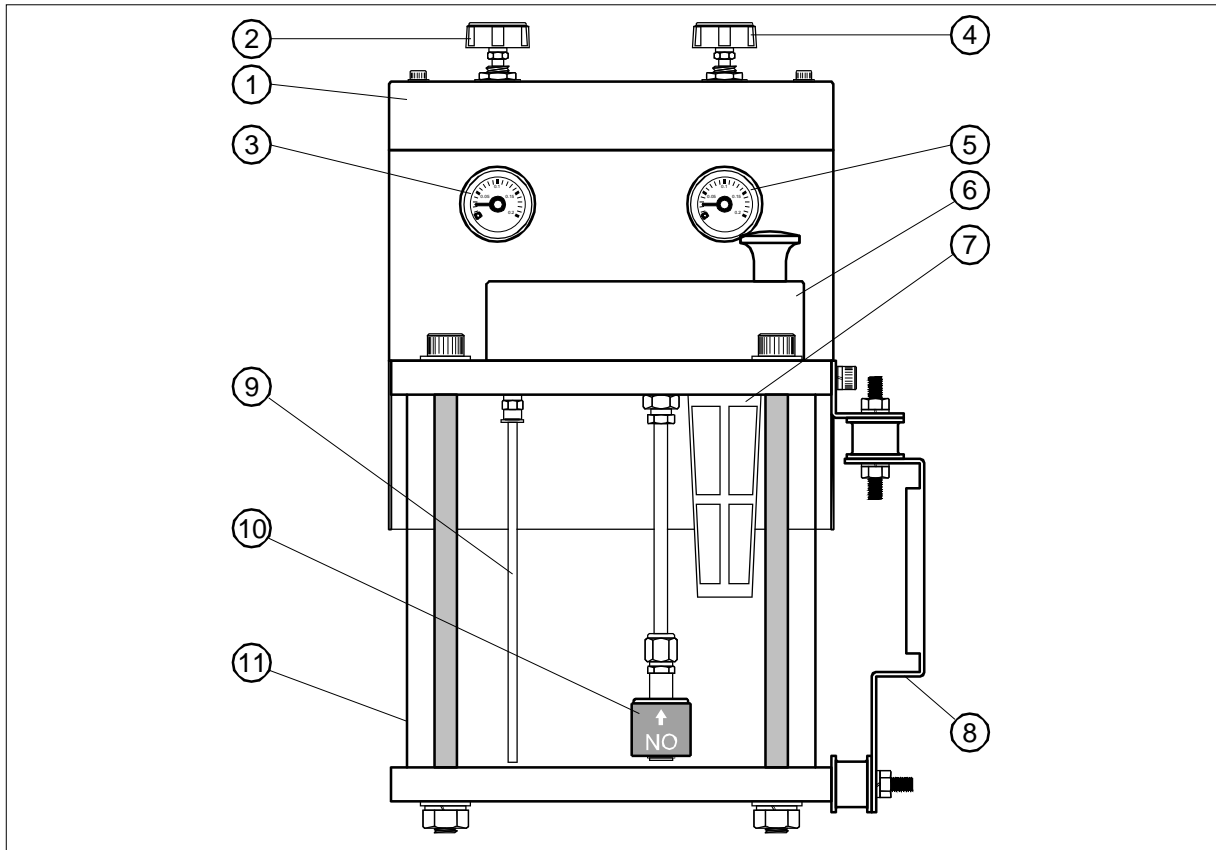


2-3-2. Valve control output cable

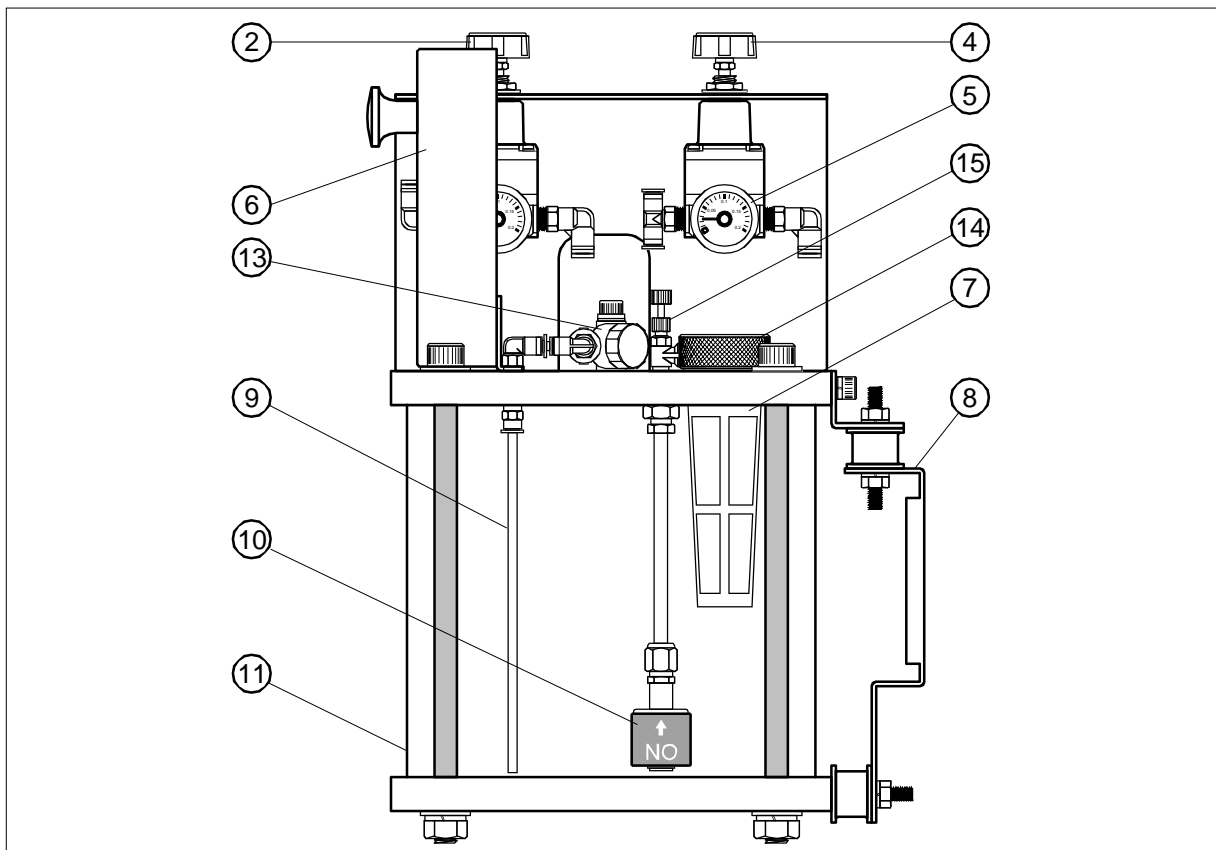
The valve control output cable is used to connect the controller and the oil distribution device.



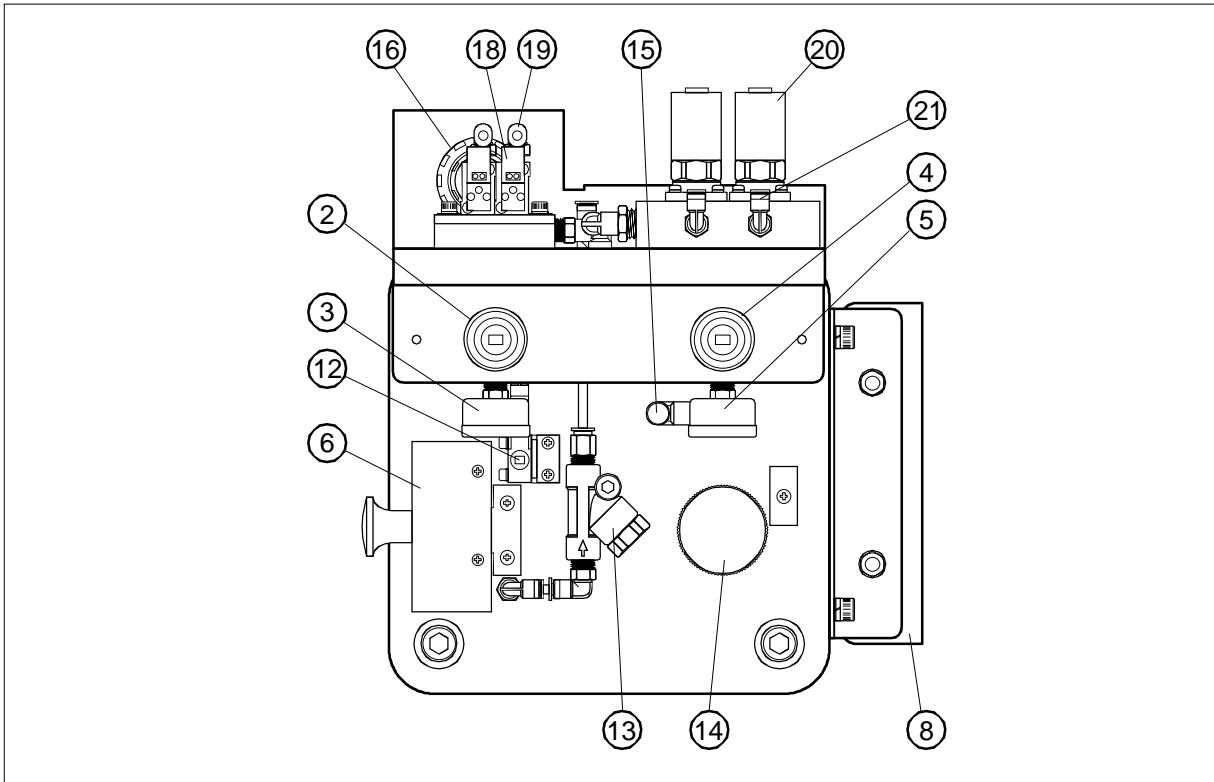
2-4. Oil distribution device



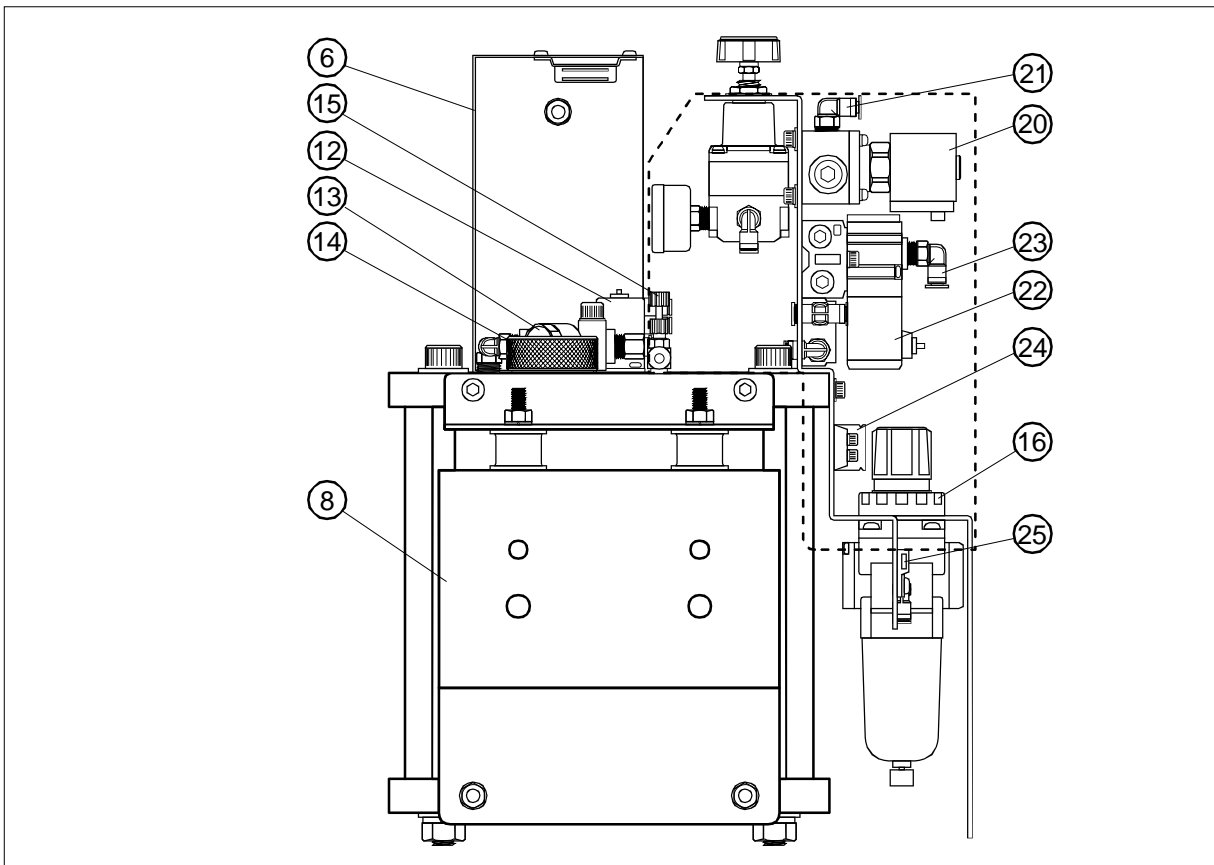
Front view



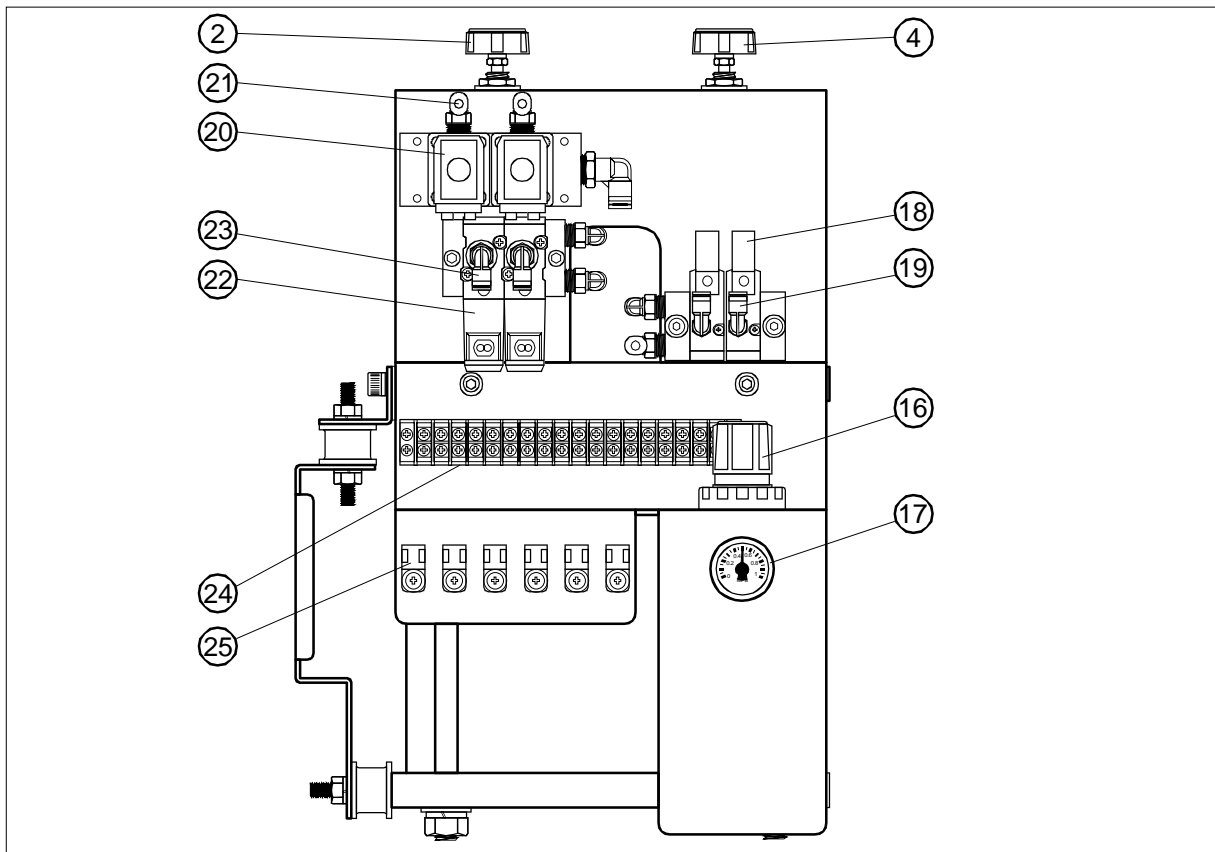
Front view (removed the cover)



Top view (removed the cover)



Side view



Back view

(1) Cover

Remove the cover when piping and wiring. Attach the cover after piping and wiring.

(2) Tank pressure (oil pressure) adjustment knob

It uses it to adjust the tank pressure (oil pressure). Pressure goes up if the knob is turned to the right. Adjust the tank pressure to 0.03-0.1MPa.

(3) Tank (oil) pressure gauge

(4) Spraying air pressure adjustment knob

Spraying air pressure goes up if the knob is turned to the right. Adjust the pressure to 0.2-0.1MPa.

(5) Spraying air pressure gauge

(6) Lid of filler opening

When the lid of filler opening is opened, it is decompressed in the tank. Shut the lid when spraying. The tank pressure doesn't rise if the lid is not shut.

(7) Strainer

(8) Installation bracket

Use the installation bracket to fix the oil distribution device.

(9) Sucking up tube

(10) Float switch

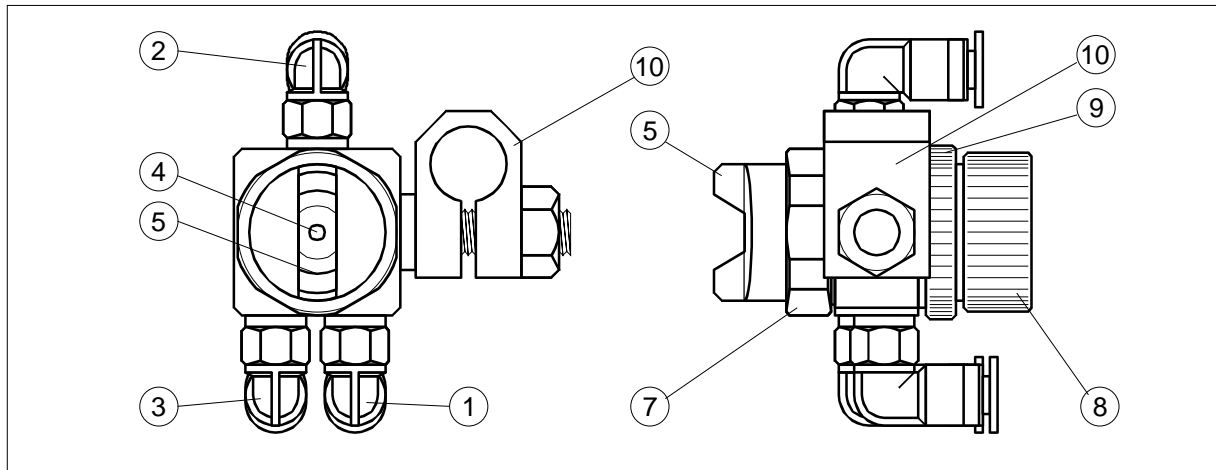
The float switch detects an oil measure decrease in the tank

(11) Pressurizing tank

The material of the pressurizing tank is acrylic resin.

- (12) Tank air decompression switch
The tank air decompression switch works to decompress it in the tank when the filler-opening lid is opened.
- (13) Oil filter
The oil filter filters the oil in the tank at the exit.
- (14) Filler opening
Pour the oil from the filler opening into the tank. Refuel slowly so that strainer may become resistance of refueling.
- (15) Relief valve
When the tank pressure becomes about 0.18MPa or more, relief valve exhausts air in the tank, and prevents the tank pressure from going up too much.
- (16) Air filter regulator
Set the output pressure to 0.4MPa about the air filter regulator.
- (17) Pressure gauge
- (18) Nozzle control air solenoid valve
It is a solenoid valve that controls the nozzle control air.
- (19) Nozzle control air fitting
Connect a yellow tube from the nozzle.
- (20) Oil flow control solenoid valve
It is a magnetic valve that adjusts the amount of spraying of the nozzle.
- (21) Fitting for oil
Connect a transparent tube from the nozzle.
- (22) Spraying air solenoid valve
It is a solenoid valve that controls the spraying air of the nozzle.
- (23) Spraying air fitting
Connect a red tube from the nozzle.
- (24) Terminal block
Connect the valve control output cable from the controller.
- (25) Cable ties holder
Use the cable ties holder to fix the tube and the cable. Bundle the tube and the cable in the cable ties holder through a cable ties.

2-5. Nozzle



(1) Nozzle control air fitting

Connect a yellow tube.

(2) Fitting for oil

Connect a transparent tube.

(3) Spraying air fitting

Connect a red tube.

(4) Oil nozzle

It is a spout of the oil.

(5) Spraying shape adjustment blowhole

Spraying shape becomes an oval by the air of spraying shape adjustment blowhole. The spouting air is spraying air.

(7) Air cap of nozzle

(8) Oil adjustment knob

The amount of oil can be adjusted.

(9) Locking screw

Locking screw of oil adjustment knob.

(10) Flexible holder

Fix the nozzle to the shaft of 10mm in the diameter by using the flexible holder.

3. Functions

3-1. Configuration

PS-218 is composed of the controller, the oil distribution device, and the nozzle. The pressurizing tank, the solenoid valve, and the air regulator are put in the oil distribution device.

The controller makes spraying control signal by the clutch and timing signal from the press machine, and drives the solenoid valve. The valve distributes the compressed air and the oil to the nozzle.

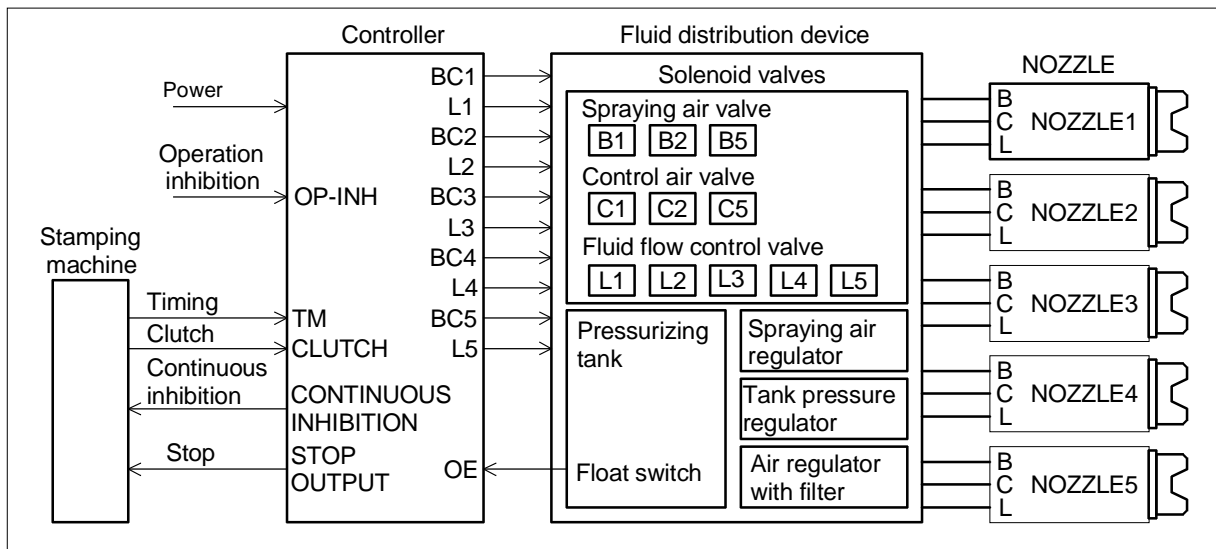
The float switch detects an oil decrease of the pressurizing tank, and the controller outputs stop signal to the press machine.

The nozzle and the oil distribution device are connected in the tube. Five nozzles or less can be connected.

Connect three tubes of the spraying air, the control air, and the oil with the nozzle.

The oil is pressurized in the pressurizing tank, and sent to the nozzle through the oil control solenoid valve. The spraying air atomizes the oil at the exit of the nozzle. The control air operates the piston built into the nozzle, and controls the spouting and the stopping of the oil from the nozzle.

The spraying air and the control air are controlled at the same time. When both airs are turned on, the oil is sprayed.



Configuration of PS218

	Nozzle 1	Nozzle 2	Nozzle 3	Nozzle 4	Nozzle 5
PS218-12	Yes	Yes	No	No	No
PS218-13	Yes	Yes	No	No	Yes
PS218-24	Yes	Yes	Yes	Yes	No
PS218-25	Yes	Yes	Yes	Yes	Yes
PS218-AB	Yes	Yes	Yes	Yes	No

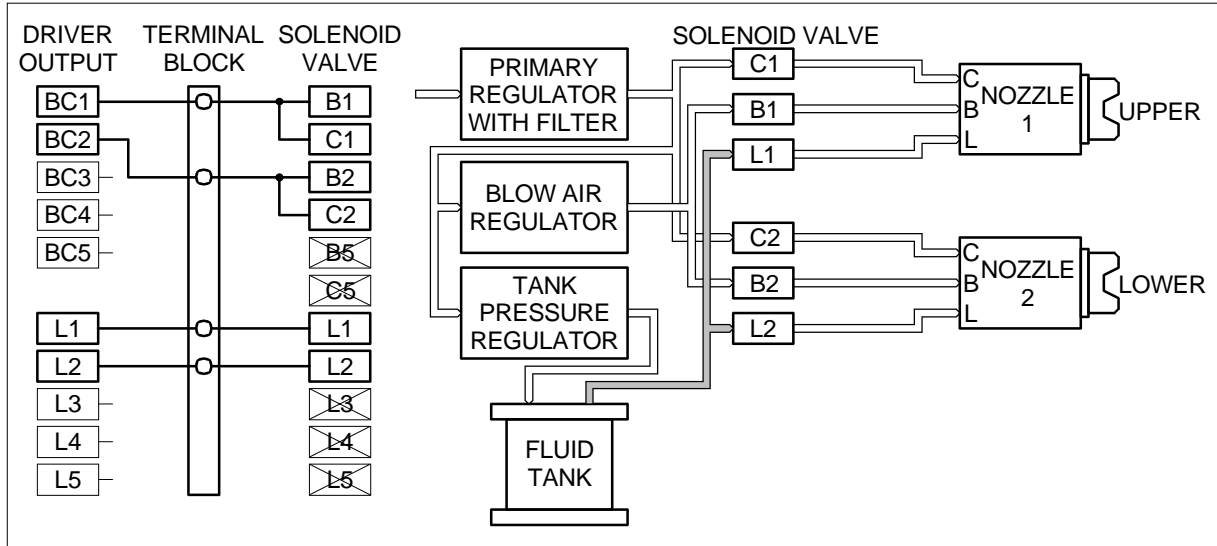
Usable nozzle and model of PS218

3-2. Model of PS-218

Five kinds of models exist in PS-218. For the controller, any model of PS218 is the common one.

3-2-1. Model PS218-12

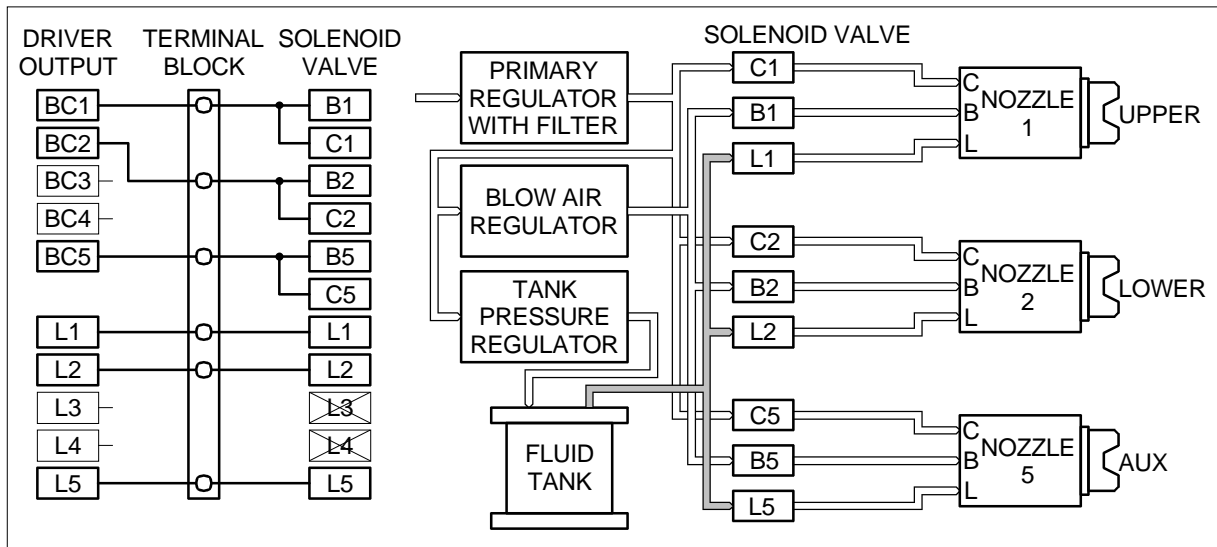
For model PS218-12, arrange the nozzle upper and under the material.



Model PS218-12

3-2-2. Model PS218-13

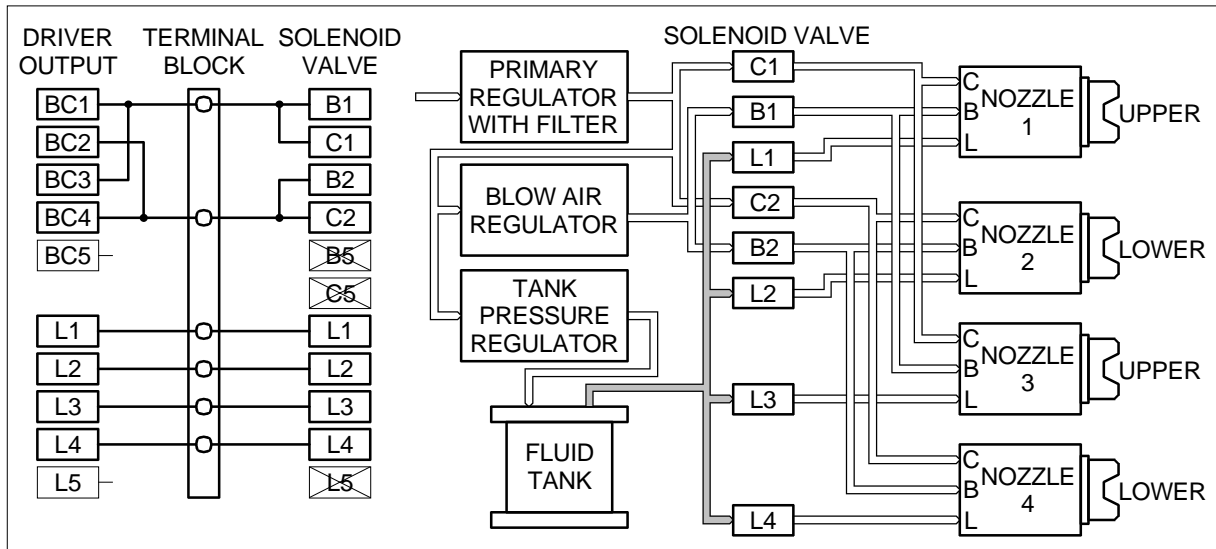
For model PS218-13, arranges the nozzle in the upper side, the lower side of the material, and the latter half of the processing.



Model PS218-13

3-2-3. Model PS218-24

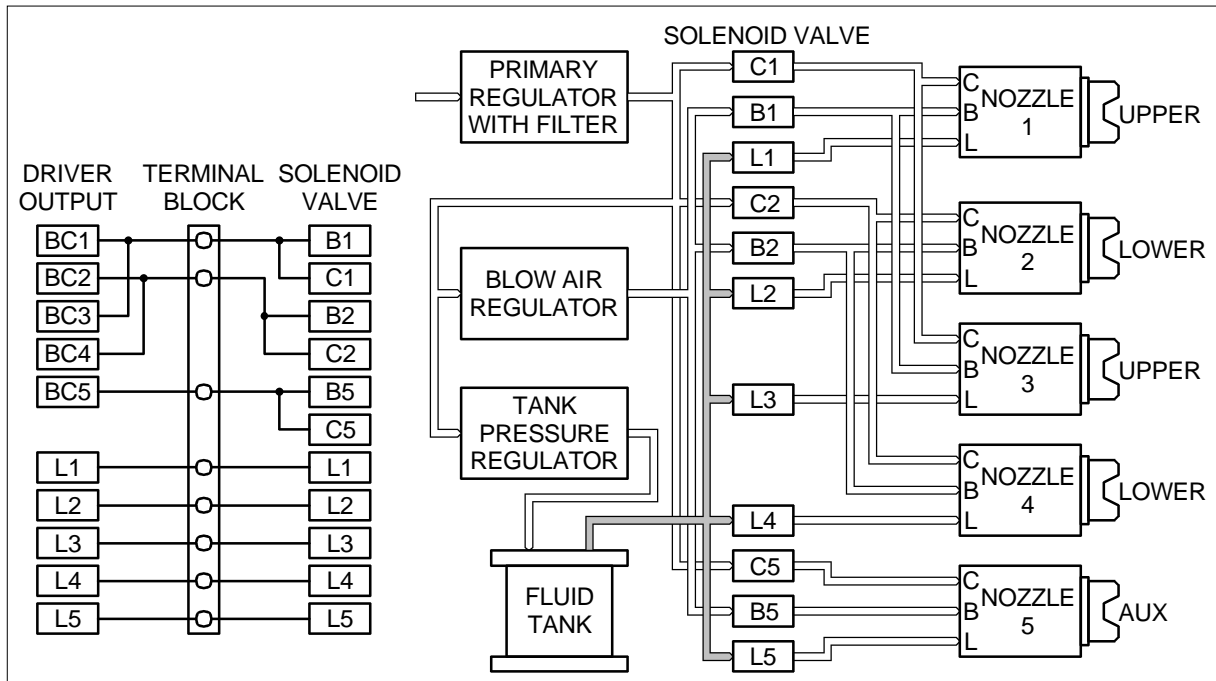
For model PS218-24, arrange two nozzles respectively upper and under the material.



Model PS218-24

3-2-4. Model PS218-25

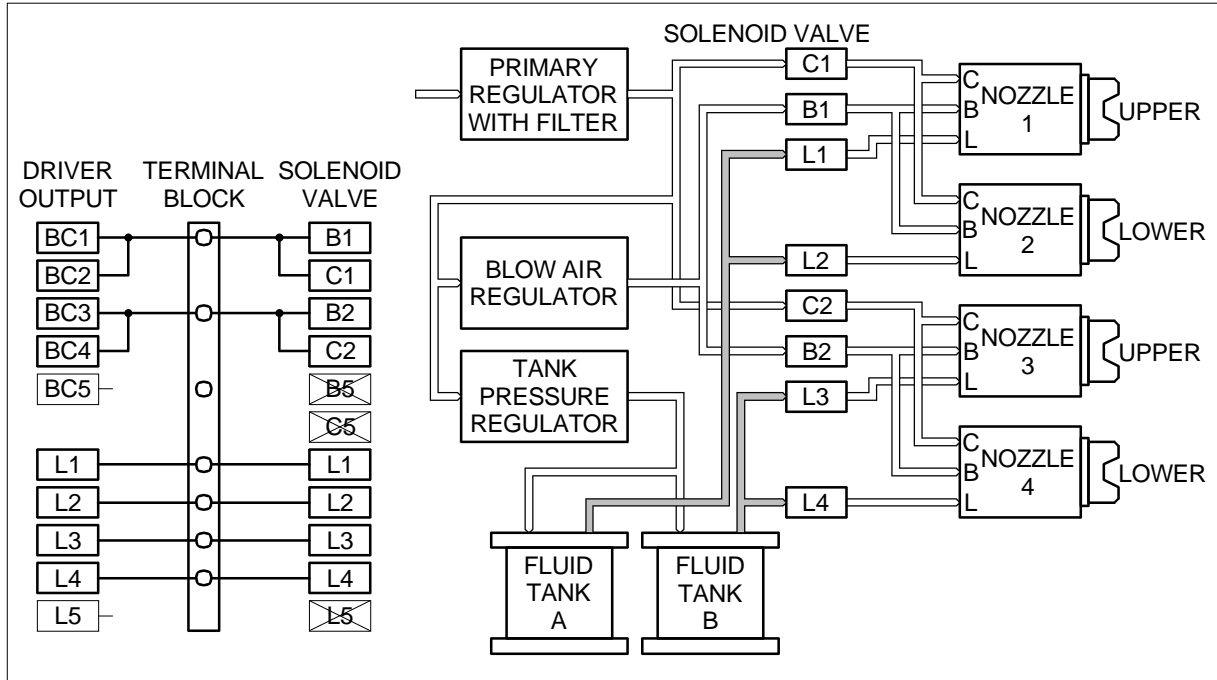
For model PS218-25, arrange two nozzles respectively upper and under the material, and the latter half of the processing..



Model PS218-25

3-2-5. Model PS218-AB

PS218-AB sprays two kinds of oils with the nozzle. Arrange two nozzles upper and under the material respectively.



Model PS218-AB

3-3. Controller

The controller drives the solenoid valve that exists in the oil distribution device, and controls spraying of the nozzle.

The control valve (BCn) driver drives the spraying air valve and the control air valve in the oil distribution device in parallel. The control valve driver is driven by clutch (spraying permission) signal.

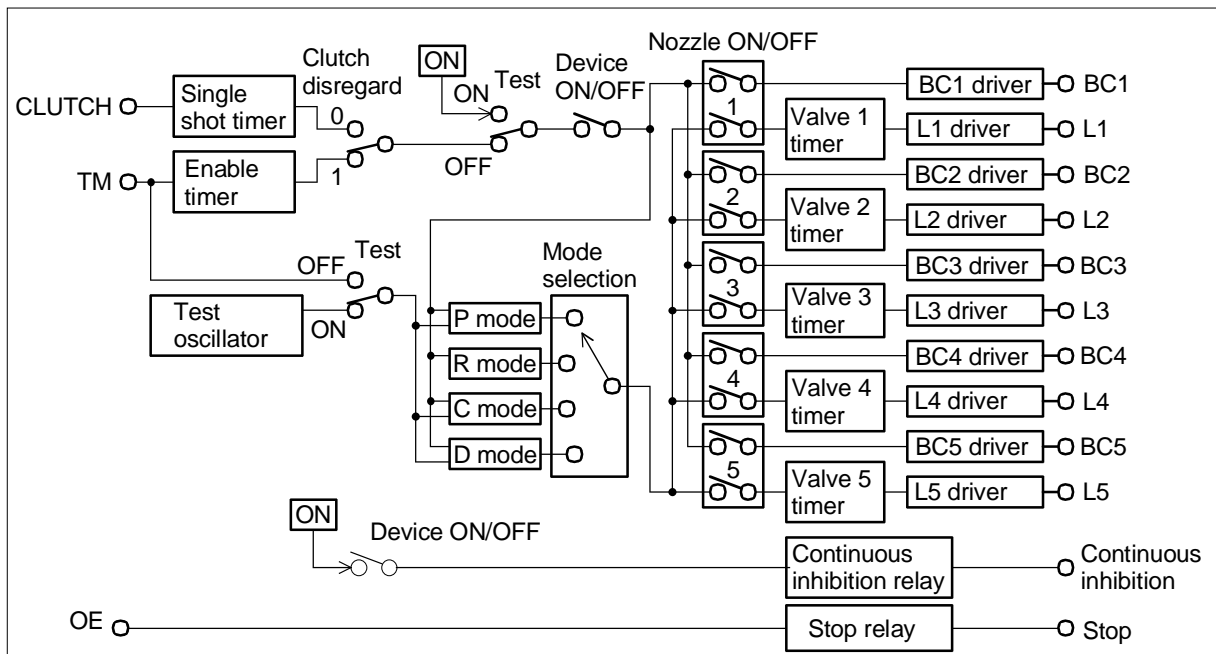
The oil flow control valve (Ln) driver drives the oil flow control valve. The oil flow control valve driver is driven by the signal made from timing signal according to spraying control mode.

The output relay outputs an oil level decrease in the pressurizing tank to the press device as stop signal. An oil level decrease of the pressurizing tank is detected with the float switch.

The float switch signal is connected with controller's OE.

The continuous inhibition output relay outputs controller's state of device OFF to the press machine.

Even if neither the clutch nor timing are connected by using test function, spraying is possible.



Controller block diagram

3-4. Oil flow control for spraying

The controller has each nozzle adjustment and summary adjustment of oil flow controls for spraying.

Each nozzle adjustment adjusts the flow with open time of solenoid valve that connected each nozzle. Use the valve open time to set of the amount of spraying basic and to adjust the balance between nozzles. From 1.00ms to 9.99ms can be set to the valve open time.

Summary adjustment adjusts the oil spraying frequency per minute. To set the oil spraying frequency per minute, four modes (P, R, C, and D) were prepared in the controller.

Mode P, C, and D can make the oil spraying frequency follow to the stroke of the press machine by using timing from the press machine. The timing input signal is disregarded in mode R, and the oil is sprayed by the set frequency per minute.

The valve open time and the oil spraying frequency can be set by the same operation.

Open the oil adjustment knob of the nozzle enough.

ATTENTION

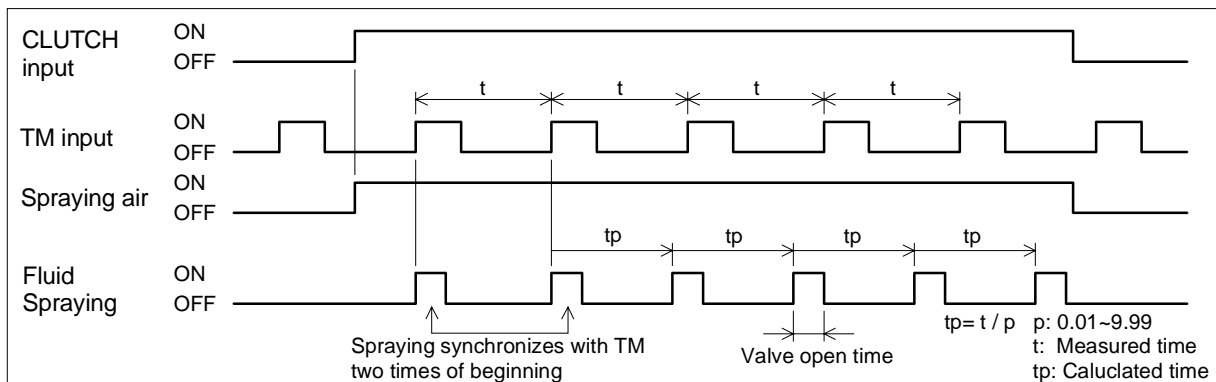
The valve open time is time that energizes to the solenoid valve. Neither the valve open time nor the amount of the spraying oil is proportional. Moreover, the amount of the spraying oil changes by other factors (oil tank pressure and viscosity, etc.) even if the valve open time is not changed. The valve open time is a standard of the amount of spraying. It is not accurate amount of spraying one that is decided, and maintained

3-4-1. Mode P (Proportion)

Mode P decides the cycle of spraying while measuring the strokes per minute of the press machine obtained from the timing input signal.

The frequency of spraying a minute becomes P times the strokes per minute. It is possible to set it from 0.01 to 9.99 to P

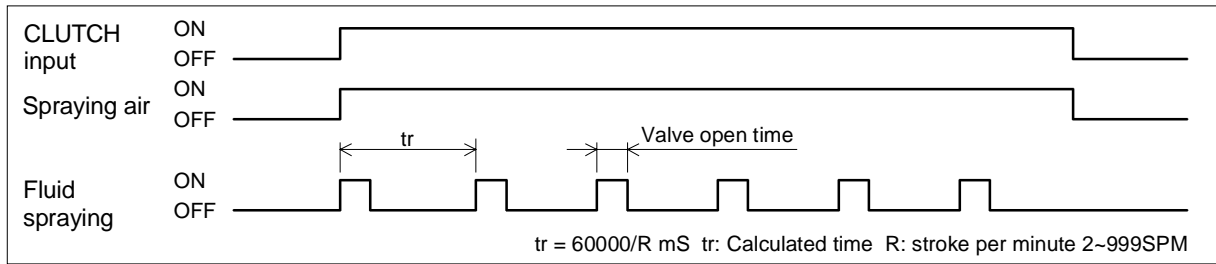
Spraying two times of the start is simultaneous with the timing input signal. It sprays it based on the cycle obtained because of the calculation since the timing of the second times. Spraying doesn't synchronize with the timing input signal excluding spraying two times of the start.



Mode P

3-4-2. Mode R (Revolution)

In mode R, it sprays it by the strokes per minute corresponding set to R. Disregard the timing input signal.

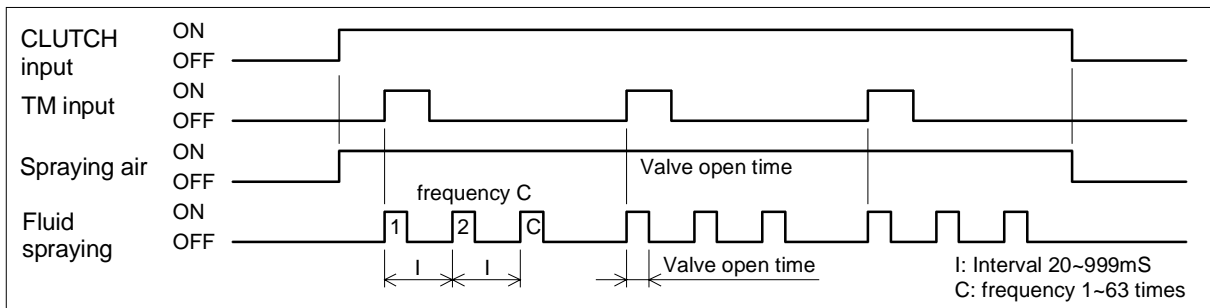


Mode R

3-4-3. Mode C (Count & interval)

Times of C of each timing input signal are sprayed at intervals I in mode C.

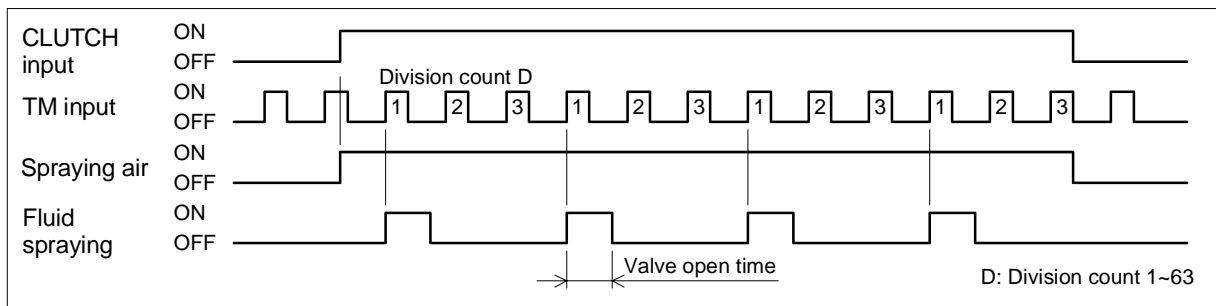
Set for the time obtained from product of C and I not to exceed the timing cycle. When this time exceeds the timing cycle, spraying is not normally done. The values that can be set to C are from 1 to 63. The value to 999ms or less can be set to I. The minimum value of I is up to a total of the valve open time that is enabled.



Mode C

3-4-4. Mode D (timing Division)

In mode D, it sprays once of timing input signal of times of D. Spraying synchronizes with the timing input signal. It is possible to set it from 1 to 63 to D.



Mode D

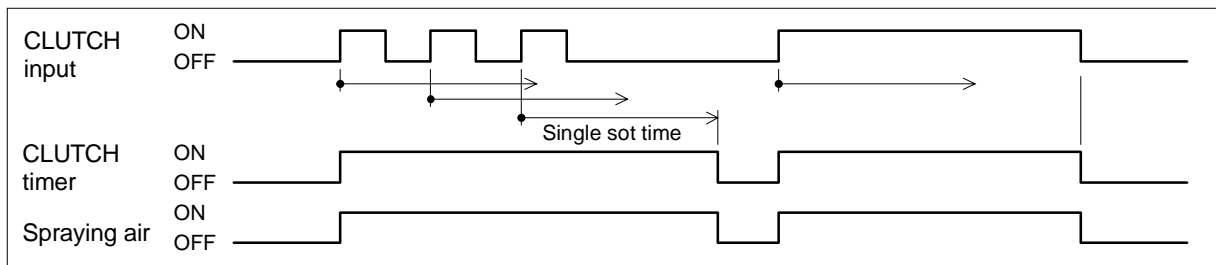
3-5. Clutch input

Clutch input is the spraying enabling signal input. When the clutch input is turned on, the control solenoid valve output is turned on.

The clutch single shot timer is installed in the input circuit for the protection of the control valve and the nozzle. Even if the clutch input will repeat ON/OFF in a short time, this timer decreases ON/OFF of an unnecessary control valve output.

The clutch single shot timer begins operating at time when the clutch input was turned on. The control valve output is turned on while clutch input ON or the clutch single shot timer is turned on.

When the clutch signal cannot be connected, spraying operation enabling signal can be made from timing signal.

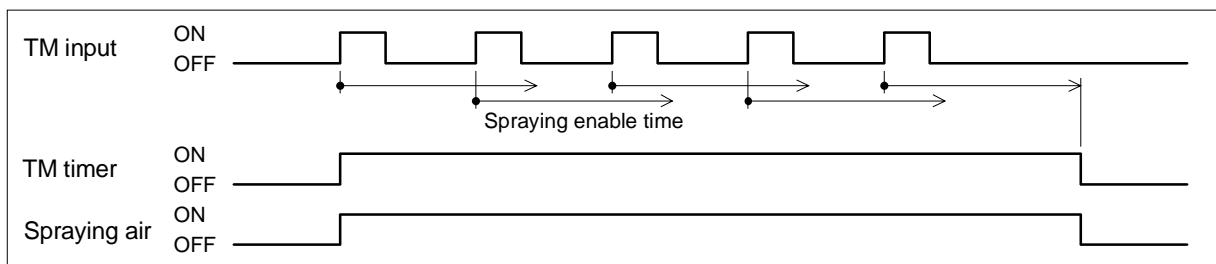


Function of the clutch single shot timer

3-6. Timing input

Connect the signal of each stroke of the press machine with the timing input. The timing signal is used to oil flow control. In P mode, use the timing input signal to measure the stroke cycle of press machine. Use it as spraying timing in C mode and D mode. Moreover, disregard the timing input signal in R mode.

When use the lubrication device with the press machine that cannot take out the clutch signal, set one to the clutch disregard of operation/function setting-1 of the function setting. Spraying enabling signal can be generated from timing signal by doing this setting.



Generation of spraying enabling signal from timing input

3-7. Negligence prevention function

The controller provides the function to prevent press working being done without operating the lubrication device.

The continuous inhibition function prohibits continuous running of the press machine when the controller is disabled. Connect the continuous inhibition output with the continuous running selection circuit of the press machine to use the continuous inhibition function.

The automatic wake-up function returns the controller in enabled state, when the controller in disabled state detects the timing of the predetermined count. It is necessary to connect timing from the press machine with the controller to make the automatic wake-up function effective.

Set the number of timing count for the automatic wake-up function to the automatic wake-up timing count of the function setting. If the number of timing count is 0, the controller doesn't wake up.

3-8. Non-display of valve open time

The chance to change the valve open time decreases after completing the installation. Because unauthorized operation is decreased, the valve open time can be made non-display. The display and non-display can be switched by pushing the SET button while pushing the FUNCTION button.

3-9. Hold of setting value

The spraying control setting value under use of the controller is backed up with the battery. The setting value can hold for about two weeks by the battery backup.

Setting values can be stored up to ten sets in EEPROM by the memory storage operation. As for EEPROM, data-hold for a long time (about ten years) is possible.

The setting value stored in EEPROM is copied onto the using setting value by the memory recall operation.

3-10. Operation inhibition

When OP-INH that exists in the terminal block is connected with GND, the controller's button operation is inhibited. Operation inhibition setting 1 and operation inhibition setting 2 of the function setting decide the inhibition operations.

3-11. Solenoid valve connection test

When device ON/OFF is switched, the controller examines the connection between the solenoid valve in the oil distribution device and the controller. Examine it even if the TEST button keeps being pushed for two seconds. When the disconnection and the short circuit of the cable are confirmed as a result of the examination, the error is displayed.

The setting not examined when device ON/OFF is switched can be done. Refer to operation setting. 1 of function setting.

3-12. Spraying test

The spraying test is a function to enable the spraying confirmation without connecting the input signal of press machine or without operating the press machine.

Make pseudo timing with internal oscillator when test mode is turned on. Set the strokes per minute of pseudo timing to the test SPM

3-13. Function setting

In the function setting, set the controller's operation. Refer to the function setting for details.

4. Error indication

When trouble is caused in the working condition, the controller displays error number in the digital display.

The error number is displayed in the setting value digital display in the form of 'E-x' with blinking.

Push the CANCEL button to release error indication. Push the CANCEL button two or more times when two or more errors occur.

4-1. Short to GND error E-1

E-1 is displayed that the controller's valve control output is short-circuited to GND when the solenoid valve connection test is done.

4-2. Unconnected error E-2

E-2 is displayed when the solenoid valve connection test is done, that the controller is not connected with the solenoid valve, or the combination of the oil control valve and the air control valve is not effective.

4-2-1. Changed connected error E-3

Display E-3 when the solenoid valve connection test is done, and a connection different from the last test results.

The changed connected error is not trouble. However, confirm it is what the model number displayed in the memory number display expects. When displayed that the model number is '--', the mistake is found in the connection.

4-3. Backup error E-5

Display the backup error at environment operating that the voltage of the battery for the backup decreases. When the backup error frequently occurs, the controller should repair.

4-4. EEPROM error E-7

When the memory is operated, the EEPROM error is displayed. The EEPROM error occurs when EEPROM built into the controller is inaccessible. Request the repair when this error occurs.

4-5. EEPROM initial value error E-8

The EEPROM initial value error occurs at environment operating. The content of EEPROM is deleted. Request the repair when the error occurs even if the power supply is reentered.

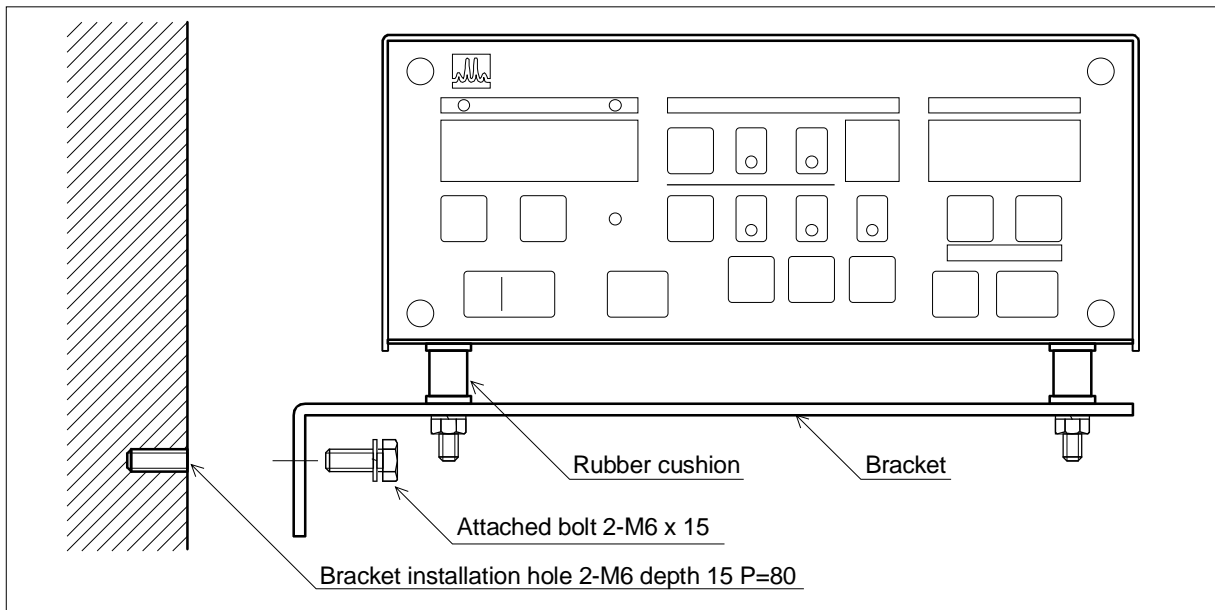
5. Installation

5-1. Installation of the controller

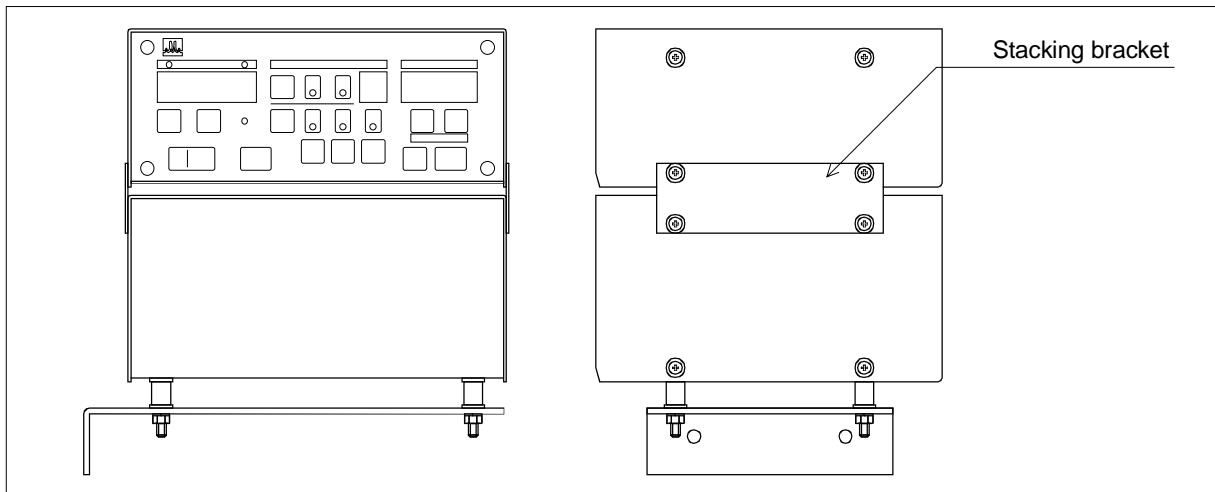
Install the controller with a special bracket. Moreover, using the stacking bracket can be stacking the controller and the other product of our company.

Select an installation place with less vibration and dust. Avoid a place expose to liquid and metal powder.

Do not put the thing on the controller.



Installation with a special bracket



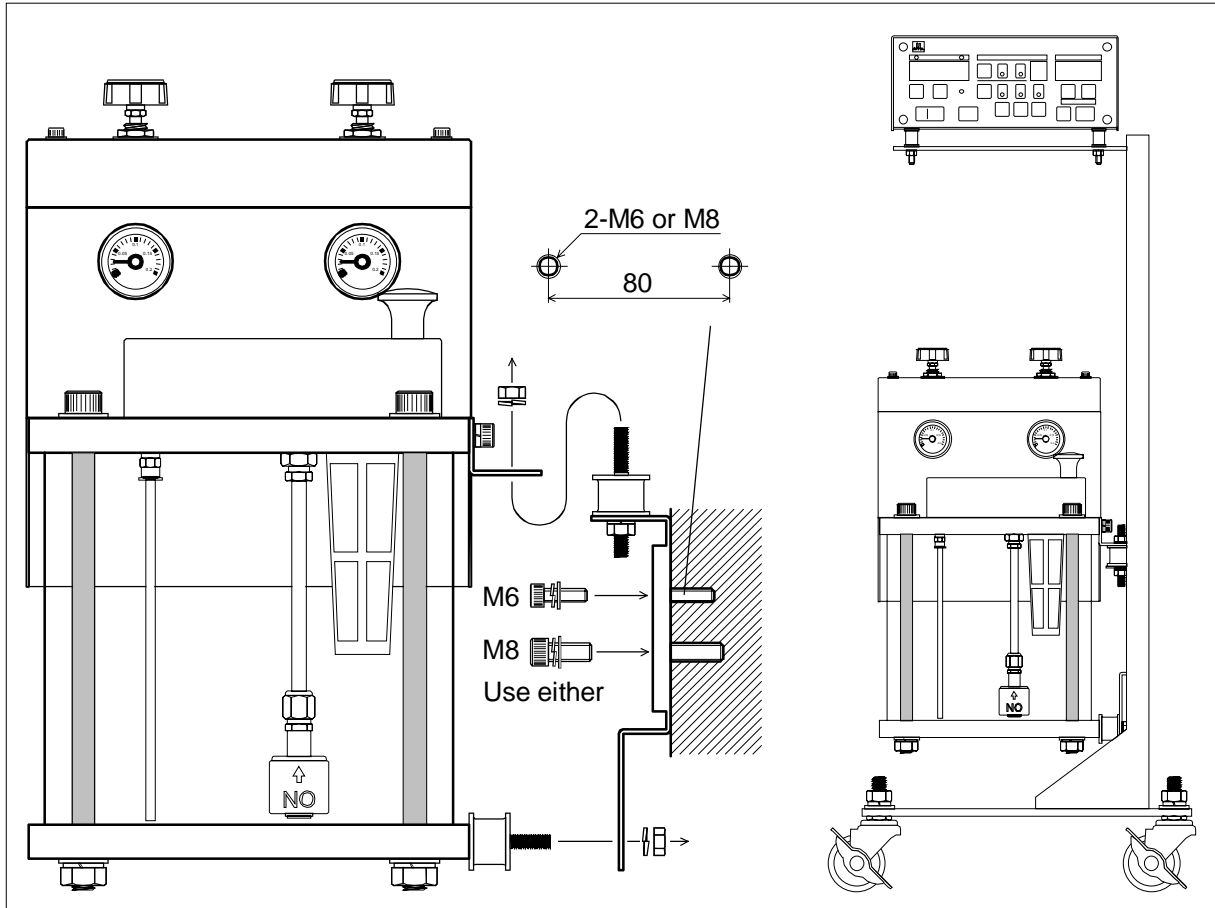
Installation with a stacking bracket

5-2. Installation of the oil distribution device

Install the oil distribution device after fixing the bracket to the wall.

A fixed screw of the bracket must use either of M6 or M8.

When a special stand is used, the oil distribution device and the controller are installed together.



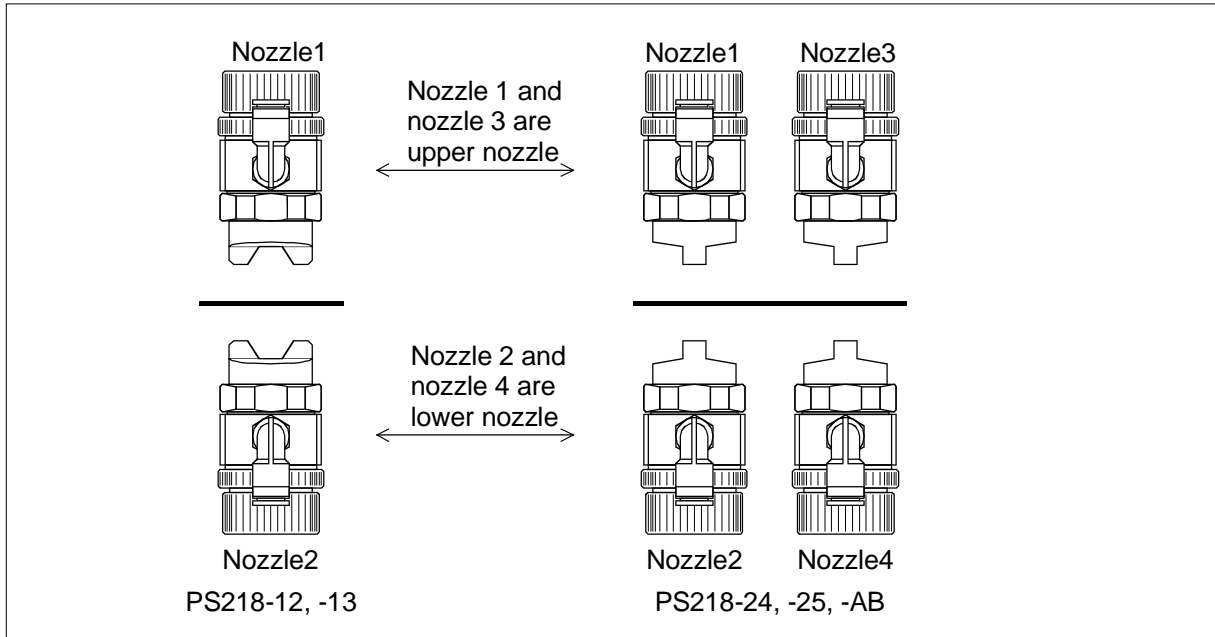
Wall installation

Stand installation

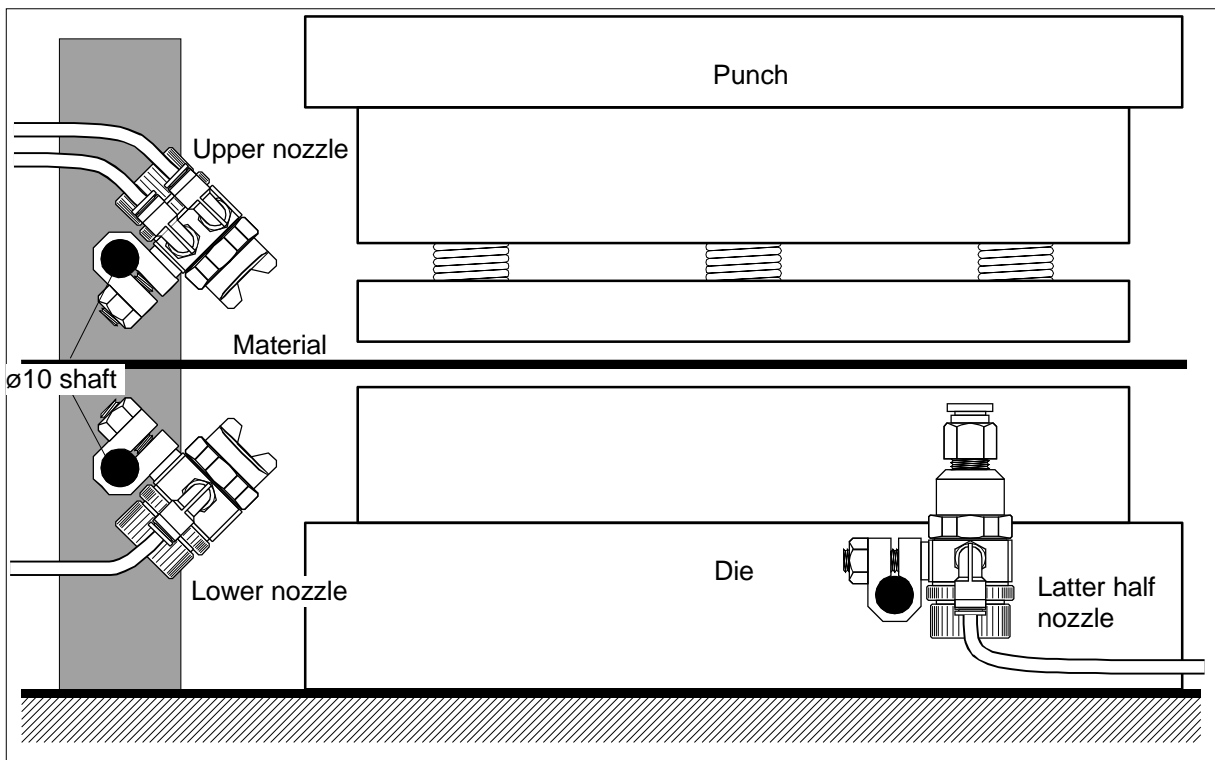
5-3. Installation of nozzle

Install the nozzle in 10mm shaft with a free holder.

Arrange nozzle 1 and nozzle 3 upper, and arrange nozzle 2 and nozzle 4 lower.



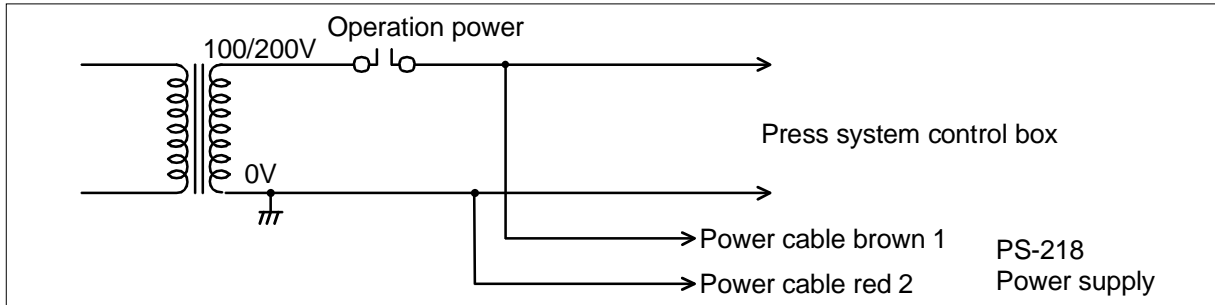
Arrange of nozzles



Example of Nozzle configuration

5-4. Wiring for power supply

Connect the operation power supply of the press machine with red and brown wire of the output cable.

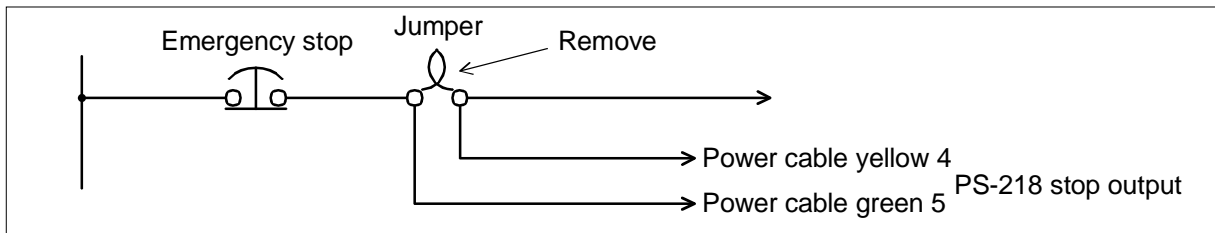


Wiring for power supply

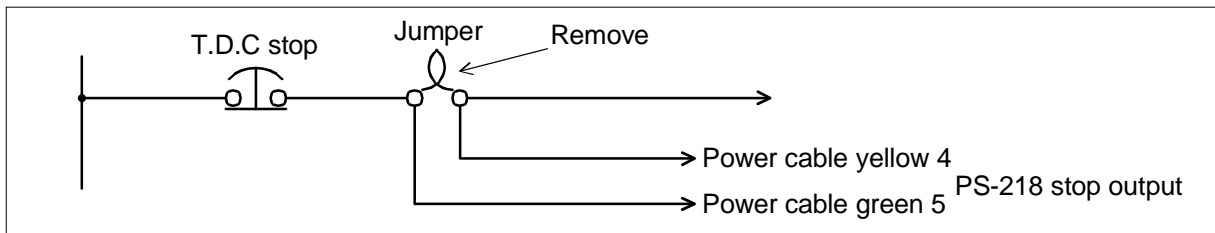
5-5. Wiring for stop output

The stop output (relay contact output) is allocated in 4(yellow), 5(Green), and 6(Blue) of output cable.

Connect the stop output with the emergency stop or T.D.C stop circuit of the press machine.



Wiring for stop output to emergency stop circuit



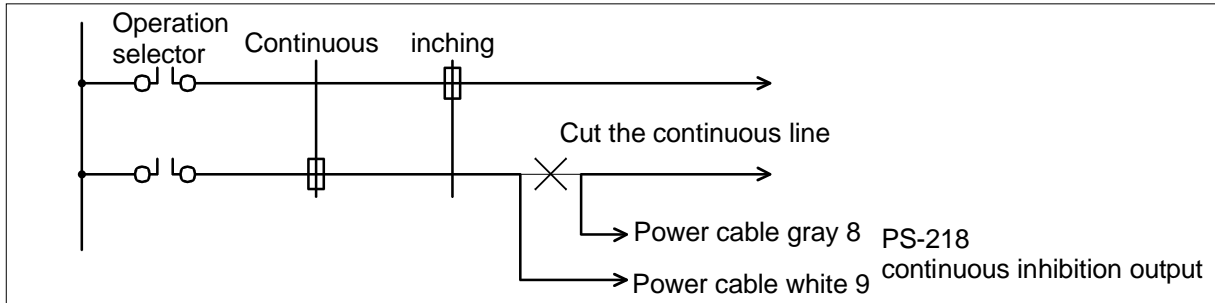
Wiring for stop output to top dead center (continuous) stop circuit

CAUTION
 Connect the stop output with either of emergency stop circuit or top dead center (continuous) stop circuit of the press machine. Circuit breaks down when connecting stop output with both stop circuits at the same time

5-6. Wiring for continuous inhibition output

The continuous inhibition output is a contact output that the contact close when the controller is enabled. The wiring for the continuous inhibition output makes the press machine possible continuous running only at the controller enabled.

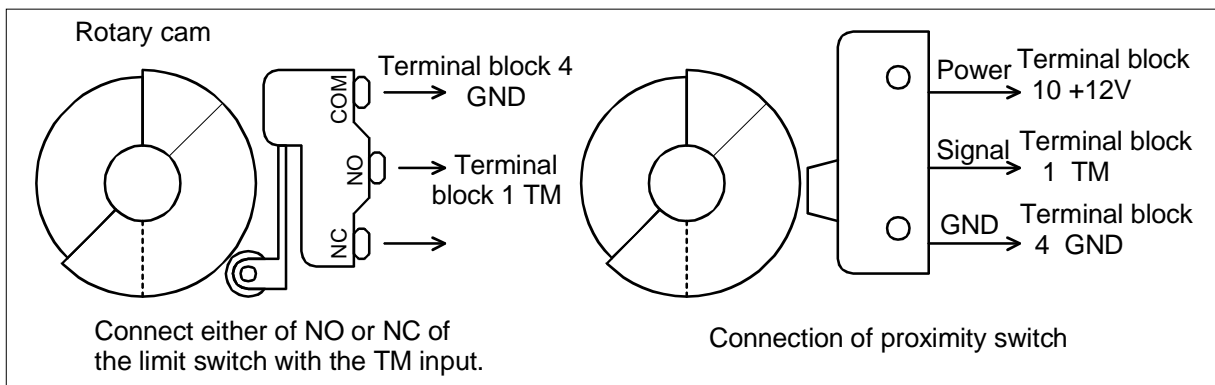
Connect the 8(Gray) and 9(White) wire of the output cable with the driving selector circuit. The controller operates even if not wiring for the continuous inhibition output.



Wiring for continuous inhibition output

5-7. Wiring for timing input

Connect the no-voltage relay contact or the no-voltage transistor output with the timing input.

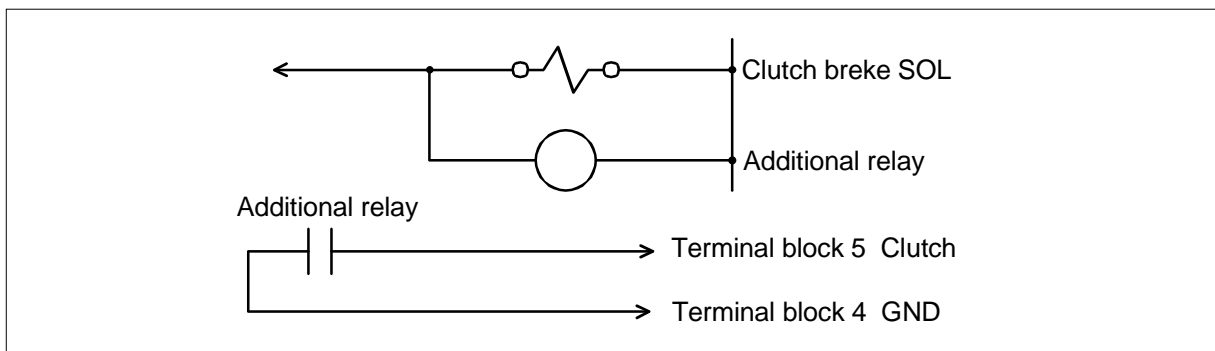


Wiring for timing input

5-8. Wiring for clutch input

Connect clutch control signal of the press machine with the clutch input. Connect the no-voltage relay contact or the no-voltage transistor output with the clutch input.

When the clutch signal cannot be connected, spraying operation enabling signal can be made from timing signal.

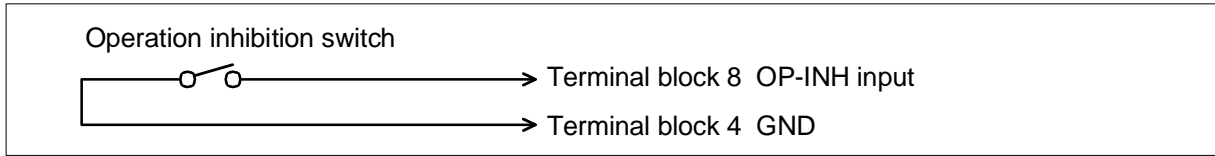


Wiring for clutch input

5-9. Wiring for operation inhibition input

Connect the operation inhibition switch with the OP-INH input. When the operation inhibition switch is turned on, the controller's panel operation is disabled.

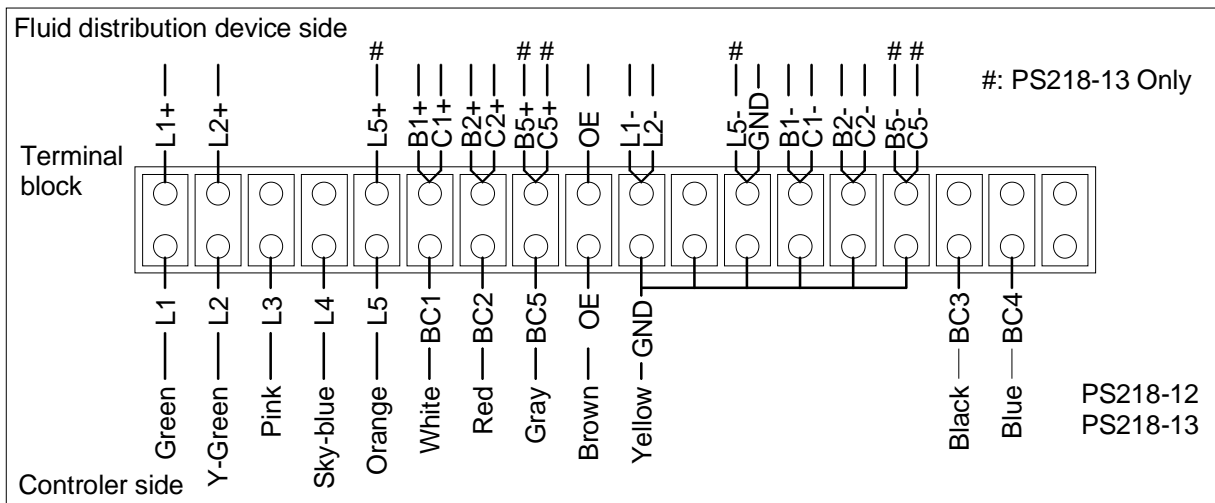
The controller operates even if not wiring for the operation inhibition input.



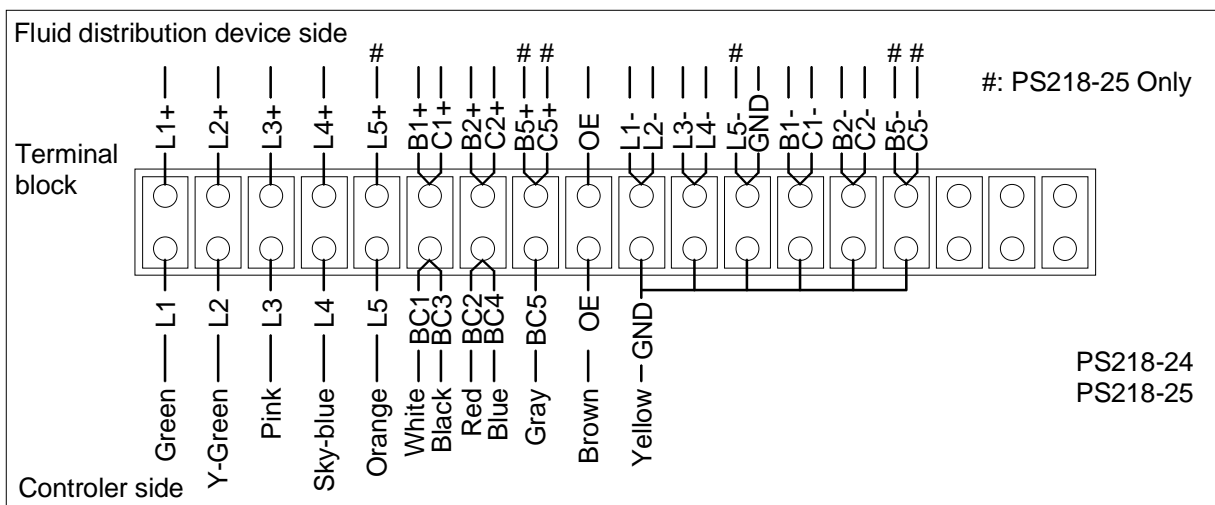
Wiring for operation inhibition input

5-10. Wiring for oil distribution device

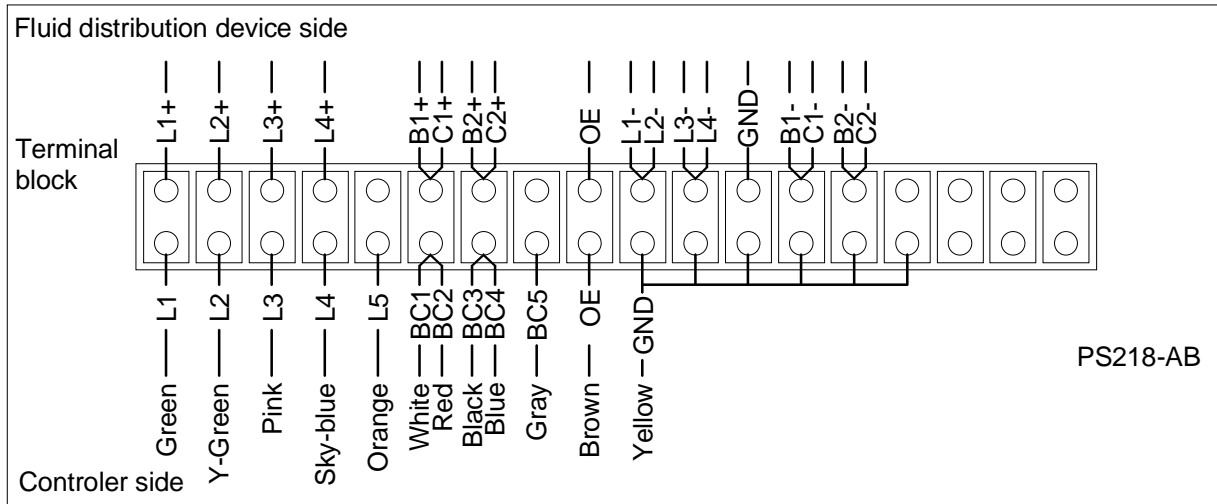
Connect the valve control output cable with the oil distribution device. The connection is different depending on the model of PS218. Wire while referring to figure.



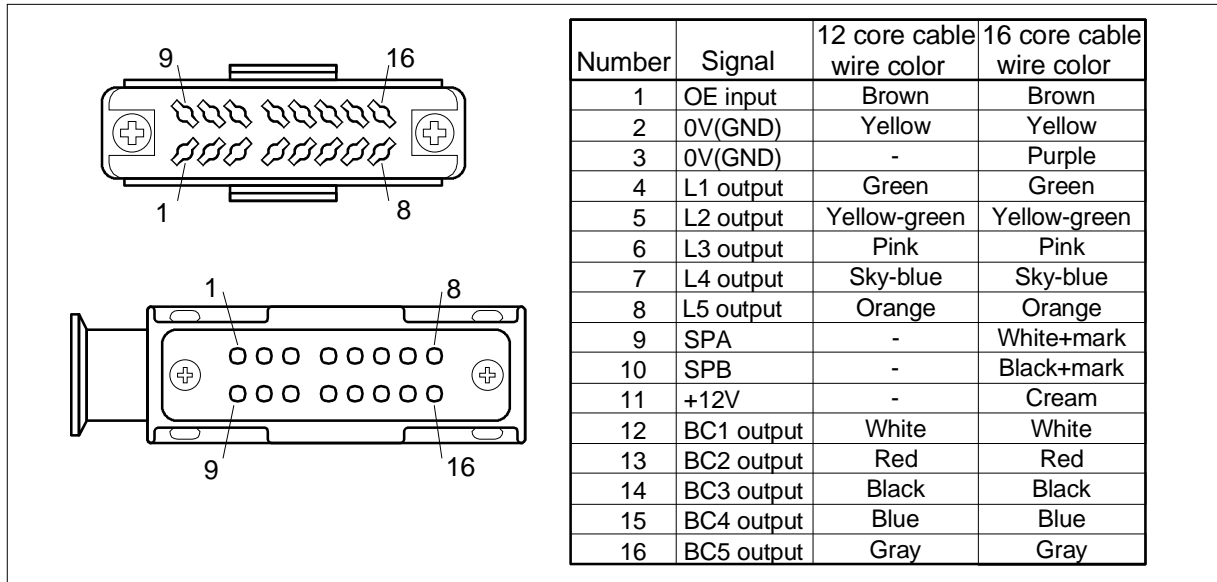
Connection of PS218-12 and PS218-13



Connection of PS218-24 and PS218-25



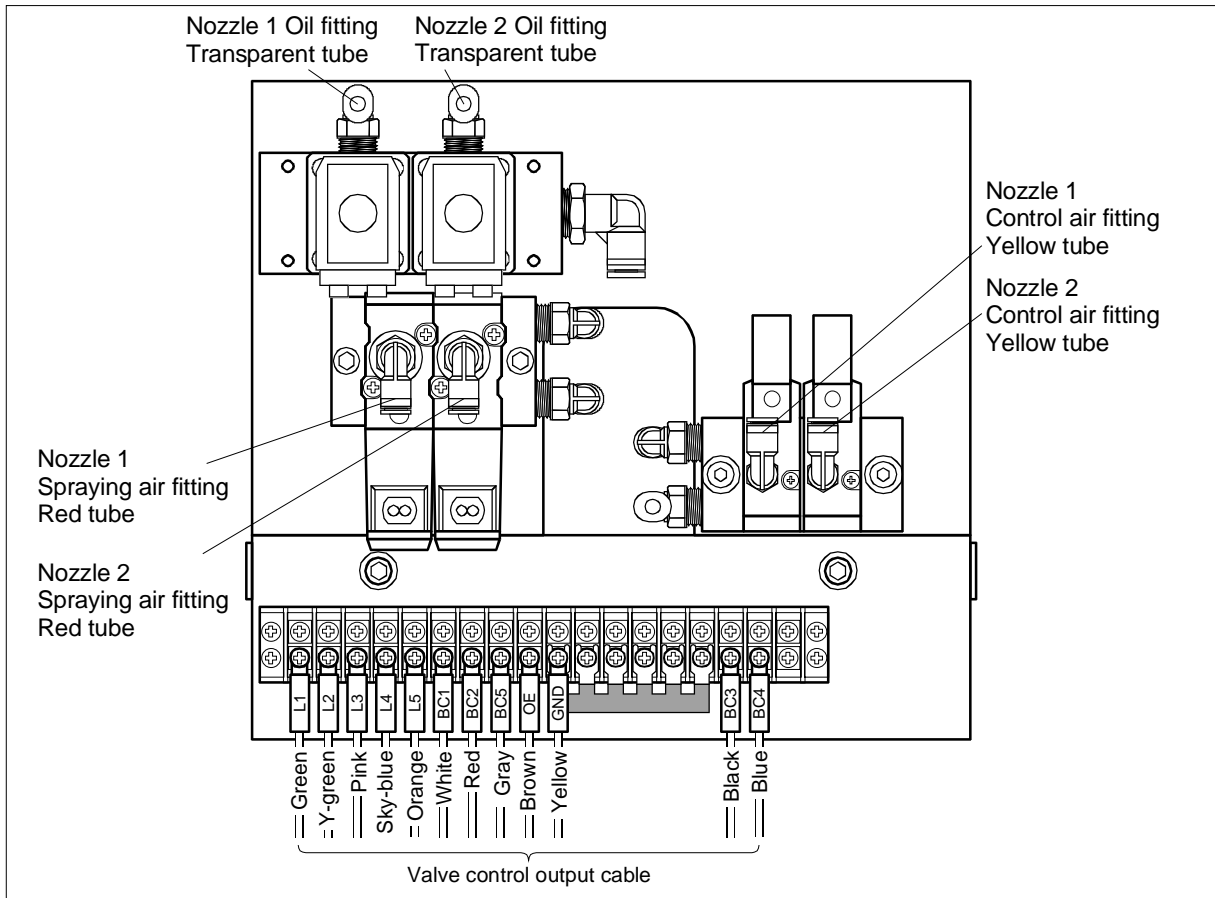
Connection of PS218-AB



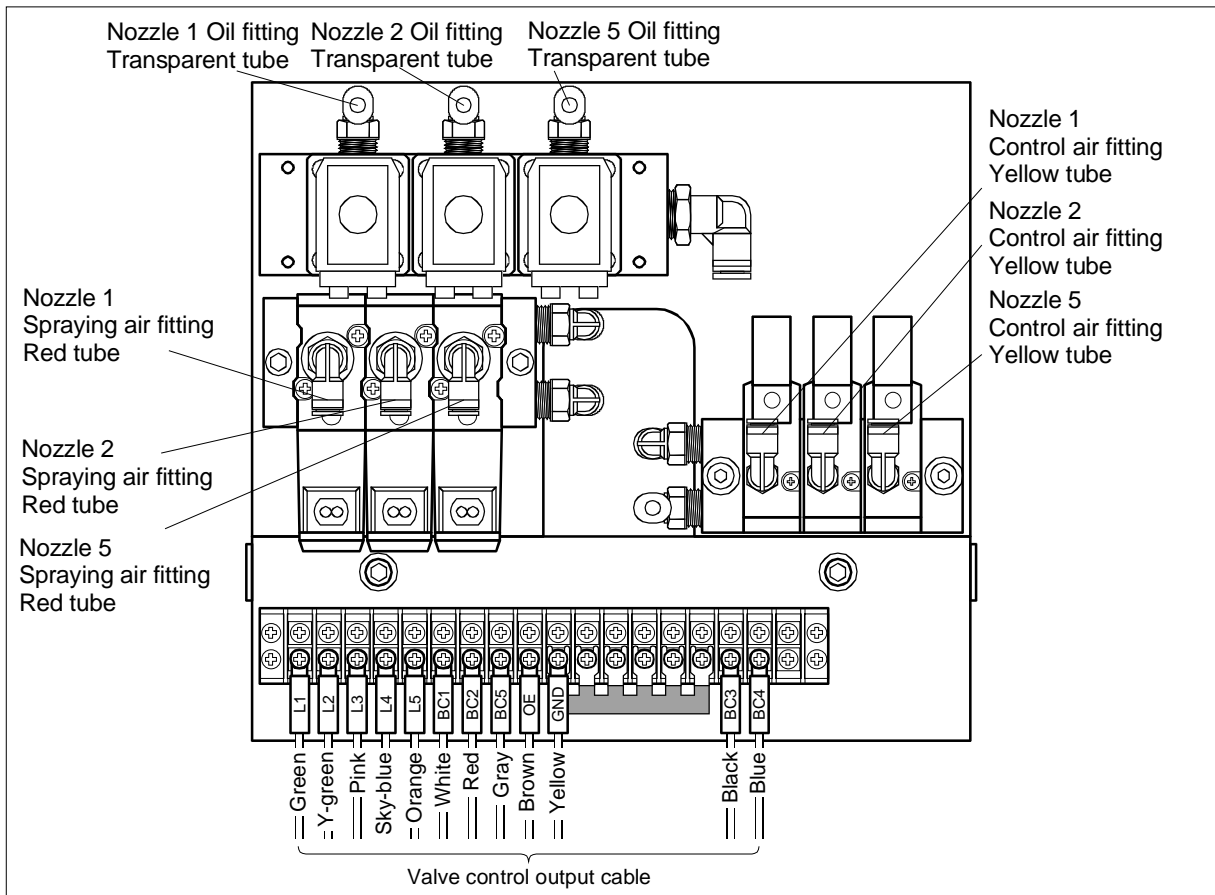
Valve control output connector

5-11. Piping and wiring for oil distribution device

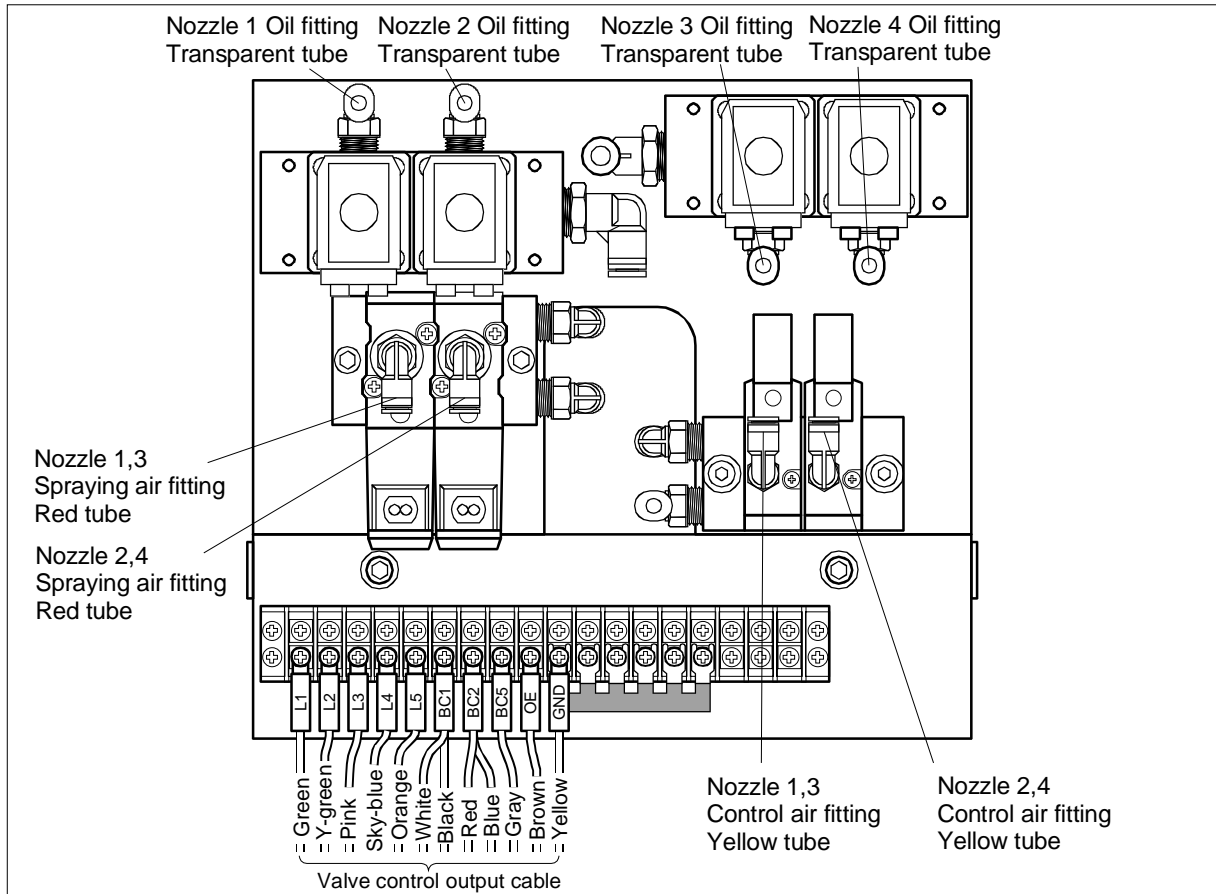
5-11-1. PS218-12



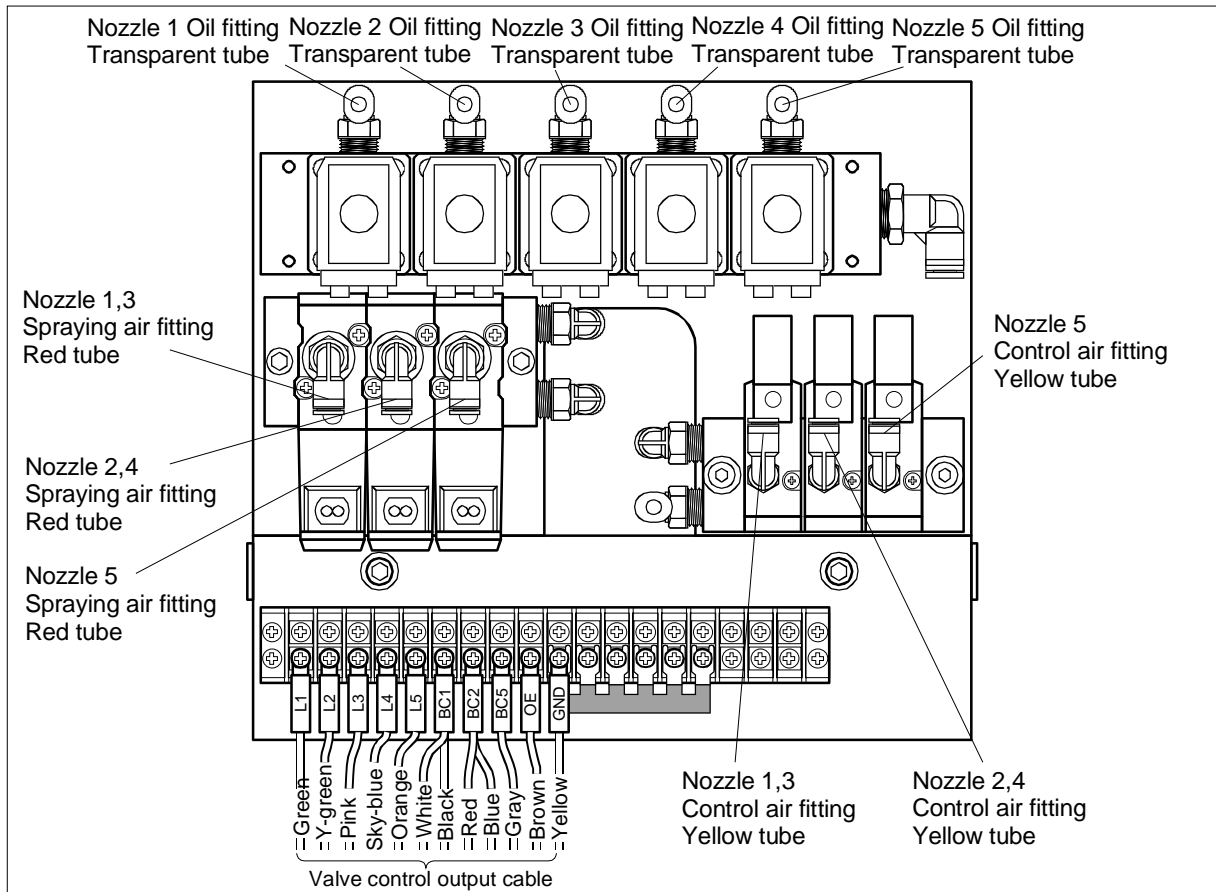
5-11-2. PS218-13



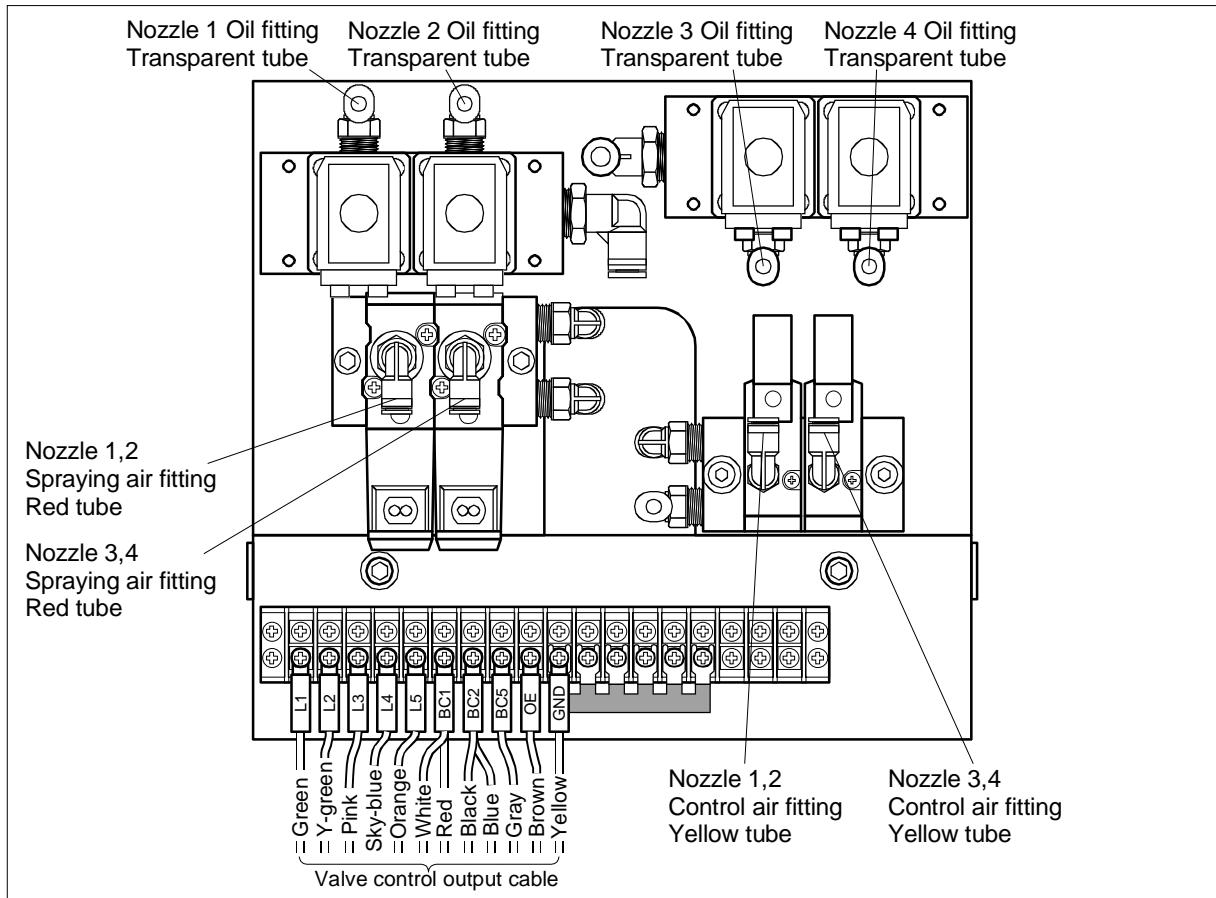
5-11-3. PS218-24



5-11-4. PS218-25



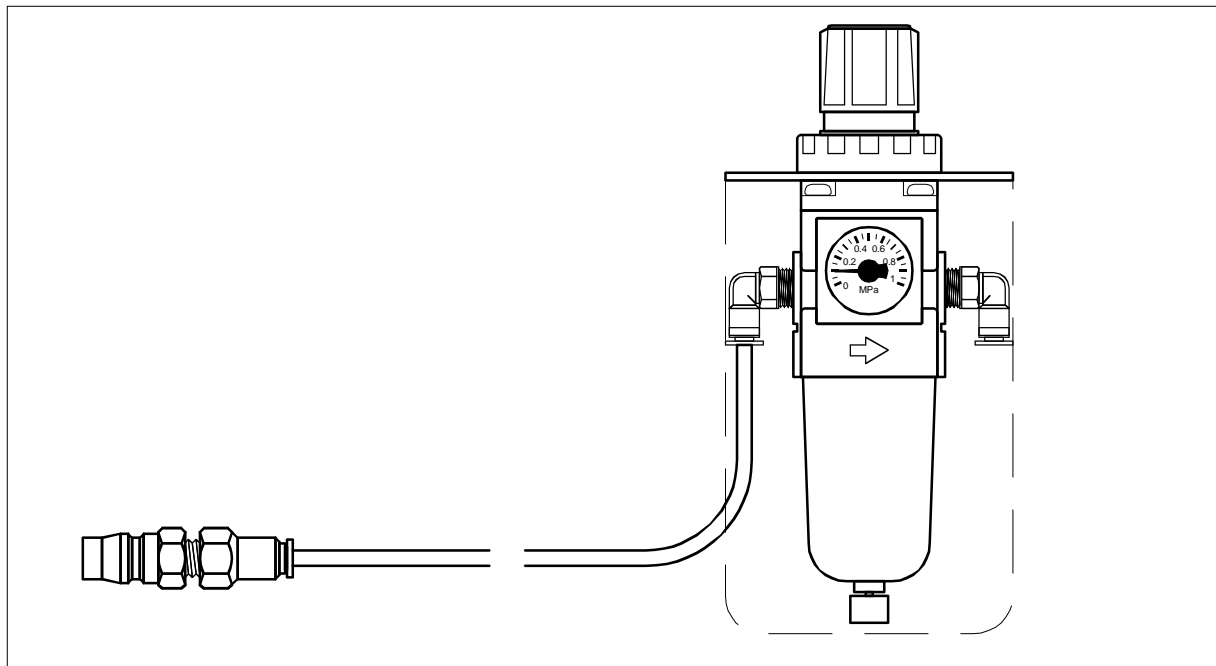
5-11-5. PS218-AB



5-12. Piping in air regulator

Connect the tube with the air coupler with the air regulator in the back of the oil distribution device.

Set the output pressure of the regulator to 0.4MPa.



6. Operation

6-1. Common operation of value change and selection

The digital display blinks when the change in the setting value begins. When the up and down arrow button is pushed, the numerical value and the symbol are changed.

Change the display to the value of hope, and push the SET button. Blinking the display ends if the SET button is pushed, and the setting change is completed

The display returns to a set previous state when the CANCEL button is pushed while blinking the digital display, and the setting change is interrupted.

As for the setting change in the device enabled, the setting value under the change is reflected in the spraying operation.

6-2. Set operation of spraying control

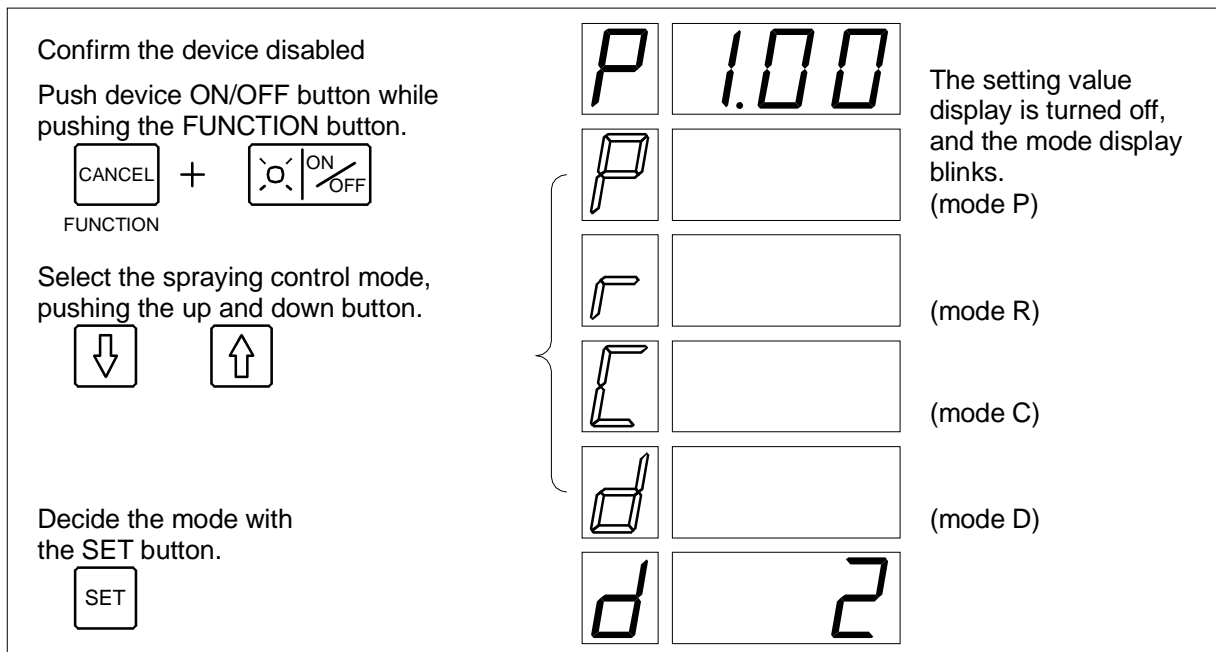
Do the spraying control by the change in the spraying control selection and the setting value.

6-2-1. Spraying control mode selection

Do the selection operation to spraying control mode in the device disabled.

When device ON/OFF button is pushed while pushing the CANCEL button, the setting change is begun.

When the setting change is begun, the control mode, that using now is displayed with blinking on nozzle/control mode digital display. The setting value digital display is not displayed.

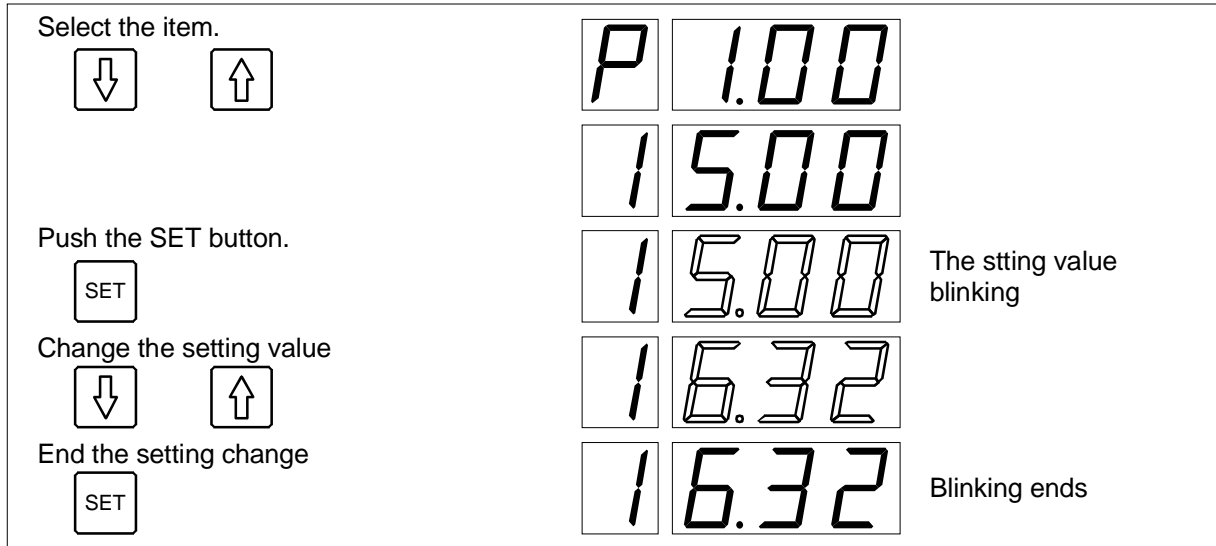


Spraying control mode selection

6-2-2. Changing of setting value

Select the item that wants to do the setting change to nozzle/control mode digital display with the up and down arrow button. The usable nozzle number and the symbol selected by spraying control mode are displayed in nozzle/control mode digital display. The content is displayed in the setting value digital display.

When the SET button is pushed, the setting change is begun.



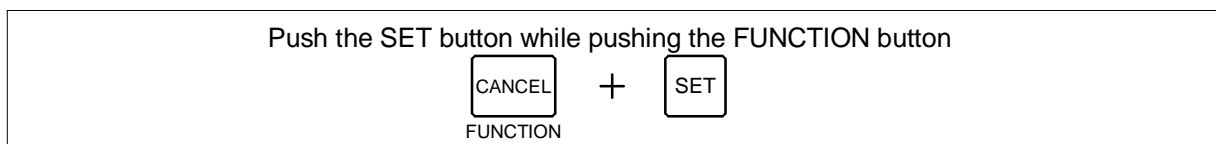
Changing of setting value

6-2-3. Display and non-display of valve open time

When the SET button is pushed while pushing the CANCEL button, the display and non-display of the valve open time are switched.

Confirm the display and non-display of the valve open time with the up and down arrow button.

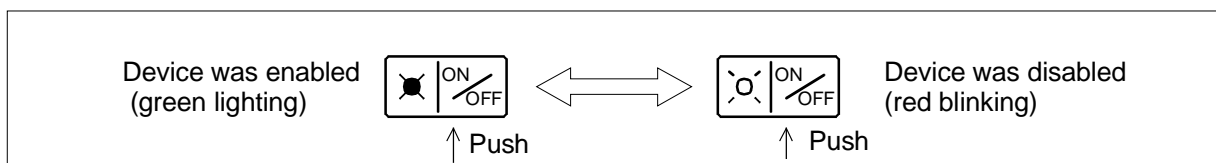
When the valve open time is non-displayed, the valve open time cannot be changed



Display and non-display of valve open time

6-3. Device enable and disable

Push device ON/OFF button to turn the device enable and disable. Confirm the device status with the lamp that is side of the button. The lamp is a red blinking in disabled and is a green lighting in enabled.



Device enable and disable

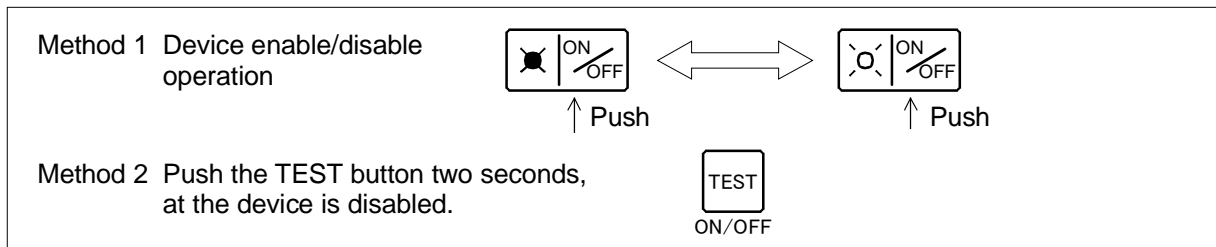
6-4. Solenoid valve connection test

The solenoid valve connection test is a setting executed when device enable/disable is operated.

Push the TEST button for two seconds in the device disabled when you prohibit the connection test in device enable/disable operation by the function setting.

When trouble is not detected by the connection test result, nothing is displayed. Error indication that trouble is found.

The function of the connection test built into the controller is simple, and all the connections cannot be detected.



Solenoid valve connection test

6-5. Nozzle ON/OFF operation

Confirm ON/OFF of the nozzle with the nozzle number lamp. When a yellow number lamp lights, the nozzle is ON (usable).

In nozzle ON/OFF button, there are UPPER, LOWER, OILA, OILB, and AUX.

Usually, push nozzle ON/OFF button individually

The UPPER button turns the upper nozzle (nozzle 1 or nozzle 3) on and off.

The LOWER button turns the lower nozzle (nozzle 2 or nozzle 4) on and off.

The OILA button turns a left nozzle (nozzle 1 or nozzle 2) on and off.

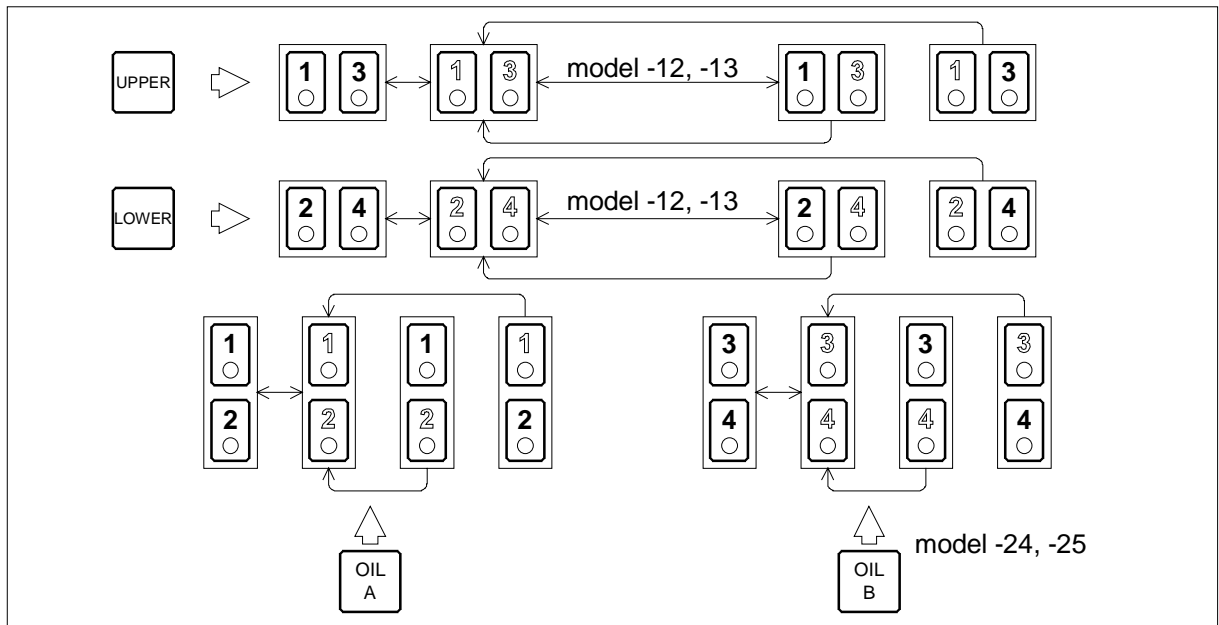
The OILB button turns a right nozzle (nozzle 3 or nozzle 4) on and off.

The AUX button turns the AUX nozzle (nozzle 5) on and off.

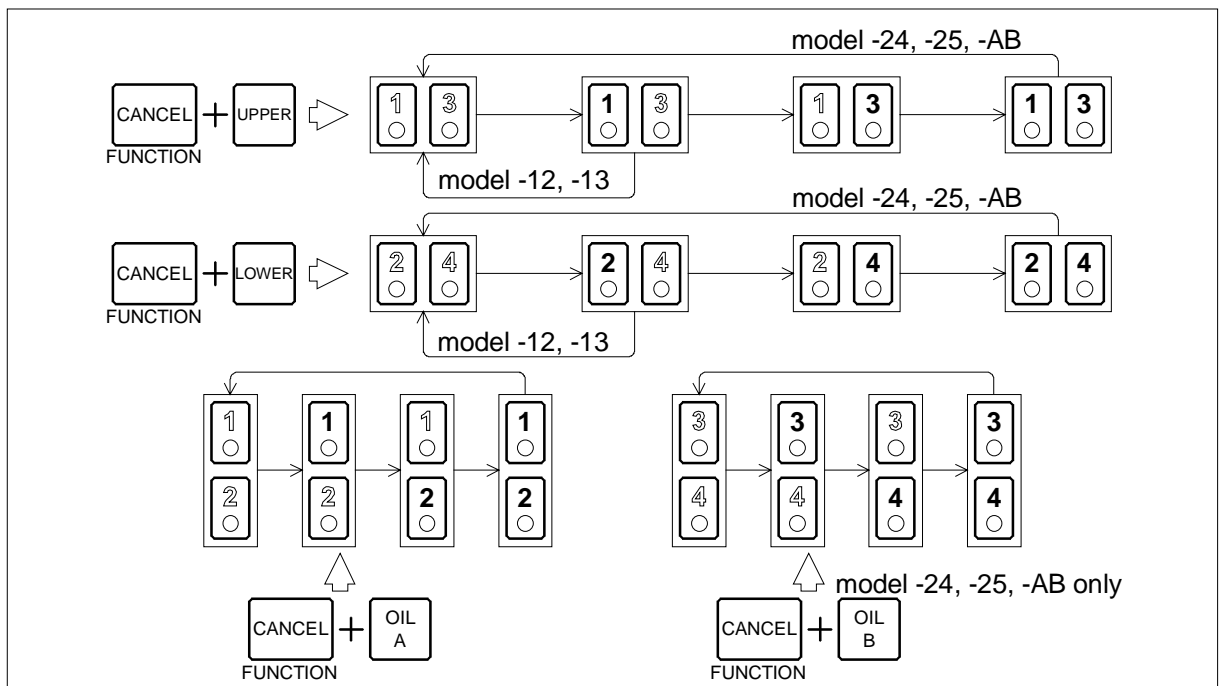
The nozzle number lamp with which the nozzle (solenoid valve) is not connected cannot be turned on

A left nozzle (nozzle 1 and 2) and a right nozzle (nozzle 3 and 4) cannot be turned on at the same time by model PS218-AB

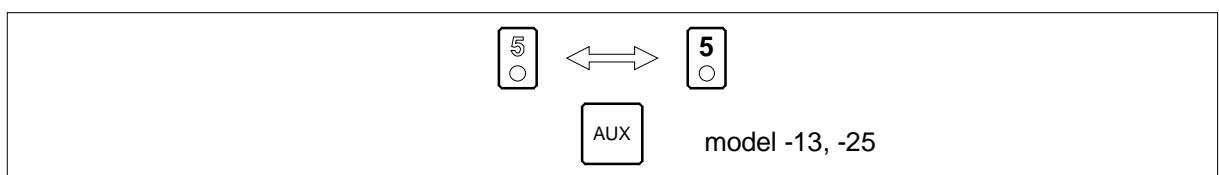
If nozzle ON/OFF button is operated while pushing the FUNCTION button, it becomes an enhanced operation. There is no limitation in nozzle ON/OFF in the enhanced operation.



Nozzle ON/OFF basic operation



Nozzle ON/OFF enhanced operation



AUX nozzle ON/OFF operation

6-6. Memory operation

The memory operation includes the recall and store operations of the setting value. Ten set setting values can be stored in the memory. When the MEMORY lamp lights, the memory number is displayed to two high rank digits of the MEMORY/SPM digital display.

Execute device-disabled state about the memory operation. Confirm device ON/OFF lamp has blinked red before operating the memory. Push device ON/OFF button, and put it into the device-disabled state when the lamp lights green.

6-6-1. Recall procedure of setting value

Confirm the MEMORY lamp lights green. Push the RECALL button, and light the MEMORY lamp when the MEMORY/SPM lamp doesn't light.

When the RECALL button is pushed while the MEMORY lamp lights, the memory number begins blinking.

Change to the memory number in which it wants to call the memory number display pushing the up and down arrow button.

When the RECALL button is pushed while the memory number has blinked, blinking ends, and the setting value is replaced.

If the CANCEL button is pushed while the memory number has blinked, the blinking memory number returns to the value before the change begins, and ends blinking. The setting value is not replaced.

6-6-2. Store procedure of setting value

Confirm the MEMORY lamp lights green. Push the RECALL button, and light the MEMORY lamp when the MEMORY/SPM lamp doesn't light.

When the STORE (RECALL) button is pushed while pushing the CANCEL button, the memory number begins blinking, and the memory lamp become a red lighting.

Select the memory number in which the setting value is stored with the up and down arrow button.

When the RECALL button is pushed while the memory number has blinked, blinking ends, and the in-service setting value is stored to the memory

If the CANCEL button is pushed while the memory number has blinked, the blinking memory number returns to the value before the change begins, and ends blinking. The setting value is not stored to the memory.

6-7. Spraying test

The spraying test operation includes test SPM setting operation and test ON/OFF operation.

6-7-1. Test SPM setting

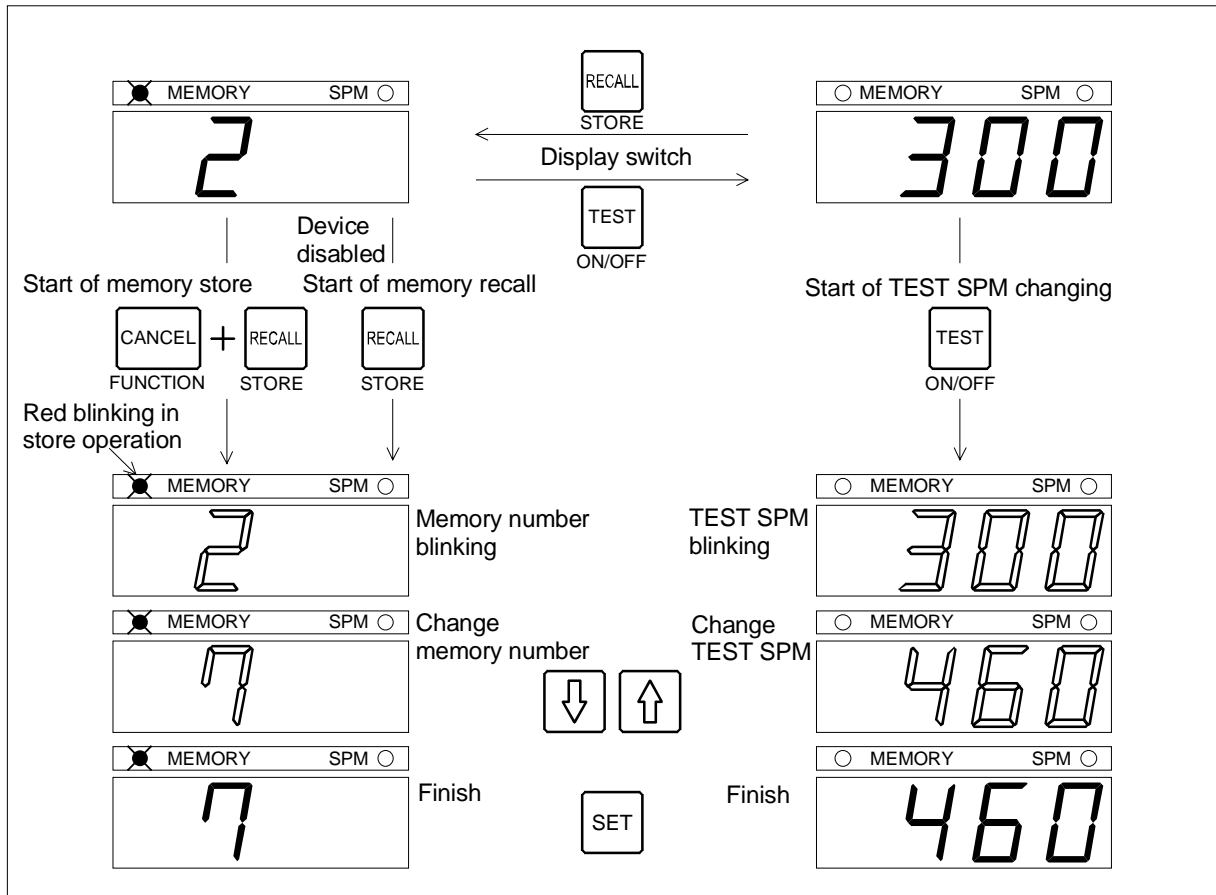
Confirm the MEM lamp doesn't light. Push the TEST button and turn off the MEM lamp when the MEM lamp lights.

When the TEST button is pushed, test SPM setting is begun.

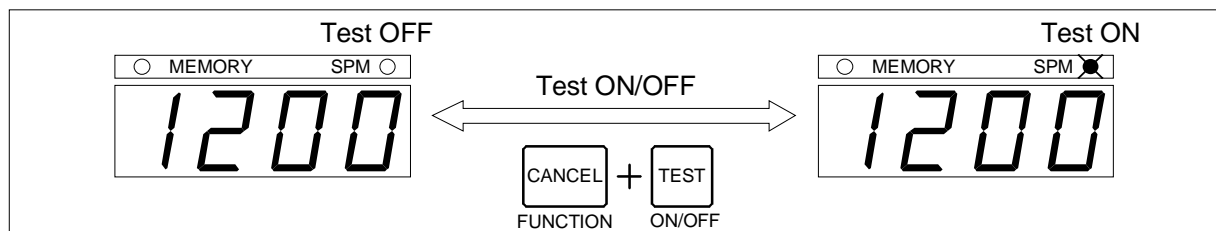
6-7-2. Test ON/OFF

The spraying test starts and stops when the TEST button is pushed while pushing the CANCEL button.

The spraying test acts when test lamp green lights, and it stops to turn off.



Memory operation and test SPM operation



Test ON/OFF operation

7. Function setting

The function setting operation edits data in EEPROM, and changes the PS218 controller's operation. Switch the controller from the normal operation to a set mode to do the function setting operation.

Attention : As for the function setting, the content might be different according to the program version of the controller. Operate the function setting after confirming the program version displayed in the FLOW CONTROL digital display at environment operating and the program version printed on the cover of the manual are the same.

7-1. Switch to set mode

Push device ON/OFF button and make it to device disabled in the normal operation. The controller switches into a set mode by pushing the CANCEL button while pushing the button of the arrow in the under.

It is not switched to a set mode in the state of the operation inhibition.

7-2. Display and operation in set mode

In a set mode, the item number is displayed to two subordinate position digits of FLOW CONTROL, and a set content is displayed in the MEM/SPM digital display. Other lamps and digital displays are turned off.

When the item number has blinked, the item number can be selected by pushing the arrow button, and pushing the SET button begins the set content changing.

All digits or one digit of the display blinks in the set content changing. Change the content of all digit blinking with the arrow button.

In one digit blinking the multi digit inside, 0 or 1 can be set to each digit. Move the blinking digit with the arrow button, and change 0/1 with UPPER or the LOWER button.

Push the SET button to store the changed set content and to end. Push the CANCEL button to the end without storing the changed set content. Blinking moves from the setting to the item number when the setting change is ended.

7-3. End of set mode

Push device ON/OFF or the SUCTION button to end a set mode while the item number is blinking. It returns to the normal operation when a set mode is ended.

7-4. Initialization of set content

The set content initialization does the function setting initialization, the spraying control setting initialization, and the release of the backup.

Select the following item number in a set mode, and keep pushing the RECALL button for two seconds. When initialization is completed, one is displayed in the item number.

Item number 00: Return to the content of the function setting ships it.

Item number 98: Return to the content of the spraying control setting ships it.

Item number 99: Release of the backup.

The selection of the item number must not use the numbers other than specification by the initialization operation. The backup is released by all the initialization operations.

7-5. Details of set content

7-5-1. Automatic wake-up count (01)

Set a count of timing input signals to wake-up from the state of device disabled to enable. 999 can be set from 0 to the count. It doesn't wake-up when 0 is set to the count.

Initial value 30 times

7-5-2. Oil detection time (02)

Set the response time of the OE input at the oil detection time. 0-65.5 seconds can be set at time.

Initial value 0.5 seconds

7-5-3. Spraying enable time (03)

Set time to hold spraying to Spraying enable time when one is set to 'Clutch input disregard' of operation setting 1(11). Spraying is hold from turning on the timing input signal to the passage of set time.

0-65.5 seconds can be set at the spraying enable time

Initial value 1.0 seconds

7-5-4. Suction time (04)

Set time that suction is executed when the suction button is pushed at the suction time. Suction is executed during the time set for numbers except 0 to be set at the suction time only by pushing the suction button once. When 0 is set at the suction time, suction is executed while the suction button is being pushed.

0-65.5 seconds can be set at the suction time.

Initial value 0.0 seconds

7-5-5. Clutch single shot time (05)

Set the shortest spraying permission time in one clutch input at the clutch single shot time. Spraying is permitted for between from clutch input ON to the passage of set time or the periods of clutch input ON.

When one is set to 'Clutch input disregard' by operation setting 1(11), the clutch single shot time is disregarded.

0-65.5 seconds can be set at the clutch single shot time.

Initial value 1.0 seconds

7-5-6. Key repeat beginning waiting time (06)

The key repeats beginning waiting time is waiting time until key repeat is begun when the arrow button kept pushing. 1-999ms can be set at the key repeat beginning waiting time.

Initial value 600ms

7-5-7. Initial key repeat time (07)

Set the key repeat time of the arrow button at the initial key repeat time. The key repeat time shortens gradually when the arrow button keeps pushing.

1-999ms can be set at the initial key repeat time.

Initial value 200ms

7-5-8. Suction division time (08)

Set time to open the solenoid valve at suction execution time at the suction division time.

When suction is executed, the controller opens the solenoid valve by order sending. All solenoid valves do not open at the same time.

It is necessary to set from 5.0 to 99.9ms at the suction division time.

Initial value 15ms

7-5-9. Operation inhibition setting 1 (09)

When the operation inhibition input is turned on, operation inhibition setting 1 specifies the inhibited operation. The set content display is four digit of 1 or 0 display. From left digit of display to memory operation, various set beginning, nozzles ON/OFF, and devices ON/OFF in order it. When one is specified for the setting, the operation is inhibited.

Initial value 1111

7-5-10. Operation inhibition setting 2 (10)

When the operation inhibition input is turned on, operation inhibition setting 2 specifies the inhibited operation. The set content display is four digit of 1 or 0 display. From left digit of display to OE reset, error reset, suction, and connection test in order it. When one is specified for the setting, the operation is inhibited.

Initial value 0011

7-5-11. Operation setting 1 (11)

Operation setting 1 specify of the controller's operation. The set content display is four digit of 1 or 0 display. From left digit of display to the order of valve connection test, clutch input disregard, OE output at device OFF, and OE stop output automatic reset. If one is set to the corresponding digit, the function becomes effective.

Valve connection test: Do the solenoid valve connection test when you operate device ON/OFF.

Clutch input disregard: Disregard the clutch input. The spraying permission is made from the timing input signal.

OE output at device OFF: Do the stop output by the oil empty in the device OFF.

OE stop output automatic reset: Release the stop output without pushing the CANCEL button when the OE input returns normally when the stop output by OE is done.

Initial value 1001

7-5-12. Operation setting 2 (12)

Operation setting 2 specify of the controller's operation. The set content display is four digit of 1 or 0 display. Display is from left digit of display to the order of Reserve, Reserve, Reserve, and Environment operating. If one is set to the corresponding digit, the function becomes effective.

Environment operating: Start with device ON in the power supply turning on when one is set

'Reserve' is for the future extension. Do not change the setting.

Initial value 0001

7-5-13. External input polarity 1 (15)

External input polarity 1 specifies the polarity of the input in the terminal block. The set content display is four digit of 1 or 0 display. Display is from left digit of display to the order of Reserve, OP-INH, Clutch, and TM. If 0 is set to the correspondence digit, the input is turned on when the input terminal and GND are shorted. If 1 is set, it becomes input is turned ON when the input terminal opening.

Do not change the setting to a reserve digit.

Initial value 0000

7-5-14. External input polarity 2 (16)

External input polarity 1 specifies the polarity of the OE input. The set content display is four digit of 1 or 0 display. Display is from left digit of display to the order of Reserve, Reserve, Reserve, and OE. When 0 is set to OE, oil empty is detected by the OE input opening. When one is set, oil empty is detected short with the OE input and GND.

Do not change the setting to a reserve digit

Initial value 0000

7-5-15. Output polarity (17)

The output polarity specifies the polarity of the relay output. The set content display is four digit of 1 or 0. Display is from a left digit to the reserve, the reserve, the continuousness inhibition, and the stop. Set 0 to the reserve digit. The relay contact of the continuous inhibition output close with device enabled when 0 is set to the continuous inhibition digit. The stop output relay contact opens at the stop signal output when 0 is set to the stop digit.

Initial value 0000

7-5-16. Input signal filtration time (18~25)

Set the noise rejection time of the input signal at the input signal filtration time. Everything from 0 to 255ms can be set at the input signal filtration time.

The content is a timing input, a clutch input, an operation inhibition input, the reserve, OE input, the reserve, the reserve, and the reserve, from the item number 18 to 25 in order

Initial value 20ms

7-5-17. Remote control input signal filtration time (26)

Set the noise reduction time of the STB input at the remote control input signal filtration time. Everything from 0 to 255ms can be set at the input signal filtration time.

Initial value 3ms

7-6. Set item list

No.	Content	Range of setting	Initial value	REM
01	Automatic wake-up count	0~999	30	
02	Oil detection time	0~65.5Sec	0.5Sec	
03	Spraying enable time	0~65.5Sec	1.0Sec	
04	Suction time	0~65.5Sec	0Sec	
05	Clutch single shot time	0~65.5Sec	1Sec	
06	Key repeat beginning waiting time	0~999ms	600ms	
07	Initial key repeat time	0~999ms	200ms	
08	Suction division time	0~99.9ms	15.0ms	
09	Operation inhibition setting 1	0/1	1111	
				MEM, Set start, Nozzle, Device ON/OFF
10	Operation inhibition setting 2	0/1	0011	
				OE reset, Error reset, Suction, Test
11	Operation setting 1	0/1	1001	
				Connection test, Clutch disregard, OE output, OE return
12	Operation setting 2	0/1	0001	
				Reserve, Reserve, Reserve, Power on device enable
13	Reserved			
14	Reserved			
15	External input polarity 1	0/1	0000	Reserve, OP-INH, Clutch, Timing
16	External input polarity 2	0/1	0000	Reserve, Reserve, Reserve, O E
17	Output polarity	0/1	xx00	
				Reserve, Reserve, Continuous, Stop
18	Input signal filtration time	0~255ms	10ms	Timing input
19	Input signal filtration time	0~255ms	20ms	Clutch input
20	Input signal filtration time	0~255ms	20ms	OP-INH input
21	Input signal filtration time	0~255ms	20ms	Reserved
22	Input signal filtration time	0~255ms	20ms	OE input
23	Input signal filtration time	0~255ms	20ms	Reserved
24	Input signal filtration time	0~255ms	20ms	Reserved
25	Input signal filtration time	0~255ms	20ms	Reserved
26	Remote control input signal filtration time	0~255ms	3ms	

8. Remote control

The remote control can control PS218 through the parallel interface. The parallel interface is an option. Install it in the enhancing unit space.

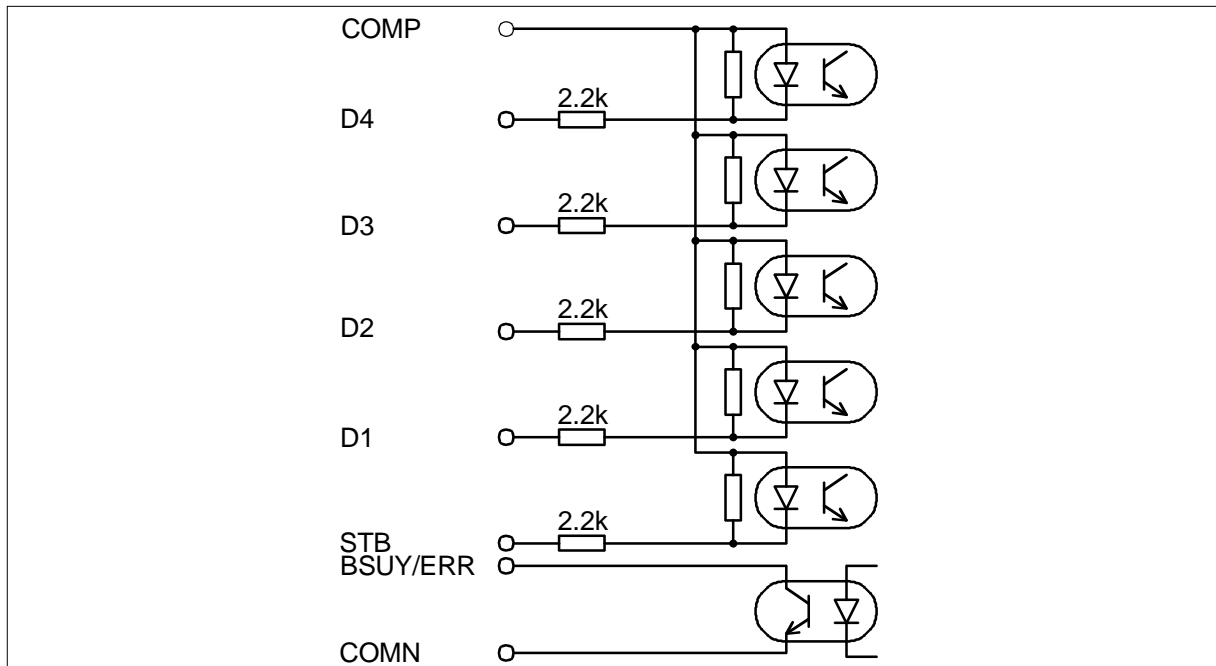
8-1. Parallel interface

The parallel interface is composed of data entry of four bits, the strobe input in one bit, and busy/error output in one bit.

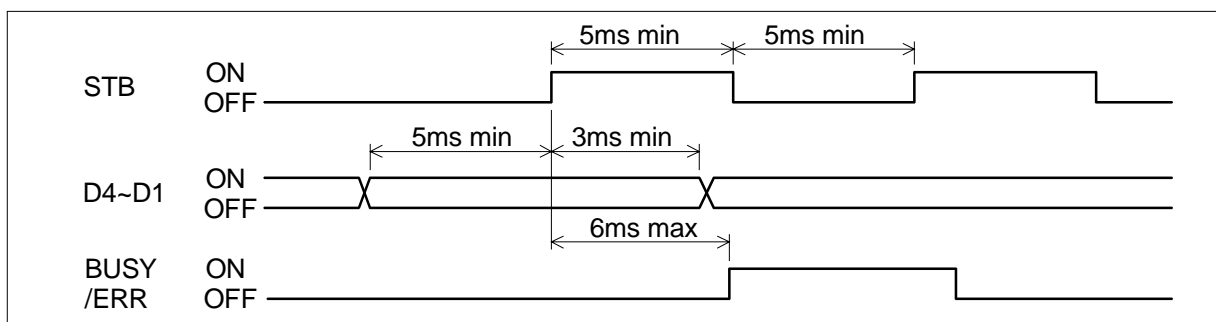
Input data is taken by the turning on edge of the strobe input. The input data of four bits assumes a general binary coded decimal code, and expresses the numeric character or the symbol of one digit. Write the value that exceeds nine by the binary coded decimal code sequentially by the character of A, B, C, D, E, and F.

A busy output is turned on at the following condition.

- (1) From the input of the command input to beginning of execution
- (2) When the error occurs
- (3) When stop signal is output.
- (4) The setting from the panel is being operated



Parallel interface



Interface timing

8-2. Control data

Input data B, C, D, E, and F are assumed to be control data. When control data is input excluding d, it is processed independently with a set command.

B: Cancel the panel operation

C: Cancel a set command and a set command error.

D: Execute the input set command.

E: Release error indication (E03-15).

F: Release stop output (OE,E01,E02).

8-3. Set command

A set command is composed of numeric character of two digits or more and symbol D that shows the end of the command string. As for the command strings, the numeric character of two head digits shows a set item, and the parameter leads to the back. There is a command without the parameter either. The command that needs the parameter cannot omit the parameter. If the first command character is input, busy/error output is turned on. If symbol D is input after the command character input is completed, the command is executed, and busy/error output is turned off. However, when the command input is illegal, and other illegal factors exist, busy/error output is not turned off.

Confirm busy/error output is turning off before inputting a set command. Input control data and turn off the output when busy/error output is turning on.

8-3-1. Open time of nozzle 1 solenoid valve (01xxxD)

Set the open time of nozzle 1 solenoid valve to this item. It is necessary to set the value of the treble between from 100 to 999 to parameter 'xxx'. The unit of the value is 0.01ms. '5.10ms' is set at time when command '01510D' is input

8-3-2. Open time of nozzle 2 solenoid valve (02xxxD)

Set the open time of nozzle 2 solenoid valve to this item. The set content is the same as the open time of one nozzle solenoid valve.

8-3-3. Open time of nozzle 3 solenoid valve (03xxxD)

Set the open time of nozzle 3 solenoid valve to this item. The set content is the same as the open time of one nozzle solenoid valve.

8-3-4. Open time of nozzle 4 solenoid valve (04xxxD)

Set the open time of nozzle 4 solenoid valve to this item. The set content is the same as the open time of one nozzle solenoid valve.

8-3-5. Open time of nozzle 5 solenoid valve (05xxxD)

Set the open time of nozzle 5 solenoid valve to this item. The set content is the same as the open time of one nozzle solenoid valve.

8-3-6. P value (06xxxD)

Set the P value in operation mode P to this item. Parameter 'xxx' is treble or less, and a value from 1 to 999. The controller displays the value in which parameter value is divided by 100. When command '06110D' is input, '1.10' is set.

It is possible to set it to the controller excluding operation mode P. The setting becomes effective when changing to operation mode P.

8-3-7. R value (07xxxD)

Set the R-value in operation mode R to this item. Parameter 'xxx' is treble or less, and a value from 1 to 999.

It is possible to set it to the controller excluding operation mode R. The setting becomes effective when changing to operation mode R.

8-3-8. I value (08xxxD)

Set the I-value in operation mode C to this item. Parameter 'xxx' is a number of the treble or less. The minimum value that can be set to the parameter is decided in total of the valve open time that is nozzle ON. The maximum value is 999. A set unit is a millisecond. When command '0850D' is input, '50ms' is set.

It is possible to set it to the controller excluding operation mode C. The setting becomes effective when changing to operation mode C.

8-3-9. C value (09xxD)

Set the C value in operation mode C to this item. Parameter 'xx' is a number of two digits or less. . When command '093D' is input, '3 times' is set.

It is possible to set it to the controller excluding operation mode C. The setting becomes effective when changing to operation mode C.

8-3-10. D value (10xxD)

Set the D value in operation mode D to this item. Parameter 'xx' is a number of two digits or less.

It is possible to set it to the controller excluding operation mode D. The setting becomes effective when changing to operation mode D.

8-3-11. Spraying mode (11xD)

Set the spraying mode to this item. It is possible to specify it from 0 to 3 for parameter 'x'. The spraying mode is 0=C, 1=D, 2=P and 3=R.

Change in the state of device disabled in the spraying mode. The spraying mode change to which the device is effective doesn't operate normally.

8-3-12. Nozzle ON/OFF (12xxxxxD)

Set the nozzle ON/OFF to this item. In the parameter, 'xxxxx' should be five digits. Each digit of the parameter specifies 0(OFF) or 1(ON). Nozzle 1 corresponds to the subordinate position of the parameter as nozzle 5 corresponds to most significant of the parameter.

8-3-13. Device enable/disable (13xD)

Set the device enable/disable to this item. Set 0(disable) or 1(enable) to parameter 'x'.

When command '131D' is input, the controller is enabled.

8-3-14. Operation inhibition/permission (14xD)

Set inhibition/permission of the panel operation. Set 0(permission) or 1(inhibition) to parameter 'x'.

The operation permission cannot be done in the remote control when setting it to the operation inhibition by the OP-INH input of the terminal block. Set the inhibited operation by the operation inhibition setting of the function setting.

It is effective to this setting by the remote control only between power supplies ON.

8-3-15. Spraying test ON/OFF (15xD)

Set ON/OFF of spraying test. Set 0(OFF) or 1(ON) to parameter 'x'.

When command '151D' is input, the spraying test is turned on.

8-3-16. Solenoid valve connection test (16D)

This command starts the Solenoid valve connection test. Turn the controller set device disabled to start the test.

8-3-17. Suction (17xD)

This command begins the suction. Set the parameter 'x' to 1.

Set the suction time to suction in the remote control. When the suction time is 0, suction is not executed. Set the suction time by the suction time setting of the function setting or the remote control.

8-3-18. Test SPM setting (18xxxxD)

This command sets test SPM. It is necessary to set parameter 'xxxx' by the number within four digits within the range from 2 to 4000.

8-3-19. Memory recall (20xxD)

This command reads out the setting value from EEROM, and set it to execution setting value. Set it from 1 to 10 to parameter 'xx'.

Execute the memory recall with device disabled.

8-3-20. Memory store (21xxD)

This command stores the execution setting value in EEPROM. Set it from 1 to 10 to parameter 'xx'.

Execute the memory store with device disabled. The memory store needs about 0.2 seconds at the processing time. Wait for the time of 0.2 seconds from beginning of the memory store execution to the following command input.

8-3-21. Automatic wake-up count (30xxxD)

Set the automatic wake-up count temporarily. It is necessary to set parameter 'xxx' by the number within three digits within the range from 0 to 999. It doesn't wake-up automatically when 0 is set. It is effective to the automatic wake-up count setting by the remote control only between power supplies ON.

8-3-22. Oil detection time (31xxxxxD)

In this command, the oil detection time is temporarily set. Parameter 'xxxxx' is a number within five digits. It is necessary to set the parameter within the range from 0 to 65535. A set unit is a millisecond. It is effective to the oil detection time setting in the remote control only between power supplies ON.

8-3-23. Spraying enable time (32xxxxxD)

In this command, the spraying enable time is temporarily set. Parameter 'xxxxx' is a number within five digits. It is necessary to set the parameter within the range from 0 to 65535. A set unit is a millisecond. It is effective to the spraying enable time setting in the remote control only between power supplies ON.

8-3-24. Suction time (33xxxxxD)

In this command, the suction time is temporarily set. Parameter 'xxxxx' is a number within five digits. It is necessary to set the parameter within the range from 0 to 65535. A set unit is a millisecond. It is effective to the suction time setting in the remote control only between power supplies.

8-3-25. Clutch single shot time (34xxxxxD)

In this command, the clutch single shot time is temporarily set. Parameter 'xxxxx' is a number within five digits. It is necessary to set the parameter within the range from 0 to 65535. A set unit is a millisecond. It is effective to the clutch single shot time setting in the remote control only between power supplies.

8-3-26. Suction division time (35xxxD)

In this command, the suction division time is temporarily set. Parameter 'xxxx' is a number within four digits. It is necessary to set the parameter within the range from 50 to 999. A Set unit is a 0.1 millisecond. It is effective to the suction division time setting in the remote control only between power supplies.

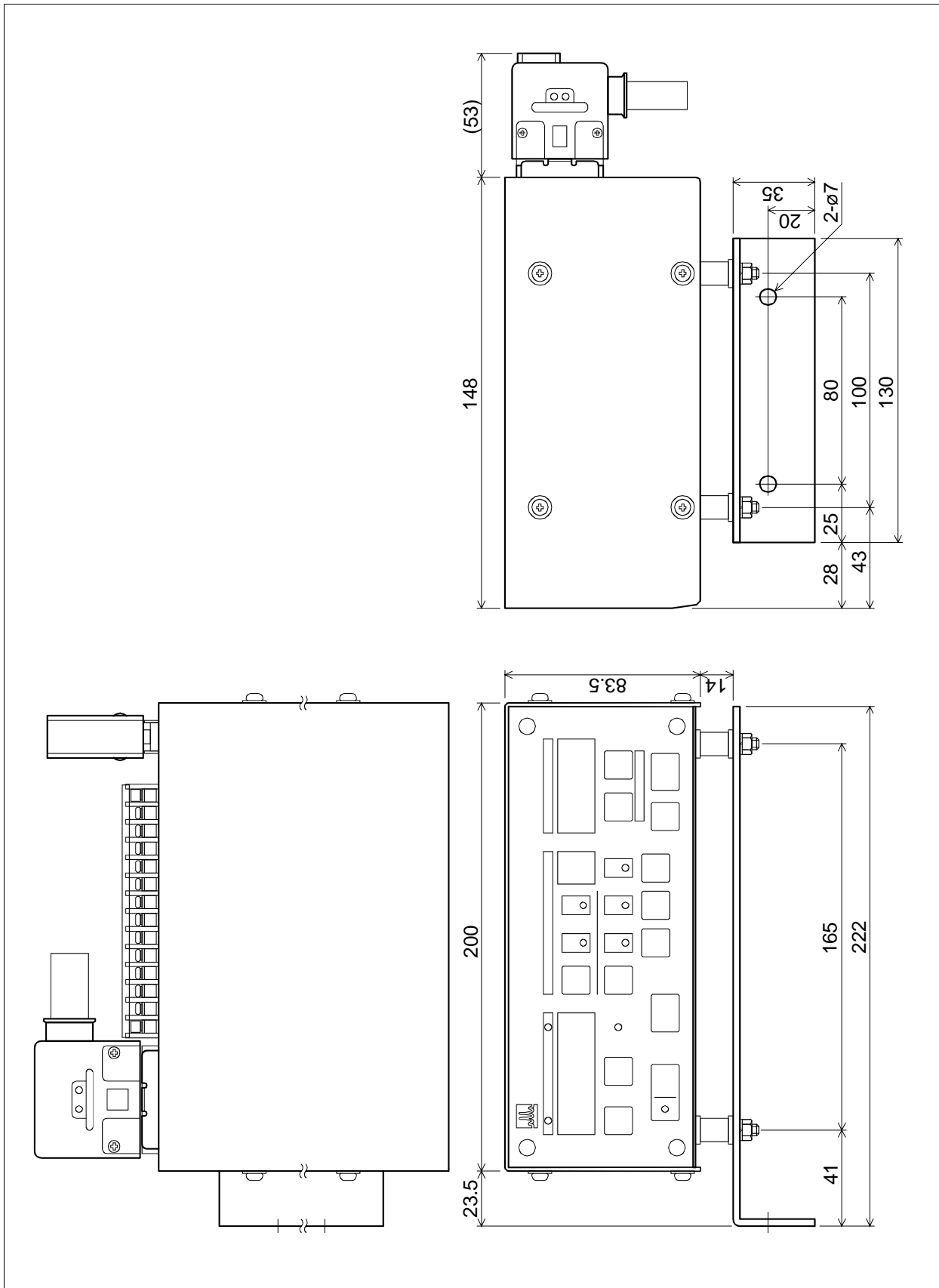
8-3-27. Operation setting 1 (36xxxxD)

Set a same content of operation setting 1 of function setting. Parameter 'xxxx' should be four digits of 0/1. It is effective to the operation setting 1 by the remote control only between power supplies ON.

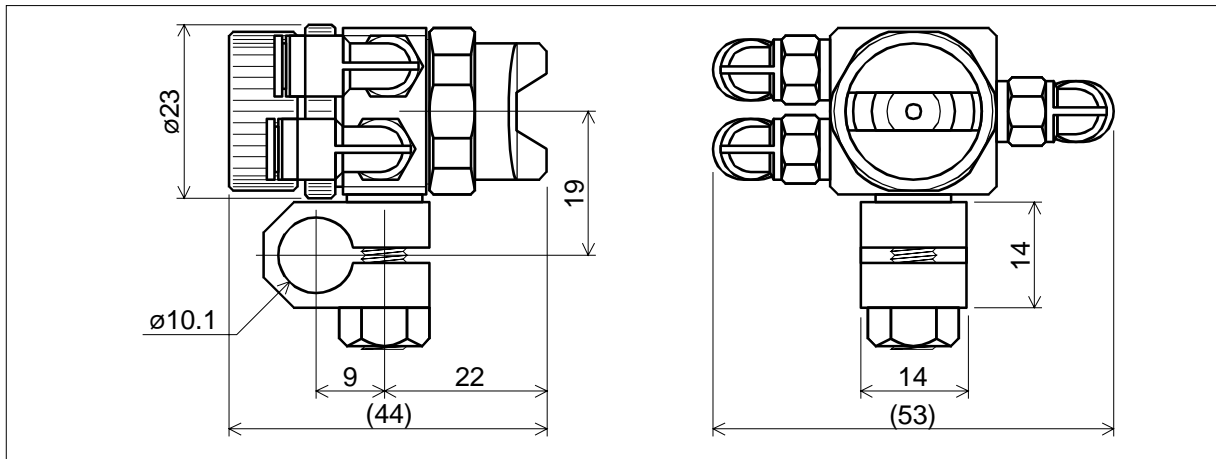
8-3-28. Operation setting 2 (37xxxxD)

Set a same content of operation setting 2 of function setting. Parameter 'xxxx' should be four digits of 0/1. It is effective to the operation setting 2 by the remote control only between power supplies ON.

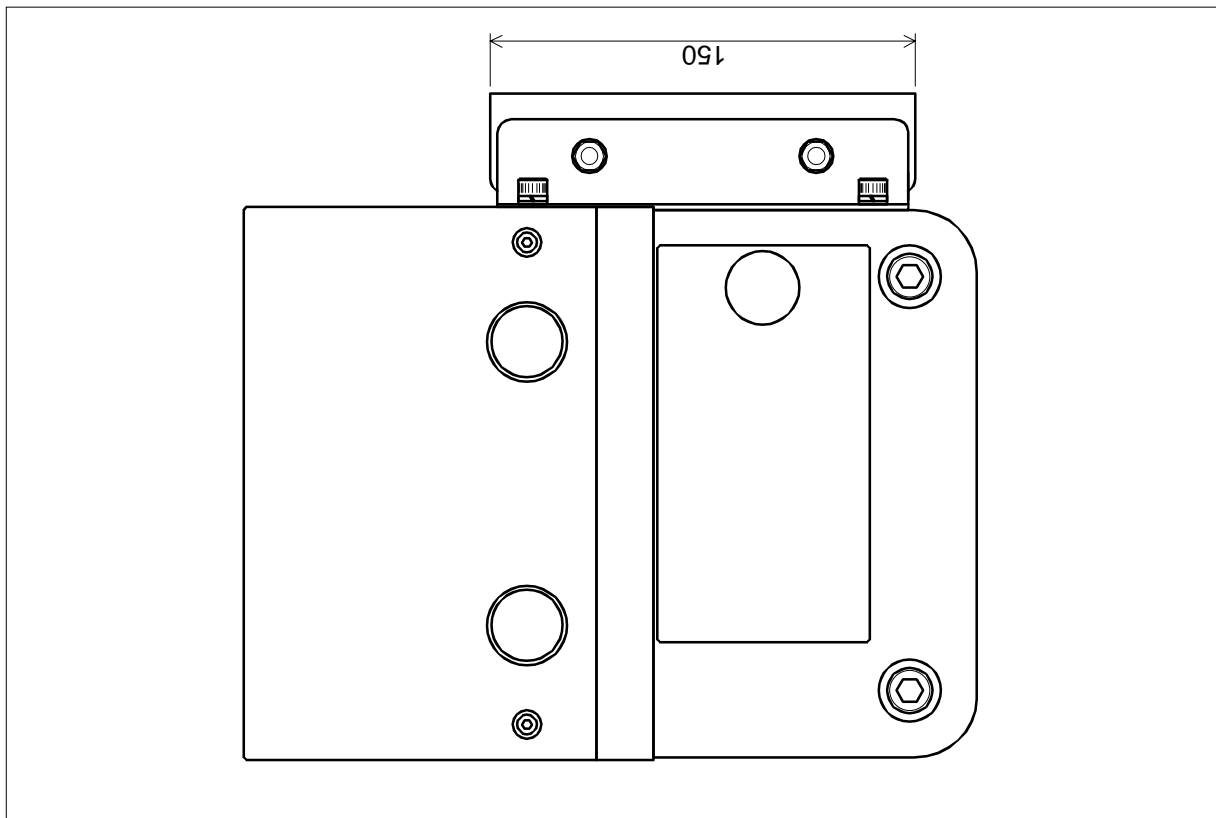
9. Dimension
 9-1. Controller

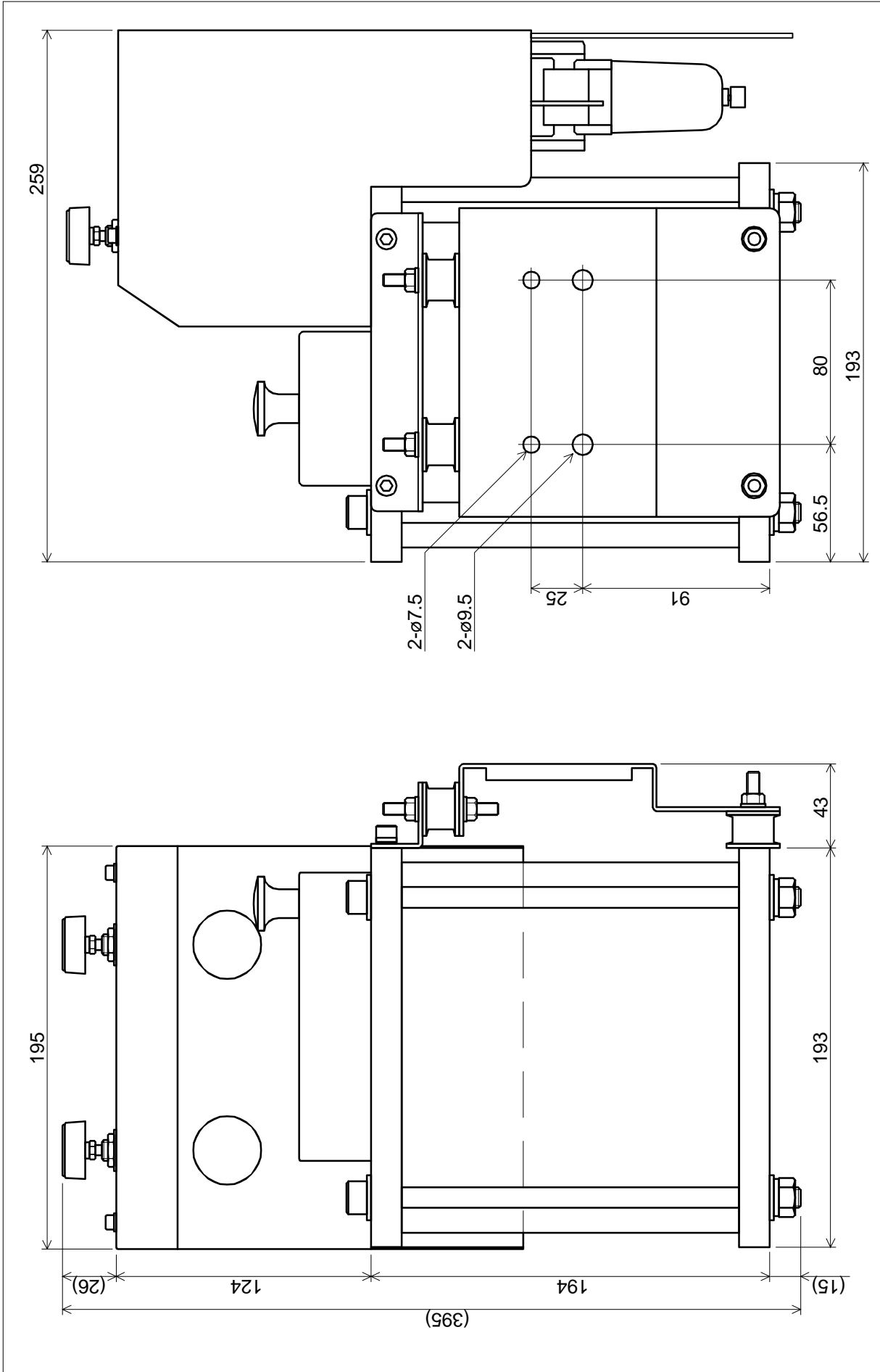


9-2. Nozzle



9-3. Oil distribution device





10. Controller specification and performance

10-1. Spraying control

Number of nozzles	max. 5
Oil flow control	Valve open time control

10-2. External input (TM, CLUTCH, OP-INH)

Input specification	Internal voltage (DC12V) type Connect the contact or the semiconductor switch of the no-voltage
High level	9.0~50V / 0~1mA
Low level	0~3.0V / 8~10mA

10-3. Output (Stop, Continuous inhibition)

Output specification	Relay contact AC240/DC30V 3A maximum
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10-4. Power supply, etc

Supply voltage	AC100~240V $\pm 10\%$ 50/60Hz
Maximum current	0.8A/100V, 0.4A/200V
Weight	2.3kg
Size	200W \times 83.5H \times 184W mm (The projection parts are not included)
Environment temperature	0~55 °C
Environment humidity	35~85%RH
Environment atmosphere	Corrosive gas and dust should not exist.

WARRANTY

All Sugiyama Electric System products are warranted against defective materials and workmanship for one year from the date of delivery. Any questions with respect to the warranty should be taken up with your Sugiyama Electric System Field Engineer or agents.

All requests for repairs and replacement parts should be directed to the Sugiyama Electric System Office or agents in your area. This will assure you the fastest possible service. Please include the instrument Type Number or Part Number and Serial Number with all requests for parts or service.

Specifications and price change privileges reserved.

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