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High Resolution Automatic Die Monitoring System

MODEL: MICRON III

Instruction Manual

(Provisional Version)

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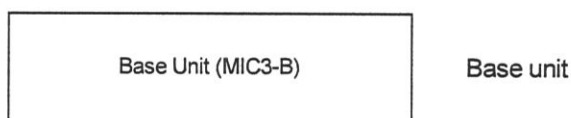
Description

Press Slug Detector is a device designed to detect faults (dents, etc. resulting from slug inclusion) of works during press operation. It judges whether the work is normal or faulty at BDC (Bottom Dead Center) on a signal from a proximity sensor installed to the press.

In addition, the device includes special functions such as detection of speed (spm) slowdown.

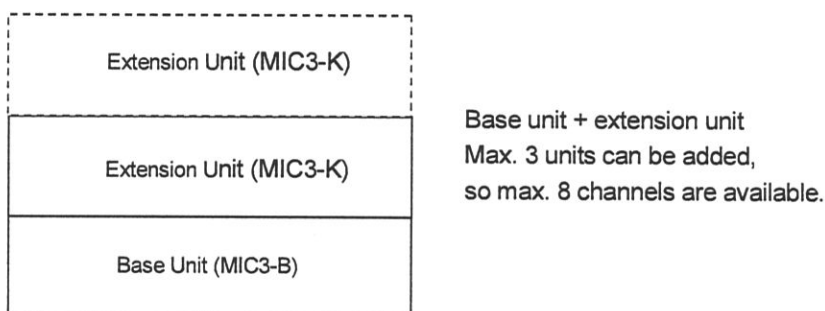
The device is composed of a two-channel base unit and a two-channel extension unit which are interconnected via a communication line

Product Structure



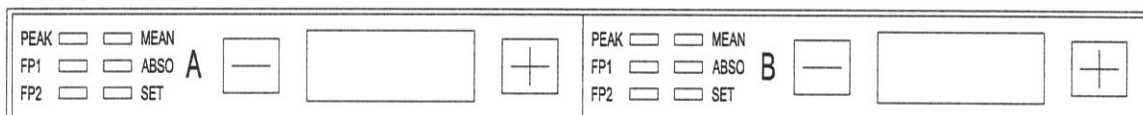
The two-channel base unit incorporating two relay output systems for outputting fault, etc. signals.

Base Unit + Extension Unit (up to three extension units are connectable)

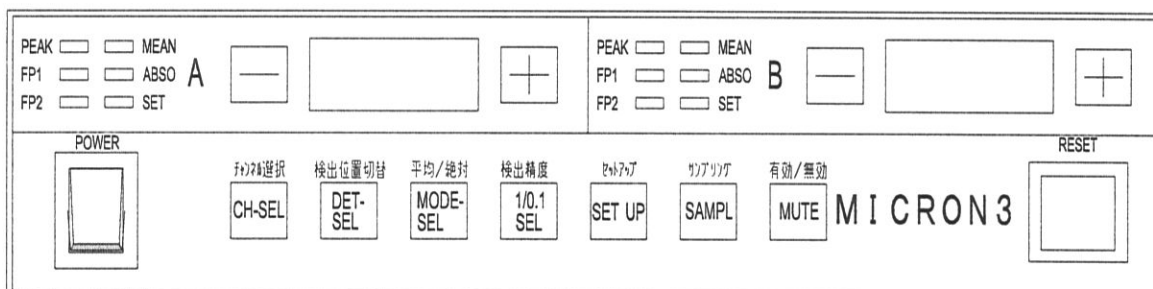


Panel Layout and Key Control

Panel Layout of Extension Unit



Panel Layout of Base Unit



Control keys [+] and [-] are provided for each channel and common keys for each unit are installed to the base unit only. The [+] and [-] keys for each channel are used to establish set values. The common keys available in only the base unit are as follows:

CH-SEL (Channel Selection): When operating each channel (setting, detection, etc. modes.), press this key to select a channel. The selected channel is indicated with the SET lamp lit in red.

DET-SEL (Detecting Position Selection): Selects the detection mode. With this key, you can select the Bottom Dead Center (PEAK), Front Porch 1 (FP1) and Front Porch 2 (FP2). The selected position is indicated by a lamp of each channel.

MODE-SEL (Mean/Absolute): Selects between display modes, mean values and absolute values. Display is changeable, but detection remains on in both modes.

1/0.1 SEL (Detection Accuracy): Only when 10/1 is selected at Item No. 7 of the menu, you can select between 0.1μ and 1μ detections on each unit.

SETUP: Selects between setup and detection modes for clearance adjustment or sensor calibration.

SAMPL (Sampling): Press this key to readjust the standard for absolute values.

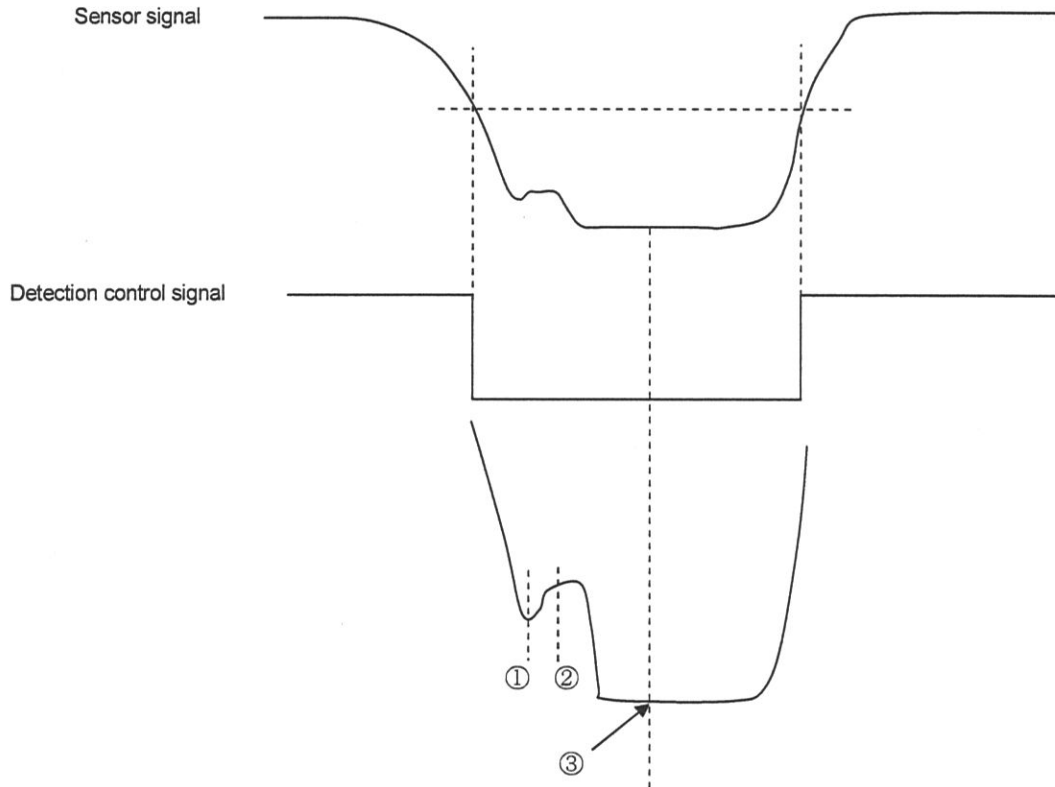
MUTE: ON-OFF switch key.

When a channel is selected, only the channel can be turned ON or OFF. When no channel is selected, the overall system can be turned ON or OFF.

RESET: Used at the time of power-ON or return to the initial state after fault detection.

Detection Method

The detecting operation of the device under actual operating conditions is shown below.



- **BDC detection**

The standard mode to detect position ③ (lowest BDC).

- **FP1 detection**

The mode to detect the first peak, i.e., to detect the stripper position at the instant when the stripper strikes the die (material).

- **FP2 detection**

The mode to detect the stripper position while the stripper striking the die (material) is compressed by the liner, etc. At this position, more stable detection can be done than at position ①.

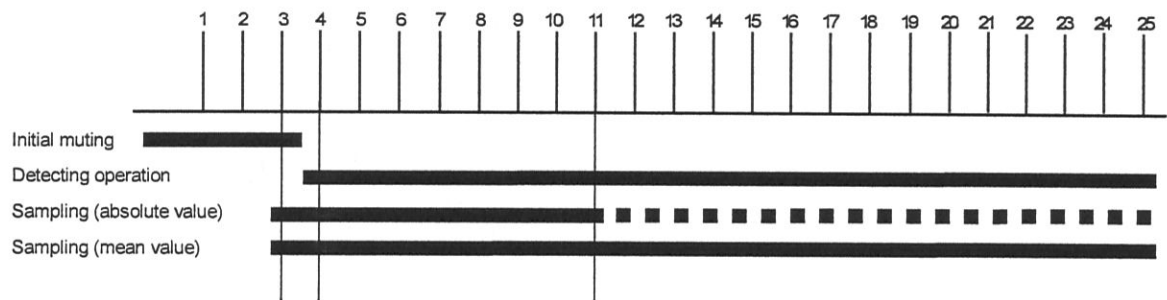
Note: Detection modes ① and ② vary greatly in detection accuracy, depending on the die structure, so which of them should be selected, based on the results of actual operation.

Detection Method

● Operation at startup

At startup (In case of the Default Settings)

The number of initial mutings (bypassed strokes) is 3, and the number of samplings is 8 for both mean and absolute value detections.



After startup, muting continues the set number of initial mutings. Sampling starts at the last bypassed 3rd stroke, and detection starts at the 4th stroke. As mean values are sampled, the 4th stroke data is compared with the 3rd stroke data, the 5th stroke data with the 4th stroke data, the 6th stroke data with the mean value of the 4th and 5th stroke data, the 7th stroke data with the mean value of the 4th, 5th and 6th stroke data and so forth until the set number of samplings is reached. In the case of absolute values, when the set number of samplings is reached, the data is always compared with the data obtained at that time. In the case of mean values, the data obtained at and after the end of the set number of samplings is always compared with the mean value of the preceding data.

Other Operations

Operation at power-on

The RESET lamp blinks.

The stop output (RL1) relay remains OFF and the auxiliary output (RL2) relay turns ON.

1. Normal state

The normal state means the condition in which a reset signal is input with the power turned ON.

The RESET lamp goes off. Two relays remain ON.

2. Operating state

The device is put into operation when a sensor signal (internal timing) or a timing signal (external timing) is input.

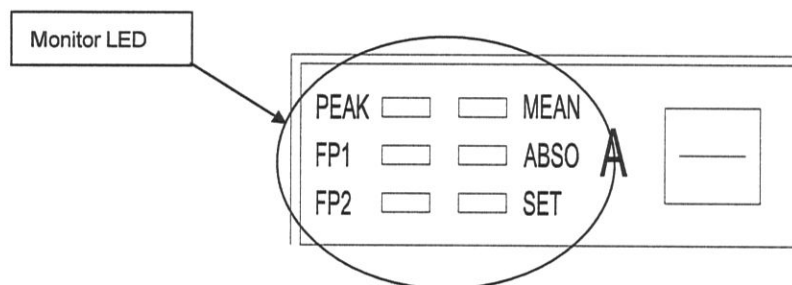
In the case of internal timing, when a sensor signal is not input after the lapse of 1.5 times the last signal cycle time, the device judges this to be an indication of stop and shifts to the normal state (1-second stop output (RL1) relay turns OFF). Two relays remain ON.

3. At fault detection

The fault state occurs when a fault is detected by one of the channels or caused by slowdown. In the case of channel fault, the detection value of the fault detection channel blinks. The RESET lamp blinks. The stop output (RL1) relay turns OFF.

ON-Off switch of each channel

By pressing the MUTE key, fault detection by a specified channel is turned ON or OFF. When a channel is set to OFF, all monitor LEDs of the channel go off.



4. Reset input

Reset operation is performed when the RESET button on the panel is pressed or an external reset signal is input. When a reset signal is input at fault detection or power-ON, the RESET lamp goes off. Two relays remain ON.

Other Operations

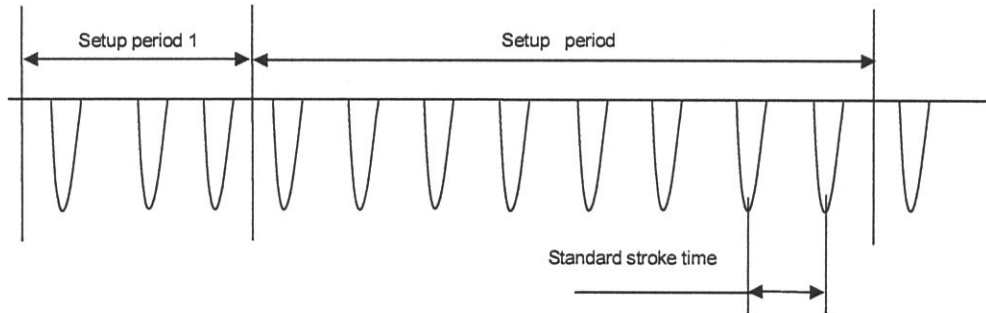
5. Operation of slowdown detection

Slowdown detection is performed, depending on the setting of slowdown by menu selection.

When the set value is -50%, slowdown detection is inactive.

The last stroke time after the setup period 2 at startup is taken as standard and compared with the succeeding stroke times. When as a result an extension of time (slowdown) exceeding the set value is found to have occurred, the device turns OFF the fault output relay, judging that a fault has occurred.

At that time, the device displays the state of stop by slowdown (displays "SLO" at the respective detection values of CH-A and CH-B). The RESET lamp blinks.



The standard stroke time is taken equal to 100% and 1% thereof is determined. Then the value of [stroke time - standard stroke time] is calculated. When the difference exceeds the set time in %, the device judges that a fault has occurred.

The device returns to the initial state at the press of the RESET button on the panel or when an external reset signal is input. The screen display of stop by slowdown is turned off. The RESET lamp goes off.

6. Change of set value

Select the channel whose set value you want to change. The set value is changeable by the [+] and [-] keys of the selected channel.

Usually the digital display indicates the mean or absolute values of detection data, but the channel selected by the CH-SEL (channel selection) key switches to the set value display.

Pressing the [+] or [-] key allows to increase or to decrease the set value.

Mean values range from 0 to 99 (in units of 0.1 from 0.1 to 7.9, and of 1 at 8 and above at the time of high sensitivity, and in units of 1 at up to 5, and of 0.1 at 4.9 and below when the sensitivity is decreased). The settable range of absolute values is 1 to 50, but this actually means 10 to 500 μ .

There are two setting modes, i.e., the mode of setting \pm values and the mode of setting + and - values separately. In the case of setting + and - values separately, press the [+] and [-] keys at a time to switch between positive [+] and negative [-] settings.

7. Digital display

A three-digit display is provided for all channels and indicates normal detection values.

The display indicates mean values of -99 to 99 and absolute values of -500 to 500. However, all decimal points are lit because the three-digit display cannot show the negative [-] sign.

Other Operations

8. Error indication (the display blinks)

Sensor breakage or not connected
 Sensor calibration error—
 RESET button kept on 6 seconds or more
 Communication error—
 Slowdown

Er1 Relevant channel only
Er2 Relevant channel only
Er3 Both channels in the case of MIC3-B only
Er4 Both channels in the case of MIC3-B only
 “SLO” display for both channels in the case of MIC-B only

9. Fault counter Function

Usually the fault counter is set to 1 by menu selection. For example, when it is set to 3, the device cannot turn off the stop output (RL1) relay, judging that a fault has occurred, unless fault detection is made three times in succession. The fault counter operates in the following three modes:

Operation 1: Counts faults detected by all channels including the extension units.

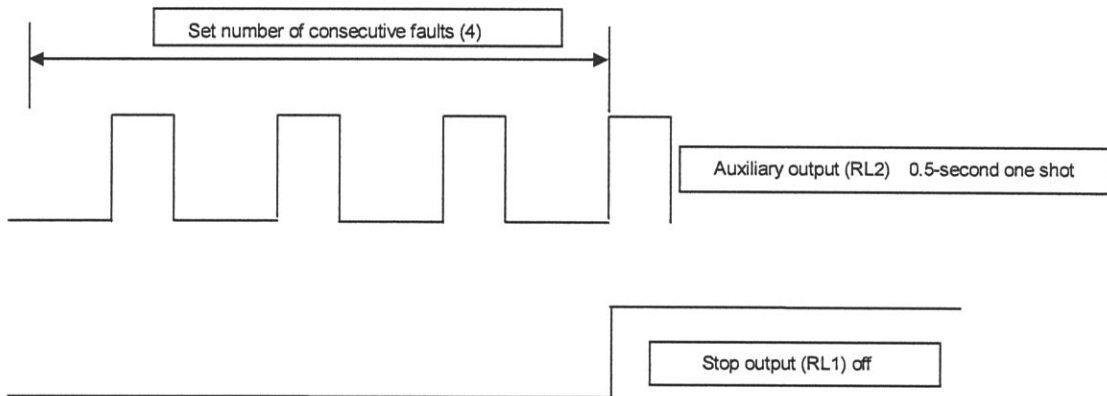
(1st stroke) (2nd stroke) (3rd stroke) (4th stroke)
 CH1 fault → CH2 fault → CH3 fault → CH4 fault Thus, the fault counter counts up to 4.

Operation 2: Counts a fault detected by each channel fault

(1st stroke) (2nd stroke) (3rd stroke) (4th stroke)
 CH1 fault → CH2 fault → CH3 fault → CH4 fault Thus, the fault counter counts 1, but does not count unless fault detection is made successively by the same channel.

Operation 3: Basically the same as operation 1 except that the auxiliary output (RL2) relay is turned off only 0.5 seconds at each fault detection.

How the auxiliary output (RL2) relay is turned off only 0.5 seconds in operation mode 3 is schematically shown below:



Other Operations

10. Sensor clearance adjustment

Press the SETUP key to establish the setup mode.

The deviation display of each channel indicates 102. (0 when the sensor is not connected).

The value of 0 means a small clearance (0.8 mm or less) and 102 a large clearance (1.8 mm or more).

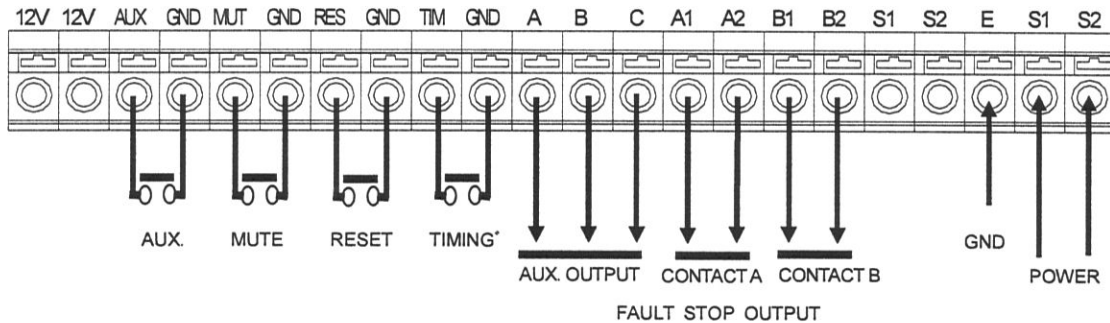
Hence, 51 is an intermediate value, so it is ideal to set the clearance to approximately 50 (± 25 or better).

After completion of clearance adjustment, press the SETUP key to shift to the normal mode.

11. Sensor calibration

Press the SETUP key to establish the setup mode. Continuing to press the RESET key 3 seconds or more causes the RESET lamp to illuminate momentarily (sensor calibration is complete). Press the SETUP key to shift to the normal mode.

Connection of Terminal Block



RESET:: The input terminal for external reset. Shorting of the terminal resets the device (the same operation as that by the RESET button on the front panel).

MUTE: The input terminal for external muting. Shorting of the terminal mutes fault detection.

TIMING: The input terminal for external timing. Use it when you want to specify the detecting position in the vicinity of BDC.

AUX.: Usually this terminal remains off, but operates when the function is changed by menu selection.

A power switch contact is placed between terminals A1 and A2. When the power switch is turned off terminals A1 and A2 are shorted.

Therefore, the press is capable of start-up even when the power to this device is turned off.

Auxiliary output relay usually operating in sync with power-on and power-off

	A1-A2	B1-B2
Power-off	OFF	ON
Power-on	ON	OFF

Fault stop output relay

	A1-A2	B1-B2
Power-off	ON	ON
Power-on in normal operation	ON	OFF
Power-on at fault detection	OFF	ON

E (FG) : The frame ground connectable to the frame.

POWER: The power input connectable to a single-phase 100-240 VAC power supply.

Menu Selection

Menu selection is to set basic device operations.

Changing the settings enables the device to perform intended operations.

1. Start of menu selection mode

To start the menu selection mode, press the SETUP and RESET keys three minutes or more at a time and release them when "ISE" appears on display A and the program version on display B. When the keys are released, the indicated "ISE" and program version disappear and "1" (menu number) appears on display A. During menu selection, the device is in the state of stop output provided.

2. Menu settings

"1" appears on display A. Additions and subtractions are performed by pressing the [+] and [-] keys, respectively. Shown on the display are menu numbers representing the following:

- 1 Number of initial mutings
- 2 Initial muting mode
- 3 Number of mean value samplings
- 4 Number of absolute value samplings
- 5 Setting of slowdown
- 6 Setting of operation mode
- 7 Sensitivity selection
- 8 Setting of FP 2 detection angle
- 9 Reset mode
- 10 Setting of internal timing detection
- 11 Chattering prevention time
- 12 Minimum working stroke speed
- 13 Fault counter
- 14 Fault counter operation mode
- 15 Change of external input polarity
- 16 External timing mode
- 17 Sensor selection
- 18 Sensor characteristics
- 19 Setting mode
- 20 Muting mode
- 21 Time setting of muting mode 1
- 22 Number-of -strokes setting of muting mode 2
- 23 Detection mode
- 24 Return to factory default settings

These 24 items are settable. Each of them is described below in detail.

Display B indicates the settings made by the [+] and [-] keys on that side.

3. Exit from menu mode

Press the RESET button to store the set values and exit from the menu mode.

(1) Number of initial mutings (default: 3, settable range: 0-250)

To prevent detection errors due to the instability of operation at press-startup, detection is muted the set number of strokes after press startup and starts at the first stroke after the set number.

Menu Selection

(2) Initial mute operation mode (default: 1, settable range: 1 or 2)

1: Mode in which detection is muted the set number of initial mutings.

2: Irregular operation mode in which detection at the 1st stroke is muted, the detection value on the display increases to 8 times the set value at the 2nd and 3rd strokes, 4 times at the 4th and 5th strokes and 2 times at the 6th and 7th strokes and detection starts with the set detection value at the 8th stroke.

(3) Number of mean value samplings (default: 8, settable range: 1-250)

Sets the number of samples for mean value detection. The detection data is compared with the mean of the set number of data to detect whether the work is good or faulty.

(4) Number of absolute value samplings (default: 8, settable range: 1-250)

Sets the number of samples for absolute value detection. After detection becomes operational after press startup, the standard value is determined by averaging the set number of data. Then this value is compared with the detection data to detect whether the work is good or faulty. During sampling for the standard value, detection is performed in comparison with the preceding mean value data.

(5) Setting of slowdown (default: -50% (muting))

Determines the set value for slowdown detection (-5 to -50%). The value is settable in units of 1%. Setting of -50% mutes slowdown detection.

(6) Setting of operation mode (default: 0 = MULTI)

Selects between MULTI and DOUBLE. 0 = MULTI. 1 = DOUBLE.

(7) Sensitivity selection (default: 1 = 1/1)

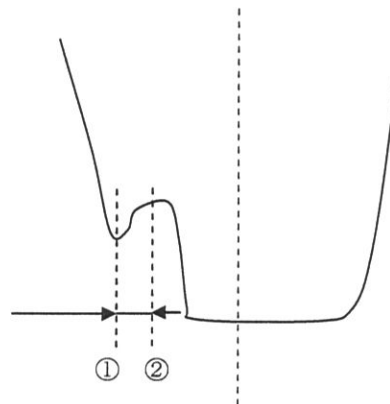
Selectable sensitivities: 0 = 10/1, 1 = 1/1, 2 = 1/2, 3 = 1/4

Note that 10/1 is a high sensitivity.

(8) Setting of FP2 detection angle (default: 5 = 5 degrees)

Sets the position of FP 2 detection and the angle from FP1.

The settable range is 5 to 15 degrees.



Menu Selection

(9) Reset mode (default: 0 = manual, settable range: 0-2)

Selects whether to reset the device automatically or by manual pressing of the RESET key when fault detection is made. When automatic reset is selected, a fault signal is output one second only.

Operation No.	
0	Manual reset
1	Automatic return after one-second stop output
2	Automatic return at power-on only

(10) Setting of internal timing detection (default: 0, settable range: 0-1)

When the press is running continuously, a signal comes from the sensor at fixed intervals.

When this interval increases 1.5 times or more, the device can provide a fault output one second only, judging that a fault has occurred.

In the case of setting to OFF, the device does not provide a fault output even in the case of 1.5 times or more.

0 = Timing detection OFF 1 = Timing detection ON

(11) Chattering prevention time (default: 50 ms, settable range: 1-250 ms)

A chattering prevention timer for external input.effective against chattering of every external input.

(12) Minimum working stroke speed (default: 20 spm., settable range: 3-20 spm.)

Sets a value below the minimum working stroke speed for press operation. Operating the press at less than the set speed does not enable normal detection.

(13) Fault counter (default: 1, settable range: 1-10)

When a fault occurs (is detected) successively the set number of times, the device turns off the relay, judging that a fault has occurred.

As the default is 1, the device turns off the relay when a fault is detected. When the counter is set to 2 or more, the device does not turn off the relay unless fault detection is made the set number of times in succession.

(14) Fault counter operation mode (default: 1, settable range: 1-3)

1 = Operation 1 Counts faults detected by all channels including the extension units and stops when the cumulative number of detected faults reaches the set value.

CH1 fault → CH2 fault → normal → CH3 fault → CH4 fault Thus, the fault counter counts up to 4.

2 = Operation 2 Counts faults detected by each channel.

CH1 fault → CH2 fault → CH3 fault → CH4 fault Thus, the fault counter counts 1, but does not count unless fault detection is made successively by the same channel.

3 = Operation 3 Basically the same as operation 1 except that the auxiliary output (RL2) relay is turned off only 0.5 seconds at each fault detection.

Menu Selection

(15) Change of external input polarity (default: 0, settable range: 0-15)

Changes the polarity of external input (timing, muting, reset, auxiliary) and operates as follows:

Operation No.	Timing	Muting	Reset	Aux.
0	"ON" INPUT	"ON" INPUT	"ON" INPUT	"ON" INPUT
1	"ON" INPUT	"ON" INPUT	"ON" INPUT	"OFF" INPUT
2	"ON" INPUT	"ON" INPUT	"OFF" INPUT	"ON" INPUT
3	"ON" INPUT	"ON" INPUT	"OFF" INPUT	"OFF" INPUT
4	"ON" INPUT	"OFF" INPUT	"ON" INPUT	"ON" INPUT
5	"ON" INPUT	"OFF" INPUT	"ON" INPUT	"OFF" INPUT
6	"ON" INPUT	"OFF" INPUT	"OFF" INPUT	"ON" INPUT
7	"ON" INPUT	"OFF" INPUT	"OFF" INPUT	"OFF" INPUT
8	"OFF" INPUT	"ON" INPUT	"ON" INPUT	"ON" INPUT
9	"OFF" INPUT	"ON" INPUT	"ON" INPUT	"OFF" INPUT
10	"OFF" INPUT	"ON" INPUT	"OFF" INPUT	"ON" INPUT
11	"OFF" INPUT	"ON" INPUT	"OFF" INPUT	"OFF" INPUT
12	"OFF" INPUT	"OFF" INPUT	"ON" INPUT	"ON" INPUT
13	"OFF" INPUT	"OFF" INPUT	"ON" INPUT	"OFF" INPUT
14	"OFF" INPUT	"OFF" INPUT	"OFF" INPUT	"ON" INPUT
15	"OFF" INPUT	"OFF" INPUT	"OFF" INPUT	"OFF" INPUT

(16) External timing mode (default: 0, settable range: 0-1)

Sets the operation mode for external timing.

0 = External timing turns off (changes to internal timing mode)

1 = Detection starts at the position of timing ON. Detection ends and judgment made at the position of timing OFF.

Note that the device judges that a fault has occurred when a sensor signal is not input between the ON and OFF positions.

(17) Sensor selection (default: 0, settable range: 0-1)

Selects between sensors:

0 = KS-1010 sensor

1 = MS-2003 sensor

(18) Sensor characteristic (default: 1, settable range: 0-2)

Selects between sensor characteristic:

0 = Characteristic A

1 = Characteristic B

2 = Characteristic C

(19) Setting mode (default: 0, settable range: 0-1)

Selects between operation modes for setting detection value.

0 = High-low limit setting

1 = Separate setting of high and low limits

Menu Selection

(20) Muting mode (default: 0, settable range: 0-2)

Selects the operation mode for external muting input.

Three operation modes for external muting input are available as shown below:

Operation 0: In normal operation, detection is muted only while an external muting signal is input.

Operation 1: When the muting time is set, detection is muted during only the timer-set time after an external muting signal is input.

Operation 2: When the number of mutings is set, detection is muted only the set number of strokes after an external muting signal is input.

(21) Time setting of muting mode 1 (default: 1 second, settable range: 0.1-25 seconds)

Sets the muting time when external muting mode operation 1 is selected.

(22) Number-of -strokes setting of muting mode 2 (default: 10 , settable range: 1-250)

Sets the number of strokes in muting mode 2 when external muting mode operation 2 is selected.

(23) Detection mode (default: 0, settable range: 0-1)

Selects whether to perform absolute value and mean value detections at a time or separately. When the set value is 0, both detections are performed at a time. When the set value is 1, only the selected detection (mean value or absolute value detection) is performed.

(24) Return to factory default settings

[— — —] appears on the CH side on display B and changes to [0 0 0] at the press of the SETUP key, and the settings of menu numbers (1)-(22) all return to factory default settings.

Specifications

- **Power supply and output section (MIC3-B)**

Power supply	100-240 VAC, 50 or 60Hz
Power consumption	Less than 15W
Output contact	1A · 1B (emergency output, auxiliary output)
Output contact capacity	Less than 250 VAC, less than 5A, Cos ϕ = 1

- **Detection section**

Number of channels	2 and 4
Detection range	0.8 mm to 1.8 mm
Repeating accuracy	1 μ m (0.1 μ m at high sensitivity)
Monitoring range	Average \pm 99 μ m
Sensor type	Proximity sensor for slug detection

- **Display section**

Display	7-segment LED
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- **Others**

Backup	Semiconductor memory Backup time: more than 10 years
Maximum speed	2,400 SPM
Operating temperature range	-10 to +50°C
Retention temperature range	-20 to +75°C
Humidity	10-85% RH max. (Wet bulb temperature shall be less than 29°C for prevention of dew condensation.)

- **Accessories (MIC3-B)**

Mounting bolt (M8-20)	Two (2)
Instruction Manual	One (1)

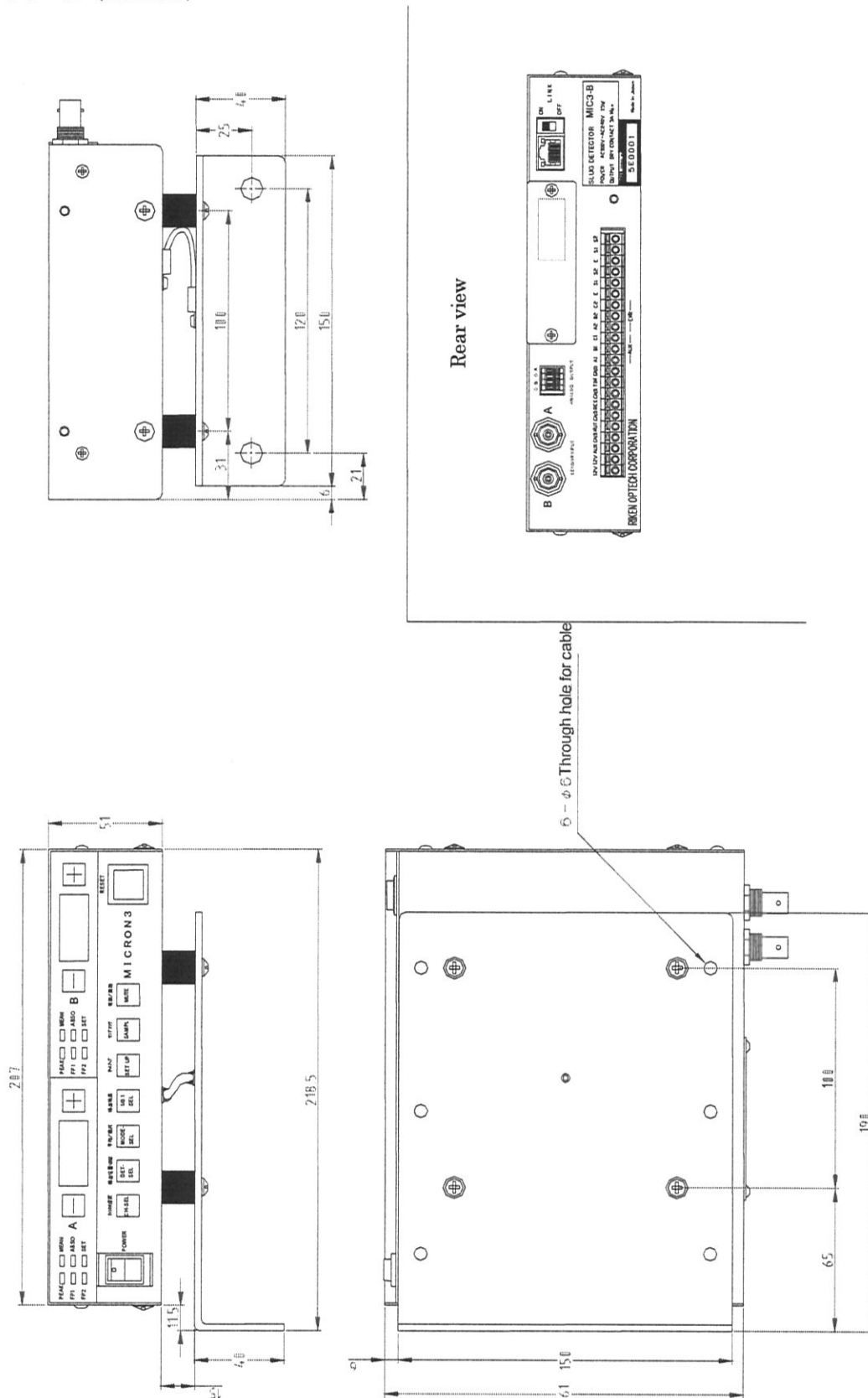
Others

Notes:

1. At power-on, it occasionally happens that all lamps illuminate for a moment, but this is not a trouble.
2. During menu selection, the device is in the state of stop output provided.
3. [Er1] appears when an operational channel is not connected to the sensor. When [Er1] appears at power-on, the channel is turned off or connected to the sensor to prevent [Er1] from appearing. In this case, the device cannot be reset unless the RESET button is pressed twice, but this is not a trouble.
4. In the case of other than the base unit, the fault output relay does not turn off only one second when an internal timing error (time of 1.5 times one cycle) is detected.

Outline Drawing

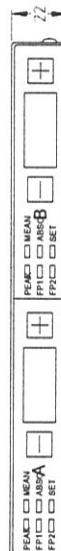
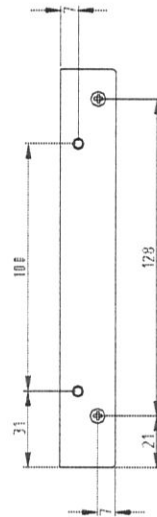
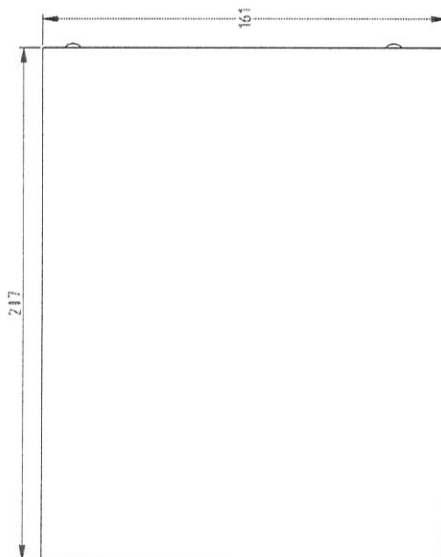
MIC-3-B (base unit)



Rear view

Outline Drawing

MIC3-K (extension unit)



Rear view