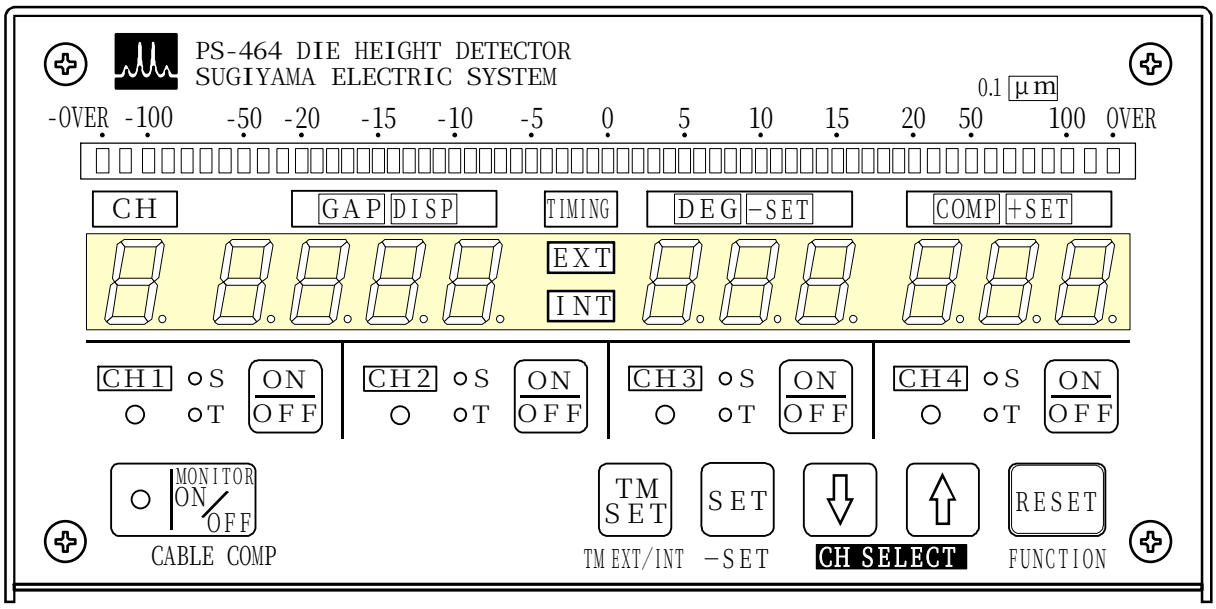
High resolution die-height detector

PS-464/462

Instruction manual

Program version 3.0x



SUGIYAMA ELECTRIC SYSTEM INC.

Warning

This detector is designed to reduce such failure as damage of the die and defects in production. It is not guaranteed that no damage and no defects of the die will occur.

Use the voltage of the power source with AC100-240V.
The voltage exceeding a specified voltage may cause fire.

Do not touch the terminal block.
Electric shock may occur when coming into contact with a metal part of the terminal block.

Do not disassemble, repair or modify the detector. Disassembling, repairing, or modifying is very dangerous.
In breaking down, turn the power source off immediately and stop the use.

In the case of abnormal situations such as heat, smoke and strange smell, turn the power source off immediately and stop the use.
The continuous use may cause fire or electric shock.

Caution

Make sure that this detector is firmly secured.
The detector may drop if used under unsteady conditions, which may result in an injury.

Do not use the detector exposed to water and other liquids.
Otherwise it may cause a malfunction, fire, or electric shock.

Check before use.
After turning the power source on, check that each function operates normally.

Notation

Number and digit position of device setting

When noted as “device setting nn”, “nn” means the 2-digit number that will be changed by the device setting.

When noted as “device setting nn-p”, “p” represents the p-digit number from the left of the device setting number “nn”. P is the number from 1 to 4.

Contents

1. Description

Die Height Detector PS-464/462 is a detector to detect floating slugs and double stamping etc. in press stamping and output a stop signal to the press machine if such a malfunction is detected.
By each stroke, the detector samples the bottom dead center of the signal of the eddy current proximity sensor set up in the press die, and computes displacement of the bottom dead center from the sampled signal with the use of a microcomputer. The bottom dead center displacement is compared with the setting value. When the displacement exceeding the setting value is detected, a signal to stop the press is output.

1-1. Features

○ Higher sensitivity
The accuracy of the sensor signal processing circuit has been improved. The maximum processing resolution has been developed to be 0.1μm. Minute displacement at the bottom dead center can be detected.

○ Displacement check with digital display and micron-indicator
The displacement is displayed simultaneously both with the digital display having high reading accuracy and the micron-indicator easy to check the condition. This enables an easy-check of the operating conditions of the detector.

○ Displayed gap for sensor installation
The distance between the sensor head and a target is displayed at the time of installing the sensor. Without the use of the gap gauge, the sensor can be installed accurately.

○ Flexible adjustment of the sensor cable length
The cable compensation function enables fine adjustment of the cable length on site. The cable length can be freely set for each channel.

○ Developed detection timing
The external timing is produced from 2 inputs and the internal timing is from each channel. If the internal angle timing is used, the equivalent detection with the external timing can be achieved without an external cam.

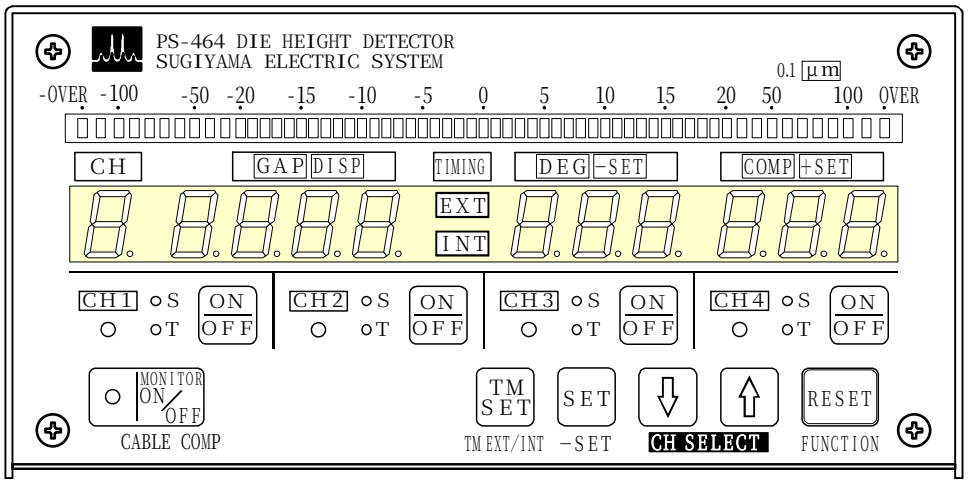
○ Effective timing test
The timing test can detect out of control conditions such as unusual installation of the sensor and improper operation of the external cam.

○ Detection of sensor wire disconnection
A stop signal is output when PS-464/462 detects disconnection/defects of the sensor or disconnection of the sensor cable by the sensor disconnection function.

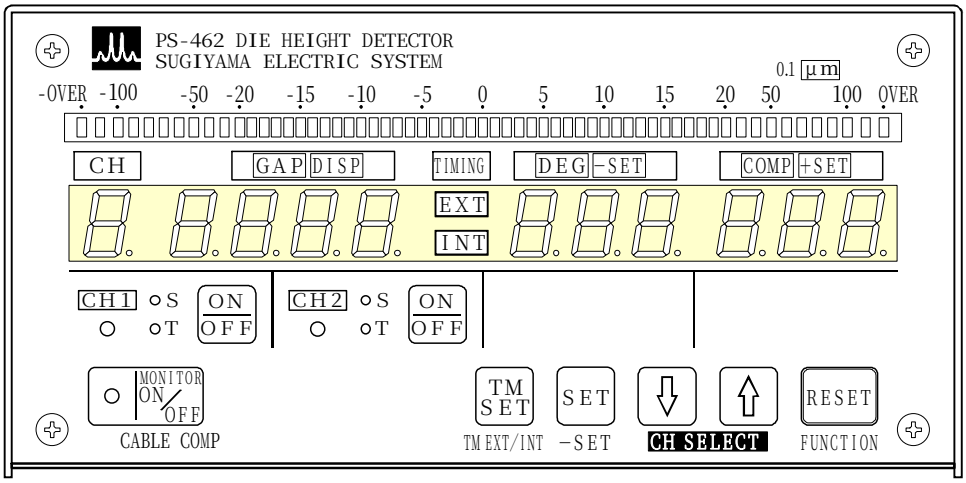
2. Explanation of panel

2-1. Front panel

The area operated/displayed by selecting a detection channel and the area independent for each channel are on the front panel. The data of the channel is displayed on the micron-indicator and the digital display. PS-462 does not have operational areas of channels 3 and 4.



Front panel of PS-464

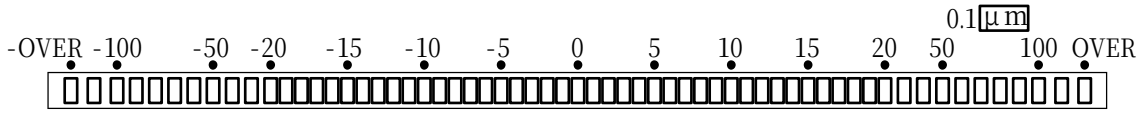


Front panel of PS-462

2-1-1. Micron-indicator

The distance between the sensor head and a target is displayed on the micron indicator at the monitor OFF. The number 0 at the center indicates a distance of 1.0mm.

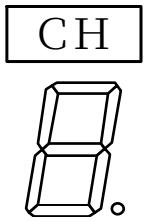
The setting value and the displacement are displayed simultaneously at the monitor ON. The setting value is displayed with lighting of both ±positions of the micron-indicator. The lamp to show displacement lights up when the detection begins and displacement is measured. It is lighter than other lamps showing setting values.



Micron-indicator

2-1-2. Channel number display

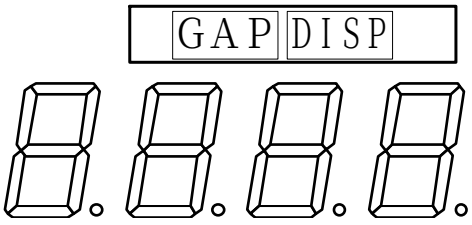
Shows which channel of the data the bar graph and digital display are indicating. The channels 1 through 4 are displayed in PS-464 and the channels 1 and 2 are displayed in PS-462. It is possible to select the channel number by pushing the channel selection button. If using the channel number shift function, the number from 5 to 8 will be displayed on the channel number display in PS-464.



Channel number display

2-1-3. GAP/DISP display

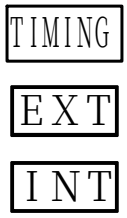
Shown with one sign and 3-digit. The sign is not displayed when a value is positive, while −(minus) is displayed when it is a negative value. When the displacement exceeds 200 or 20.0, 'EEE' is displayed. Lighting on the lamp of 'GAP' or 'DISP' indicates whether the value is the gap or displacement. At the monitor OFF, an absolute distance between the sensor head and a target is displayed with a positive value such as 1.50 with the unit of mm. The displacement is displayed at the monitor ON. The unit of the displacement is μm. When the power is ON, the program version has been displayed for approximately 1 second.



Gap and displacement display

2-1-4. Timing mode display

Shows the detection timing setting of the displayed channel. The lamp 'EXT' (external) or 'INT' (internal) lights up. It is possible to change the timing mode by pushing the TM SET (timing) button while holding down the RESET (FUNCTION) button. Depending on the operational mode, the external timing may not be selected.

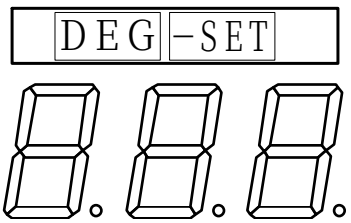


Timing mode display

2-1-5. DEG/−SET display

Shows the angle or the −setting value. Lighting on the 'DEG' or '−SET' indicates whether the displayed value is the angle or the −setting value. Push the TM SET button for changing an angle, push the −SET button (push the SET button while holding down the RESET button) for changing −setting value, and then change the numerical value with the UP/DOWN button.

Depending on the operational mode, DEG or −SET value may not be changed.

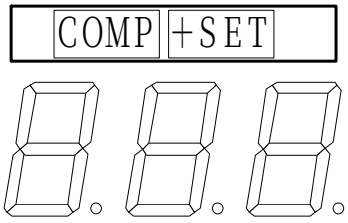


DEG/−SET display
(Angle/−setting digital display)

2-1-6. COMP/+SET display

Shows the compensation value or the +setting digital value. Lighting on the 'COMP' or '+SET' indicates whether the displayed value is the compensation value or the +setting value. To change +setting value, push the SET button and then change the numerical value with the UP/DOWN button.

The compensation value changes when the cable compensation is executed. The longer the sensor cable is, the larger the value will be.



COMP/+SET display
(Compensation value/
+setting digital display)

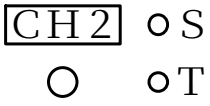
2-1-7. Channel indicating status lamp, detection ON/OFF button

Exist independently in each channel. The channel indicating status lamps include the stop display lamp, the sensor lamp, and the timing lamp. When the channel is off, these lamps go out. The stop display lamp lights green at the detection ON and it turns to red when an abnormal condition is detected in the channel. However, even if the channel is turned off in other cases than sensor errors, the red lamp will not go out. If the RESET button is pushed, the stop signal is released and the lamp goes out.

The sensor lamp (S lamp) lights green when the gap between the sensor head and a target is within an inductive distance, while the lamp is out when it is outside of the inductive gap. The lamp lights red if the sensor head is not connected.

The timing lamp (T lamp) shows the timing condition determined by the timing mode. The lamp lights green when the detection timing is ON and it turns to red when an abnormal condition is detected during the detection timing.

By the detection ON/OFF button, detection is turned on or off for each detection channel.

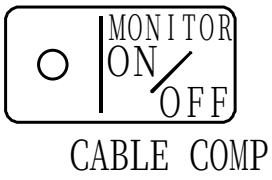


Channel
indicating status lamp

Detection ON/OFF button

2-1-8. Monitor ON/OFF (cable compensation) button

Used to turn the monitor on or off. The lamp next to the monitor button indicates the monitor ON or OFF. It blinks red at the monitor OFF, and lights green at the monitor ON. When pushing the monitor ON/OFF button while holding down the RESET (FUNCTION) button, the cable compensation is performed.



Monitor ON/OFF
(Cable compensation)
button

2-1-9. TM SET (timing) button

Used to change the angle and set the internal angle timing mode.

To change the angle, hold down the TM SET button for three seconds or more.

To change the timing modes, push the TM SET button while holding down the RESET (FUNCTION) button.

TM EXT/INT

TM (timing) button

2-1-10. SET (−SET) button

Used to set the comparison value with displacement. Push this button before changing the ± setting value simultaneously with the UP/DOWN button.

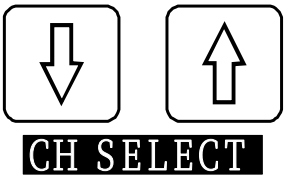
If the SET button is pushed while holding down the RESET button, the −setting value only changes.

−SET

SET (−SET) button

2-1-11. UP/DOWN button

Used to change the channel on the display except for the cases when changing numerical values. This button is used for changing of numerical values during the numerical setting. Numerical values change successively by holding down the button.



UP/DOWN button

2-1-12. RESET (FUNCTION) button

Used to reset the data during setting and releases a stop signal output.

The stop signal output resulting from abnormal conditions is released by pushing the RESET button.

When pushing the RESET button during setting, the numerical value during setting is returned to the value before setting and then the setting ends.

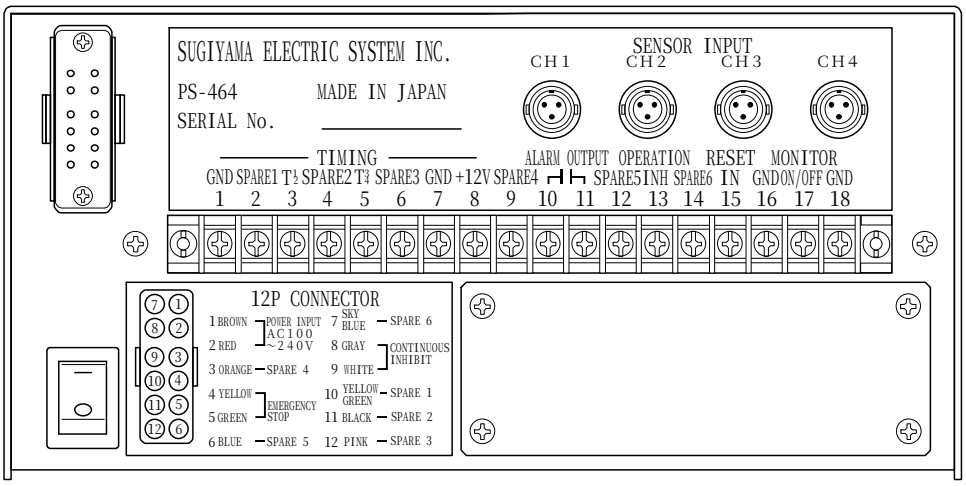
The RESET button works as a function key. While holding down the RESET button, push other buttons.

FUNCTION

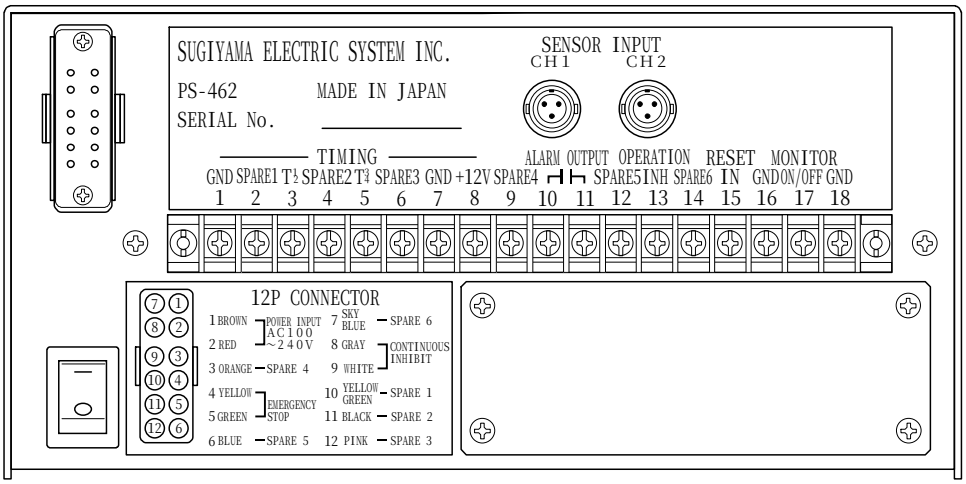
RESET (FUNCTION) button

2-2. Rear panel

The sensor connectors, the output connectors, the power source switch, and the terminal block are on the rear panel.



Rear panel of PS-464

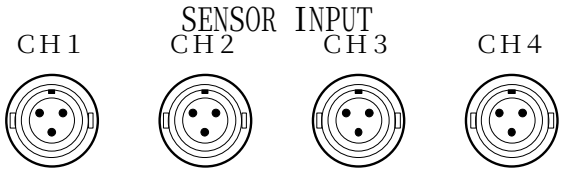


Rear panel of PS-462

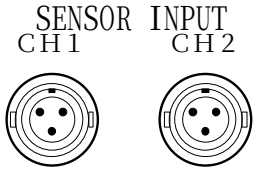
2-2-1. Sensor connector

Used to connect the proximity sensor head. The connector and the sensor head are connected with the sensor cable specified by Sugiyama Electric System Inc.

Four or less sensors can be connected with PS-464, and two or less can be with PS-462.



Sensor connectors of PS-464

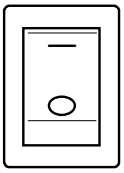


Sensor connectors of PS-462

2-2-2. Power source switch

Used to turn the power of the detector on or off. The power is on when the upper half of the switch is pressed.

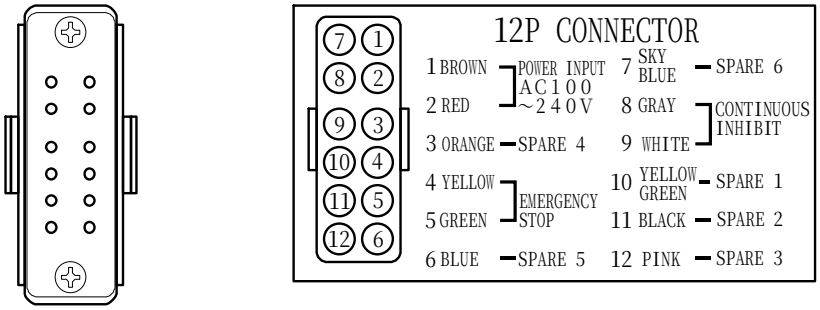
Avoid flipping the switch on or off frequently.



Power source switch

2-2-3. Output connector

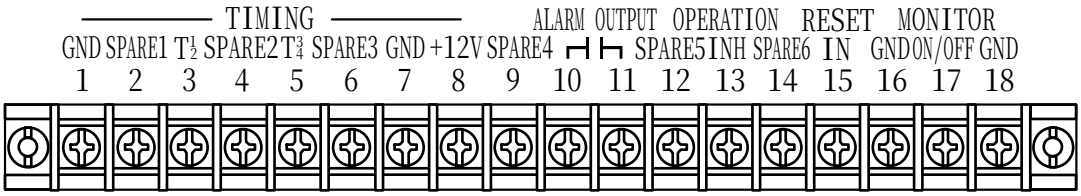
Contains the power input, the emergency stop output, the continuous inhibition output, and the spare wires. The spare wires are connected with the terminal block inside the control box. Connect the cable attached with the connector specified by Sugiyama Electric System Inc. to the output connector.



Output connector

2-2-4. Terminal block

Contains the external timing input, the operation inhibition input, the external reset input, the external monitor ON/OFF input, the alarm output, and the spare wires.



Terminal block

T12 (3) is an external timing input terminal of channels 1 and 2. T34 (5) is an external timing input terminal of channels 3 and 4. The external timing input is turned on during the terminal opening. From the +12V terminal (8), the 12V/50mA DC or less can be supplied for the proximity switch.

The reset input (15) and the monitor ON/OFF input (17) have the same functions as the RESET button and the monitor ON/OFF button of the front panel respectively. A remote control is available if the push-button switch is connected.

The operation inhibition input (13) is an input terminal to inhibit any change of various settings of the front panel. Such switches as a key switch are connected. If the switch is turned on, operations are inhibited.

The terminal GNDs (1, 7, 16, 18) are common lines of the input signals in the terminal block and connected to the chassis of the control box. Other input than the external timing input has been on while occurring short-circuit between the input terminal and GND.

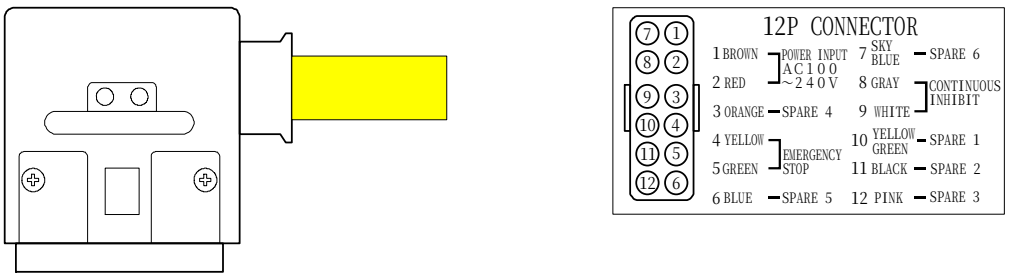
To the signal input of the terminal block, the signal of no-voltage is connected. If the external voltage is input, the internal circuit will be damaged.

The alarm outputs (10, 11) are connected with an internal relay contact. The alarm signal is output (closed) simultaneously with a stop signal.

The spare wires (2, 4, 6, 9, 12, 14) are connected with the output connectors, used when the I/O signal of the terminal block is connected through the output cable.

2-3. Output cable

Attached with a connector, which makes it possible to connect to the output connectors. The length of the attached cable is 5m in length as standard.



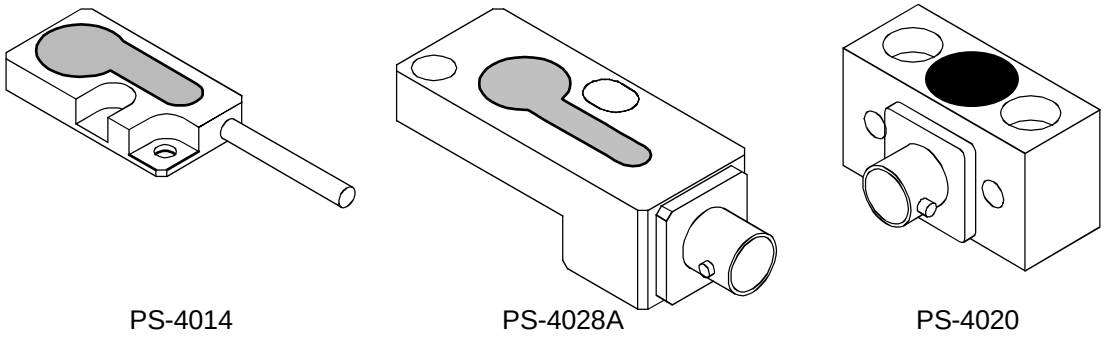
Output cable with connector

2-4. Sensor head and sensor cable

Customers need to purchase the sensor head and the sensor cable separately.

2-4-1. Sensor head

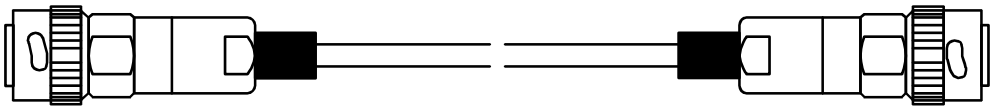
Select the suitable sensor head in accordance with installation conditions.



Typical sensor heads

2-4-2. Sensor cable

As for the length of the cable, 3m and 5m are the standard. The colors of the cable are blue, red, yellow, and white. Select a cable as short as possible.



Sensor cable

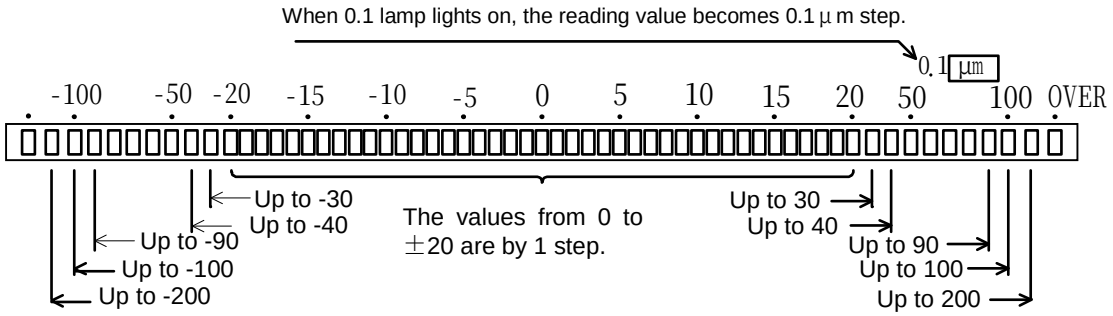
3. Function

3-1. Display of micron-indicator

Indicates relative values from 0 up to ±200 with lamps, positioning 0 as the center. Values are displayed with lamps; 0 through 20 are by the 1 step, 30 through 100 are by the 10 steps with 8 lamps, and 101 through 200 with 1 lamp. The lamp with some range of numerical values indicates the value itself specified by the lamp or below the value. For instance, when the lamp lights up at the position of 90, it means the value is 81 through 90. Lighting on the position of OVER means the numerical value exceeds 200.

The displayed data and the unit of the micron-indicator vary depending on the conditions of the usage.

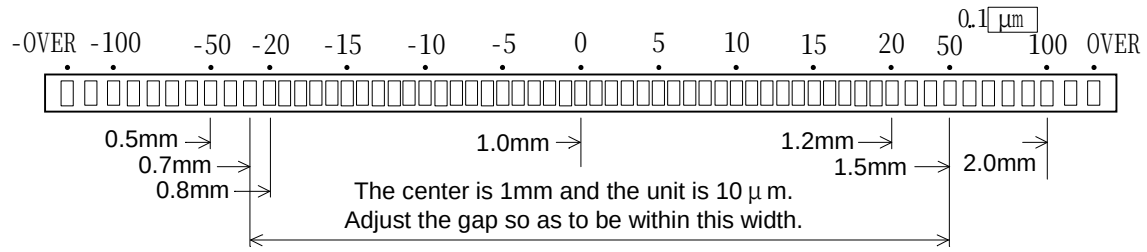
The setting value and the displacement are displayed when the monitor is ON. The unit is 1 or 0.1μm. The unit is displayed with the unit lamp at the upper right of the micron-indicator. When 0.1 is displayed, the unit is 0.1μm by 20μm step. When it is off, it is 1μm by 200 μm step.



Display at the monitor ON

A distance between the sensor head and a target is displayed on the micron-indicator display at the monitor OFF. The distance is shown as displacement, positioning the center as 1mm. At the monitor OFF, the unit is set to 10μm.

This is usable for adjustment of the distance when installing the sensor head. The unit lamp at the monitor OFF is not related to the display of the micron-indicator.



Display at the monitor OFF

3-2. Cable compensation

In this function, voltage characteristics are internally memorized in the combination of connected sensor and sensor cable. Whether the sensor is connected or not is also memorized. The length of the sensor cable can be flexibly changed by functions of the cable compensation. Make sure to perform cable compensation in the case where the connection of the sensor is changed. Keep the sensor head away from a target up to the maximum distance (15mm or more). When the compensation is completed, the compensation value appears in the COMP digital display. The compensation value varies according to the combination of internal circuits, sensors and sensor cables. The longer the length of the sensor cable is, the larger the value will be. If a standard 3m cable is used, the value becomes around 90. As for the channel not connected with the sensor, the compensation value becomes 0. When the cable is long, sometimes it may be impossible to compensate. In that case, the compensation value becomes 0 and comes to the same condition where the sensor is not connected. The maximum range of the compensation value is 255; however, if the compensation value exceeds 200, the operation of the detector becomes unstable. A sensor cable as short as possible should be used. The cable compensation methods are three types; manual cable compensation, quick cable compensation, and the monitor ON cable compensation. Manual cable compensation is used regardless of the device setting. Quick cable compensation and monitor ON cable compensation are selected by the device setting. At the factory setting, the quick cable compensation is set to ON, and monitor ON cable compensation is to OFF. When the sensor head installed to the die cannot be kept away from a target at the distance of 15mm or more, perform the manual cable compensation after selecting 0 in the device setting (38-2, 38-3, 38-4).

3-2-1. Manual cable compensation

To perform the manual cable compensation, push the monitor ON/OFF button, holding down the RESET button at the monitor OFF. The channel state after the cable compensation varies on the setting of the detection ON/OFF after the compensation. The manual cable compensation is simultaneously executed for 4 channels. Change the channels with UP/DOWN button to check the completion of the compensation for each channel.

3-2-2. Quick cable compensation

Set 1 in the device setting (38-4) to execute the quick cable compensation. After connection or disconnection of the sensor, the following operation of the quick cable compensation starts. When connecting the sensor to the channel with the compensation value of 0, the cable compensation starts. At the completion of the cable compensation, the channel turns to the detection ON regardless of the setting of the detection ON after compensation (device setting 38-1). To connect the sensor, the distance of 15 mm or more between the sensor head and a target is required. A sensor error has occurred when the compensation value was 0 and the detection was ON in the channel, however if the cable compensation succeeds, the error will be released. At the detection OFF, if detaching the sensor connecting to the channel, the compensation value turns to 0. When selecting 1 in the settings of the detection ON after compensation (device setting 38-1) and the detection OFF after compensation (device setting 38-2), the channel with the detection ON turns to the detection OFF. However, the channel

with the compensation value of 0 as well as the detection ON will not turn to the detection OFF.
At the monitor ON, if detaching the sensor from the channel with the detection OFF, the compensation value becomes 0. In the case of the channel with the detection ON, the detector enters the sensor error without changing the compensation value and switching to the detection OFF.
For the channel in which the compensation value is excessively large, the compensation value is reduced up to the proper value. This function does not work at the monitor ON. This is used for compensating the distance between the sensor head and a target if too close, or adjusting the overcompensation when replacing with a shorter cable.
The above–mentioned quick cable compensation starts during the interruption of the press machine, at the power ON, or 10 seconds later after switching to the monitor ON. How the press currently operates is read from the external timing input or changes in the internal timing. When no change in the timing signal is observed for 10 seconds or more, it is considered that the press machine stops. When the sensor is detached from the channel with compensation completed, note that the internal timing changes and the similar signal occurs as the press machine operates and the quick cable compensation stops for 10 seconds (it is misguided as becoming inoperative).
When the compensation value becomes unusual resulting from the contact error of the sensor connectors, stop the use of the quick cable compensation and instead use the manual cable compensation. When seeking the detection angle, note that the detector does not turn to the preparatory state of seeking the detection angle even by performing the quick cable compensation. When the sensor or the sensor cable is replaced at the power OFF, make sure to execute the manual cable compensation.

3-2-3. Monitor ON cable compensation

In this function, the cable compensation is executed when switching from the monitor OFF to the monitor ON. Set 1 in the device setting (38-3) to execute this function. The channel state after the cable compensation are determined by the setting of the detection ON or OFF after compensation. When seeking the detection angle, note that the detector does not turn to the preparatory state of seeking the detection angle even by executing the monitor ON cable compensation.

3-3. Detection ON/OFF after compensation

In detection ON after compensation, the detection is turned ON for the channel with the completed compensation. In detection OFF after compensation, the detection is turned OFF for the channel with the failed compensation. Detection OFF after compensation is enabled only when especially required.
Detection ON/OFF after compensation is applied to all the cable compensation, however, operations may vary to some extent on the types of the cable compensation. Set the detection ON after compensation in the device setting (38-1), and the detection OFF after compensation in the device setting (38-2). When selecting 1 in the setting, the function becomes enabled. Unless the detection ON after compensation is enabled, the detection OFF after compensation is disregarded.

3-4. Sensor error detection

Sensor error is detected only for the channel with the detection ON. If a sensor error occurs, the S (sensor) lamp of the corresponding channel lights red. As for the channel not connected to the sensor, turn its detection OFF.

Sensor errors occur in the cases where the sensor of the channel comes off, or even when the sensor is not connected or the channel with the compensation value of 0 is turned to the detection ON. If the cause is removed, the sensor error is automatically released. Moreover, the stop signal due to the sensor error is also released. Sensor errors are detected regardless of the monitor ON or OFF, and the S (sensor) lamp lights red. The sensor error stop output is activated at the monitor ON. By changing the device setting (39-3), the sensor error stop output can be also activated at the monitor OFF.

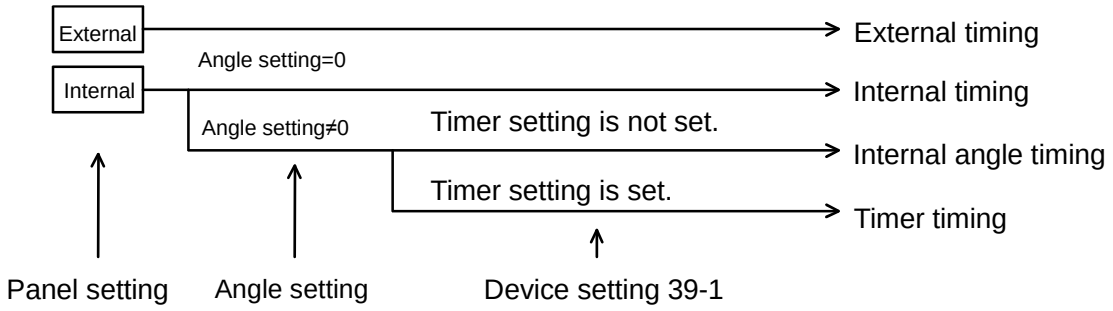
3-5. Detection timing

Divided into four types; external timing, internal timing, internal angle timing, and timer timing. In the external timing, the detection timing is produced from the external timing input signals (T12, T34) in the terminal block. In the internal timing, it is produced from the sensor signal. The internal angle timing and timer timing are produced from the internal timing.

When 'EXT' is displayed in the timing mode, the detector turns to the external timing mode.

When selecting 'INT' in the timing mode, it turns to the internal timing mode. When setting an angle in the internal timing mode, it turns to the internal angle timing mode. When setting 1 in the device setting (39-1), the internal angle timing mode changes to the timer timing mode.

Set the timing mode for each channel. The internal angle timing mode and the timer timing mode cannot be used in channels at the same time.

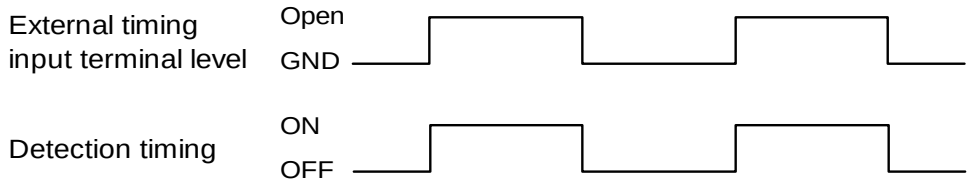


Type and selection of detection timing

3-5-1. External timing

Produced from the external timing input signals in the terminal block. The channels 1 and 2 correspond to the signal of T12, while the channels 3 and 4 correspond to the signal of T34. When setting 1 in the device setting (42-1), the input T12 is for the timing of channel 1 and 3, the input T34 is for that of channel 2 and 4.

Note that the external timing input is treated as ON when the input terminals are open, unlike other external input. When the external timing is used for the detection timing, select 'EXT' in the timing mode. With the T lamp, it is possible to check whether the detection timing from the external timing input is on or off. When the detection timing is turned on, T lamp lights green.

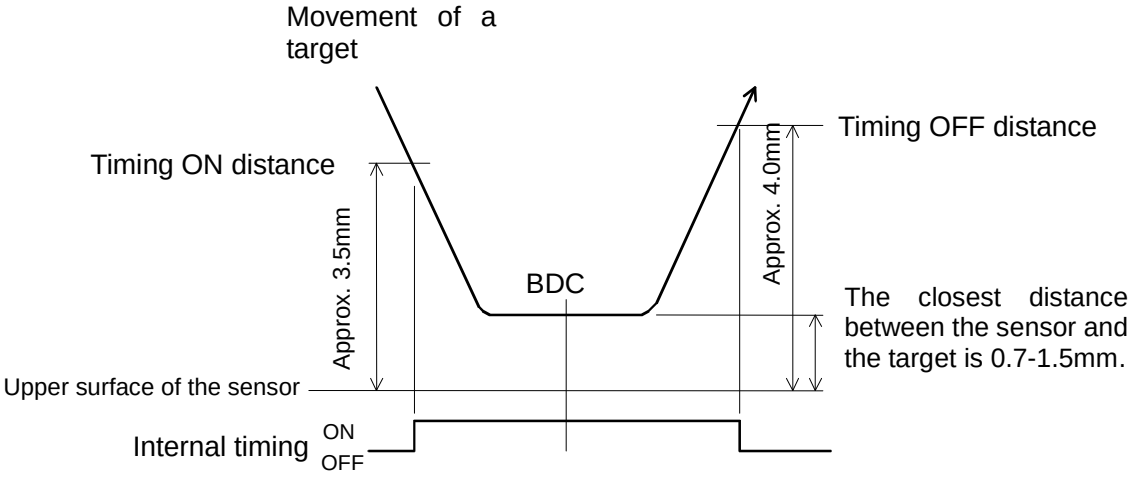


External timing

3-5-2. Internal timing

Produced from the sensor signal. The timing signal is produced for each channel. The ON/OFF state of the internal timing corresponds to the lighting of S lamp. When the S lamp lights, the internal timing is ON; when the lamp goes out, it is OFF. The internal timing is turned on when the distance between the sensor head and a target becomes about 3.5mm in the approaching direction; it is turned off when the distance becomes about 4.0mm in the direction away. When the internal timing is used, select 'INT' in the timing mode.

Be sure to set 0 in the angle setting when using the internal timing. It is the internal timing when the angle setting is 0; all settings except for 0 permits the internal angle timing or the timer timing mode.



Internal timing

3-5-3. Internal angle timing

Produced from the internal timing. To produce the internal angle timing, the setting angle is converted into the time in which the cycle of the counted standard internal timing is 360 degrees. Then, operating the internal timer, the internal angle timing is produced.

In the internal angle timing, set the position where the standard internal timing is turned ON as 0 degree, and its detection timing is performed between the skip angle (device setting 44) and the setting angle.

If the setting angle is larger than the skip angle, the detection timing starts at the skip angle. If the skip angle is larger than the setting angle, the detection timing starts at the setting angle.

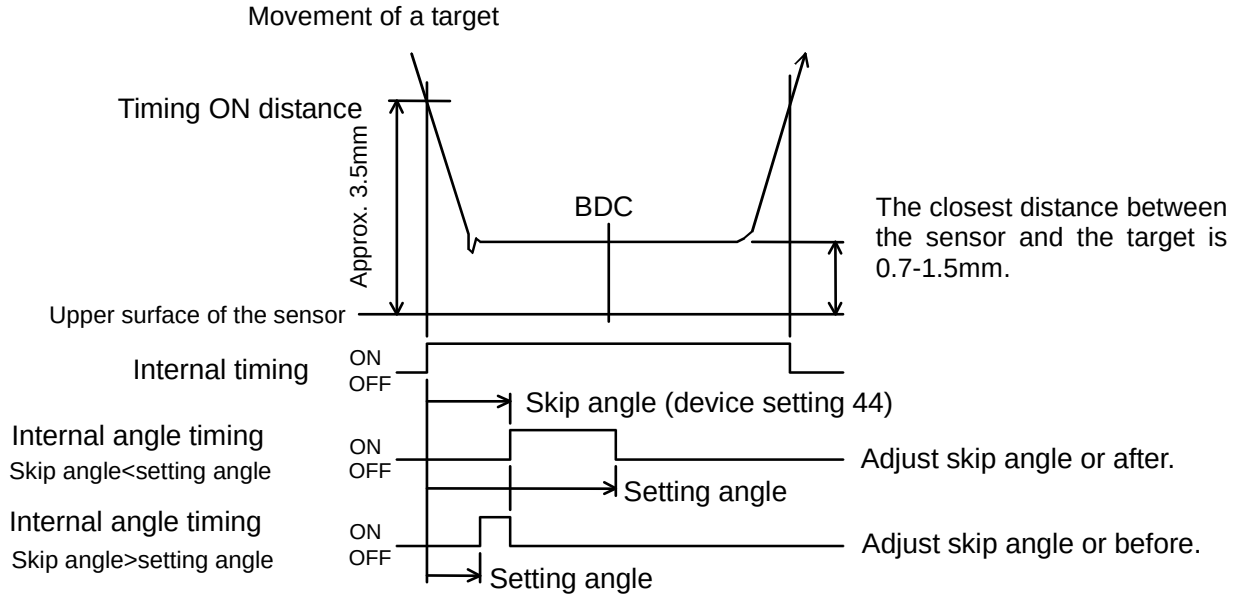
As the internal angle timing is produced after counting the cycle of the standard internal timing, the detection timing becomes enabled at the 3rd internal timing or after.

The standard internal timing to produce the internal angle timing is derived from the ON channel on the leftmost channel when the monitor is turned ON. When all the channels are turned OFF, the timing is derived from the internal timing of the channel that has been turned on first.

When it takes 6 seconds or more for the internal timing cycle, the internal angle timing cannot be used. Cycles are counted per timing, and the timing will not be produced if the disparity of 25% or more exists in the successive two cycles.

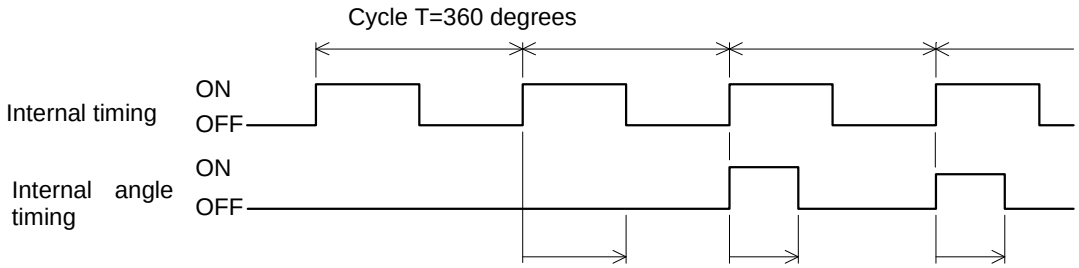
When the internal angle timing is used, select 'INT' in the timing mode and set the value in the angle setting. Whether the timing is internal or internal angle is determined by whether the angle has been set or not. The timing is internal when the angle setting is 0, while it is internal angle in other cases than 0.

The angle of the internal angle timing ranges from 0 to 99.9 degrees. The skip angle (device setting 44) ranges from 0 to 25.5. The internal angle timing is not used at the same time with the timer timing.



Production of internal angle timing

The internal angle timing is not produced in the case where the cycle T is 6 seconds or more.



Until completion of counting cycles, the internal angle timing has not been produced.

The timing is computed from the last cycle and the preset angle.

The timing is produced based on the cycle by two cycles before.

The preset angle is 0.1-99.9 degrees.

Start of internal angle timing

3-5-4. Timer timing

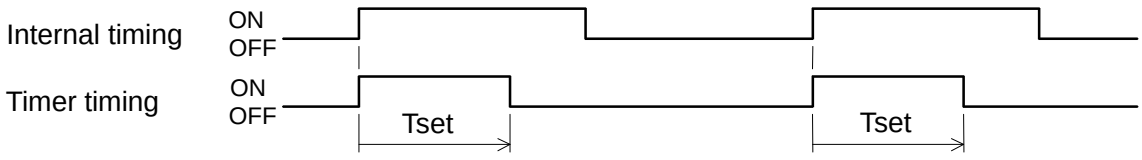
Produced from the standard internal timing. In the passage of the preset timer timing after the standard internal timing has been ON, the detection timing has been ON. The standard internal timing is derived from the leftmost ON channel when the monitor is turned ON. When all the channels are turned OFF, the timing is derived from the internal timing of the channel that has been turned on first.

Setting 1 in the device setting (39-1) enables the timer timing. Select 'INT' in the timing mode and set the value in the angle setting. Whether the timing is internal or timer is determined by whether the timer timing (ANGLE) has been set or not. The timing is internal timing when the timer timing is 0, while it is timer timing in other cases than 0.

The value set in the angle setting is treated as the timer timing, with the unit of [ms] . When setting the timer timing (DEG) with the unit of 0.1ms, a decimal point appears on the lowest digit as XX.X. to distinct it from the angle setting.

When 0 is selected in the device setting (39-2), the value ranges from 0 to 999ms, with the unit of 1ms. When 1 is selected in the device setting (39-2), it ranges from 0.1ms to 99.9ms, with the unit of 0.1ms.

The timer timing is not used at the same time with the internal angle timing.



Tset = timer timing

Timer timing

3-6. Detection timing and sensor signal sampling

In the bottom dead center detection, the distance between the sensor head and a target is computed in each stroke. How the distance between the sensor head and a target is sampled is determined by the detection timing and the hold mode. To detect the slugs efficiently, the signal needs to be sampled at the most floating slug position (angle). The sample position is determined by the detection timing, and the sample method is by the hold mode.

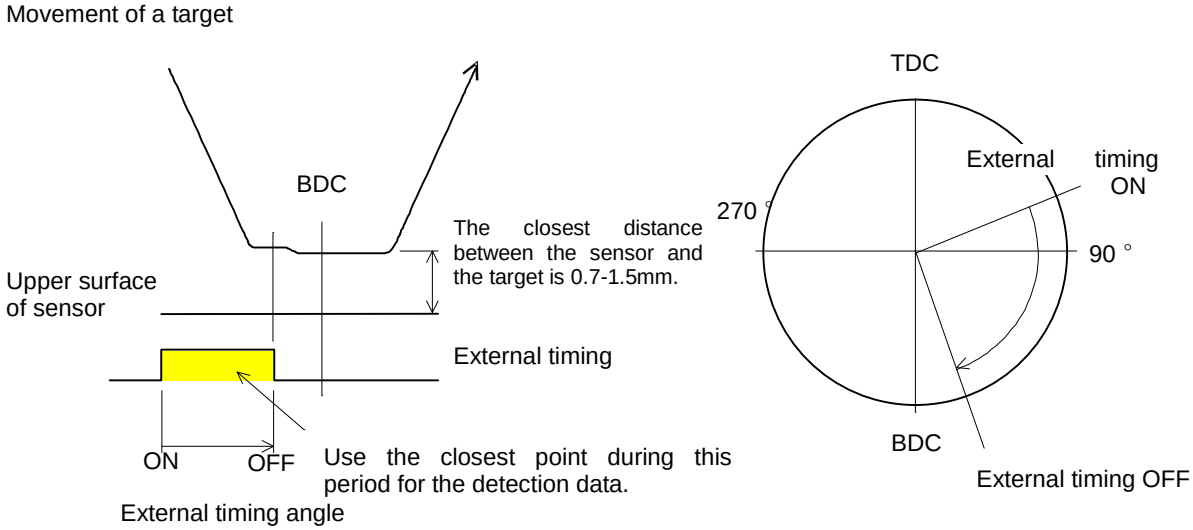
The sampled signals are converted into the processing data. Processing begins when the timing signal is turned off. In the slug detection, the stop signal has not been output until the timing is turned off.

The hold mode is divided into peak hold or sample hold: the former is to hold the closest value of the distance between the sensor head and a target at the detection ON, the latter is to hold the value at the detection OFF. The external timing and the internal timing are activated in the peak hold only. Either peak hold or sample hold is available in the internal angle timing and the timer timing. In the sample hold mode, the timing lamp lights up yellow. The hold mode is set for each channel by the device setting (40). When 0 is set in the hold mode, it is selected to peak hold. When 1 is set, it is to the sample hold. As for details of the detection timing, refer to *detection timing.*

3-6-1. External timing

The rotary cam is required in the external timing. It is possible to set the sample angle flexibly in the external timing. If selecting the external timing as the detection timing, set it to overlap with the internal timing. While the external timing and the internal timing are ON, the peak hold data is converted into the processing data. When the internal timing remains ON even at the top dead center, use the external timing.

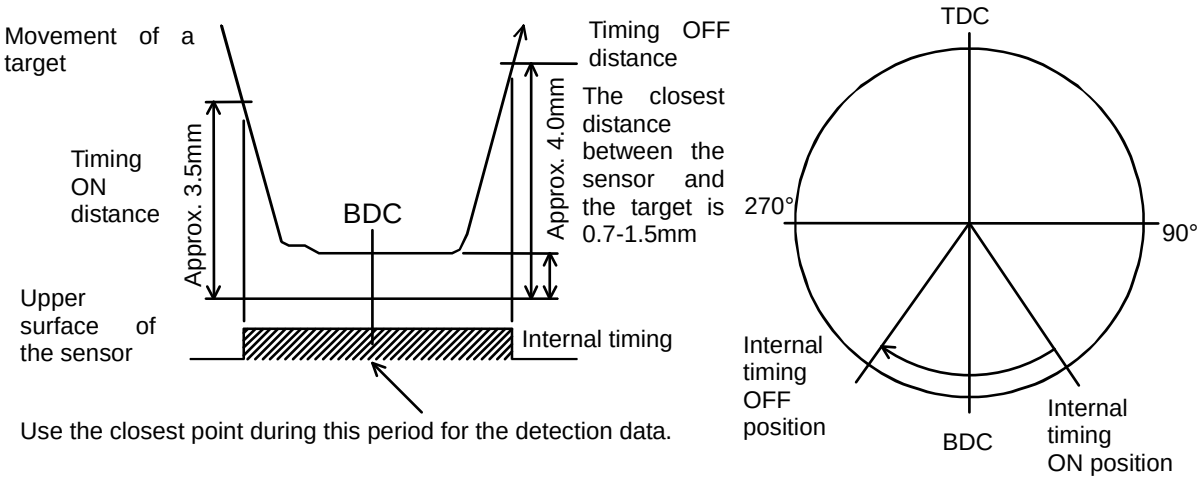
Set 10ms or more for the setting angle width of the external timing by converting it into time. To set 10ms or below, use the proximity switch and adjust values by the device setting (25).



External timing and sampling

3-6-2. Internal timing

When using the internal timing as the detection timing, the signal to include the most bottom dead center is sampled. This mode is the most convenient timing mode among other timing modes. Until the press machine gives one revolution, the internal timing needs to be turned on or off. Use the external timing when the internal timing is not turned to OFF even at the top dead center.



Internal timing and sampling

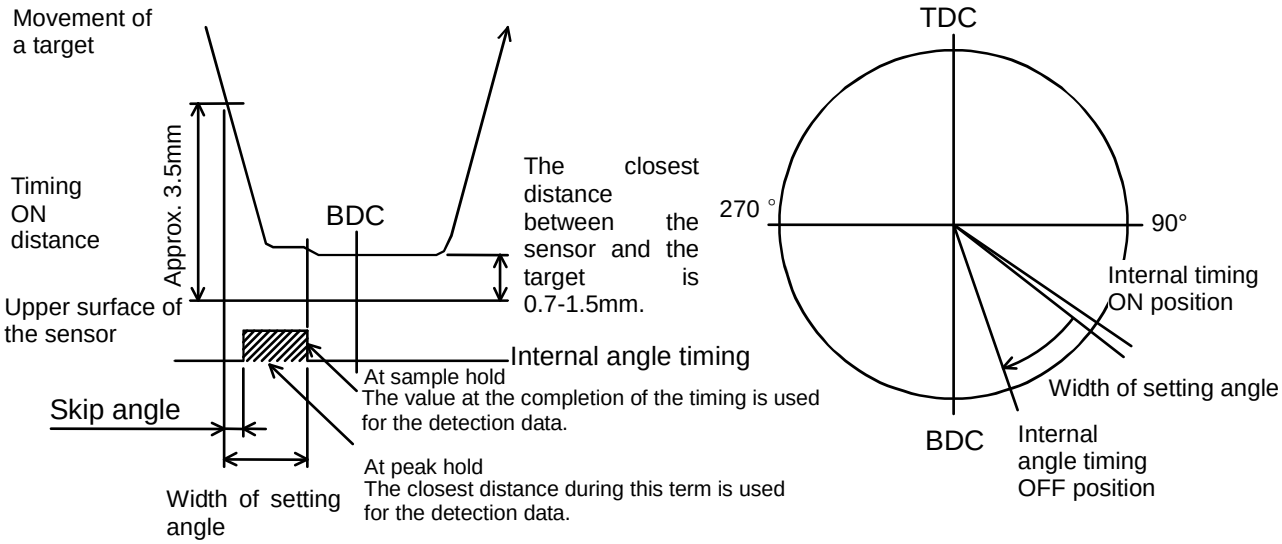
3-6-3. Internal angle timing

The similar setting to the external timing is available without using the rotary cam in the internal angle timing.

Since the internal angle timing is produced from the internal timing, the internal timing needs to be turned on or off until the press machine gives one revolution as mentioned in the internal timing. Set the setting angle width not to exceed that of the internal timing.

It is possible to set the hold mode in the internal angle timing. The peak hold and the sample hold differ in the data of the sensor signal taken in.

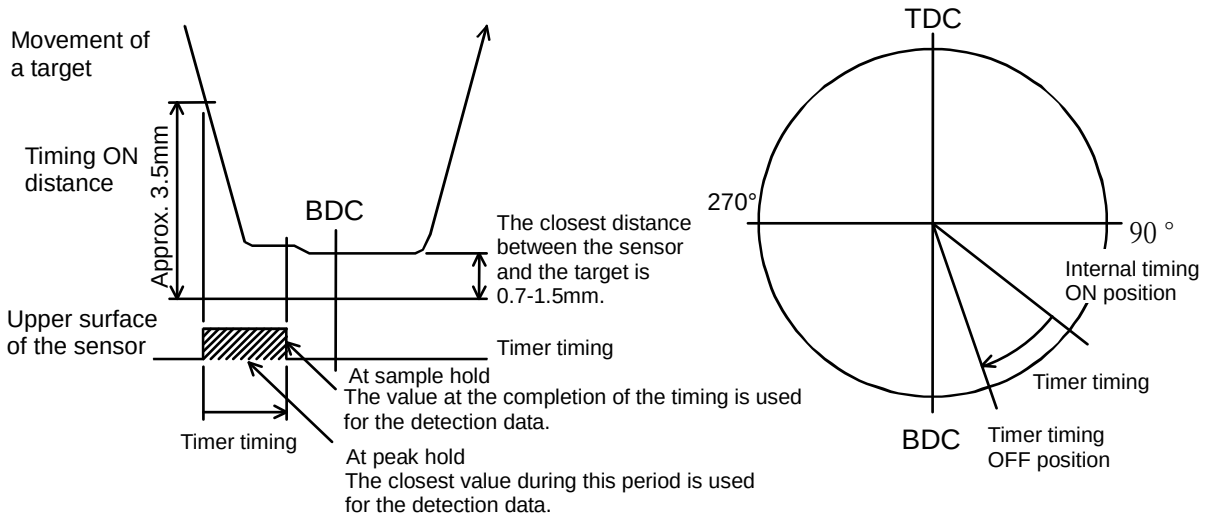
Proper adjustment of the skip angle can prevent the adverse effect resulting from the overshoot that may occur immediately after the internal timing is turned ON.



Internal angle timing and sampling

3-6-4. Timer timing

This timing is similar with the internal angle timing. The internal angle timing is not activated properly unless the press machine continuously gives one or more revolutions, however, the timer timing is activated regardless of the revolutions. In the timer timing, it is possible to set the hold mode.



Timer timing and sampling

3-7. Function of seeking detection angle

This function is a supplemental function for the angle setting of the internal angle timing. Every time the function of seeking the detection angle is performed, the peak hold waveform of the sensor signal is analyzed and then the sudden changing position of its slope is set for the angle. It is necessary to install the analogue monitor unit (PS-4643) to the detector and observe the sensor waveform in advance.

After replacing with the sensor, start the function of seeking the detection angle to enter the standby mode of seeking detection angle before the first slug detection. Subsequently, when the slug detection starts, the peak hold waveform is analyzed, the detection angle is set, and then, the detector will enter the complete mode of seeking the detection angle. The slug detection continues with the sought detection angle.

The complete mode of seeking the detection angle is not in a special state, but in the normal state that detection is available with the preset detection angle.

3-7-1. Seeking of detection angle

At the angle when the variation of the sensor signal is 0 or becomes a positive value for the first time after the internal timing is turned on, set it as the sought detection angle. When the sensor gets closer to a target, the sensor signal is more reduced. Due to amplifying sensor signals in the internal circuit, if a larger disparity of voltage exists between the expected detection position (angle) and the bottom dead center, the amplifier gets saturated. To avoid this, set the tentative detection angle (device setting 43) for determining the rough detection position. For the tentative detection angle, set the angle width between the expected angle and the bottom dead center at the start of the internal timing.

3-7-2. Adjustment of sample period

If the sought angle position is earlier than desired, it is possible to extend the sample end position of the internal angle timing by this function.

The adjustment methods are divided into two; sample extension and angle extension. Select the adjustment methods by the extension selection (device setting 42-4). The time (by the unit of 0.1ms) is set in the sample extension of the device setting (45), and the angle (by the unit of 0.1 degree) is set in the angle extension of the device setting (46).

By the sample extension, the specified time is added to the sought angle. On the display, the sought detection angle still appears. The sample angle actually used is the sum of the setting angle and the angle converted from the specified time, varying depending on the press SPM.

By the angle extension, the sum of the sought detection angle and the setting angle by the angle extension is used for the setting angle of the internal angle timing. Due to the operation only by the angle setting, the sample angle is not influenced by the press SPM.

3-7-3. Operational procedure

To start to seek the detection angle, set 1 in the device setting (39-4). Set other numbers than 0 in the angle setting, select the internal angle timing mode, and turn the detection ON. To enter the standby mode of seeking the detection angle, follow one of three instructions:

When pushing the monitor ON/OFF button with the FUNCTION button held down, all the detection ON channels enters the standby mode at the same time of performing the cable compensation.

When pushing the TM SET button with the FUNCTION button held down (the same operation with the timing selection), all the detection ON channels will enter the standby mode if no channels are not in the standby mode, and all the channels will enter the complete mode if any channel is in the standby mode.

Push –SET button while holding down the FUNCTION button (the same operation with changing –SET value), the standby mode and the complete mode of the selected channel are switched.

After switching to the standby mode, 50.0 (tentative detection angle) appears on the angle display and the DEG lamp blinks, which is an indication that the detection angle is being sought (or in the standby mode).

When operating the press machine and checking sensor signals for the required count, the detection angle is set, the DEG lamp ends blinking, and the function of seeking the detection angle is completed. Seeking of detection angle is performed only for the detection ON channel in the internal angle timing mode. If the detector enters the standby mode of seeking the detection angle, the tentative detection angle (device setting 43) will be set for the detection angle. When the channel is turned to the detection OFF, the detector enters the complete mode of seeking the detection angle. If changing the angle of the channel that is in the standby mode, the channel enters the complete mode.

3-7-4. Restriction in seeking the detection angle

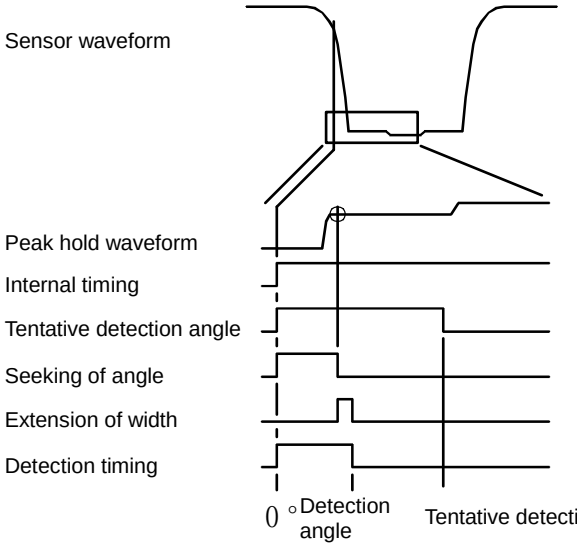
While the detection angle is sought, the function of the detection is limited:

Neither the external timing mode nor the timer timing can be used.

Changing only the –SET value is not allowed. The same value is set for ±SET values.

If the sample hold is set, its operation does not work properly.

By initializing the detection, one more stroke of the timing signal is required. In other cable compensation than the manual one, the detection angle does not start to be sought.



From the start of internal timing, the detector computes (seeks) the angle, when the slope of the peak hold waveform becomes 0, within the range of tentative detection angle.

When the angle extension has been set, the sum of the sought angle and extended angle will be used as the detection angle.

When the sample extension has been set, the sum of the sought angle and the extended time will be used as the detection angle.

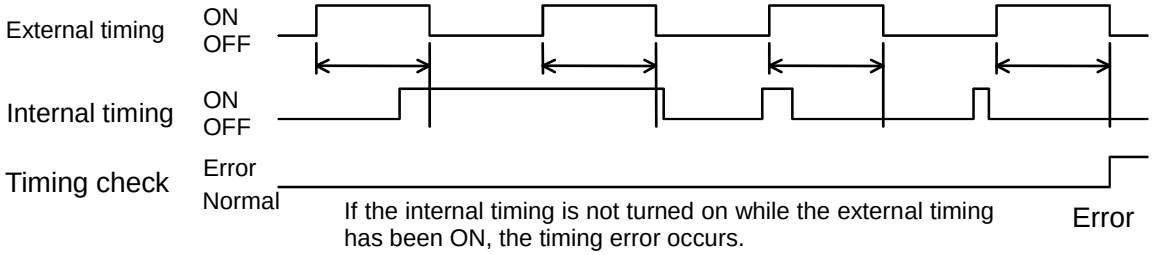
Seeking of detection angle

3-8. Timing check

This function is for preventing the detection from being interrupted. Improper installation of the sensor or disconnection in the external timing circuit is detected. When an error is detected by the timing check, a stop signal is output. As an indication of the timing error, T (timing) lamp lights red.

3-8-1. Timing duplication check

Used in the external timing mode. When the external timing is turned off, this check monitors that the internal timing is turned on while the external timing has been on. When the internal timing is not turned ON, a stop signal is output. The check is performed regardless of the device setting.



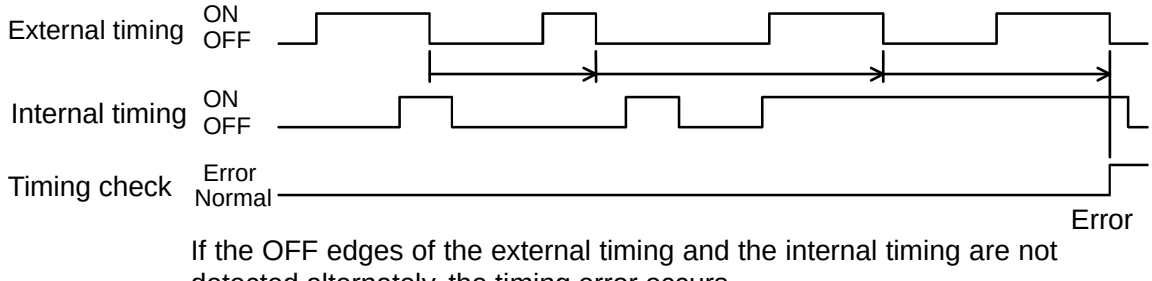
Timing duplication check (External timing mode)

3-8-2. Timing alternate check

In this function, the detector monitors that the internal timing is turned on or off during one cycle of the external timing in the external timing mode, or the external timing is turned on or off during one cycle of the internal timing mode in the internal timing mode. Set the timing alternate check enabled or disabled for each channel. Select enabled or disabled by the device setting (21) in the external timing mode, select by the device setting (22) in the internal timing mode. At the factory setting, it is set to enabled in the external timing, it is to disabled in the internal timing.

In the standard timing check, when used in the external timing mode, the timing error occurs if the external timing is repeatedly turned on or off at the condition where the sensor head is closing to a target (the S lamp does not go out). If the similar state occurs due to the structural problem of the die, set the timing check 'OFF' in the external timing.

When used in the internal timing mode, if the internal timing may not be turned on even at the bottom dead center, connect an appropriate signal(one signal per stroke of the press machine) to the external timing input terminal, and change the timing check to 'ON' (1) in the device setting (22).



Timing alternate check

3-9. Slug detection

Slug is detected by comparing the setting value with the difference between the sampled sensor signal and the previous average standard. The previous average standard is an average of two successive sample values taken immediately before the sample value for detection. The difference between the sample value and the previous average standard is displayed in the bar graph and the DISP digital display as displacement. Comparing this displacement with the setting value, if it exceeds the setting value, it is recognized as slug and a stop signal is output. The previous average standard is updated with an average of both the sample value for detection and the previous sample if displacement equals to the setting value or less. When a stop signal is output, the previous average standard is not updated. The previous average standard is normally produced from the two sample values, however, the value ranges from 1 to 64 by the device setting (07). Detection begins at the next the detection timing after completing the previous average standard. If the number of samples to produce the standard increases, the non-detection state at the beginning of detection stays on longer.

SAMPLE	1	2	3	4	5	6	7
SAMPLE VALUE	490	490	500	510	480	500	560
STANDARD	-	-	490	495	505	495	490
DISPLACEMENT	-	-	+10	+15	-25	+5	+70

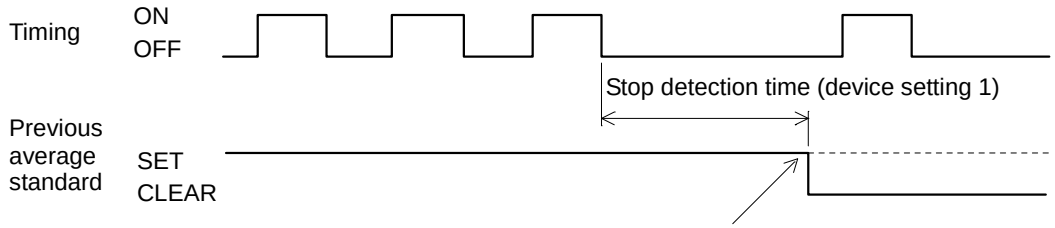
When the preset value is ±30, the stop signal is output at sample 7.

(The sample value is different from an actual value.)

Slug detection operation

3-10. Detection initialization, clearing of previous average standard

The previous average standard is cleared by initializing the detection. All detection channels are initialized by turning the power on or turning the monitor off with the monitor ON/OFF button. When the detection is turned off with the detection ON/OFF button for a channel, the detection of the channel is initialized. If the stop detection time (device setting 01) is set together with the setting of detection initialization (device setting 10), the detection initialization starts after the passage of the stop detection time from the last detection timing. Use this setting to detect the interruption of the press machine and initialize the detection automatically. When the initialization setting has been set by the device setting (10), the detection is initialized by pushing the RESET button to release a stop signal. When the detection initialization is set together with the device setting (42-2), it is possible to initialize the detection by pressing the RESET button. The detection initialization is set for each channel. The stop detection time is used for all channels.



Automatic reset of previous average standard

3-11. Beginning of slug detection

The methods of beginning the slug detection are divided into two; with the use of the monitor ON/OFF button and with the use of detection ON/OFF button.

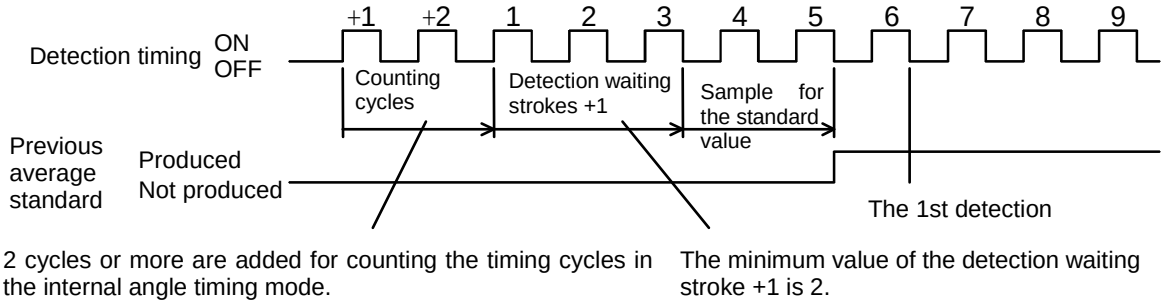
To begin detection with the monitor ON/OFF button, turn the required channel on by pushing the detection ON/OFF button at the monitor OFF, and then turn the monitor ON. In this method, the detection will be simultaneously performed for the channels turned the detection ON.

To begin detection with the detection ON/OFF button, turn the monitor on while the channel detection is off, and then turn the channel on. In this method, detection will be performed for each channel in which the detection is turned on.

When the detection is executed with the use of the buttons, the detector is initialized and sampling begins at the detection waiting stroke + 1 or after.

The previous average standard is produced at the start of sampling, and detection begins at the following stroke after completion of the previous average standard. In the normal setting, two strokes are required for the detection waiting strokes and other two strokes are required for producing the previous average standard, so actual detection starts at the 6th stroke after executing the detection.

The detection waiting strokes can be changed by the device setting (05, 06). The detection waiting strokes are to set the number of strokes required until the press rotation is stabilized after starting the press operation. The minimum value of detection waiting stroke +1 is 2. The number of samples of the previous average standard is 64 at the maximum.
When the larger value is set for the sample of the previous average standard, the non-detection strokes increases until the detection starts. If a larger value needs to be set depending on detection conditions, set the tentative standard detection in the device setting (04). In tentative standard detection, an average of only the samples that have been taken is used as the previous average standard during detection until all samples are taken. In the Nth detection, the previous average standard is the average from the 1st to Nth sample value -1. At the first detection, the second sample value is checked by using the first sample value as the previous average standard.
When setting the tentative standard detection, the detection starts from the 2nd sample. When setting 1 in the sample number of the previous average standard, the tentative standard detection is disregarded.



Previous average standard at starting the detection

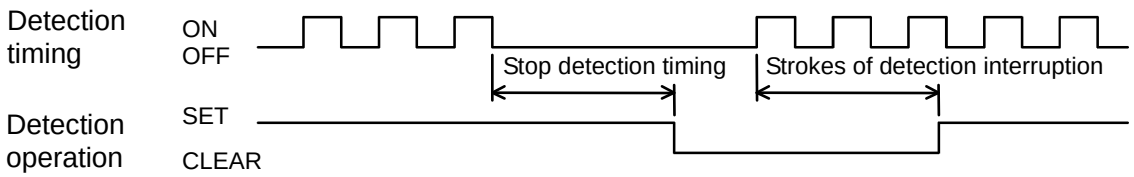
3-12. Detection interruption

During the slug detection, when the press machine resumes after once interrupted, it is possible to make the setting to skip the detection until the condition of the die is stabilized.

When setting stop detection time (device setting 01) and strokes of detection interruption (device setting 02, 03), detection is interrupted for the setting strokes at the restart of the press machine after detecting the press machine has stopped. This setting is to avoid detection errors due to unstable rotation at the press comeback movement when restarting the press machine with the previous average standard stored.

When the strokes of the detection interruption and the device setting (42-3) are set, detection has been skipped for the strokes of the interruption by pushing the RESET button.

The strokes of the detection interruption are set in the device setting (02) by the range of 200μm, the device setting (03) by the range of 20μm. The strokes of the detection interruption are set to all the channels simultaneously. However, if the initialization setting is performed, the initialization setting gets priority over the detection interruption.



Detection interruption at restart

3-13. Function of trimming setting value

In this function, the setting value derived from the detected displacement is produced, trimming the setting value that is set manually by the initial setting.

By this function, the maximum value is selected among the displacement absolute value of the preset number, and the product of the maximum value and the specified magnification is set for the expected value. The lowest digit of the setting value on the display is decreasing by 1 to get closer to the expected setting value every detecting stroke.

Expected setting value = the absolute value of the maximum displacement × (increase percentage of the setting + 100) ÷ 100

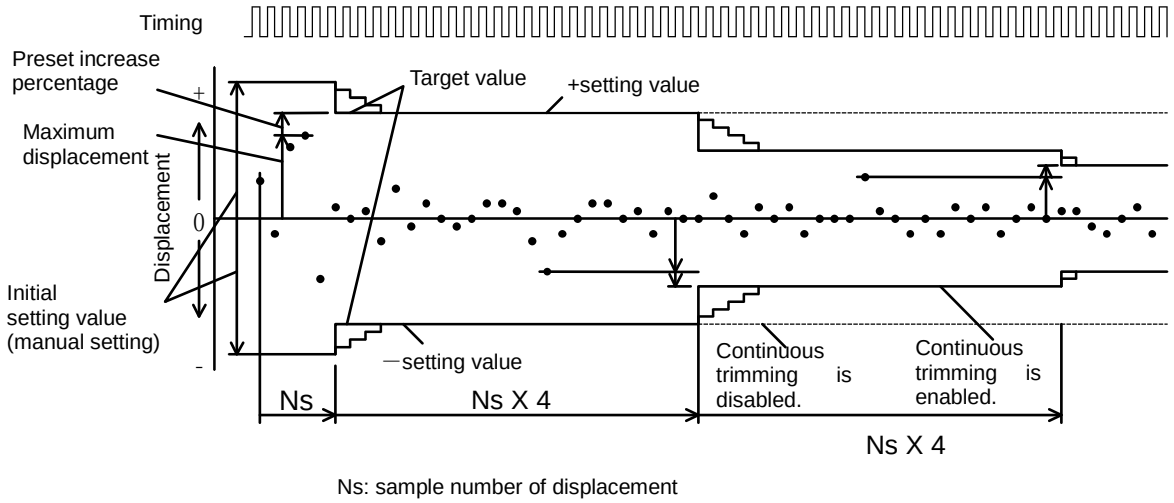
Increase percentage of the setting: the value of the device setting (32) 0-200 %

The displacement (when the slug is detected) exceeding the setting value on the display is not used for computing the expected setting value.

The expected setting value is limited not to exceed the setting value on the display (the initial value is the value manually set).

Set whether the function of trimming the setting value is enabled or disabled for each channel by the device setting (30). If the detection is initialized, the setting value on the display is returned to the value manually set. Select whether continuous trimming is enabled or disabled for each channel by the device setting (31).

When selecting 0 in the continuous trimming, the expected setting value is computed only once. The setting value on the display is normally reduced. When selecting 1 in the continuous trimming, the expected setting value is repeatedly computed.
Set the sample number for detecting the maximum displacement in the sample number of displacement (device setting 33). At the start of the detection, sampling is performed for the number specified in the device setting (33) at the start of the detection, however, it changes to four times as many as the preset number in the 2nd and after.
If enabling the function of trimming for a channel, changing only the -SET value is not allowed in the channel. The same values are used in the ±setting values.



Ns: sample number of displacement

Trimming of setting value

3-14. Sensitivity and setting value
Sensitivity depends on the setting value shown on the display. If the integer number is displayed, the sensitivity is the range of 200μm, the step of 1μm. For the value with a decimal point, it is the range of 20μm, the step of 0.1μm.
In changing the setting value, it is possible to change both ± values simultaneously and the −setting value independently. The sensitivity of the +setting value is adopted and that of the −setting value is shown as the + setting value: If the +setting value is displayed with an integer, the −setting value is also displayed with an integer. If the +setting value is displayed with a decimal point, the −setting value is also displayed with a decimal point. The sensitivity of the ±values is the same.
If the +setting value shown with an integer is changed to become smaller than 3, the setting value will be the value with a decimal point. If the value with a decimal point is changed to become larger than 7.9, it will be shown with an integer.
When the setting change ends, a lamp of 0.1μm on the bar graph changes. The detection will be initialized when changing the setting value together with sensitivity during detection.

3-15. Sensitivity and material thickness change

When it gets larger disparity (absolute value change) between the first sample data after the detection initialization and the sample data during the detection, the amplifier inside the detector gets saturated and the detection cannot be operated properly. In that case, the error indication of 'E-01' or 'E-02' appears on the displacement display and a stop signal is output. 'The absolute value change' means the gradual change of the distance between the sensor head and a target at the sampling position during press stamping. 'E-01' appears when the distance is too close, and 'E-02' does when it is too wide. The tolerance of the absolute value change is ± 0.2μm in the range of 200μm, 0.02μm in the range of ±20μm.

The absolute change is caused mainly by the bottom dead center change resulting from such changes as thickness change of the material and change of the press SPM. Moreover, it may be caused by the drift of an internal voltage due to the temperature change of the detector. The voltage drift due to the temperature change will be reduced within 30 minutes after the power source is turned on. Avoid detection immediately after the power source is turned on, especially when used in the 20μm range.

3-16. Channel number display shift

Adding the value normally displayed (channel number) to the offset, this function is to display the sum on the channel number display. The offset value ranges from 0 to 7 by the device setting (17). For example, if the offset is 4, the values ranging from 5 to 8 will be displayed on the channel number display of PS-464.

3-17. All channels OFF inhibition

Used to prevent the continuous inhibition ON even by switching to the monitor ON when no detection ON channel exists. It inhibits the press machine from operating in this function. If 1 is set in the device setting (41-4), the function becomes enabled.

3-18. External monitor ON/OFF input

Monitor ON/OFF is controlled even by the monitor ON/OFF input on the terminal block. At the factory setting, the edge mode is selected, which switches the monitor on or off every time the input terminal is activated. This function is the same as the monitor ON/OFF on the panel. When setting 1 in the device setting (41-3), the mode can be changed to the level mode. In the level mode, the terminal input OFF leads the detector to enter the monitor OFF; the terminal input ON is to the monitor ON. The monitor ON/OFF button on the panel is available only when the input on the terminal block is ON.

When the monitor is turned to OFF by pressing the monitor ON/OFF button at the terminal input ON, push the monitor ON/OFF button again, or deactivate the terminal input once and then activate the input on the terminal block again, to return to the monitor ON.

In the edge mode, the detection automatic return is available, however, this is disregarded in the level mode.

3-19. Automatic return function

In this function, the monitor is turned to ON from OFF automatically, computing the external timing or the internal timing. When the value computed at the monitor OFF reaches the automatic return strokes (device setting 09), the detector enters the detection mode. 30 is set for the automatic return strokes.

To enable the detection automatic return, any of channels needs to be ON at the monitor OFF. When all the channels are OFF, this function does not work. When 0 is selected in the automatic return strokes of the device setting, the automatic return does not start.

Regardless of the timing mode and the channel detection ON/OFF, timing signals are monitored. Even though such a situation where the internal timing is not activated while all the channels are used in the internal timing, this function becomes enabled only if the external timing is connected. The internal timing of the detection OFF channel is also used for this function.

3-20. Operation inhibition

In this function, the operations involving the detection are limited only to the monitor ON/OFF or the error reset, when connecting the operation inhibition input in the terminal block with the GND terminal.

The device setting (34, 35) can change the data of the inhibition. By adjusting the setting, the monitor ON/OFF and the reset operation can also be inhibited. The operations not involving the detection are, even while the operation inhibition is enabled, available.

3-21. Backup data

Detection settings that are likely to be frequently changed are backed up with the battery. The backup data has been memorized for about two weeks.

Check the backup conditions when the power is on. The backup error 'E-04' is displayed and the settings are initialized when the backup is unusual.

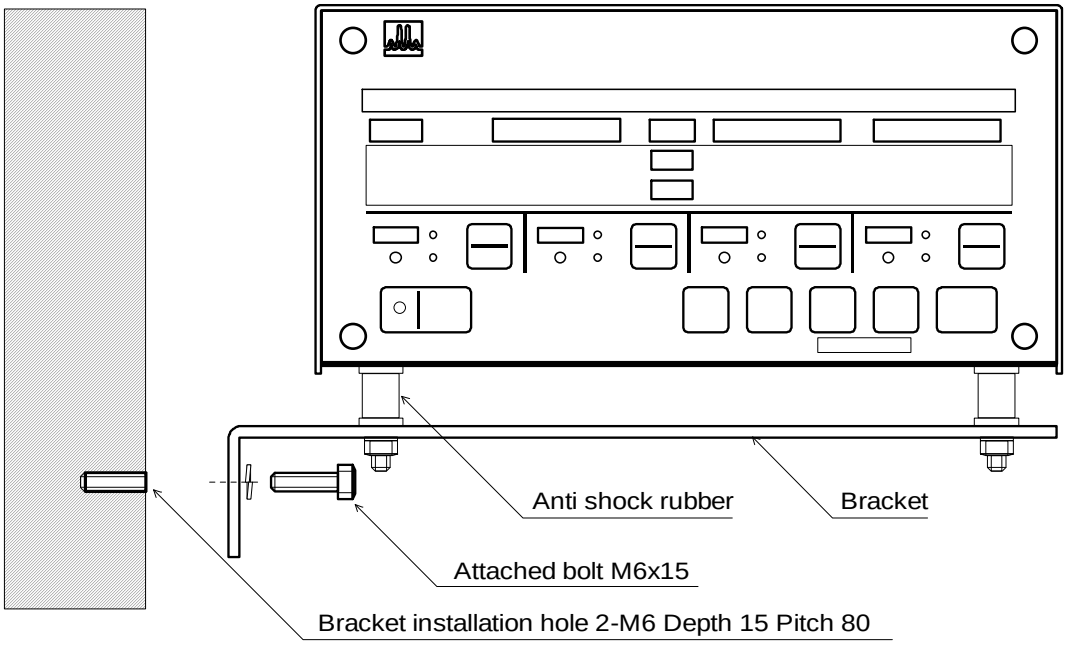
When the backup error occurs, adjust cable compensation, timing mode, and detection ON/OFF setting again.

EEPROM are used for the device setting data, not initialized by the backup error.

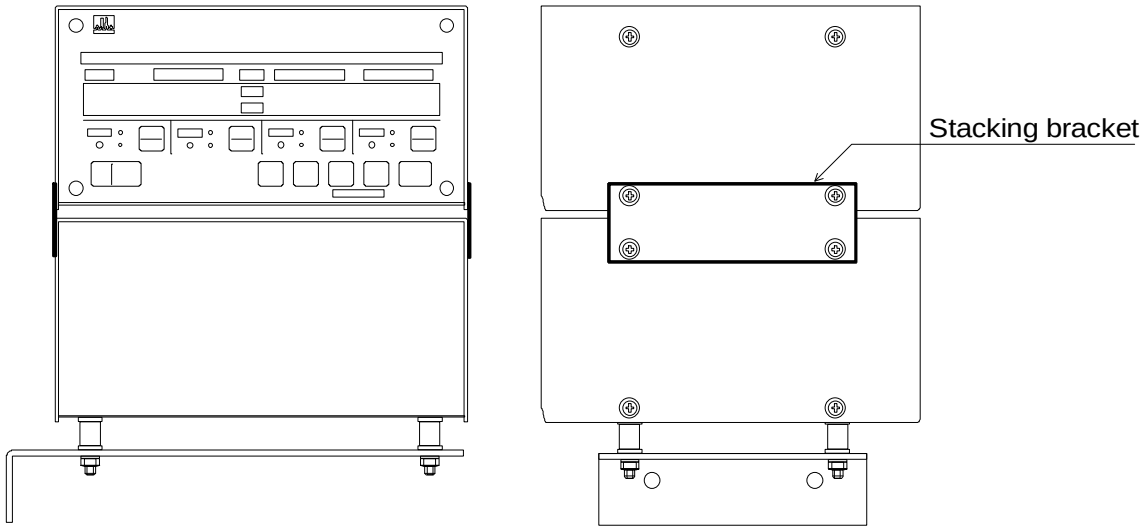
4. Installation

4-1. Installation of control box

Install the control box with the use of the designated bracket, or stack the detector on other devices with the use of the stacking bracket. Choose the location free from vibration and dust. Note that processing oil and metallic powder may cause malfunction or failure. Use an electric wire of 0.5mm^2 or more to connect the control box with the press bolsters.



Installation with a special bracket

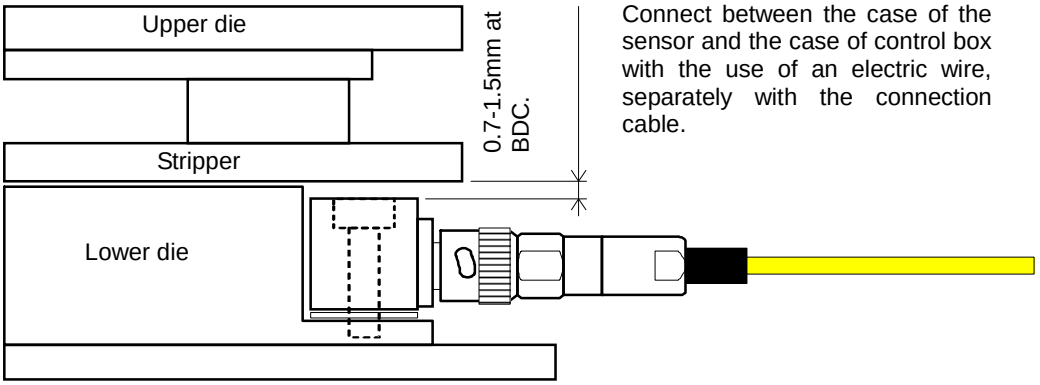


Installation of control box with a stacking bracket

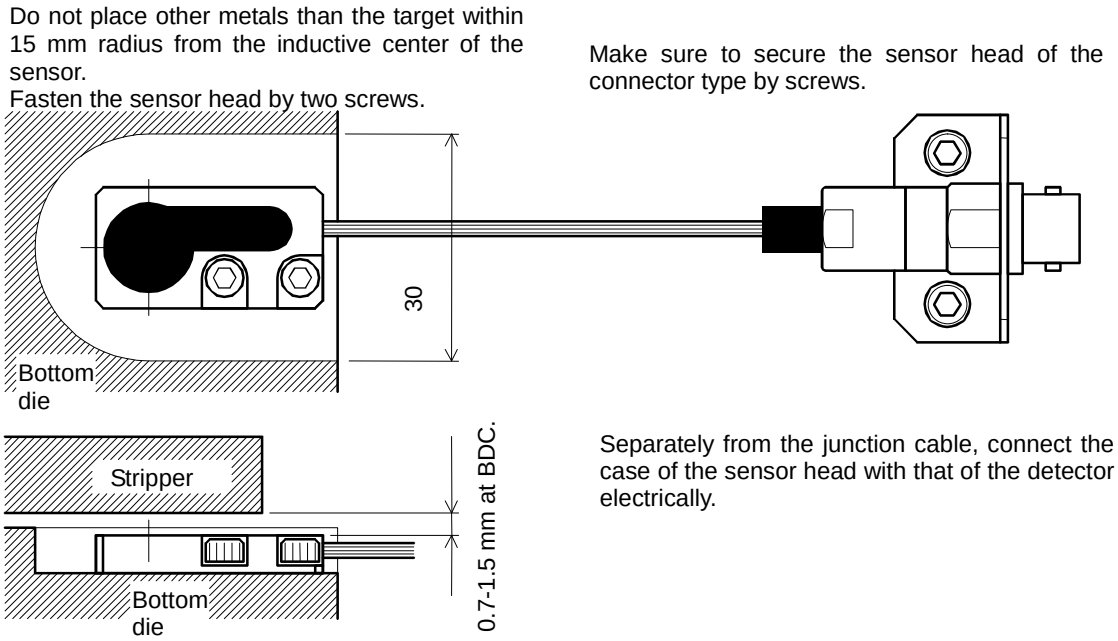
4-2. Installation of sensor head

Install the sensor head so that the gap between the sensor head and a target can become from 0.7 to 1.5mm at the bottom dead center of the press. When using the connector type ones such as PS-4014 and PS-4013, be sure to secure their connectors with screws.

Use an electric wire of 0.5mm² or more to connect the control box with the press bolsters. It is necessary to electrically connect the metallic case of the sensor head and the control box chassis. A target and the mounting bracket of the sensor should be prepared by a customer. To improve detection accuracy, use a target and the mounting brackets that are not bent even by vibration resulting from the press stamping. Place a target so as to cover the sensor induction center by 30mm or more in diameter.



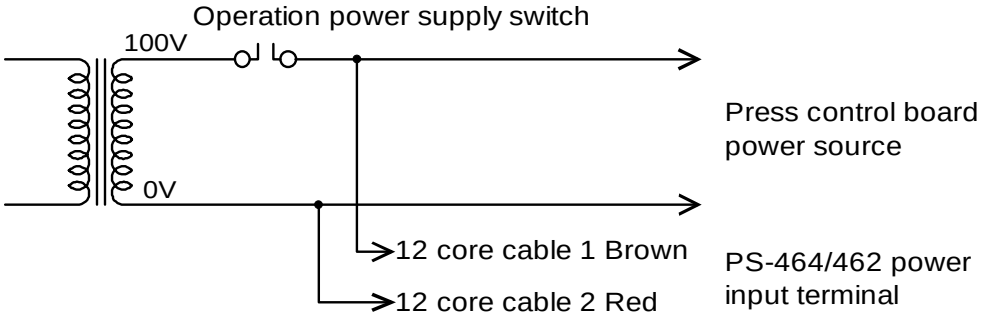
Example of installing sensor head (PS-4020)



Example of installing sensor head (PS-4014)

4-3. Connection of power source

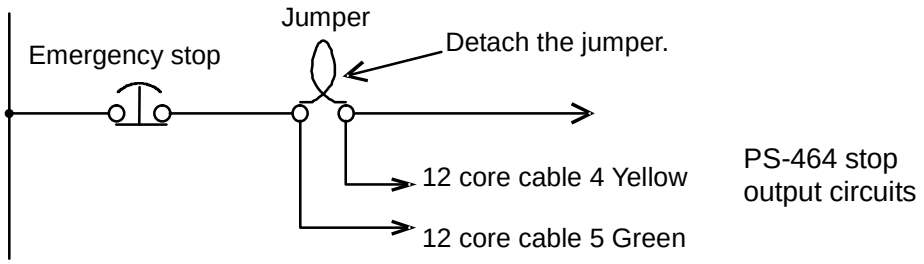
Connect the power source for operating the press with the brown and red output cables.



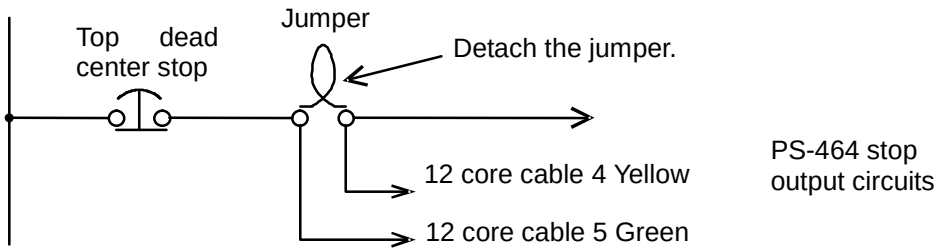
Wiring for power source

4-4. Connection of stop output

Connect the yellow and green cables with the emergency stop or the top dead center (continuous) stop circuit during the press operations.



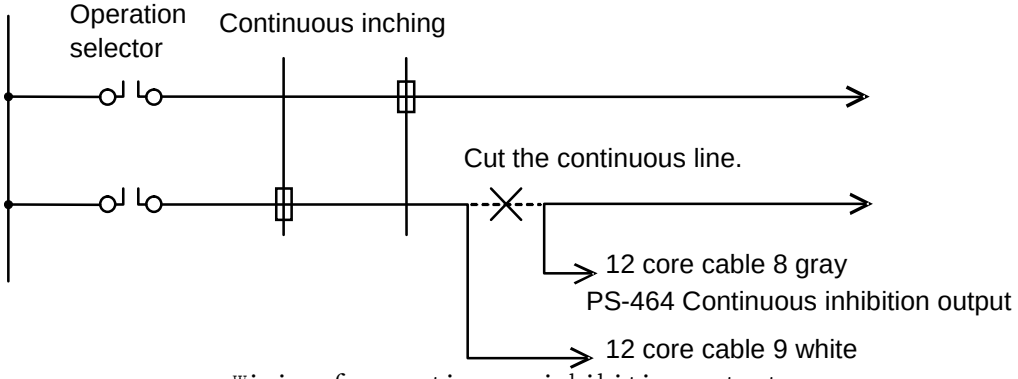
Wiring to emergency stop circuit



Wiring to top dead center stop circuit

4-5. Connection of continuous inhibition output

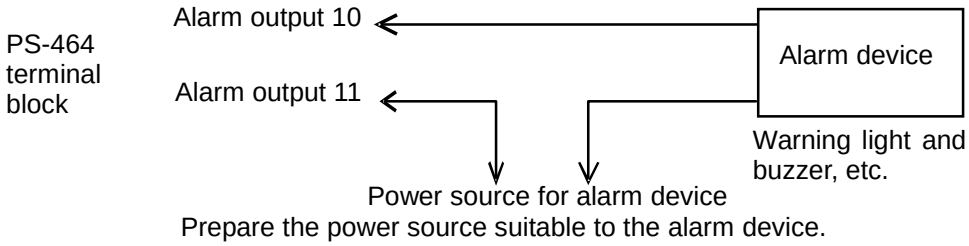
Connecting the continuous inhibition output with the circuit of the operation selector can prevent the press to operate continuously at the monitor OFF. The continuous inhibition output (Gray, White) is turned ON (Close) at the monitor ON.



Wiring for continuous inhibition output

4-6. Connection of alarm device

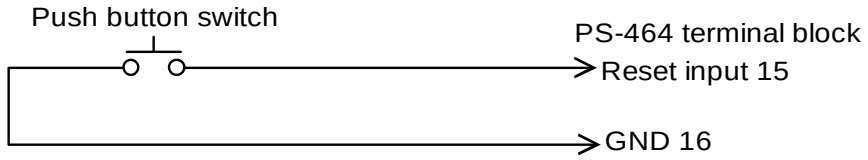
With the use of the alarm output contacts, alarm devices such as warning light and buzzers can be operated. It is necessary to prepare the power source for the alarm device separately.



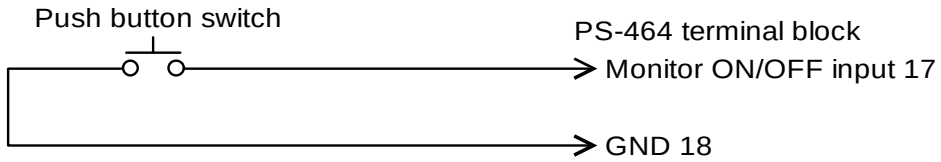
Wiring for alarm device

4-7. Connection of external reset, monitor ON/OFF button

Locate the reset switch or the monitor ON/OFF switch (button) in the system control panel if the control box is not close to the system control panel of the press. This will make the operation easier. Wiring is not particularly required.



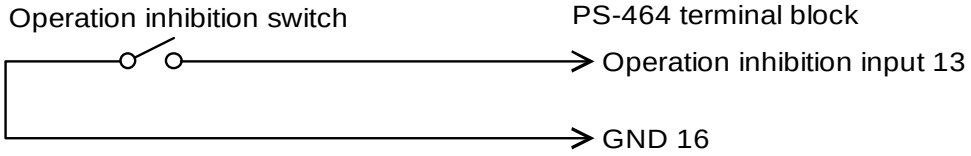
Wiring for external reset switch



Wiring for external monitor ON/OFF switch

4-8. Connection of operation inhibition switch

Connect the operation inhibition switch. Wiring is not particularly required.
The operation inhibition is enabled by turning this switch ON (close).

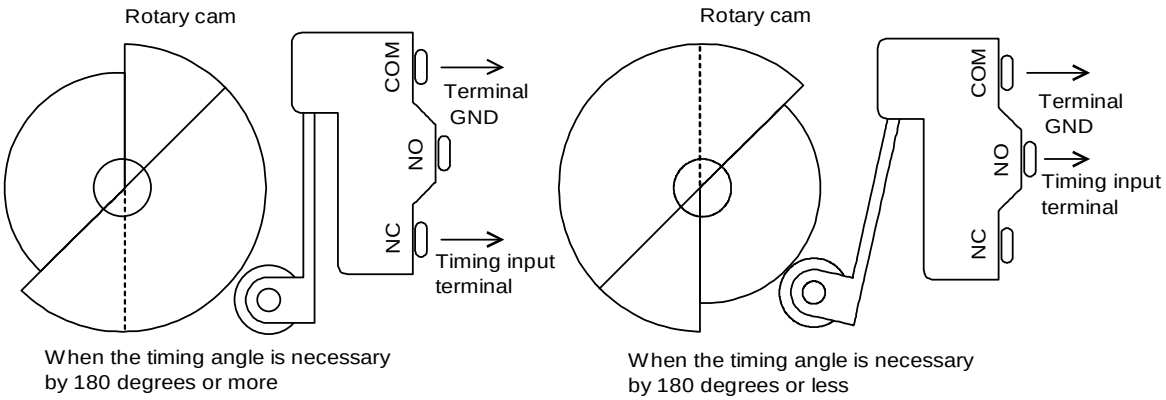


Wiring for operation inhibition switch

4-9. Connection of external timing signal

Connect the contact or contact-less signal of the no-voltage signal input to external timing input (3, 5) of the terminal block. The common terminal is indicated as GND. Connecting is not required when used in the internal timing mode.

Wiring for the limit switch change might be required depending on the width of the setting angle of the timing. Pay attention to NO and NC of the output when using the proximity switch.



Example of external timing connection

4-10. Power ON/OFF

The power source switch is located on the rear of the detector. Use the control power source of the press in normal times.

4-11. Cable compensation

Make sure that the sensor is connected and the gap between the sensor head and a target is sufficient. Check that the detector is at the monitor OFF (the lamp at the monitor ON/OFF button blinks red). Then, push the monitor ON/OFF button while holding down the RESET (FUNCTION) button.

Confirm that the compensation value of the channel connected with the sensor is not 0 with the use of the UP/DOWN button.

4-12. Check for gap between sensor head and target at bottom dead center

Check for the gap between the sensor head and a target at the bottom dead center in the condition of the monitor OFF. The gap is displayed in the GAP digital display by the unit of mm. Adjust the gap so that the value may become from 0.70 to 1.50.

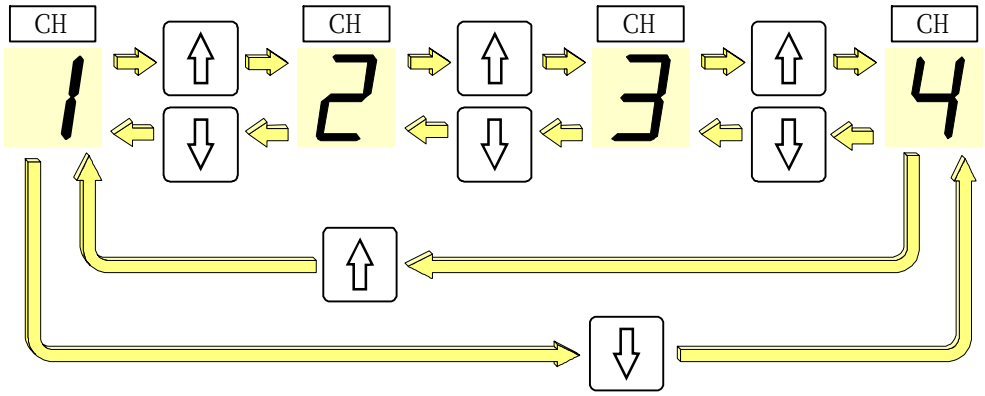
4-13. Parameter setting

Set the setting value, the timing mode, and the detection ON/OFF for each channel.

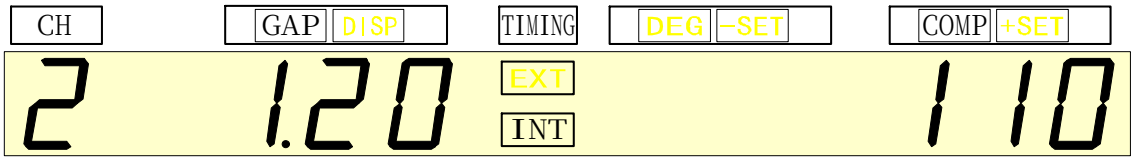
5. Operation

5-1. Selection of displayed channel

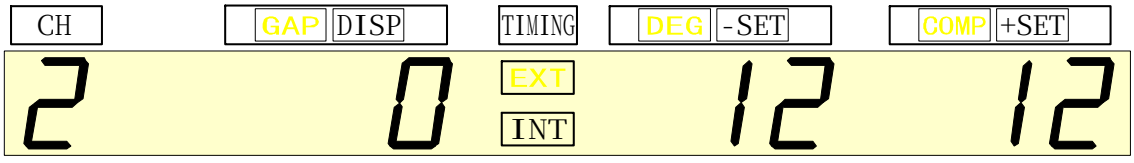
Select the channel to display in the digital display and the micron-indicator.
Confirming that the digital display does not blink, select the channel with the UP/DOWN buttons.
The selected channel is displayed in the channel number display.
The displayed data varies depending on the monitor ON or OFF. At the monitor OFF, gap and compensation value are displayed. The gap between the sensor head and a target is displayed in the micron-indicator. At the monitor ON, +SET value, −SET value, and displacement are displayed. The setting values and displacement are also displayed in the micron-indicator. Displacement, however, will not be displayed until the detection result is obtained.



Selection of channel on the display



Display in state of detection monitor OFF



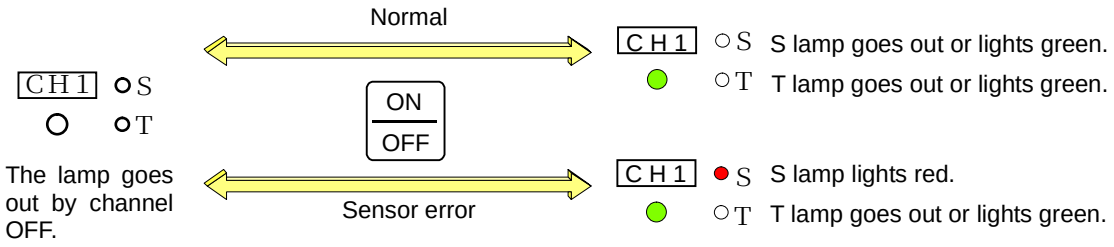
Display in state of detection monitor ON

Difference of digital display on the display
(Refer to *Function* for the micron-indicator)

5-2. Detection ON/OFF

To turn the detection channel on or off, push the corresponding detection ON/OFF button. If the detection of the channel is turned on, the stop display lamp lights green. When the sensor is improperly connected, the S (sensor) lamp lights red and a stop signal is output. The T (timing) lamp lights up or goes out depending on the timing mode.

When the detection of the channel is turned off, the stop display lamp goes out. However, the red stop display lamp stays on, if turned off in outputting the stop signal. In this time, push the RESET button to turn the red lamp off.



Detection channel ON/OFF

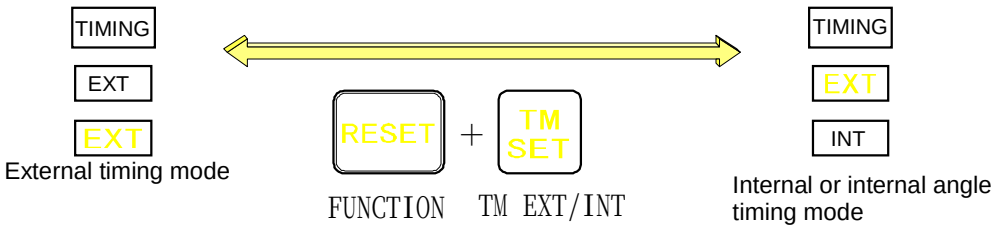
5-3. Monitor ON/OFF

The detection monitor of the detector is turned on or off by pushing the monitor ON/OFF button. The display lamp lights green at the monitor ON and the lamp blinks red at the monitor OFF.

Monitor ON/OFF

5-4. Setting of timing mode

To set up timing mode, push the TM SET button while holding down the RESET (FUNCTION) button. The lamp in the timing mode will be switched, 'INT' or 'EXT'. However, changing the detection ON channel is not allowed during the monitor ON.



Push the TM SET button, holding down the RESET button.

Setting of timing mode

5-5. Change of ±setting value

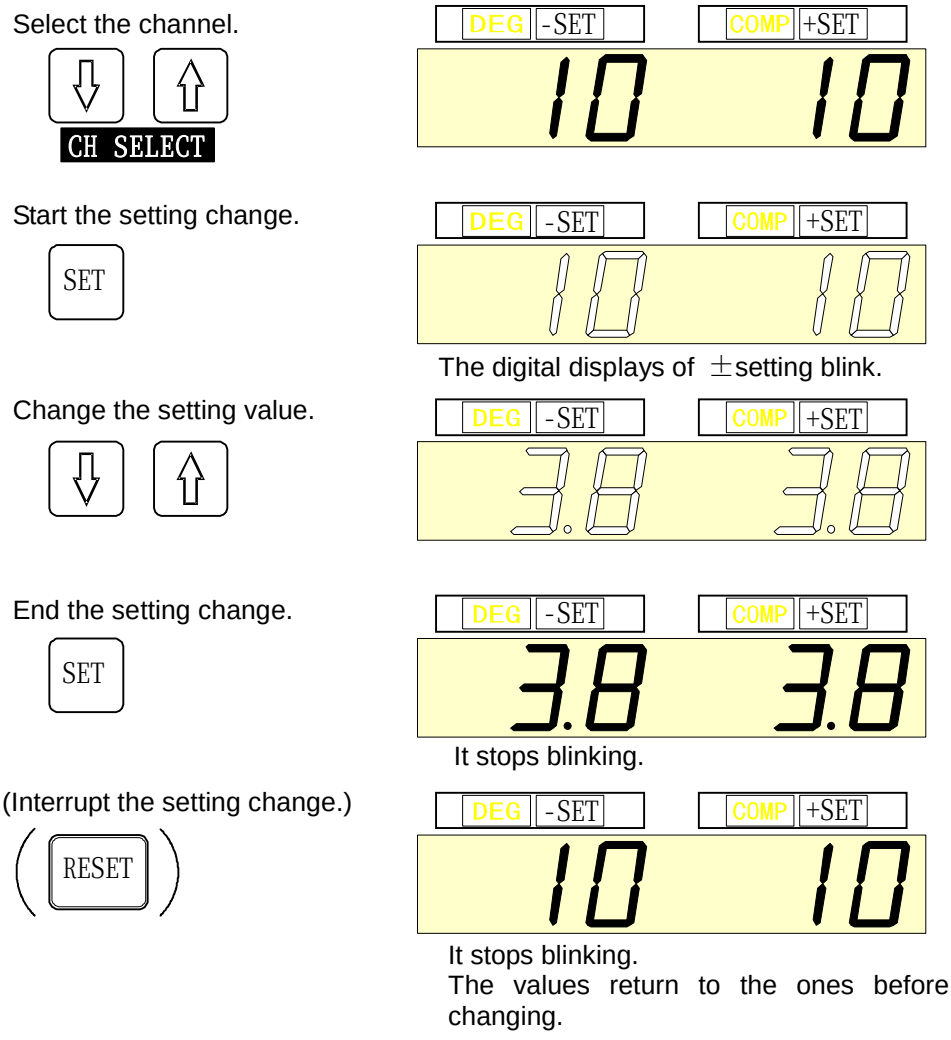
To change the setting value for a channel, select the channel with the UP/DOWN button. The setting value is displayed in the digital display at the monitor ON. At the monitor OFF, the value appears by pushing the SET button, not by the UP/DOWN button.

Two numerical values of the + SET value and the −SET value start to blink by pushing the SET button after selecting the channel. Change the blinking value with the UP/DOWN button.

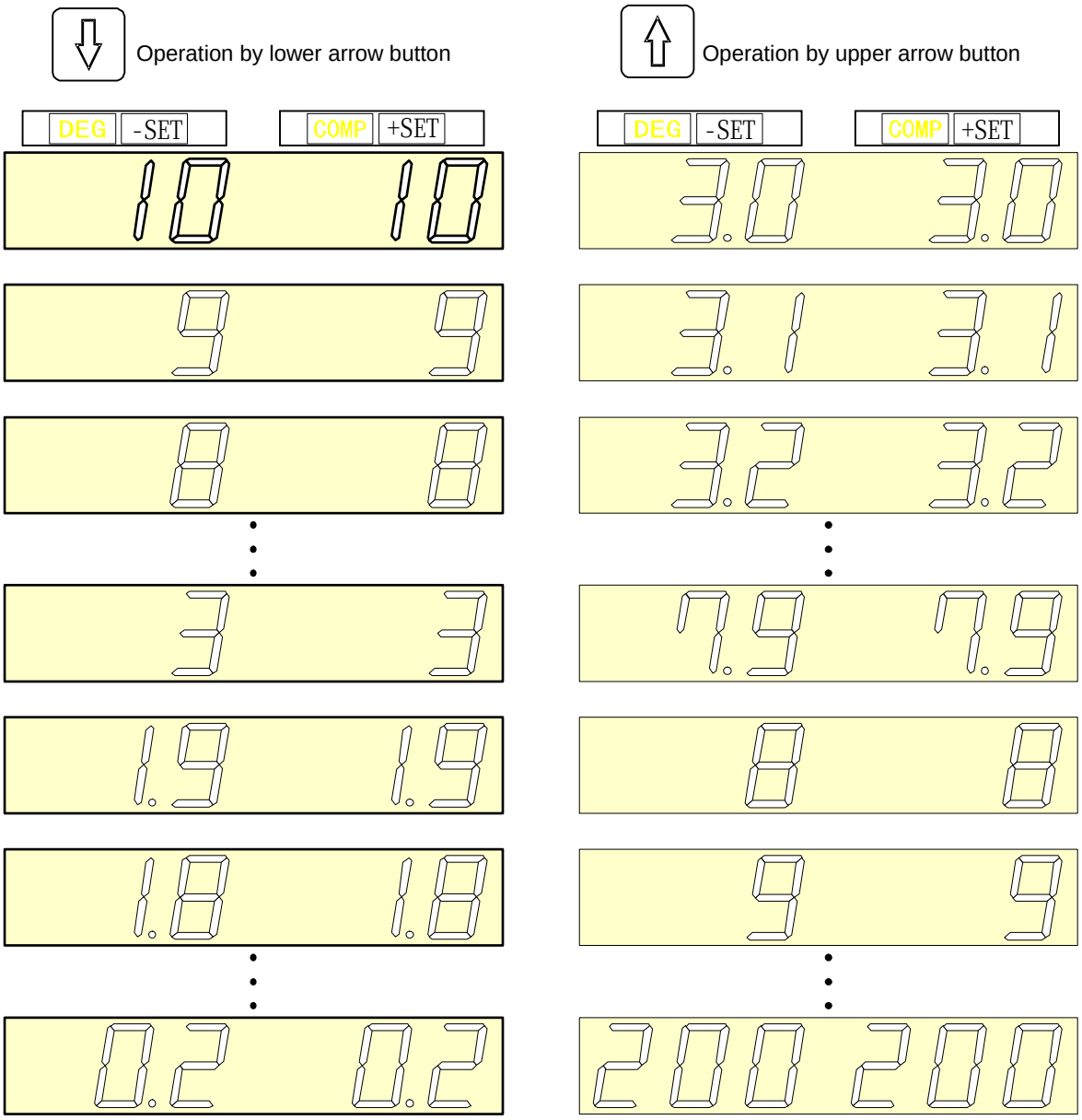
If 3 without a decimal point on the display is decreased by pressing buttons, the display will turn to the value with a decimal point. On the other hand, if 7.9 with a decimal point on the display is increased in the same way, the display will turn to the value without a decimal point.

If the required value is set and then the SET button is pushed, the setting change ends. If the RESET button or the TM SET button is pushed while the value blinks, the setting is interrupted and then the value returns to the one before making the setting.

After completion of the setting, the sensitivity will be changed. The setting value without a decimal point is shown with 200μm. The one with a decimal point is shown with 20μm.



Change of ±setting value



The minimum preset value is 0.2 μm.

The maximum preset value is 200 μm.

Selection of sensitivity

5-6. Change of –setting value

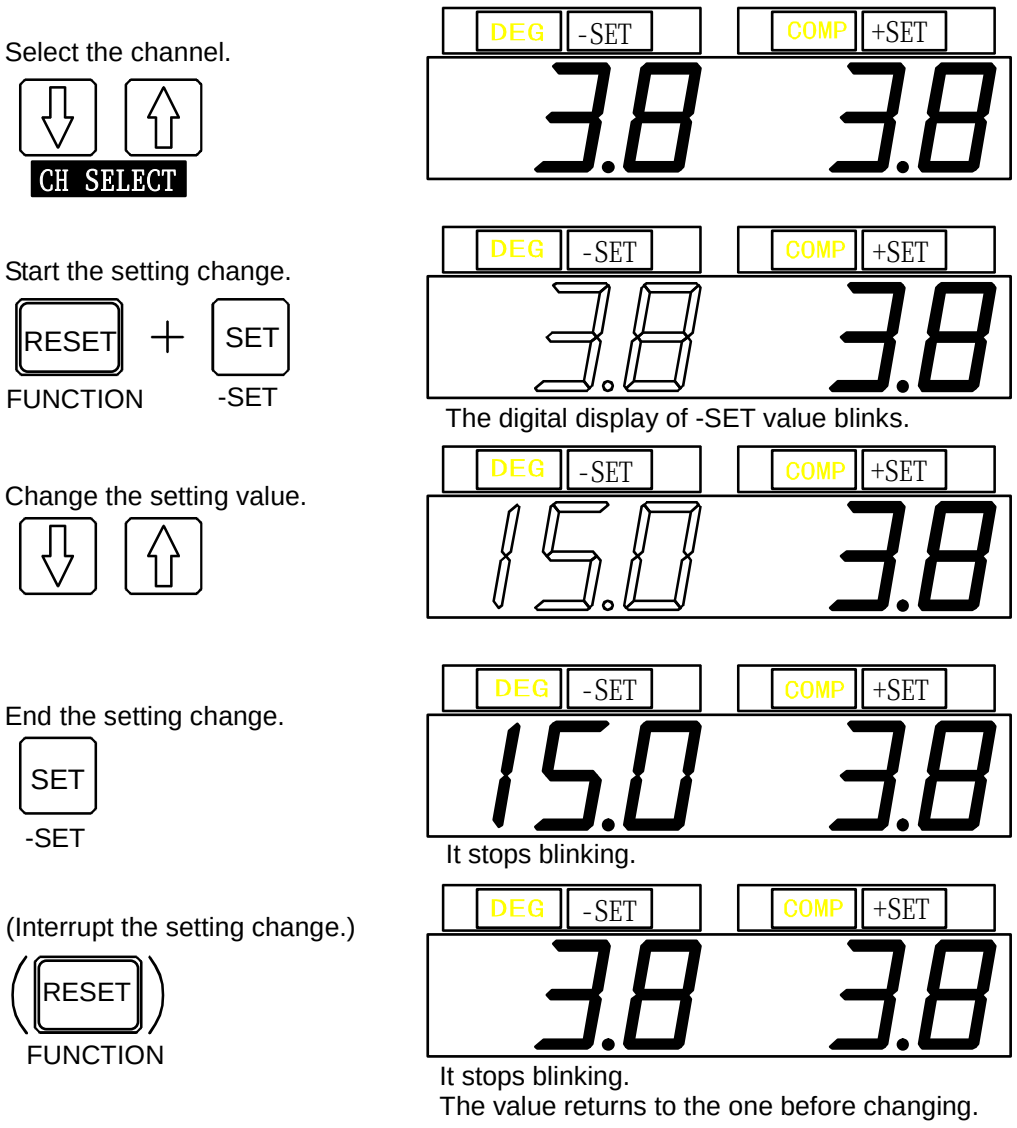
Select a channel by pressing the UP/DOWN button to change the –setting value of the channel. At the monitor OFF, even if the channel is selected, the setting value does not appear. It will appear when beginning to change the setting.

After selecting the channel, push the SET (–SET) button with the RESET (FUNCTION) button held down. Then, the –setting value begins blinking. Change the flashing –setting value with the UP/DOWN button.

Set the required value and then push the SET button to stop blinking and end the setting. If the RESET or the TM SET button is pushed while the –setting value blinks, the setting is interrupted and the value returns to the one before making the setting.

In changing the –setting value, neither changing from displayed without a decimal point to the one with a decimal point nor vice versa is allowed. In other words, changing sensitivity in the setting of the –setting value is not allowed.

In seeking the detection angle or trimming the setting value, changing the –SET value is not allowed.



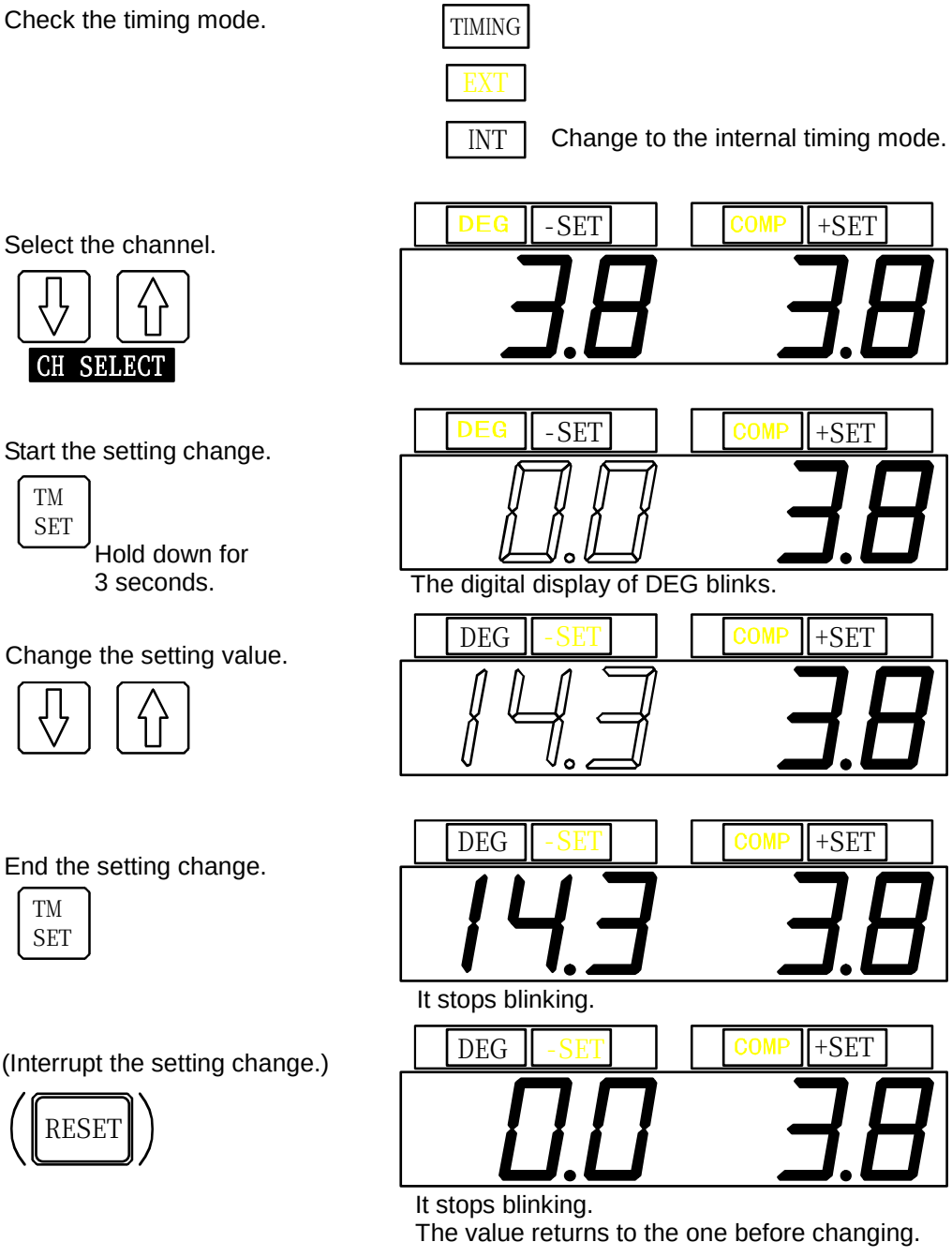
Change of –setting value

5-7. Setting of internal angle timing

To set up the internal angle timing, it is necessary to select the internal timing mode and set up the angle. If the external timing is set in the timing mode, the angle is impossible to set.

If holding down the TM SET button for three seconds, the angle digital display start to blink and then the setting starts. Select the angle with the UP/DOWN button. When the TM SET button is pushed, the setting ends. When the SET button or the RESET button is pushed while the digital display blinks, the setting is interrupted.

The internal angle timing becomes enabled except for the case where the angle is set to be 0. Set 0 in the angle setting to use the internal timing.



Setting of internal angle timing

Attention: Be sure to hold down the TM SET button for 3 seconds to change the angle setting.

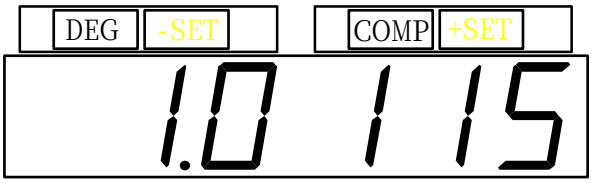
5-8. Seeking of detection angle

To start to seek the detection angle, it is necessary to set 1 in the device setting (39-4) and select the internal angle timing in the timing mode.

To seek the detection angle, three types of operational methods are available. When the detection angle is sought, the DEG lamp blinks and the detector enters the standby mode. When the required timing count is input at the standby mode, the detection angle is set and the operation ends.

To finish the standby mode (enter the complete mode), push the TM SET button while holding down the FUNCTION button. For the specified channel, turn the detection OFF, or push the –SET button while holding down the FUNCTION button.

Set the detection angle.
Select the internal angle timing.
Turn the detection ON.



Set any of the following operations.

RESET + Monitor ON/OFF
FUNCTION CABLE COMP

All the channels are in the standby mode.

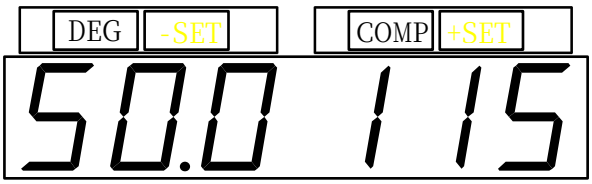
RESET + TM SET
FUNCTION TIMING

All the channels are in the standby mode.
Completed.

RESET + SET
FUNCTION -SET

The selected channel is in the standby mode.
Completed.

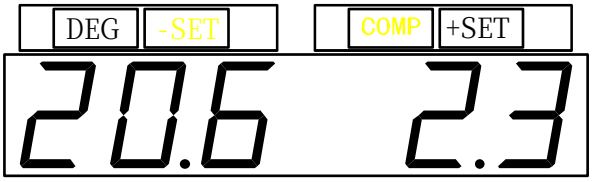
When it enters the standby mode of seeking the detection angle, “DEG” lamp blinks and the tentative angle is set.



Turn the monitor ON.

Monitor ON/OFF

When the required count of the sensor signal is input, the detection angle is set.
And the function of seeking the detection angle ends.



Seeking of detection angle

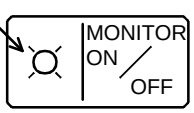
5-9. Manual cable compensation

To start this function, push the monitor ON/OFF (cable compensation) button while holding down the RESET (FUNCTION) button at the monitor OFF. Selecting the channel is not required. However, confirm that the compensation value of the channel connected to the sensor is not 0 after compensation.

When 1 is set in the detection ON after compensation (device setting 38-1), the channel lamp lights green after the cable compensation is completed.

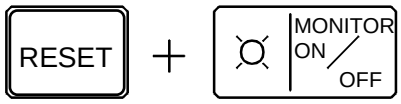
1. Connect the sensor head.
2. Keep the sensor head from a target.
3. Check that the detector is at the monitor OFF.

Check this lamp blinks.



CABLE COMP

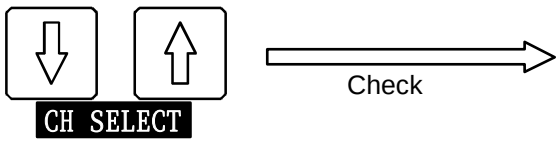
4. Conduct cable compensation.

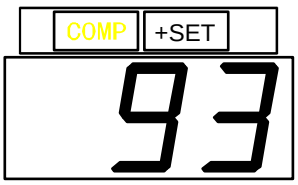


FUNCTION CABLE COMP

While holding down the RESET button, push the monitor ON/OFF button.

5. Check the compensation value.





Check that the compensation value is not 0 in the channel connected to the sensor.

Cable compensation

5-10. Reset of error and stop signal output

To release the error and stop signal output, push the RESET button. However, this cannot release the sensor error. Turn off the channel in which S lamp lights red, or check that the sensor and the sensor cable work normally.

5-11. Device setting

Change the mode from the operation mode to the device setting mode. Various functions are available. Refer to the *Device setting*.

6. Error

The lamp or the digital display indicates that an error occurs.

6-1. Error indicated with lamp

6-1-1. Sensor error

If a sensor error occurs, S lamp and the stop display lamp light red. The sensor error occurs when the sensor is not connected or the detection is turned ON for the channel showing 0 for the compensation value of the cable compensation.

If the channel not connected with the sensor was turned on, turn off the channel. When the sensor is connected, check that the cable compensation value is not 0. If the compensation value is 0, compensate the cable again.

If the compensation value is not 0, the error may be caused by an improper sensor head or sensor cable. When the cause is removed, the sensor error is automatically released.

6-1-2. Timing error

If a timing error occurs, T lamp and the stop display lamp light red. In the external mode, the timing error occurs if the external timing is improperly set. Change the angle setting of the external timing. Push the RESET button to release the timing error.

6-2. Error displayed with digital number

Push the RESET button to release the error showing 'E-nn' on the digital display. Displaying 'EEE' represents that the displacement exceeds the range. This is not malfunction of the detector.

6-2-1. Previous average standard level error (E-01, E-02)

Indicates that an internal amplifier gets saturated due to the material thickness change and voltage drift. This error occurs when using the 20μm range. If the error frequently occurs, set 200μm for the detection range.

6-2-2. Error of producing previous average standard (E-03)

Occurs when a sensor signal is not stabilized at the beginning of producing the previous average standard. This error frequently occurs when setting excessively small value for the angle of the internal angle timing. When the error occurs, set 0 in the angle setting, or correct it to the proper value.

6-2-3. Backup error (E-04)

Occurs when the voltage of the battery for the built-in memory backup gets low and the setting data has been initialized.

Adjust cable compensation, timing mode, and detection ON/OFF again when the backup error is displayed.

7. Device setting

Partial change is available in the specification such as operation and detection by the device setting mode.

Attention: Confirm that the program version displayed, when turning the power on, is the same with the version number in the cover of this manual (This instruction manual is for the version 3.0x) before changing the device setting. If the version number is not the same, the setting data may not correspond.

7-1. Switching to device setting mode

Turn the monitor OFF in the normal operation mode to enter the device setting mode. '1' blinks in the digital display of COMP/+SET display if the RESET button is pushed with the DOWN button held down. The number is also displayed in GAP/DISP digital display. When the operation inhibition is ON, switching to the device setting mode is not allowed.

7-2. Display of data, change of setting

In the device setting, an item of the setting is shown by the number, which is called as the item number or the device setting number. The item number appears in COMP/+SET display. The data of each item number is displayed in the GAP/DISP display. Select the value from 0 to 99 for the item number. If no data is set for an item number, the item number does not appear on the digital display. When an item number blinks, the item number can be changed with the UP/DOWN button. If pushing the SET button after selecting the item number, blinking will be transferred over the data. The blinking data can be changed with the UP/DOWN button. The detection ON/OFF button is occasionally used to change the setting value depending on settings. When the data is displayed with 4-digit of 0 or 1 and a single digit blinks, transfer blinking over digits by pushing the UP/DOWN button and change the data of the blinking digit by the detection ON/OFF button. Any detection ON/OFF button is available for changing the data. When each digit of 4-digit is set with 0 or 1, the 1^{st} digit is the leftmost and the 4^{th} digit is the rightmost. When 4-digit represents channels, the leftmost digit is channel 1, the rightmost is channel 4. In PS-462, the setting of the channel 3 and 4 are invalid. When pushing the SET button after changing the data, the setting value is recorded and blinking returns to the item number. Push the RESET button instead of the SET button to interrupt the setting. If the RESET button is pushed, the data returns to the value before the setting and blinking is transferred over the item number.

7-3. Initialization of setting

Select 0 in the device setting and then push the SET button while holding down the RESET button. This action returns the data to the factory setting. After the initialization ends, '1' appears for the item number.

7-4. Switching to normal operation mode

The detector is returned to the normal operation mode if the TM SET button is pushed during the device setting mode.

7-5. Details of device setting

7-5-1. Stop detection time (device setting 01)

Sets the time for detecting the interruption of the press. The detector determines, when the interval of the detection timing exceeds the preset stop detection time, that the press machine has stopped. The value ranges from 0 to 65.5 seconds, with the unit of second. However, if 0.0 is set, the stop detection does not work.

This option does not start unless the device settings (02, 03) (strokes of detection interruption) or the device setting (10) (setting of detection initialization) is set.

Initial value 0.0 sec (Stop detection is disabled.)

7-5-2. Strokes of 200μm detection interruption (device setting 02)

Sets the strokes of the detection interruption for the channel used in 200μm range. The setting value ranges from 0 to 9999. However, as for the channel in which the detection initialization (device setting 10) has been set, the detection initialization is prioritized and this setting is disregarded.

By using this setting together with the stop detection time, the detection can be automatically interrupted at the detection restart.

When the strokes of detection interruption function have been set, pushing the reset button leads to interruption of the detection for the specified strokes. While this setting is enabled, avoid unnecessary operation of the RESET button during detection.

Initial value 0

7-5-3. Strokes of 20μm detection interruption (device setting 03)

Sets the strokes of the detection interruption for the channel used in 20μm range. The setting value ranges from 0 to 9999. However, as for the channel in which the detection initialization (device setting 10) has been set, the detection initialization is prioritized and this setting is disregarded.

Other content is the same as the device setting (02).

7-5-4. Tentative standard detection (device setting 04)

Determines whether to start slug detection or not before completion of the previous average standard. Set 0 or 1 for each channel. Select '1' to enable this option. When the sample signals from the sensor reaches the preset sample number of the standard value (set in the device setting 07), the previous average standard will be completed. Without setting of the tentative standard detection, slug detection will start at the next stroke after the previous average standard has been completed. When 1 is set in the tentative standard detection, the detection starts at the 2nd sample.

If a large value is set for the sample number of the previous average standard, the detection will start at the earlier stage. If 1 is set in the sample number of the previous average standard (device setting 07), this setting is disregarded.

Initial value 0000

7-5-5. 200μm detection waiting strokes (device setting 05)
Sets the waiting strokes for the channel of the 200μm, taken 1 from the strokes which have been counted until producing the previous average standard after starting the detection by pushing the monitor ON/OFF button and the detection ON/OFF button. The number ranges from 0 to 9999. However, at least two strokes are required by the time of starting to produce the previous average standard.
Initial value 2

7-5-6. 20μm detection waiting strokes (device setting 06)
Sets the waiting strokes for the channel of the 20μm, taken 1 from the strokes which have been counted until producing the previous average standard after starting the detection by pushing the monitor ON/OFF button and the detection ON/OFF button. The number ranges from 0 to 9999. However, at least two strokes are required by the time of starting to produce the previous average standard.
Initial value 2

7-5-7. Sample number of previous average standard (device setting 07)
Sets how many sample values are required to produce the previous average standard. The value ranges from 0 to 9999, however, set from 1 to 64.
Initial value 2

7-5-8. Maintenance setting (device setting 08)
No setting change is allowed for this option.
Initial value 5

7-5-9. Automatic return strokes (device setting 09)
Sets the strokes for returning to the monitor ON from the monitor OFF. The values ranges from 0 to 9999. The detector does not return automatically if 0 is set. When all the channels are OFF, the automatic return does not start.
Initial value 30

7-5-10. Setting of detection initialization (device setting 10)
Selects the channel, which will be initialized when the press stops after the passage of the setting stop detection time (device setting 01) from the last sample.
Setting is with 4-digit numerical values of 0 or 1. To initialize a channel, set 1 for the channel. The channel is initialized by even pushing the RESET button when a slug is detected and a stop signal is output. When 1 is set in the device setting (42-2) and the initialization is set, the channel is initialized only by pushing the RESET button.
Initial value 0000 (No initialization)

7-5-11. Time for holding down the key (device setting 11)
Sets the time for holding down the key on the panel. Only the TM SET button requires holding down.
Set the value from 200 to 9999, with the unit of ms. Do not set from 0 to 199.
Initial value 3000ms

7-5-12. Key repeat time (device setting 12)
Sets the repeat time of the key repeat with the UP/DOWN button. Set from 1 to 9999 with the unit of ms.
Initial value 200mS

7-5-13. Spare (device setting 13)
The option is a spare. No setting data is in this device setting.

7-5-14. Setting end time (device setting 14)
Sets the time from the last operation of the setting change to the automatic end of the setting. The setting change is interrupted automatically, when the normal operation mode stays on without ending the setting change (the setting data blinks). Set from 0.1 to 65.5 seconds, with the unit of second.
Initial value 20.0 seconds

7-5-15. 200μm lower limit (device setting 15)
Sets the lower limit allowable in 200μm range. If the setting value falls below this limit in the normal operational mode, the setting is switched to 20μm range. The unit is μm. Set a smaller value than [(preset 20μm upper limit) ÷10] as well as within values ranging from 2 to 19.
Initial value 3

7-5-16. 20μm upper limit (device setting 16)
Sets the upper limit allowable in 20μm range. In this setting, the unit is 0.1μm step; when 100 is set, 10.0μm is shown. If the setting value equals to this limit or over in the normal operation mode, the setting is switched to 200μm range. Set a larger value than [(preset 200μm lower limit) ×10] as well as within values ranging from 10 to 200.
Initial value 80

7-5-17. Channel number offset (device setting 17)
Sets the offset value for the channel number display shift. The sum of the selected channel number and the offset value of the channel number appears on the channel display. If 4 is set, the channel number from 5 to 8 appear in PS-464. Set the values from 0 to 7.
Initial value 0

7-5-18. External input polarity (device setting 18)
Determines the input polarity of the operation inhibition on the terminal block. The display is shown with 4-digit of 1 or 0. The input polarity is determined by the value of the leftmost digit. Do not change other digits. Set '0' for ON in closing between the input and the GND, set '1' for ON in opening between input and the GND.
Initial value 0XXX

7-5-19. External timing polarity (device setting 19)
Determines the input polarity of timing input T12 and T34 on the terminal block. The display is shown with 4-digit of 0 or 1, corresponding to T12, T12, T34, T34 from the left digit. The higher 2-digit or the lower 2-digit is changed at the same time when changing this setting. Select '0' for ON in closing between the input and the GND, and '1' for ON in opening between the input and the GND.
Initial value 1111

7-5-20. Sensor error level (device setting 20)
Sets the value for detecting the disconnection of the sensor. Set the value from 0 to 255 for the system setting. Do not change.
Initial value 40

7-5-21. Timing alternate check for external (device setting 21)
Sets whether the timing alternate check is enabled or disabled for the channel currently used in the external timing mode. Shown with 4-digit numeric values of 0/1 for each channel. Set '1' to enable the timing alternate check for the channel.
Initial value 1111

7-5-22. Timing alternate check for internal (device setting 22)
Sets whether the timing alternate check is enabled or disabled for the channel currently used in the internal timing mode. Shown with 4-digit numeric values of 0/1 for each channel. Set '1' to enable the timing alternate check for the channel.
Initial value 0000

7-5-23. Reset output time (device setting 23)
Sets the time to output the reset signal from the external reset input terminal on the terminal block when pushing the RESET button. Set from 0 to 9999 with the unit of ms. When 0 is set, the signal is not output.
Initial value 200mS

7-5-24. Monitor ON/OFF output time (device setting 24)
Sets the time to output the monitor ON/OFF signal from the external monitor ON/OFF input terminal on the terminal block when pushing the monitor ON/OFF button. Set the number from 0 to 9999 with the unit of ms. When 0 is set, the signal is not output.
Initial value 0mS

7-5-25. Constant at external timing (device setting 25)
Sets the internal processing time of the external timing. Set the setting value from 0 to 255, with the unit of 0.1mS. When used in the stroke exceeding 2500 SPM, it is necessary to change the setting value.
Initial value 100 (10.0mS)

7-5-26. External input processing time (device setting 26, 27, 28, 29)
Sets the time for removing chattering in the external input signal. Set the setting value from 0 to 255 with the unit of ms. The device setting (26) is operation inhibition, (27) is reset, (28) is monitor ON/OFF, (29) is unused.
Initial value 20ms

7-5-27. Trimming of setting value (device setting 30)
Selects the channel in which trimming function is used. Set 0 or 1 for each digit, shown with 4-digit numeric values. Set 1 for the channel to enable this function.
Initial value 0000

7-5-28. Continuous trimming of setting value (device setting 31)
Selects the channel in which continuous trimming is used. Set 0 or 1 for each digit, shown with 4-digit numeric values. Set 1 for the channel to enable this function. If 0 is selected for the channel in the device setting (30), this setting is disregarded.
Initial value 0000

7-5-29. Setting increase percentage (device setting 32)
Used for computing the expected value by the trimming function. The increase percentage is set by the centile. The expected value is used as the comparing value for monitoring the displacement and computed as follows.
The expected value = maximum displacement × (setting increase percentage + 100) / 100
The setting increase percentage ranges from 0 to 200%. The expected value is limited not to exceed the setting value on the display.
Initial value 50%

7-5-30. Sample number of displacement (device setting 33)
Sets the sample number of displacement. The displacement will be taken in for detecting the maximum displacement used in the trimming function. At the 2nd and after detection of the maximum displacement, four times as many as the displacement sample number is taken in.
Initial value 20

7-5-31. Operation inhibition item 1 (device setting 34)
Selects which panel operation is inhibited when the operation inhibition input on the terminal block is activated. Inhibition of setting change, cable compensation, detection ON/OFF, and the TM SET button can be controlled. Shown with 4-digit numerical values of 0 or 1. Entering 0 permits 'operation is allowed', while 1 is 'operation is inhibited.' From the left in order, the digit represents "Setting change", "Cable compensation", "Channel ON/OFF" and "TM SET button". The operation of the TM SET button means changing the angle setting and the timing mode. While the operation inhibition input is activated, switching to the device setting mode is not allowed.
Initial value 1111

7-5-32. Operation inhibition item 2 (device setting 35)
Sets whether resetting of the stop output and switching of the monitor ON/OFF are inhibited or not when the operation inhibition input of the terminal block is activated.
Shown with 4-digit numerical values of 0 or 1. 0 is 'Operation is allowed.', while 1 is 'Operation is inhibited.' From the left in order, the digit represents "Monitor ON/OFF button", "RESET button", "External monitor ON/OFF input", and "External reset input".
Initial value 0000

7-5-33. Start, output polarity (device setting 36)
Sets starting condition and relay output polarity.
Shown with 4-digit numerical values of 0 or 1. From the left in order, the digit represents "Start", "Alarm", "Continuous inhibition", and "Stop output".
"Start" represents the detection status after the power ON. Entering '0' permits the monitor OFF while 1 is the detector ON.
In the settings of "Alarm", "Continuous inhibition", and " Stop output", the corresponding output relay polarity are switched. If 0 is selected, the detector is in the standard condition; if 1 is selected, NO and NC is switched. In the standard condition, "Alarm" is set to NO, "Continuous inhibition" and "Stop output" are selected to NC.
Regardless of this setting, when the power is cut off; the stop output is set to ON (close), the alarm and the continuous inhibition output are to OFF (open).
Initial value 0000

7-5-34. Absolute value detection (device setting 37)
Selects the channel that will be switched from the last value mode to the absolute value detection mode. When '1' is set for the channel, the channel enters the absolute value detection mode. The detection in such a channel is not guaranteed.
Initial value 0000

7-5-35. Cable compensation (device setting 38)
Shown with 4-digit numerical values of 0 or 1. From the left, the digit represents “Detection ON”, “Detection OFF”, “Monitor ON compensation”, and “Quick compensation” respectively. When ‘1’ is set for each digit, the function becomes enabled. If “Detection ON” is set, the detection is turned ON for the channel in which the cable compensation is completed. If “Detection OFF” is set, the detection is turned OFF for the channel in which the oscillation is not checked by the cable compensation. However, when 0 is set in the detection ON, this setting is disregarded. “Monitor ON compensation” is to execute the cable compensation when the detector is switched to the monitor ON. “Quick compensation” is to execute the cable compensation only by connecting the sensor.
Initial value 1001

7-5-36. Operation setting 1 (device setting 39)
Shown with 4-digit numerical values of 0 or 1. From the left, the digit represents “Timer timing”, “Time unit”, “Sensor error output”, and “Seeking detection angle”. “Timer timing” is to select the timing mode when the angle is set in the internal timing. When 0 is set, the internal angle timing is selected; when 1 is set, the timer timing is selected. “Time unit” is to set the time unit used in the timer timing. When 0 is set, the unit is selected to 1ms; when 1 is set, it is to 0.1ms. “Sensor error output” is to set whether a stop signal is output or not when the sensor error is detected at the monitor OFF. When 0 is set, the stop signal is not output; When 1 is selected, the signal is output. At the monitor ON, an error signal is output in regardless of this setting. “Seeking detection angle” is to set whether detection angle is sought or not. To seek the detection angle, set 1. When 1 is set, the timer timing mode is disregarded, and the internal angle timing becomes enabled.
Initial value 0000

7-5-37. Hold mode (device setting 40)
Sets the hold mode in the internal angle timing mode. Shown with 4-digit numerical values of 0 or 1. If 0 is set, the peak hold is selected; If 1 is set, the sample hold is selected.
Initial value 0000

7-5-38. Operation setting 2 (device setting 41)
Shown with 4-digit numerical values of 0 or 1. From the left, the digit represents “Holding down”, “Angle display”, “Monitor ON/OFF mode” and “All channels OFF”. In “Holding down”, select 1 to start the angle setting after holding down the TM SET button for three seconds; select 0 to start immediately. In “Angle display”, select 1 to display the angle that is presently set by pushing the TM SET button. When 0 is set, the angle does not appear. In this setting, when 0 is set at the leftmost digit, the setting is disregarded. “Monitor ON/OFF mode” is to set the external monitor ON or OFF. 0 is the edge mode, 1 is the level mode. In “All channels OFF”, the continuous inhibition output, when detection of all channels is OFF, is set. When 0 is set, the continuous inhibition is turned on: when 1 is selected, it is not turned on.
Initial value 1000

7-5-39. Operation setting 3 (device setting 42)

Shown with 4-digit numerical values of 0 or 1. From the left, the digit represents “External TM allocation”, “Reset initialization”, “Reset interruption”, and “Extension selection”.

In “External TM allocation”, change the allocation channel in the external timing. When 1 is set, T12 is changed to CH1, CH3, and T34 is to CH2, CH4.

“Reset initialization” is to set the detection initialization by the reset operation when the detection initialization (device setting 10) has been set. When 0 is set, this setting is disabled; when 1 is set, it is enabled. In the reset operation during outputting a stop signal, the detection is initialized in regardless of this setting. When the detection initialization is not selected, this setting is disregarded.

“Reset interruption” is to set the detection interruption by the reset operation when strokes of the interruption (device setting 02, 03) has been set. When 0 is set, the setting is disabled; when 1 is selected, it is enabled. In the reset operation during outputting a stop signal, the detection is interrupted in regardless of this setting. When 0 is set for the strokes of the interruption in the device setting (02, 03), this setting is disregarded.

“Extension selection” is to select whether to use the sample extension or the angle extension for the extension of the detection angle in seeking the detection angle. When 1 is set for the extension selection, the sample extension is selected; when 0 is set, the angle extension is selected. When the sample extension is selected, the detection angle width is adjustable with the unit of the internal sample time. When the angle extension is selected, the sum of the sought detection angle and the extended angle is set for the detection angle width.

Initial value 0000

7-5-40. Tentative detection angle (device setting 43)

Sets the angle limit of the detection to prevent the data of the expected position of the detection from being hidden at the peak of the bottom dead center in seeking the detection angle. Set the angle width ranging from the internal timing ON to the position before the bottom dead center. Set the values from 0 to 255° by the unit of 1°.

Initial value 50°

7-5-41. Skip angle (device setting 44)

Sets the angle limit of the detection to disregard overshoot of the sensor signal immediately after the internal timing ON. Set the angle width from the internal timing ON to the time when the sensor signal is stabilized after overshooting. Set the values from 0 to 99.9° by the unit of 0.1°.

Initial value 0°

7-5-42. Sample extension (device setting 45)

Sets the extension width of the peak hold timing in the sensor signal. This is used for extending the sample time in “Sample hold” function or the automatically sought detection angle. Because the sample extension value is “Time”, it is not influenced by the press SPM. To use the sample extension for the extension of the automatically sought detection angle, select the sample extension for the extension selection in the operation setting 3. The sample extension ranges from 0 to 255.

Initial value 0

7-5-43. Angle extension (device setting 46)

When selecting the extended angle in the extension selection of the operation setting 3, the automatically sought angle at the completion of seeking the detection angle is added with the extended angle and the sum is set for the detection angle. As the sum is treated as the detection angle, the sample time becomes inversely proportional to the press SPM. The value ranges from 0 to 25.5 for the extended angle.

Initial value 0 °

7-5-44. Sensor calibration value (device setting 50-82)

Used for calibrating. Do not change these settings.

7-6. Item list of device setting

Item Number	Function	Setting value	Initial value/data	
01	Stop detection time	0-65.5	0.0s	
02	Strokes of 200μm detection interruption	0-9999	0	
03	Strokes of 20μm detection interruption	0-9999	0	
04	Tentative standard detection	0/1	0000	0: disable 1: enable
05	200μm detection waiting strokes	0-9999	2	
06	20μm detection waiting strokes	0-9999	2	
07	Sample number of previous average standard	0-9999	2	Set 1 to 64.
08	Maintenance setting		5	Any changing is inhibited.
09	Automatic return strokes	0-9999	30	0: No automatic return
10	Setting of detection initialization	0/1	0000	0: do not initialize. 1: initialize.
11	Time for holding down the key	0-9999	3000ms	Set 200-9999.
12	Key repeat time	1-9999	200ms	
13	Spare			Setting is inhibited.
14	Setting end time	0.1-65.5	20.0s	
15	200μm lower limit	0-9999	3	1μm unit
16	20μm upper limit	0-9999	80	0.1μm unit
17	Channel number offset	0-255	0	Set 0-7.
18	External input polarity	0/1	0XXX	0: NO 1: NC Only for operation inhibition input.
19	External timing polarity	0/1	1111	0: NO 1: NC T12,T12,T34,T34
20	Sensor error level	0-255	40	Any changing is inhibited.
21	Timing alternate test for external	0/1	1111	0: no test 1: test, CH1,CH2,CH3,CH4
22	Timing alternate test for internal	0/1	0000	0: no test 1: test, CH1,CH2,CH3,CH4
23	Reset output time	0-9999	200ms	
24	Monitor ON/OFF output time	0-9999	0ms	
25	Constant at external timing	0-255	100	0.1ms
26	External input processing time	0-255	20ms	Operation inhibition
27	External input processing time	0-255	20mS	Reset
28	External input processing time	0-255	20mS	Monitor ON/OFF
29	External input processing time	0-255	20mS	Spare
30	Trimming of setting value	0/1	0000	
31	Continuous trimming of setting value	0/1	0000	
32	Setting increase percentage	0-255	50%	Upper limit 200%
33	Sample number of displacement	0-255	20	4 times larger for continuous use
34	Operation inhibition item 1	0/1	1111	0: permitted 1: inhibited Setting change, Cable compensation, Channel ON/OFF, TM SET button

35	Operation inhibition item 2	0/1	0000	0: permit 1: inhibited Monitor ON/OFF PB、Reset PB、 Monitor ON/OFF IN, Reset IN
36	Start, output polarity	0/1	0000	0: Standard 1: Reverse Start, Alarm, Continuous inhibit, Stop
37	Absolute value detection	0/1	0000	
38	Cable compensation	0/1	1001	Detection ON, Detection OFF, Monitor ON compensation, Quick compensation
39	Operation setting 1	0/1	0000	Timer timing, Time unit, Sensor error output, Seeking detection angle
40	Hold mode	0/1	0000	0: peak hold 1: sample hold
41	Operation setting 2	0/1	1000	Holding down, Angle display, Monitor ON/OFF mode, All channels OFF
42	Operation setting 3	0/1	0000	Ext. TM allocation, Reset initial, Reset interrupt, Extension select
43	Tentative detection angle	0-255	50 °	
44	Skip angle	0-25.5	0.0 °	
45	Sample extension	0-255	0	With the unit of 0.1μs
46	Angle extension	0-25.5	0.0 °	
47	Spare			Setting is inhibited.
48	Spare			Setting is inhibited.
49	Spare			Setting is inhibited.

The following settings are for the calibration mode. If their setting values are changed, the detector will not work properly. DO NOT change them.

Device setting 50 Distance of center
Device setting 51, 52, 53, 54 LGAIN
Device setting 55, 56, 57, 58 HGAIN
Device setting 59, 60, 61, 62 LOFFSET
Device setting 63, 64, 65, 66 HOFSSET
Device setting 67, 68, 69, 70 SNGAIN
Device setting 71, 72, 73, 74 CENTRV
Device setting 75, 76, 77, 78 TMONV
Device setting 79, 80, 81, 82 TMOFFV

8. Specification and performance

8-1. Detection

The number of channels	4(PS-464), 2(PS-462)
Resolution	1μm or 0.1μm
Maximum setting value	200μm or 20.0μm
The closest gap between sensor head and target (BDC)	0.7-1.5 mm
Sensor environmental temperature	0-55°C
Detection timing	External, internal, internal angle timing, and timer timing
The length of sensor cable	3m (standard)
SPM	4000SPM (MAX)

8-2. Output (Stop, Alarm, Continuous inhibition)

Relay output	250VAC/30VDC 3.0A (MAX)

8-3. External input (Reset, Monitor ON/OFF, Operation inhibition)

Input specification	Connect the contact of no-voltage or the semiconductor switch. Internal voltage (DC12V) type
H level	9.0V or over, 1mA or below
L level	3.0V or below, 8mA or over (12mA MAX)

8-4. Display and setting

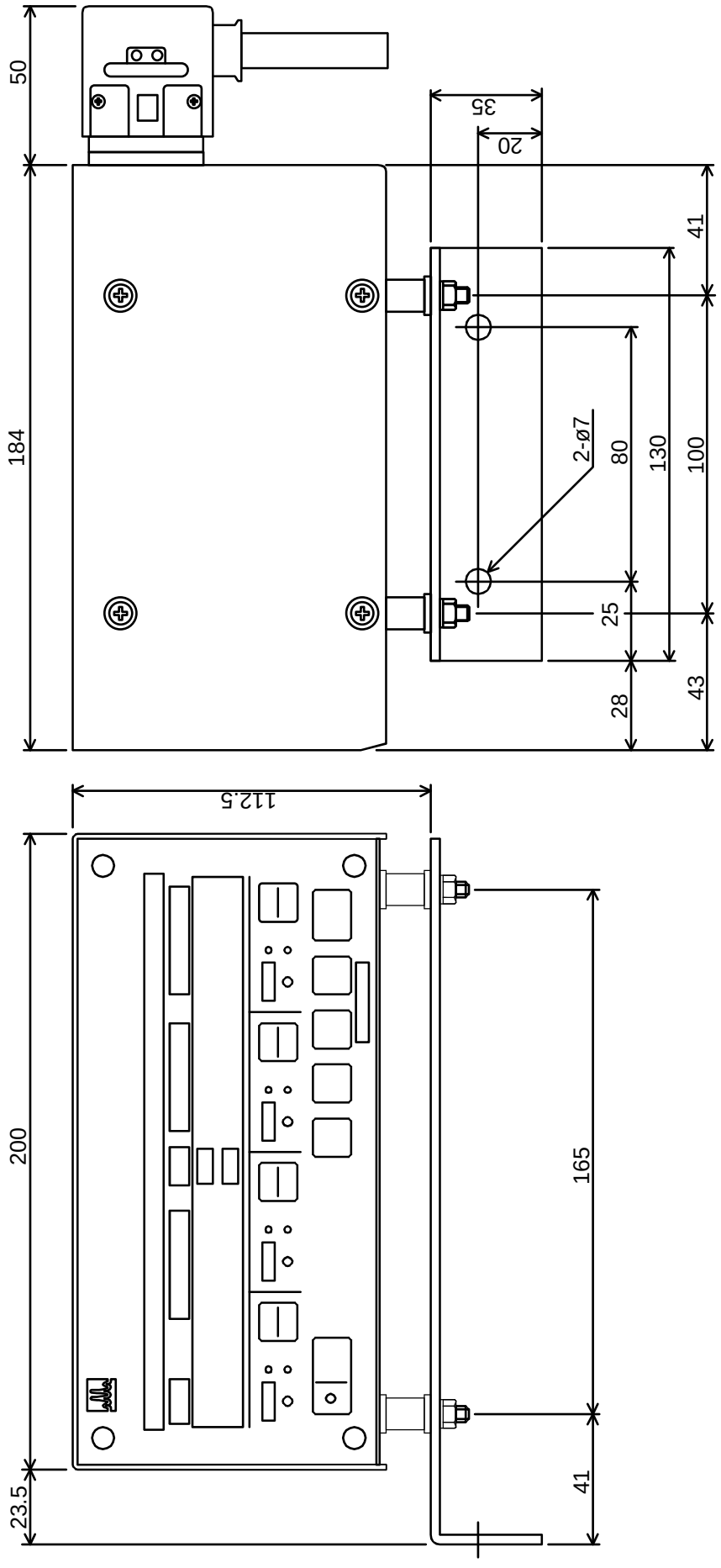
Micron-indicator	61 Point Bar Graph
Channel No.	1 digit
Displacement	Sign + 3-digit
±Setting value	3-digit
Channel condition	Sensor, Timing, ON/OFF lamp
Setting change	With the use of UP and DOWN buttons

8-5. Power source

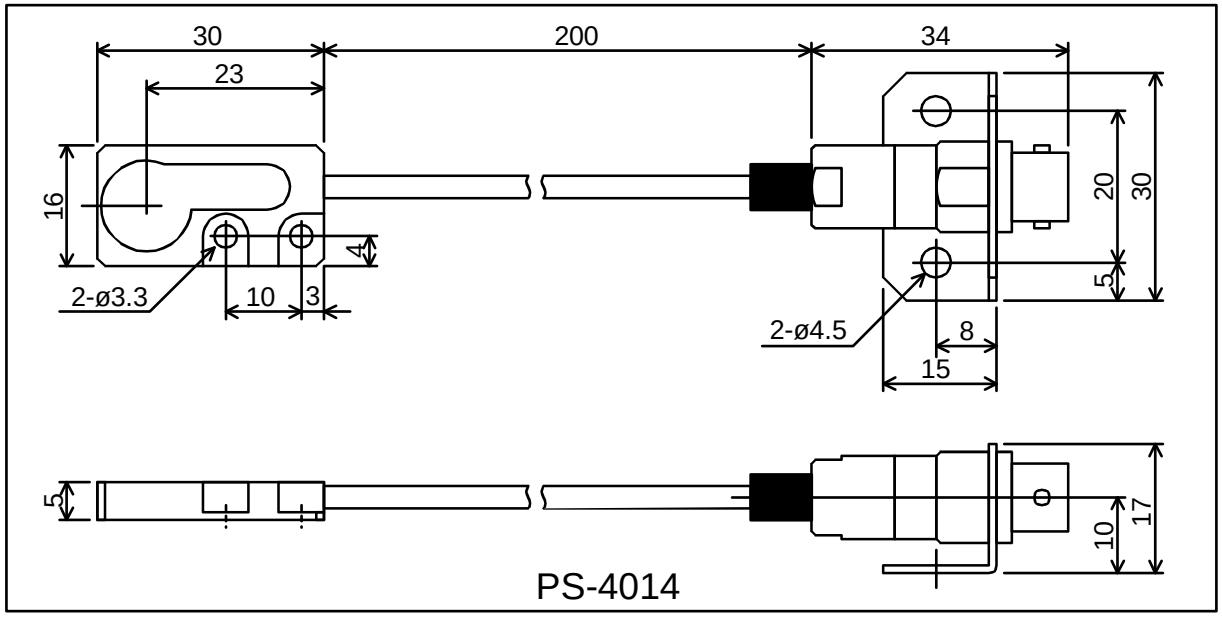
Voltage	AC100-240V ±10% 50/60Hz
Consumption	22VA (MAX)
Weight	2.8KgW
Dimensions (WHD)	200×98.5×184[mm] Projection is not included.
Environmental temperature	0-55°C No sudden temperature change during the use.
Environmental humidity	35-85% RH (No condensation)
Environmental atmosphere	Free of corrosive gas, dust

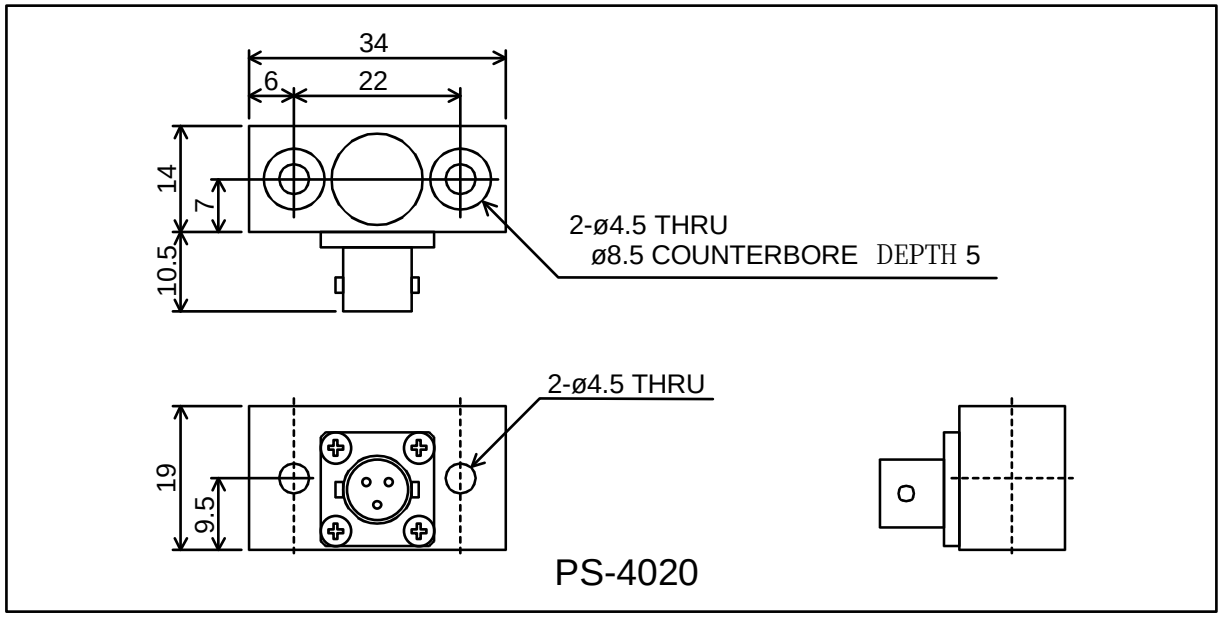
9. Dimensions

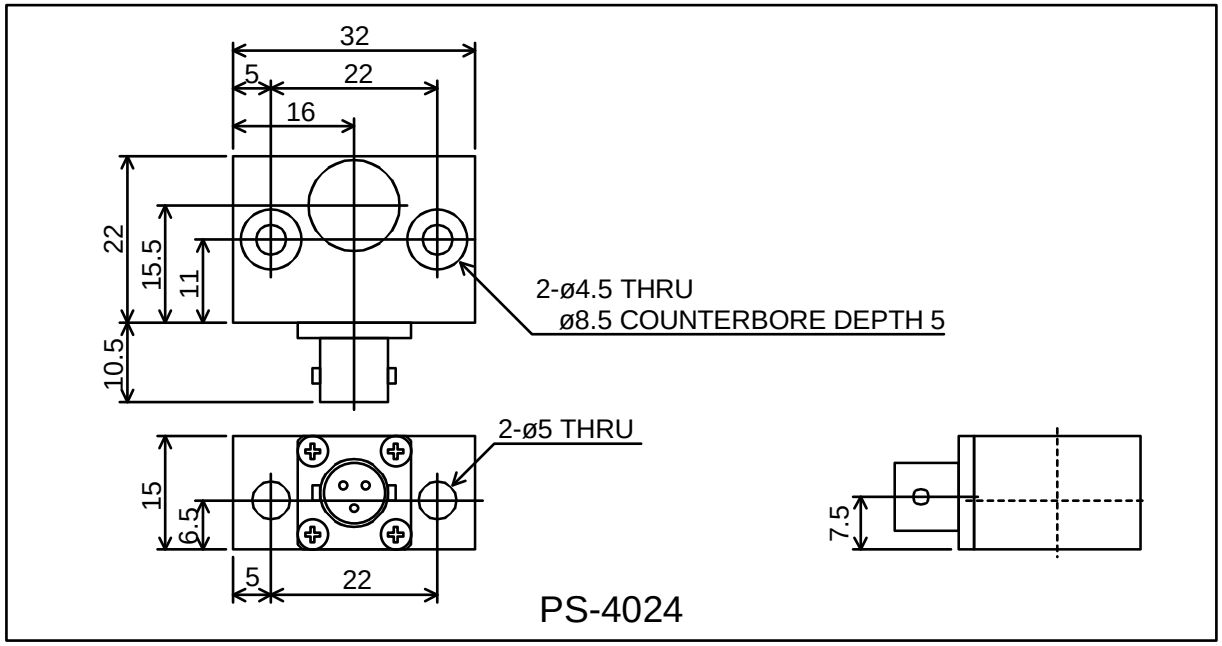
9-1. Control box

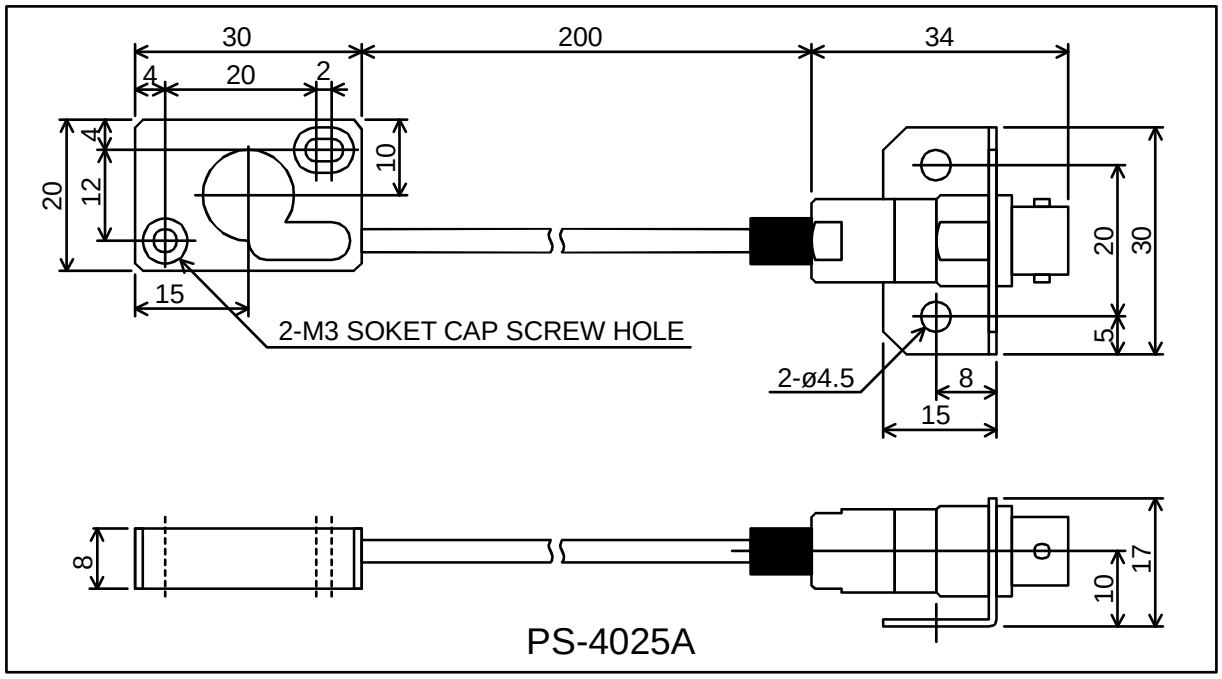


9-2. Sensor head

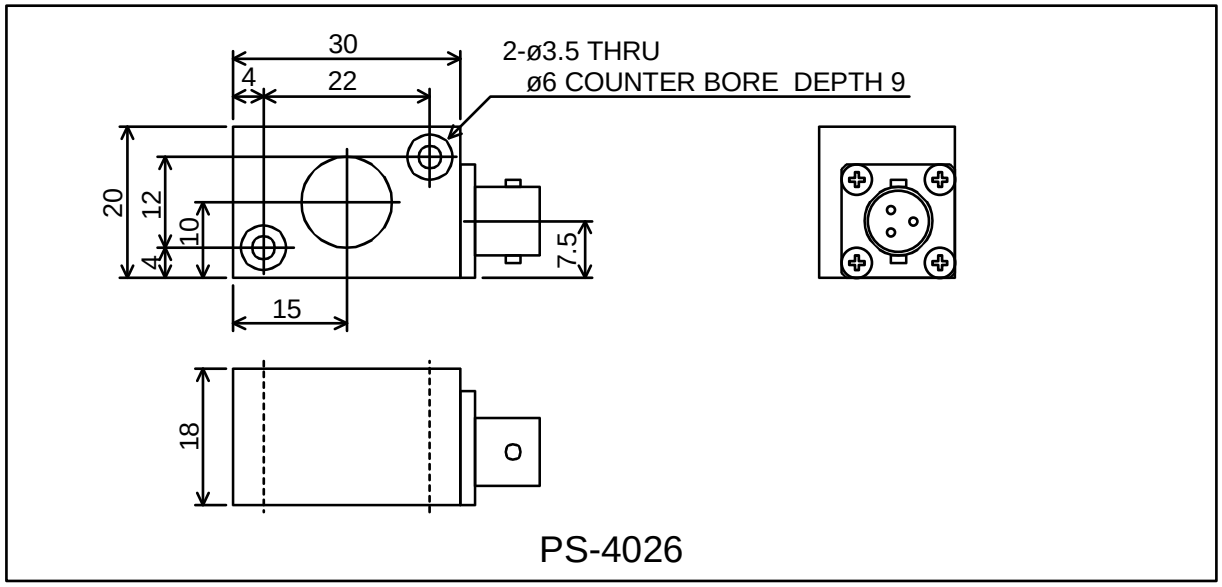




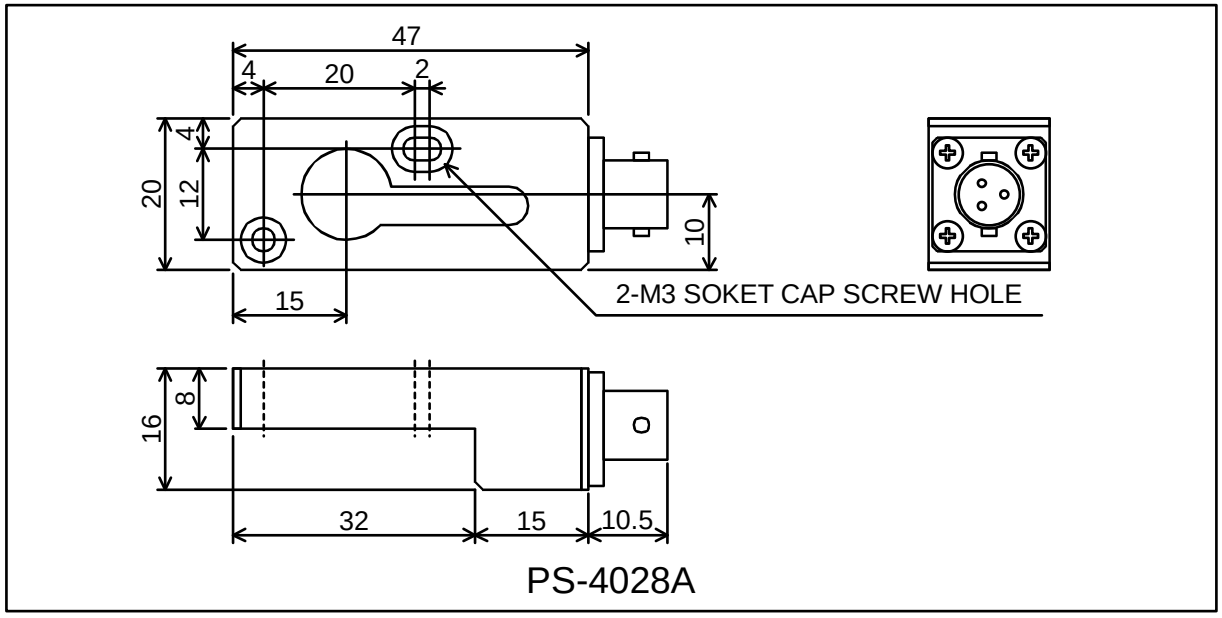




PS-4025A



PS-4026



PS-4028A

WARRANTY

All Sugiyama Electric System products are warranted against defective materials and workmanship for one year from the date of delivery, provided the product is installed and operated in accordance with factory recommendations and instructions. 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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