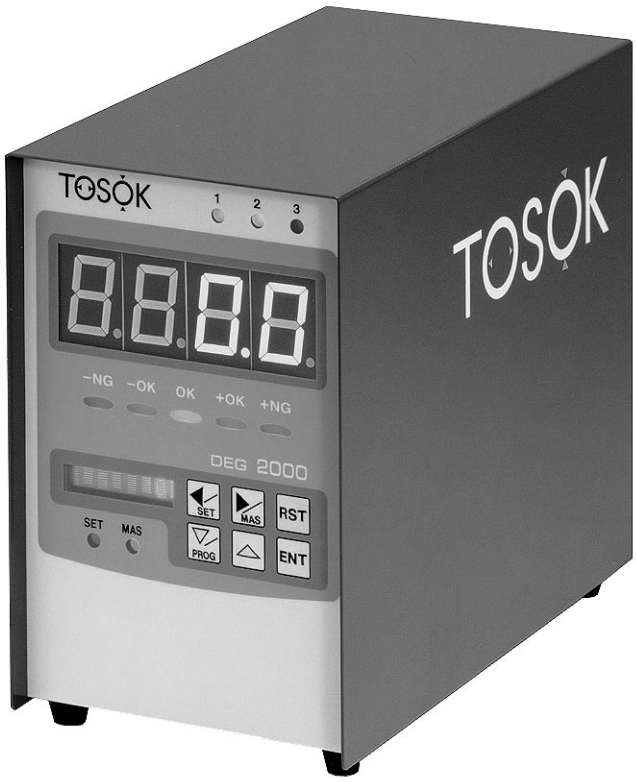
TOSOK

NO. ELE-DE011101

Digital Electric Micrometer

DEG2000 Instruction Manual



NIDEC TOSOK CORPORATION

Contents

1. Introduction

The digital electric micrometer is a measuring instrument with a large easy-to-see (three-color) digital display and an automatic mastering function. It can be operated by external input and output signals and is thus suited for automatic measurement.

2. Main Features

(1) A large three-color main digital display provides the ease of seeing judgment and measurement results.

(2) An eight-digit multifunctional alphanumeric display indicates the measurement conditions and items.

(3) Control keys and external signals automate mastering.

(4) Judgment result output signals are provided as standard and are ideal for automatic measurement.

(5) The standard serial communication function allows the output of data to the personal computer and printer. The data can be stored, statistically processed, and input to a spreadsheet program like Excel.

(6) Two electric micrometers can be connected for measurement by operational processing. Tapers, ovals, and steps can be measured.

3. Main Modes

The instrument operates in the following four main modes:

(1) Measure mode

Measure:	Measures a work.
Hold measured value:	Holds the measured value, except when the mastering result is NG.

(2) Set mode

Enters and changes the set value.

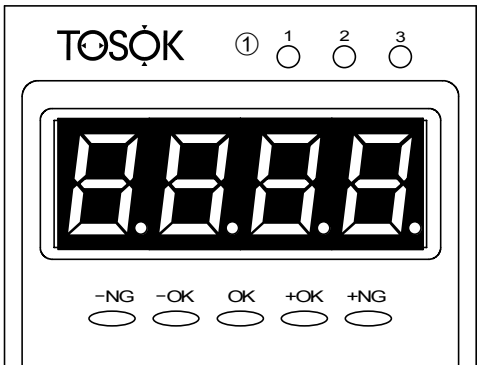
(3) Master mode

Master:	Calibrates the instrument with the masters. This instrument is a comparative measuring instrument. Be sure to use it upon completion of the mastering operation.
Adjust detector:	Adjusts the detector.
Clear mastering data:	Clears the mastering data.

(4) Change program mode

Changes from one program to another. When the instrument is started, the program used last is launched.

4. Names and Functions of Controls and Parts

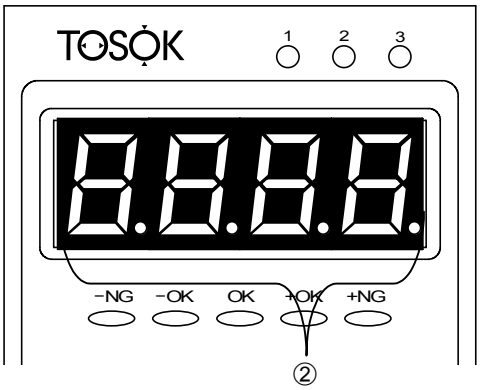


① Item and judgment LEDs

Indicate the judgment result and measurement under way (as shown on the main display), among other things. The conditions of Items 1 to 3 are indicated by LEDs 1 to 3, respectively. The lighting colors of the LEDs and the conditions indicated by them are shown in Table 1.

Table 1. LED colors and conditions indicated.

Color	Condition	Mode
Green (light and dark)	Judgment result OK; Main display item	Measure
Green (light)	Judgment result OK; Other item	Measure
Green (dark) and blank	Judgment result OK; Main display item	Hold measured value
Green (dark)	Judgment result OK; Other item	Hold measured value
Red (light and dark)	Judgment result NG; Main display item	Measure
Red (light)	Judgment result NG; Other item	Measure
Red (dark) and blank	Judgment result NG; Main display item	Hold measured value
Red (dark)	Judgment result NG; Other item	Hold measured value
Orange (light)	Set value of item being entered	Set
	Instrument being calibrated with master	Master
	Detector being adjusted	Adjust detector

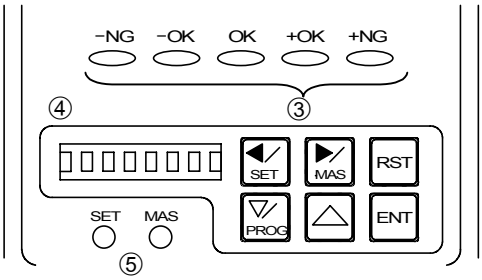


② Main display

Shows a value or condition in one of three colors. The display colors in each mode are as given in Table 2.

Table 2. Display colors and items in each mode.

Mode	Color	Item
Measure	Green (light) Red (light) Orange (light)	Measured value (Judgment result OK) Measured value (Judgment result ±NG) Measured value (Judgment result ±OK)
Hold measured value	Green (dark) Red (dark) Orange (dark)	Measured value (Judgment result OK) Measured value (Judgment result ±NG) Measured value (Judgment result ±OK)
Master	Green (light) Red (light)	Mastering enabled Mastering disabled
Adjust detector	Orange (light)	Measured value



③ Display item judgment LEDs

Judge the data shown on the main display. OK is indicated by green, ±OK by orange, and ±NG by red. ±OK is used only when the number of ranks is three.

④ Alphanumeric display

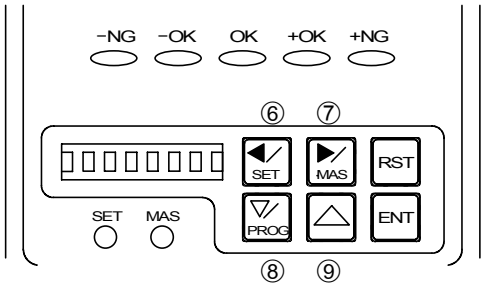
The measured value, set value, set description, and other data are indicated by 8-digit 7 × 5 dot characters.

⑤ Mode LEDs

Indicate the condition of the current mode and the mastering result. The LED lighting colors, modes, and mastering results are as shown in Table 3.

Table 3. LED colors and conditions indicated.

SET mode LED	MAS mode LED	Mode	Mastering result
Orange	Off	Set	OK
Orange	Red flashing	Set	NG
Green	Off	Change program	OK
Green	Red flashing	Change program	NG
Off	Orange	Master	OK
Off	Orange and red	Master	NG
Off	Red flashing	Measure	NG
Off	Off	Measure, Hold measured value	OK



⑥ Left arrow /SET key

Mode	Keying	Operation
Measure	Press 2 sec.	Mode is changed to set mode.
Set	Press once.	Set description is changed.
Adjust detector	Press once.	Measuring head is changed.

⑦ Right arrow/MAS key

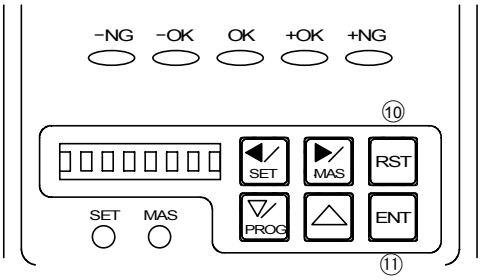
Mode	Keying	Operation
Measure	Press 2 sec.	Mode is changed to master mode.
Set	Press once.	Set description is changed.
Master	Press once.	Mode is changed to adjust detector mode.
Adjust detector	Press once.	Measuring head is changed.

⑧ Down arrow/PROG key

Mode	Keying	Operation
Measure	Press 2 sec.	Mode is changed to change program mode.
Measure	Press once.	Item is changed from ITEM 3 to ITEM 1.
Set	Press once.	Set value is entered (or decremented).
Master	Press once.	Master is changed from MAS 2 to MAS 1.
Adjust detector	Press once.	Master is changed from MAS 2 to MAS 1, or set value is entered (or decremented).
Change program	Press once.	Program is changed from PROG 4 to PROG 1.

⑨ Up arrow key

Mode	Keying	Operation
Measure	Press once.	Item is changed from ITEM 1 to ITEM 3.
Set	Press once.	Set value is entered (or incremented).
Master	Press once.	Master is changed from MAS 1 to MAS 2.
Adjust detector	Press once.	Master is changed from MAS 1 to MAS 2, or set value is entered (or incremented).
Change program	Press once.	Program is changed from PROG 1 to PROG 4.



⑩ RST (reset) key

Mode	Keying	Operation
Hold measured value	Press once.	Measured value hold is cleared.
Set	Press once.	Set description is returned to previous condition. Setting is finished (WRITE or CANCEL).
Master	Press once.	Reading of master measured value is canceled.
Adjust detector	Press once.	Set description is returned to previous condition.

⑪ ENT (enter) key

Mode	Keying	Operation
Measure	Press once.	Mode is changed to hold measured value mode (when mastering result is OK).
Set	Press once.	Set description is determined.
Master	Press once.	Master measured value is read.
Adjust detector	Press once.	Adjustment description is determined.

⑫ RS232C connector

A serial communication connector for connecting a personal computer or printer.

⑬ Switch input connector

A connector for entering a measure or mastering command with an external button. It is also used for RS422 communication and Digimatic output.

⑭ Analog input/output connector

A connector for external analog signal input and amplifier signal output.

⑮ DC input/output connector

A judgment result input/output connector for connecting LEDs, sequencers, etc.

⑯ DC input/output connector (option)

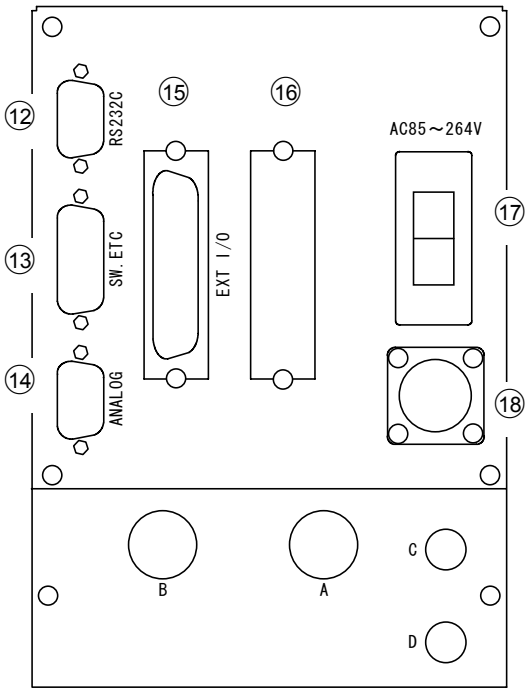
⑰ Power switch

Used to turn on and off the power of the instrument.

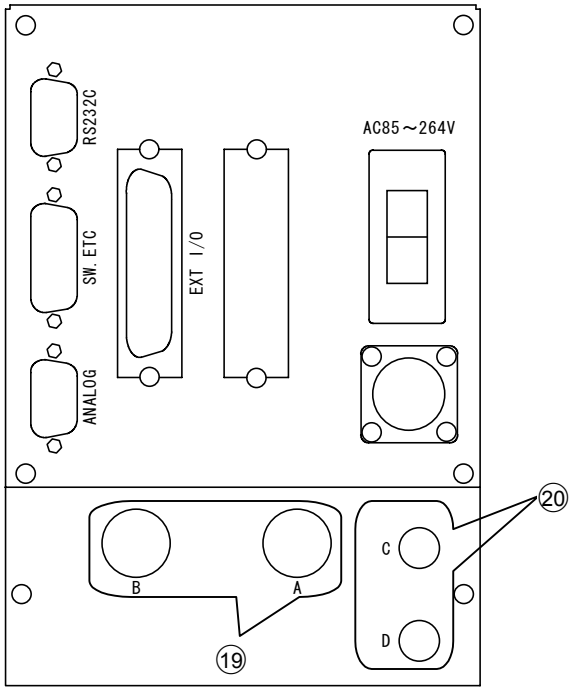
⑱ Power connector

Used to input AC power. It can be used in the range of 85 to 264 VAC, but the accessory power cable must be used in the range of 85 to 125 VAC.

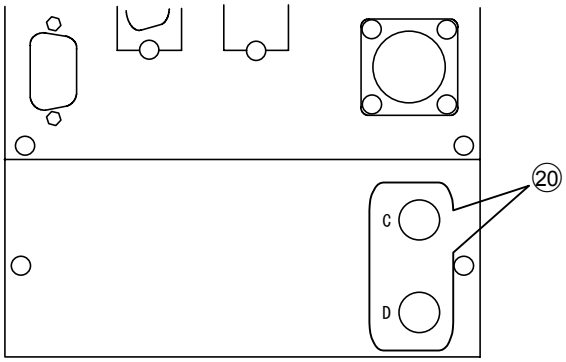
Rear of DEG2000



Rear of standard model DEG2000-N



Rear of dedicated model DEG2000-A for air micrometer



⑲ Electric micrometer connector
Two detectors can be connected.

⑳ A/E converter (AE2000) connector
Two AE2000 converters can be connected.

5. Specifications

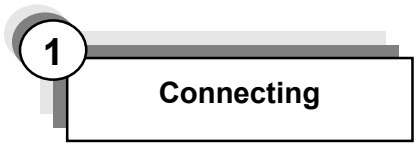
Item	Specification	Remarks
Power supply voltage and frequency	85 to 264 VAC, 50/60 Hz	100 VAC power cable supplied as accessory
Power supply capacity	30 VA	
Dimensions and mass	120 mm wide × 200 mm high × 220 mm deep, 2.7 kg	
Operating temperature	0 to 45°C	
Number of programs	4 (Programs 1 to 4)	Programs 1 to 3 are changeable from external input.
Input module	1. Standard (1) Electric micrometer (2) Air micrometer	Changeable by software and unusable simultaneously: 2 channels for air micrometer (external) and 2 channels for electric micrometer (internal)
	2. Dedicated for air micrometer	2 channels for air micrometer (external)
Number of measurement items	3 (Items 1 to 3)	
Number of masters	2 (MAS 1 and MAS 2)	
Number of input channels (XDUCER)	4	
Indicating range (resolution)	Air micrometer 1. FS±10 μm (0.05 to 2) 2. FS±20 μm (0.1 to 2) 3. FS±50 μm (0.1 to 2) 4. FS±100 μm (0.1 to 2) Electric micrometer 1. FS±20 μm (0.1 to 2) 2. FS±100 μm (0.1 to 2) 3. FS±1000 μm (1 to 2)	Set for each program. Resolution is available in six types of 0.05, 0.1, 0.2, 0.5, 1, and 2.
Mastering data input	Select from among four detectors A to D (multiple choice possible). Symbols and coefficients (-9.999 to +9.999) can be freely combined.	Set for each master. Example: MAS 1 = A + B + C MAS 2 = -A + B
Operation functions	Item 1 can select MAS 1 or MAS 2, Item 2 can select MAS 1, MAS 2, or Item 1, and Item 3 can select MAS 1, MAS 2, Item 1, or Item 2 (multiple choice possible). Symbols and coefficients (-9.999 to +9.999) can be freely combined.	Set for each item. Example: Item 1 = MAS 1 + MAS 2 Item 2 = -MAS 1 +MAS 2 Item 3 = Item 1 - Item 2
Measuring functions	1. BYPASS	Set for each item.
	2. +PEAK	
	3. -PEAK	
	4. TIR	
	5. TIR/2	
	6. MAX	
	7. min	
	8. MAX - min	
	9. (M - m)/2	
	10. (M + m)/2	
	11. ABS	

Item	Specification	Remarks
Judgment method	±NG and rank	Set for each item.
	1. EQUAL	Equal ranking: Maximum of 99 ranks (Judgment result output: Maximum of 99 ranks)
	2. SELECT	Arbitrary ranking: Maximum of 39 ranks (Judgment result output: Maximum of 39 ranks)
Number of masters with which instrument is to be automatically calibrated	1. All masters together	Set for each program. Automatic mastering is possible from external signal.
	2. Each master separately	
Mastering method	1. MIN M.	Set for each program.
	2. MAX & MIN	
Mastering range	Zero adjustment: Indicating range ± 30%	
	Sensitivity adjustment: Indicating range ± 20%	
Number of smoothing cycles	1 to 30 cycles	Set for each program.
Communication functions	1. Measured value output to personal computer	RS232C communication cable is sold separately.
	2. Measured value output to printer	
	3. External input and foot switch	External buttons and foot switch are sold separately.
Judgment result output	1. ±NG, ±OK, and OK	Output for 3 measurement items + All OK/NG
	2. ±NG and 16 ranks	Output for 1 measurement item
	3. ±NG and 99 ranks (code output)	
Options	1. Digimatic output	Output to printer (DP-1)
	2. BCD output (addition of output board required)	BCD data output
	3. Additional judgment result output (addition of output board required)	Individual output of ranks 17 to 39
	4. Serial communication	RS422 output

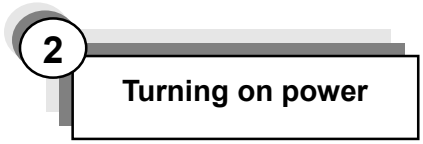
6. Operation

6.1 Description

Here is described a series of steps from connecting a measuring head to measuring with the head.



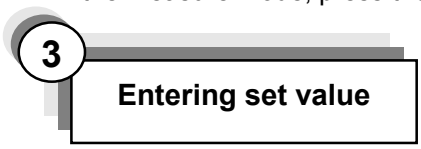
Connect the measuring head or the AE2000 (A/E converter), and the accessory power cable to the rear of the instrument.



Turn on the power switch at the rear of the instrument to supply the power of 85 to 264 VAC (50/60 Hz).

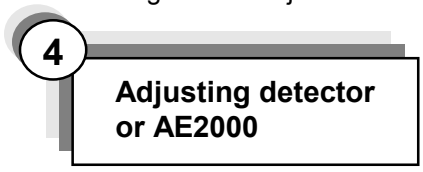
Immediately after the startup, the instrument falls in **the master request condition** ("MAS REQ" appears on the alphanumeric display). Press one of the SET MAS RST PROG ENT keys to clear the master request. The instrument changes to the measure mode.

In the measure mode, press the SET key for 2 sec or more to change to the set mode.



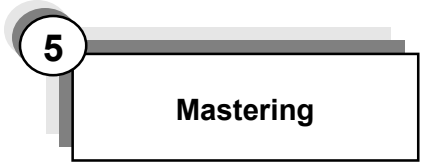
Enter the set value. Refer to "6.4 Setting" and "Set mode" in "13. Operation flow".

In the measure mode, press the MAS key for 2 sec or more, and press the MAS key once to change to the adjust detector mode.

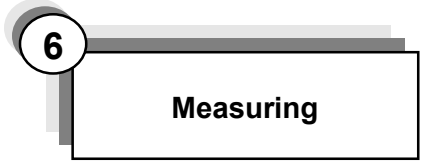


Adjust the detector or AE2000. Refer to "Adjust detector mode" in "13. Operation flow".

In the adjust detector mode, press the MAS key twice to change to the master mode (showing "MIN M." on the alphanumeric display).



Calibrate the instrument with a master. Refer to "6.3 Automatic mastering" and "Master mode" in "13. Operation flow".



In the measure mode, press the ENT key once to change to the hold measured value condition. Press the RST key to clear the measured value hold. **The measured value cannot be held when the mastering result is NG.** Refer to "6.2 Measuring".

6.2 Measuring

Measure mode

- The conditions indicated by the colors of the item and judgment LEDs in this mode are as shown in Table 4.

Table 4. Conditions indicated by colors of item and judgment LEDs in measure mode.

Color	Condition
Green (light/dark)	Judgment result OK; Main display item
Green (light)	Judgment result OK; Other item
Red (light/dark)	Judgment result NG; Main display item
Red (light)	Judgment result NG; Other item

- Press the ENT key once to change to the hold measured value condition. The measured value cannot be held when the mastering result is NG.
- Press the △ and PROG keys to change from one main display item (ITEM 1 to 3) to another.
- Select the program to be used for the measurement in the change program mode. Refer to “Measure mode and change program mode” in “13. Operation flow”.

Hold measured value mode

- Press the RST key to clear the measured value hold and return to the measure mode.
- The conditions indicated by the colors of the item and judgment LEDs in this mode are as shown in Table 5.

Table 5. Conditions indicated by colors of item and judgment LEDs in hold measured value mode.

Color	Condition
Green (dark/blank)	Judgment result OK; Main display item
Green (dark)	Judgment result OK; Other item
Red (dark/blank)	Judgment result NG; Main display item
Red (dark)	Judgment result NG; Other item

- Press the △ and PROG keys to change from one main display item (ITEM 1 to 3) to another.

6.3 Automatic mastering

Notes: 1. This instrument is a comparative measuring instrument. Be sure to use it after calibrating it with a master.
2. During a program change, the instrument reads the previous mastering data.
3. Clear the mastering data when changing the settings of [I-RANGE], [RESOLUTION], [XDUCER] and [MASTER] and when turning on the power of the instrument.

① Press the MAS key for 2 sec or more in the measure mode.
② The MAS mode LED (orange) lights, "MIN M." appears on the alphanumeric display, and the instrument changes to the master mode.
When the RST key is pressed during the mastering operation, the instrument returns to the last condition or to the measure mode when "MIN M." is shown on the alphanumeric display.

③ Set the minimum master in the detector. When the main display is stabilized, press the ENT key.

When "EACH" is selected with [SYSTEM]–[MasSet] in the set mode beforehand…
⇨ The mastering operation is carried out according to the master (MAS 1 or MAS 2) whose mastering data is shown on the main display. Press the △ and PROG keys to select the master to be used. The master selection is indicated by one of the item and judgment LEDs as follows:
LED 1 lights to indicate MAS 1.
LED 2 lights to indicate MAS 2.

④ The alphanumeric display shows "MAX M.".
⑤ Set the maximum master in the detector. When the main display is stabilized, press the ENT key.
⑥ "MAS OK" appears for 2 sec on the alphanumeric display to indicate the completion of the mastering procedure. (The instrument automatically returns to the measure mode.)

For other details, refer to "Master mode" in "13. Operation flow".

Mastering errors

- The alphanumeric display shows the following errors:

ERR ZERO:	Zero error (outside of mastering range)
ERR MAG:	Sensitivity error (outside of mastering range)
ERR REV:	Maximum and minimum master values reversed
ERR OFFR:	Outside of measuring range

  Press the ENT key to return to step ② above. Re-master.
- When calibrating the instrument with individual masters separately, the mastering channel changes to return to step ② above unless the mastering result is OK for both maximum and minimum masters.

When a mastering error occurs despite re-mastering, adjust the detector. Refer to "Adjust detector mode" in "13. Operation flow".

6.4 Setting

The set value is entered and changed in the set mode.

6.4.1 Set mode

The set mode covers the following settings:

[XDUCER]
The sensitivity of the detector is set. Refer to “Set mode (2)” in “13. Operation flow”.

[MASTER]
The master input channel and the maximum and minimum master values are set. Refer to “Set mode (3)” in “13. Operation flow”.

[ITEM]
The item constitutive data, measuring function, number of ranks, and boundary values (upper/lower limits) are set. Refer to “6.4.2 Measuring functions”, “Set mode (4)” in “13. Operation flow” and “Set mode (5)” in “13. Operation flow”.

[COMM]
Input/output data, like A/D external input and judgment result output data, are set. Refer to “Set mode (6)” in “13. Operation flow”.

[SYSTEM]
The mastering and automatic measuring functions are set. Refer to “6.4.3 Automatic measuring functions” and “Set mode (7)” in “13. Operation flow”.

6.4.2 Measuring functions

The measuring functions are set with [ITEM]–[FUNCTION] in the set mode. Here is described [ITEM], centering on [FUNCTION].

[STRUCT]
The constitutive data of each item and the coefficient of each constitutive data are set.

[FUNCTION]
The measuring function of each item is selected.

Example

When the constitutive data of Item 1 are MAS 1 and MAS 2…
① Select “BYPASS”.
⇨ The measured value of Item 1 is (MAS 1 + MAS 2).
② Select “+PEAK”.
⇨ The measured value of Item 1 is the maximum value of (MAS 1 + MAS 2).
③ Select “MAX”.
⇨ The measured value of Item 1 is the larger measured value of (MAS 1 and MAS 2).

◆ When “+PEAK”, “–PEAK”, “TIR”, and “TIR/2” are selected, the automatic measuring functions are enabled. Refer to “6.4.3 Automatic measuring functions” and “Set mode (7)” in “13. Operation flow”.

[RANK]
The OK ranking method of each item and the number of OK ranks are set.

[LIMIT]
The OK rank boundary of each item is set.

Example

① When [RANK] = EQUAL, [RANK n] = 4, [R1/-NG] = -30, and [+NG/Rn] = +30 are set…

⇨ -NG < -30 ≤ R1 < -15 ≤ R2 < 0 ≤ R3 ≤ +15 < R4 ≤ +30 < +NG

② When [RANK] = SELECT, [RANK n] = 3, [R1/-NG] = -15, [R1/R2] = -5, [R2/R3] = 0, and [+NG/Rn] = +15 are set…

⇨ -NG < -15 ≤ R1 < -5 ≤ R2 ≤ 0 < R3 ≤ +15 < +NG

Refer to “Set mode (5)” in “13. Operation flow”.

6.4.3 Automatic measuring functions

The automatic measuring functions are enabled when “+PEAK”, “-PEAK”, “TIR”, and “TIR/2” are selected with [FUNCTION]. The following automatic measuring functions are set with [SYSTEM] in the set mode.

[AutoMeas]
Sets the percentage of all master data in the indicating range at which to start the automatic measurement start function. Disabled when the automatic measurement start function is turned off.

[InToOut]
Sets whether to hold or reset the measured value when the mastering data change from inside of the measuring range to outside of the measuring range. Disabled when the automatic measurement start function is turned off.

[WaitTime]
Sets the stabilizing timer at the time for the automatic measurement to start. When the stabilizing timer is set at 0.00 sec, the automatic measurement start function is turned off.

[MeasTime]
Sets the measuring timer at the time for the automatic measurement to stop. When the measuring timer is set at 0.0 sec, the automatic measurement stop function is turned off.

Example

① When [WaitTime] = 0.0 and [MeasTime] = 0.0 are set…

⇨ Press the ENT key to start the measurement and the RST key to stop the measurement.

② When [I-RANGE (indicating range)] = ±100, [WaitTime] = 1.00, [AutoMeas] = ±80%, and [MeasTime] = 5.0 are set…

⇨ The automatic measurement starts 1 sec after the mastering data fall within the range of -80 to +80 and stops 5 sec after the start. The instrument remains in the hold measured value mode until the measured value falls outside the range of -80 to +80.

7. I/O Description

7.1 Serial output

(1) Description

This instrument can output the measured values to a printer and communicate with a personal computer (PC) through RS232C.

Data to be transmitted from instrument to PC

Measurement item:	Items 1 to 3
Measured value:	Data displayed on instrument, NO USE
Judgment result:	R 1 to R99, NJG (stabilizing timer in operation), or NDT (only when NO USE is displayed)

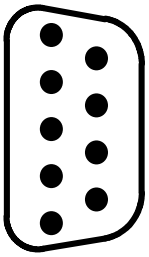
(2) Preparation

The RS232C connector at the rear of the instrument is provided for the PC or printer. Connect the D-sub 9-pin (male) plug of the optional communication cable to the RS232C connector.

(3) Connector pin arrangement

(

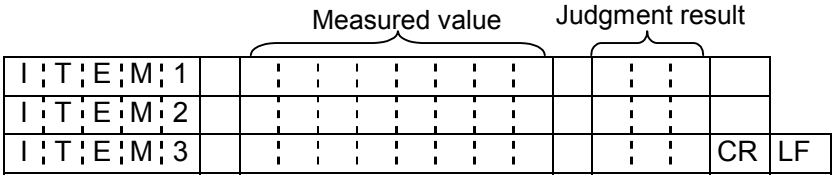
Description	No.
	1
R × D	2
T × D	3
	4
GND	5



No.	Description
6	
7	RTS
8	CTS
9	

(

Item 1 (5 characters), space (1 character), measured value (8 characters), space (1 character), rank (3 characters), space (1 character);
Item 2 (5 characters), space (1 character), measured value (8 characters), space (1 character), rank (3 characters), space (1 character);
Item 3 (5 characters), space (1 character), measured value (8 characters), space (1 character), rank (3 characters), CR, LF



(6) Data transmission method to PC

In the measure mode, press the ENT key. The instrument falls in the hold measured value condition and transmits the measured value to the personal computer. The data transmission is disabled when the mastering result is NG.

(7) Data request command from PC

① Measured value latch (data hold) command
Transmit the command byte “E”<45H>. The instrument holds the measured value.

② Latch clear command
Transmit the command byte “R”<52H>. The instrument clears the measured value hold.

③ Measured value request
Transmit the command byte “D”<44H>. The instrument transmits the above-mentioned data (5) to the PC.

Example

character-string	I	T	E	M	1				–	2	5	.	0		–	N	G		
	I	T	E	M	2					1	2	.	5		+	O	K		
	I	T	E	M	3			N	O		U	S	E		N	D	T	CR	LF
ASCII code	49	54	45	4D	31	20	20	20	20	2D	32	35	2E	30	20	2D	4E	47	20	
	49	54	45	4D	32	20	20	20	20	20	31	32	2E	35	20	2B	4F	47	20	
	49	54	45	4D	33	20	20	20	4E	4F	20	55	53	45	20	4E	44	54	0D	0A

7. 2 External input

(1) Description

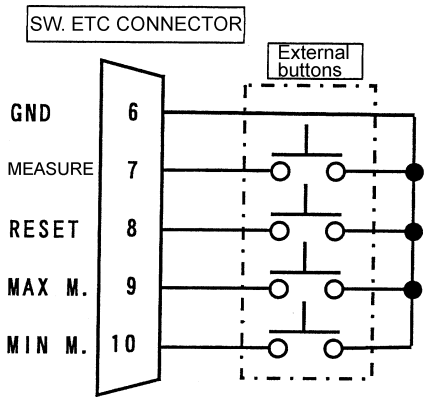
The instrument allows no-voltage contacts, such as those of an external button or foot switch, to be connected to the SW. ETC connector at the rear. This external input can be used to perform measurement, reset, maximum mastering, and minimum mastering.

Notes:
- Use a cable of 2 m or less in length.
- Do not connect to a sequencer.

(2) Preparation

The SW. ETC connector at the rear of the instrument is provided for external buttons. It accepts a D-sub15-pin (male) plug.

(3) Connector pin arrangement and connection diagram



(4) Operation with external buttons

a. MEASURE button

① In the measure mode, press the MEASURE button.

② The measured value is held. (This is called the hold measured value condition.)

Note: The measured value cannot be held when the mastering result is NG.

b. RESET button

① Clears the measured value hold.

c. MAX M. (maximum master) button

① In the measure mode, set the maximum master in the measuring head.

② When the measured value is stabilized, press the MAX M. button. When the maximum mastering procedure is completed, the instrument returns to the measure mode.

d. MIN M. (minimum master) button

① In the measure mode, set the minimum master in the measuring head.

② When the measured value is stabilized, press the MIN M. button. When the minimum mastering procedure is completed, the instrument returns to the measure mode.

When a mastering error occurs, adjust the detector. Refer to “Adjust detector mode” in “13. Operation flow”.

7.3 Judgment result output

The result of three-item judgment, two-item judgment, or ranking is output to the DC input/output connector. (refer to ⑮ on page 7).

7.3.1 Specifications

Item			Specification
Input section	Input type		Photocoupler insulated input
	Input resistance		5 kΩ
	Input on voltage		10 V or more
	Input off voltage		2 V or less
	Number of input signals		8
	Input protection circuit		No
	Response time		1 msec or less
	External circuit power supply		12 to 24 VDC
Output section	Output type		Open collector output
	Rating	Output voltage	30 VDC
		Output current	Maximum of 50 mA per output signal
	Number of output signals		24
	Output protection circuit		No
Current consumption			110 mA

7.3.2 Input signal arrangement

Note: The input signals are enabled when “READY” is turned on. The following table shows the input signal arrangement of the DC input/output connector (refer to ⑮ on page 7).

Pin No.	Signal name	Description
1	Measure command	Hold measured value and data output command (Enabled when mastering result is OK.)
2	Minimum mastering	Minimum mastering command
3	Maximum mastering	Maximum mastering command
4	RESET	Measured value hold clear command
5	Program change (lower)	Specifies program numbers 1 to 3 to be changed. (Refer to Table 6.)
6	Program change (higher)	
7	Item bit (less significant)	Specifies measurement items 1 to 3 to be output. (Refer to Table 7.)
8	Item bit (more significant)	
9	+COM	Input common line: +12/24 V
10	+COM	

Table 6. Program change and program numbers.

	Program number		
	1	2	3
Program change (lower)	On	Off	On
Program change (higher)	Off	On	On

Table 7. Item bits and measurement items to be output.

	Measurement item to be output			
	Setting for this instrument*1	1	2	3
Item bit (less significant)	Off	On	Off	On
Item bit (more significant)	Off	Off	On	On

*1 Item set with [JUDG OUT] is output.

7.3.3 Procedure for calibrating instrument with masters by external input

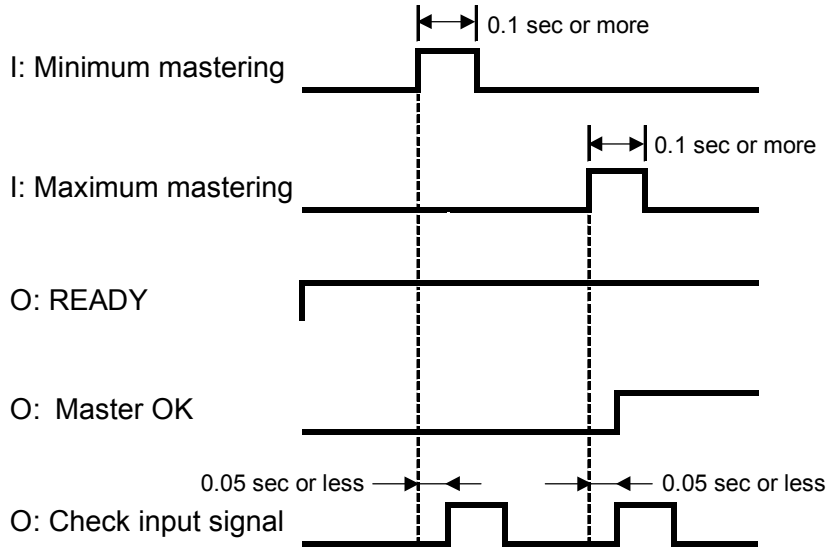
(1) Description

Set the minimum and maximum masters in that order.

(2) Mastering

① Check that “READY” is displayed.
② Set the minimum master in the measuring head.
③ After about 2 sec of stabilization time, input the “Minimum mastering” signal.
④ Set the maximum master in the measuring head.
⑤ After about 2 sec of stabilization time, input the “Maximum mastering” signal.
⑥ Check that “MAS OK” is displayed. If “MAS OK” is displayed, the mastering procedure is completed. If “MAS OK” is not displayed, check the setting of each master, and adjust the measuring head and A/E converter, among other things.

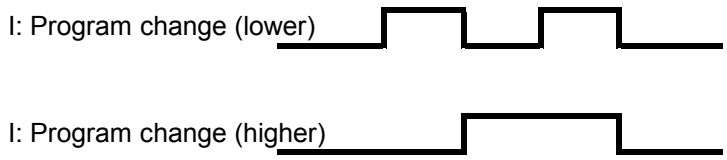
<I: Input to instrument, O: Output from instrument>



(3) Program change

When the program change on condition is held for 0.2 sec, the measuring program is changed. Programs 1 to 3 can be freely changed from one to another.
*No change can be made to program 4.

<I: Input to instrument>



Condition of instrument	No program change	PROG 1	PROG 2	PROG 3	PROG 3

7.3.4 Measuring procedure

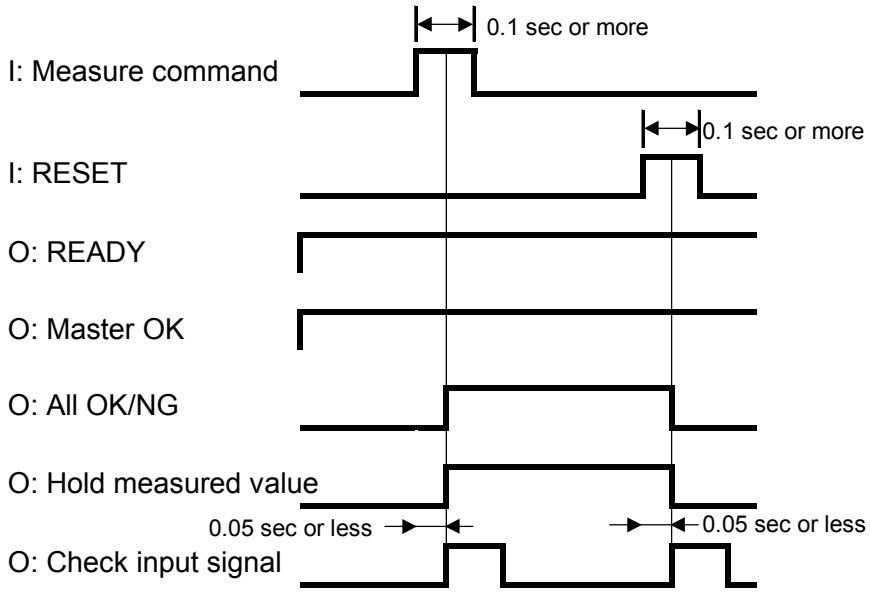
(1) Description

In the measure mode, the instrument continues to produce the judgment result output. In the case of static measurement, it holds the measured value display and judgment result output when the measure command changes from off to on.

(2) Static measurement

① Check that “READY” is displayed.
② Check that “MAS OK” is displayed.
③ Set the work in the measuring head.
④ After about 2 sec of stabilization time, turn on the measure command. (The measured value display and judgment result output are held, and “All OK/NG” is output.)
⑤ Read the data.
⑥ Input the RESET signal. (The measured value display and judgment result output hold is cleared.)

<I: Input to instrument, O: Output from instrument>



(3) Dynamic measurement

When “+PEAK”, “–PEAK”, “TIR”, or “TIR/2” is selected at [FUNCTION], the instrument makes dynamic measurement. When any other item is selected, the instrument makes static measurement.
The dynamic measurement differs from the static measurement in that the instrument starts the measurement at the first measure command and holds the measured value at the second measure command. When making a measurement at an external input signal, usually set WaitTime and MeasTime both at 0 sec. Before the start of the measurement, input the RESET signal to clear the peak value accumulation.

7.3.5 Selecting judgment result output and BCD output

Number		1	2	3	4	5		6
Output type		Parallel	Parallel	Parallel	Parallel	Code		BCD
		OK 3 or less	OK 7 or less	OK 16 or less	OK 39 or less	OK 99 or less		
Output items	All items	●	–	–	–	–	–	–
	Each item	–	–	●	▲	▲	●	▲
	Items 1 and 2	–	●	–	–	–	–	–
External input/output type		All	All	All	DC	DC	Other than those shown at left	BC
Setup of number of ranks	Setup item name	–	Item 1 Item 2	Item	Item	Item	Item	–
		–	Rank n	Rank n	Rank n	Rank n	Rank n	–
	Setup descrip-tion	–	7 or less	16 or less	39 or less	40 or more	17 or more	–
Output item change by input signal		No	No	Yes	Yes	Yes	Yes	Yes
Remarks		Refer to 24 page	Refer to 25 page	Refer to 26 page	Refer to 27 page	Refer to 28 page	Refer to 28 page	Refer to 29 page

1. Output type selection

- The output types marked by ● are normally usable, and the other output types are options.
- The output types marked by ▲ call for addition of a circuit board.
- Numbers 4 and 6 cannot be selected at the same time.

2. Output item change

- The settings of output items 1 to 5 can be changed with [JUDG OUT] in the set mode.
- The setting of output item 6 can be changed with [BCD OUT] in the set mode.
- When one of Items 1 to 3 is selected as output item, an item bit can be entered to temporarily change the output item among Items 1 to 3. When the item bit is not entered, the data of the set output item is output.
  *In the case of BCD output, enter a BCD item bit instead of an item bit.

7.3.6 Three-item judgment result output — Output signal arrangement

The three-item judgment result output signal is output when “ALL ITEM” is selected with [JUDG OUT] in the set mode (6).

Note: “Item” refers to “ITEM” of DEG2000. The following table shows the output signal arrangement of the DC input/output connector (refer to ⑮ on page 7).

Pin No.	Signal name	Description
11	READY	Turns on in measure mode during normal operation.
12	Error	Turns on when two signals are simultaneously input and turns off when all signals are turned off.
13	Master OK	Turns on when mastering result is OK.
14	Check input signal	Turns on when input signal is received and processing is completed, and turns off when input signal is turned off.
15	All OK	Turns on at input of measure command when all items are OK.
16	All NG	Turns on at input of measure command when any one item is NG.
17	Item 1 -NG	
18	-OK	
19	OK	
20	+OK	
21	+NG	
22	Item 2 -NG	
23	-OK	
24	OK	
25	+OK	
26	+NG	
27	Item 3 -NG	
28	-OK	
29	OK	
30	+OK	
31	+NG	
32		
33		
34		
35	-COM	Output common line: 0 V
36	-COM	

7.3.7 Two-item judgment result output — Output signal arrangement

The two-item judgment result output signal is output when “ITEM 1&2” is selected with [JUDG OUT] in the set mode (6).

Note: “Item” refers to “ITEM” of DEG2000. The following table shows the output signal arrangement of the DC input/output connector (refer to ⑮ on page 7).

Pin No.	Signal name	Description
11	READY	Turns on in measure mode during normal operation.
12	Error	Turns on when two signals are simultaneously input and turns off when all signals are turned off.
13	Master OK	Turns on when mastering result is OK.
14	Check input signal	Turns on when input signal is received and processing is completed, and turns off when input signal is turned off.
15	All OK	Turns on at input of measure command when all items are OK.
16	All NG	Turns on at input of measure command when any one item is NG.
17	Item 1 -NG	
18	+NG	
19	OK1	
20	OK2	
21	OK3	
22	OK4	
23	OK5	
24	OK6	
25	OK7	
26	Item 2 -NG	
27	+NG	
28	OK1	
29	OK2	
30	OK3	
31	OK4	
32	OK5	
33	OK6	
34	OK7	
35	-COM	Output common line: 0 V
36	-COM	

7.3.8 Ranking output (OK rank 16 or less) — Output signal arrangement

The ranking output signal is output when “ITEM 1”, “ITEM 2” or “ITEM 3” is selected with [JUDG OUT], or an item bit is entered in the set mode (6).

Note: “Item” refers to “ITEM” of DEG2000. The following table shows the output signal arrangement of the DC input/output connector (refer to ⑮ on page 7).

Pin No.	Signal name	Description
11	READY	Turns on in measure mode during normal operation.
12	Error	Turns on when two signals are simultaneously input and turns off when all signals are turned off.
13	Master OK	Turns on when mastering result is OK.
14	Check input signal	Turns on when input signal is received and processing is completed, and turns off when input signal is turned off.
15	All OK	Turns on at input of measure command when all items are OK.
16	All NG	Turns on at input of measure command when any one item is NG.
17	Item -NG	
18	+NG	
19	OK1	
20	OK2	
21	OK3	
22	OK4	
23	OK5	
24	OK6	
25	OK7	
26	OK8	
27	OK9	
28	OK10	
29	OK11	
30	OK12	
31	OK13	
32	OK14	
33	OK15	
34	OK16	
35	-COM	Output common line: 0 V
36	-COM	

7.3.9 Ranking output (OK rank 39 or less) — Output signal arrangement (option)

The ranking output signal is output when “ITEM 1”, “ITEM 2” or “ITEM 3” is selected with [JUDG OUT], or an item bit is entered in the set mode (6). For OK rank 16 or less, refer to “7.3.8 Ranking output”.

Note: “Item” refers to “ITEM” of DEG2000. The following table shows the output signal arrangement of the optional DC input/output connector (refer to ⑯ on page 7).

Pin No.	Signal name	Description
11	Item OK17	
12	OK18	
13	OK19	
14	OK20	
15	OK21	
16	OK22	
17	OK23	
18	OK24	
19	OK25	
20	OK26	
21	OK27	
22	OK28	
23	OK29	
24	OK30	
25	OK31	
26	OK32	
27	OK33	
28	OK34	
29	OK35	
30	OK36	
31	OK37	
32	OK38	
33	OK39	
34		
35	-COM	Output common line: 0 V
36	-COM	

7.3.10 Ranking code output (OK rank 99 or less) — Output signal arrangement

The ranking code output signal is output when “ITEM 1”, “ITEM 2” or “ITEM 3” is selected with [JUDG OUT] or an item bit is entered in the set mode (6).

Note: “Item” refers to “ITEM” of DEG2000. The following table shows the output signal arrangement of the DC input/output connector (refer to ⑮ on page 7).

Pin No.	Signal name	Description
11	READY	Turns on in measure mode during normal operation.
12	Error	Turns on when two signals are simultaneously input and turns off when all signals are turned off.
13	Master OK	Turns on when mastering result is OK.
14	Check input signal	Turns on when input signal is received and processing is completed, and turns off when input signal is turned off.
15	All OK	Turns on at input of measure command when all items are OK.
16	All NG	Turns on at input of measure command when any one item is NG.
17	Item -NG	
18	+NG	
19	OK1	“OK1” to “OK64” shown at left are ranking codes. Total of ranking codes is number of ranks. Example: When “OK2” and “OK4” are turned on, OK6.
20	OK2	
21	OK4	
22	OK8	
23	OK16	
24	OK32	
25	OK64	
26		
27		
28		
29		
30		
31		
32		
33		
34		
35	-COM	Output common line: 0 V
36	-COM	

7.3.11 BCD output — Input/output signal arrangement (option)

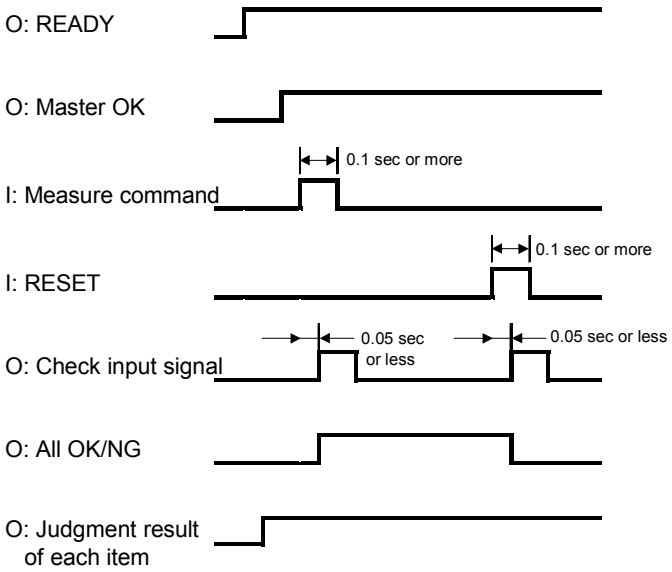
The BCD input/output signal is output when “ITEM 1”, “ITEM 2” or “ITEM 3” is selected with [BCD OUT] or a BCD item bit is entered in the set mode (6).

Note: “Item” refers to “ITEM” of DEG2000. The following table shows the input/output signal arrangement of the DC input/output connector (refer to ⑯ on page 7).

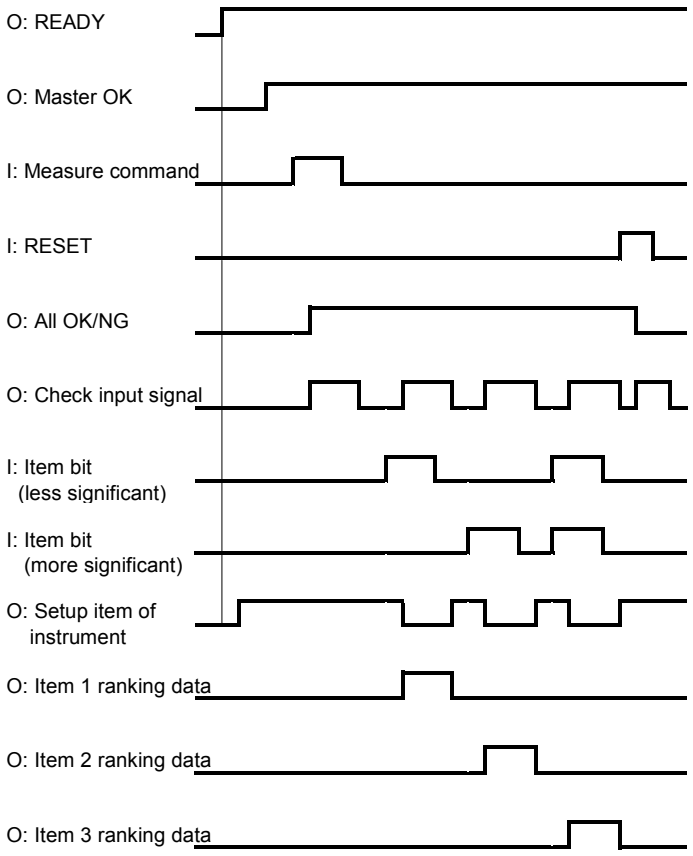
Pin No.	Signal name	Description
7	BCD item bit (less significant)	Specifies measurement item to be BCD output.
8	BCD item bit (more significant)	Specifies measurement item to be BCD output.
9	+COM	Input common line: +12/24 V
10	+COM	
11	BCD OUT 1	
12	2	
13	4	
14	8	
15	10	
16	20	
17	40	
18	80	
19	100	
20	200	
21	400	
22	800	
23	1000	
24	Decimal place (0)	
25	(1)	
26	POL	+: Off, -: On
27		
28		
29		
30		
31		
32		
33		
34		
35	-COM	Output common line: 0 V
36	-COM	

7.3.12 Timing charts

Three-item judgment and two-item judgment (I: Input signal to instrument, O: Output signal from instrument)



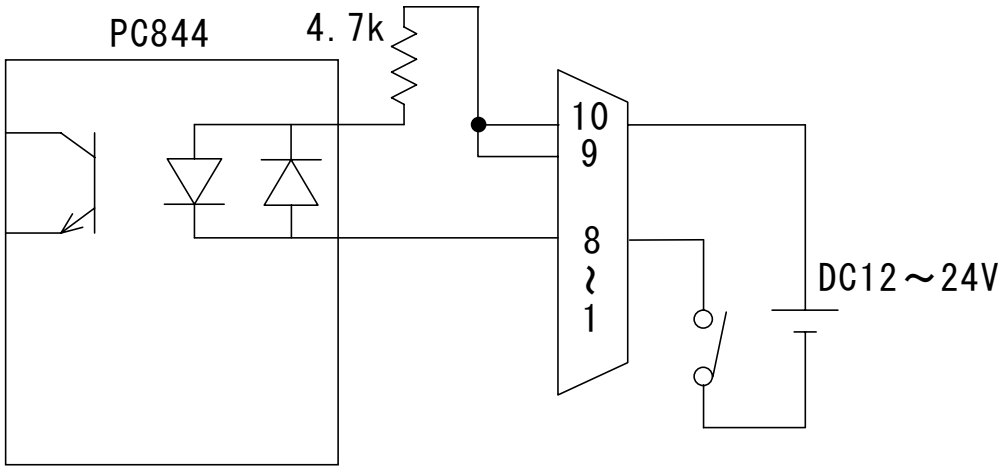
Ranking (I: Input signal to instrument, O: Output signal from instrument)



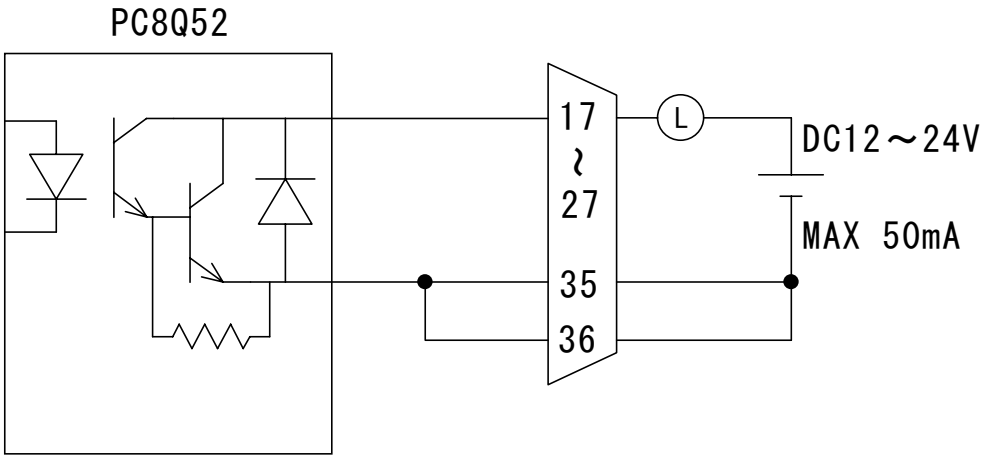
7.3.13 Connector pin arrangement diagram

A cable connector (57-30360 and DDK make) is supplied as accessory. Usually, a cable is not supplied as accessory.

7.3.14 Input circuit diagram

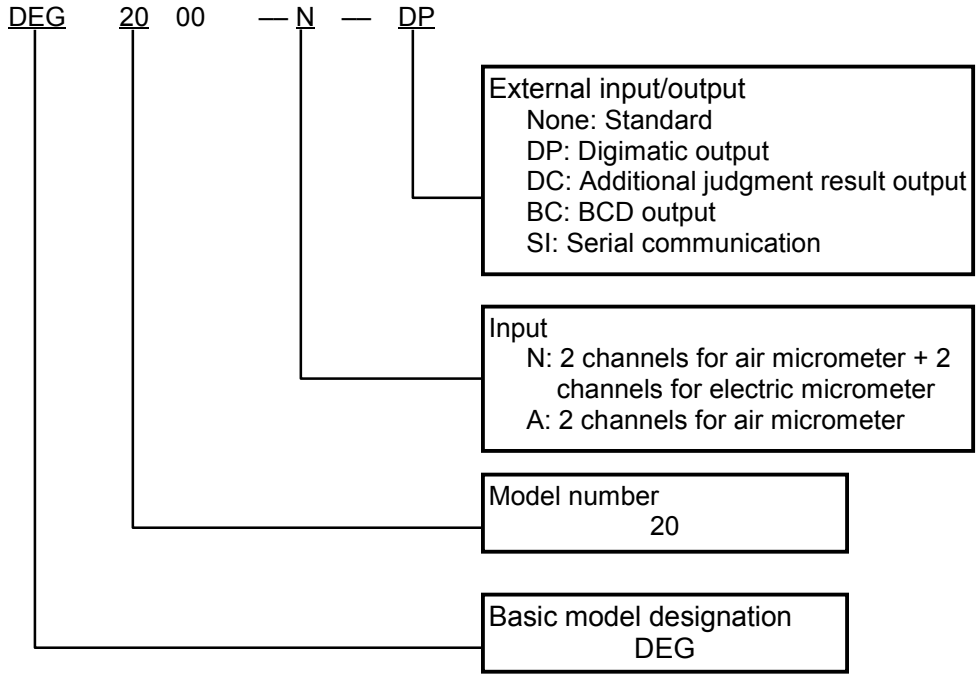


7.3.15 Output circuit diagram



Open collector output: Maximum of 50 mA per output signal

8. Model Identification



9. Options

9.1 Instrument

① Digimatic output:	Output to DP-1 printer (cable supplied as accessory)
② Additional judgment result output:	Output of individual ranks above rank 17 (addition of output board required)
③ BCD output:	Output of BCD data (addition of output board required)
④ Serial communication:	RS422 output

9.2 Separately sold parts

① Communication cable (DEG2000-OP-CB-1):	D-sub 9-pin connector (EIA-232) for personal computer
② Communication cable (DEG2000-OP-CB-2):	D-sub 25-pin connector (EIA-574) for personal computer
③ Communication cable (DEG2000-OP-CB-3):	D-sub 25-pin connector (EIA-574) for printer

10. Maintenance

(1) Use alcohol for cleaning the instrument. Use of thinner may discolor or darken the instrument.

11. Troubleshooting

Phenomenon	Cause	Remedy
Repeatability is not stable.	① Measuring head is loosely secured.	① Retighten its fasteners.
Main display does not operate.	① Specified power is not supplied.	① Supply power of 85 to 264 VAC.
	② Detector is improperly adjusted.	② Adjust detector.
	③ Instrument falls in hold measured value condition. Main display appears green (dark) or red (dark).	③ Press RST key to clear this condition.
	④ Instrument is in set mode.	④ End set mode.
Main display and alphanumeric display do not light.	① Power is not supplied.	① Supply power of 85 to 264 VAC.
	② Power supply or internal circuit is faulty.	② Ask NIDEC TOSOK for repair.

12. Cautions

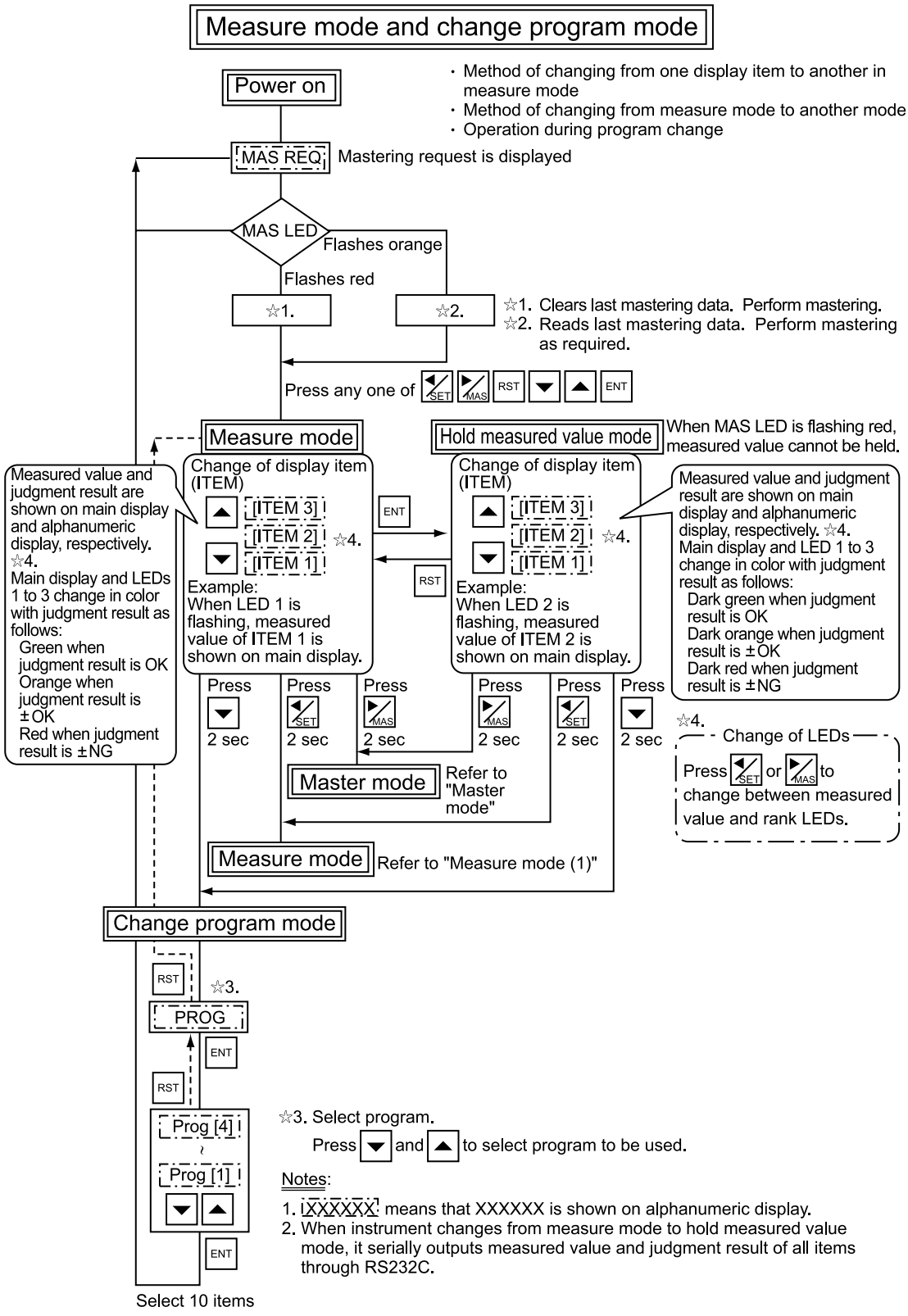
(1)Power cable
The power cable supplied as standard accessory is for 100 V. If you use supply voltage in excess of 125 V, separately prepare a 250-V power cable.

(2)Control keys
Never operate the control keys with a sharp-pointed tool or the like.

(3)Export
When you try to export this instrument overseas, you may have to have the export approved by the Ministry of Economy, Trade and Industry under the Export Trade Control Ordinance. In such a case, contact your nearest NIDEC TOSOK sales office.

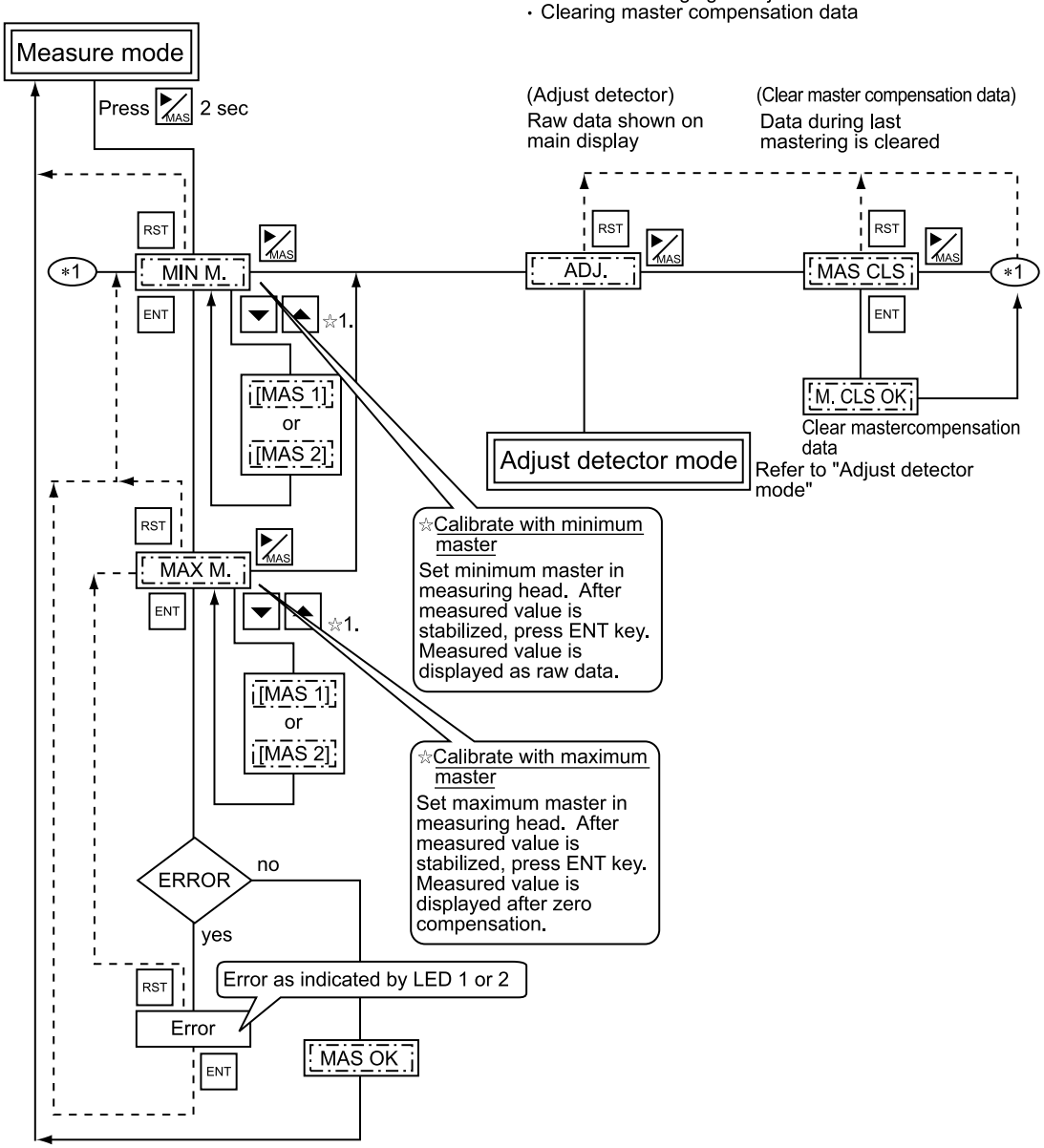
(4)Specifications
The specifications are subject to change without notice.

13. Operation Flow



Master mode

- Mastering
- Method of changing to adjust detector mode
- Clearing master compensation data

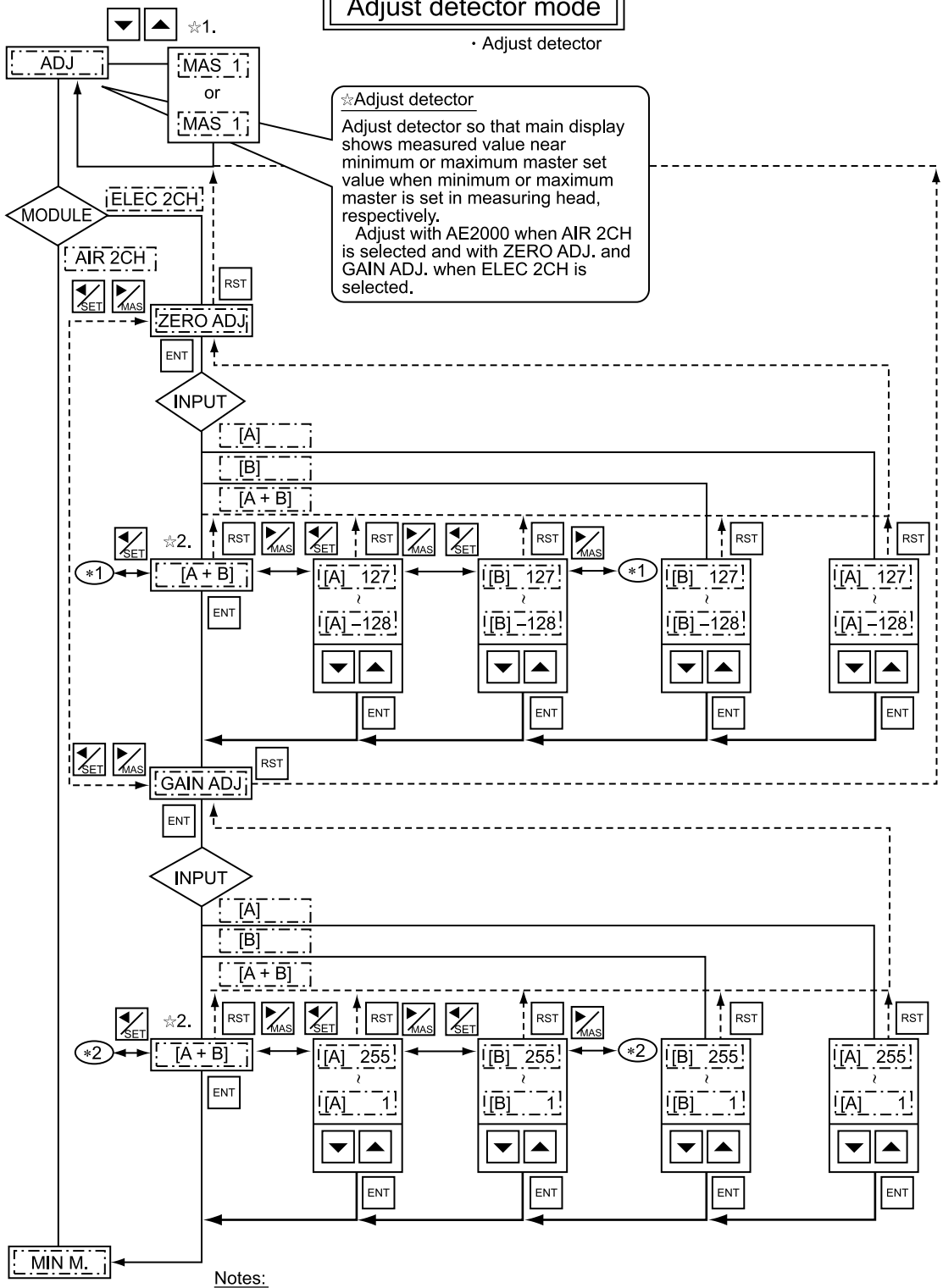


Notes:

☆1. Press ▼ and ▲ to change from one displayed master to another.
When MAS SET is MAS EACH, displayed master is used.
When MAS SET is MAS ALL, all masters are used.

Adjust detector mode

・Adjust detector

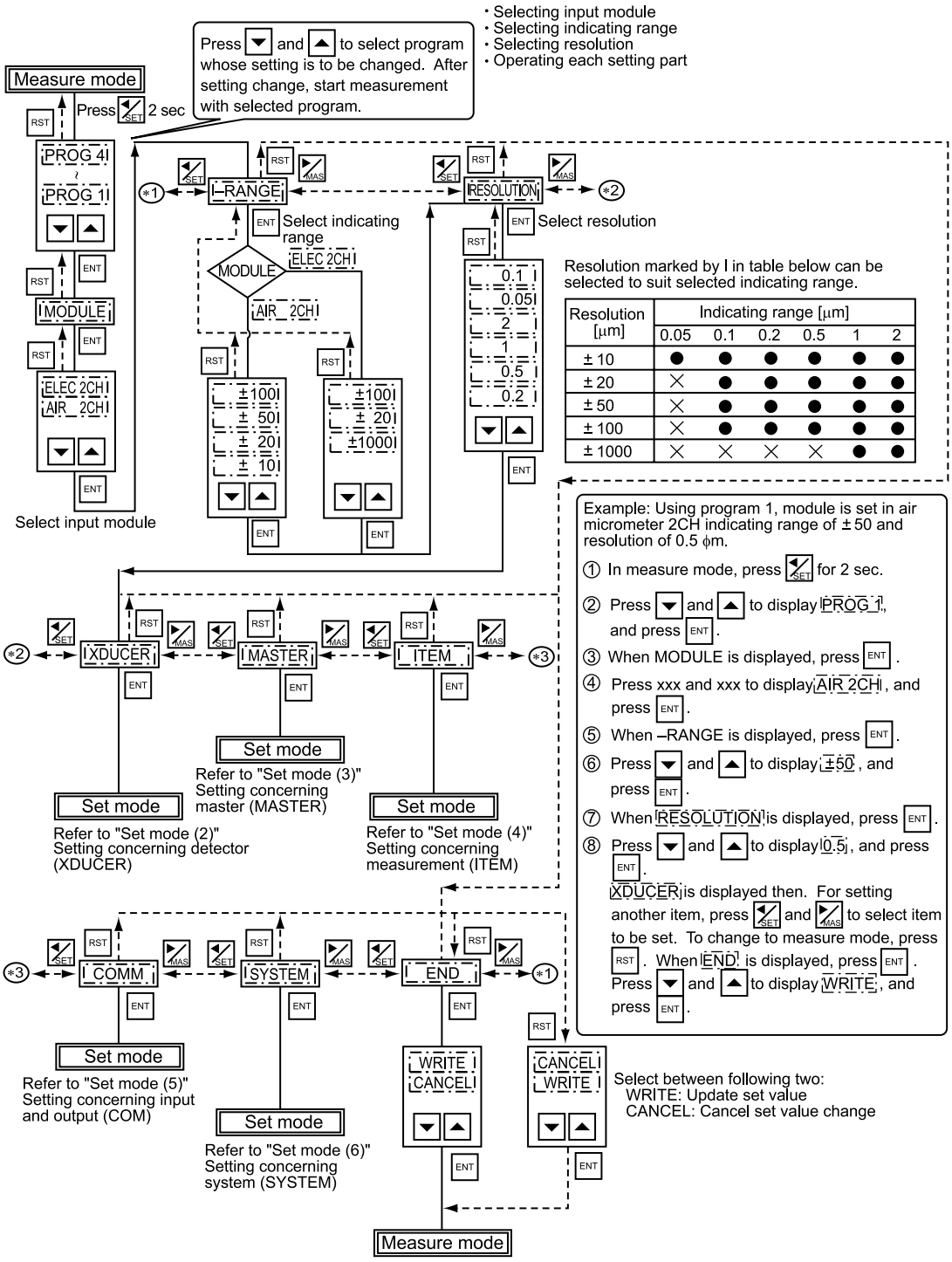


Notes:

☆1. Press ▼ and ▲ to change master to be adjusted.

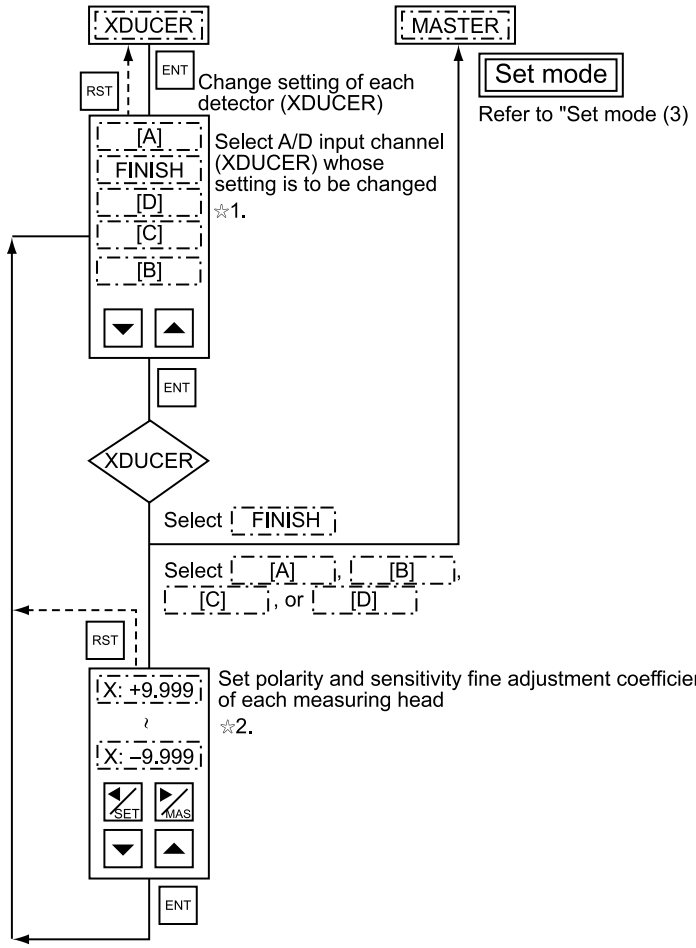
☆2. Press SET and MAS to change measuring head or master to be displayed. When changing setting of measuring head, press ▼ and ▲ to change set value.

Set mode (1)


• Selecting input module
• Selecting indicating range
• Selecting resolution
• Operating each setting part
Press ▼ and ▲ to select program whose setting is to be changed. After setting change, start measurement with selected program.
Measure mode
Press SET 2 sec
PROG 4
PROG 1
MODULE
ELEC 2CH
AIR 2CH
Select input module
–RANGE
Select indicating range
±100
± 50
± 20
± 10
±100
± 20
±1000
RESOLUTION
Select resolution
0.1
0.05
2
1
0.5
0.2
Resolution marked by I in table below can be selected to suit selected indicating range.
Resolution [μm] | Indicating range [μm]: 0.05 0.1 0.2 0.5 1 2
± 10 ● ● ● ● ● ●
± 20 × ● ● ● ● ●
± 50 × ● ● ● ● ●
± 100 × ● ● ● ● ●
± 1000 × × × × ● ●
Example: Using program 1, module is set in air micrometer 2CH indicating range of ± 50 and resolution of 0.5 ϕm.
① In measure mode, press SET for 2 sec.
② Press ▼ and ▲ to display PROG 1, and press ENT.
③ When MODULE is displayed, press ENT.
④ Press xxx and xxx to display AIR 2CH, and press ENT.
⑤ When –RANGE is displayed, press ENT.
⑥ Press ▼ and ▲ to display ±50, and press ENT.
⑦ When RESOLUTION is displayed, press ENT.
⑧ Press ▼ and ▲ to display 0.5, and press ENT.
XDUCER is displayed then. For setting another item, press SET and MAS to select item to be set. To change to measure mode, press RST. When END is displayed, press ENT. Press ▼ and ▲ to display WRITE, and press ENT.
XDUCER
MASTER
ITEM
Set mode
Refer to "Set mode (2)" Setting concerning detector (XDUCER)
Refer to "Set mode (3)" Setting concerning master (MASTER)
Refer to "Set mode (4)" Setting concerning measurement (ITEM)
COMM
SYSTEM
END
Refer to "Set mode (5)" Setting concerning input and output (COM)
Refer to "Set mode (6)" Setting concerning system (SYSTEM)
WRITE
CANCEL
Select between following two:
WRITE: Update set value
CANCEL: Cancel set value change
Measure mode

Set mode (2)

・Setting change of each detector (XDUCER)



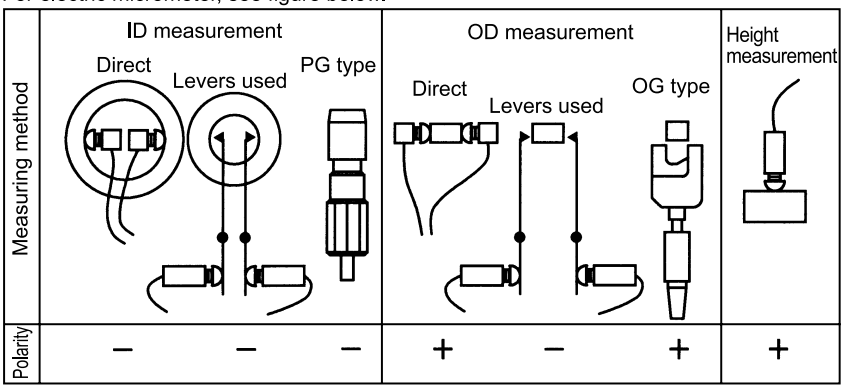
Notes:

☆1. Usually, [A], [B], [C], [D], and FINISH can be selected.
To select other XDUCER, set A/D external input EXT CH at USE (Set mode refer to "Set mode (5)".

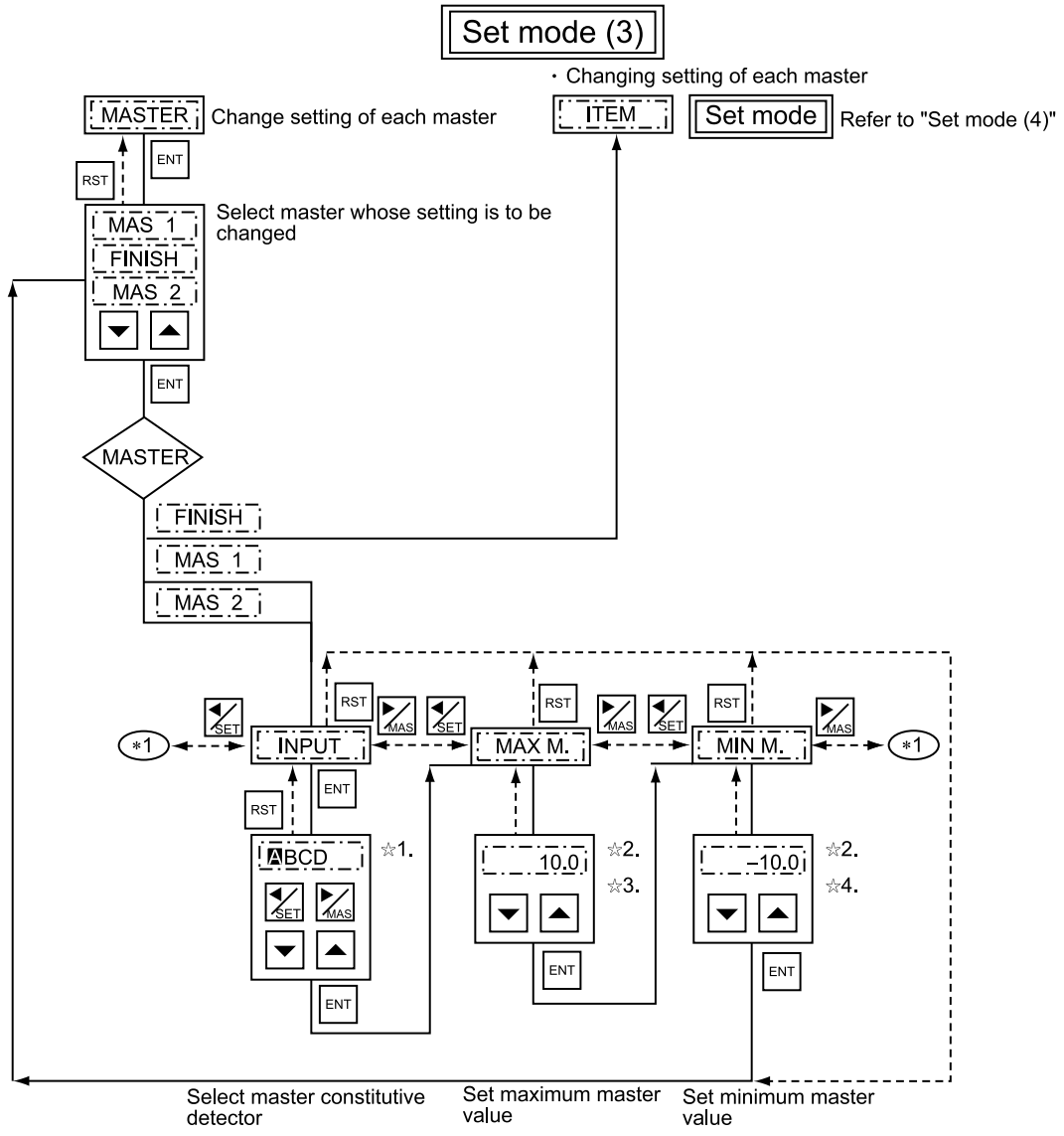
☆2. Press SET and MAS to select digit, and press ▼ and ▲ to change value of that digit.

・Polarity

For air micrometer, enter "+" for ID measurement and "–" for OD measurement.
For electric micrometer, see figure below.



Sensitivity fine adjustment coefficient
Usually set sensitivity fine adjustment coefficient of measuring head at 1.000.



Notes:

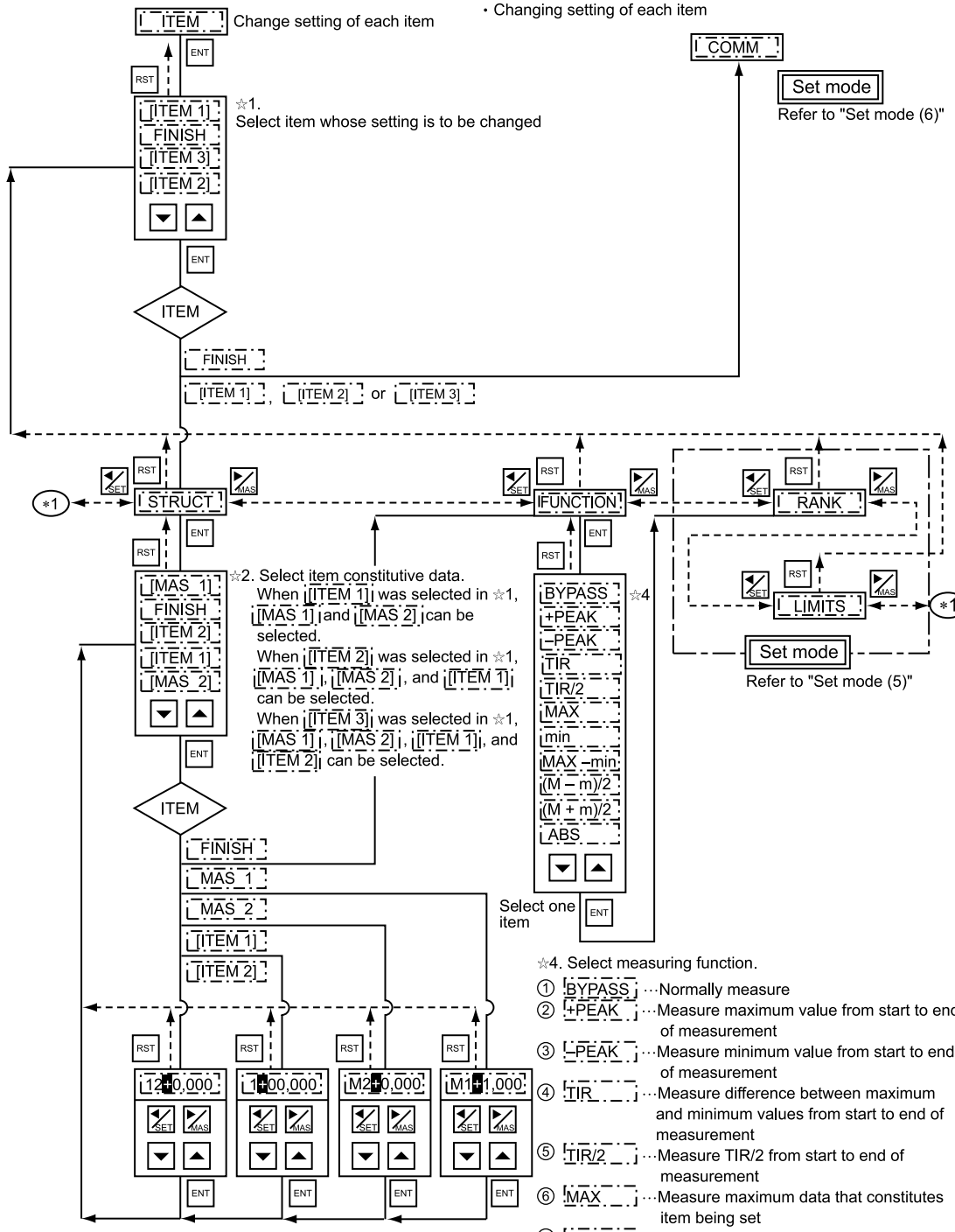
☆1. Select detector (XDUCER) that constitutes setting master ([MAS 1] or [MAS 2]). Press SET and MAS to select detector that constitutes setting master, and press ▼ and ▲ to select detector on or off.
Usually, ABCD can be selected. To select EFGH, set A/D external input EXT CH at USE (Set mode refer to "Set mode (6)".

☆2. Press ▼ and ▲ to increment or decrement set value by one resolution at a time.

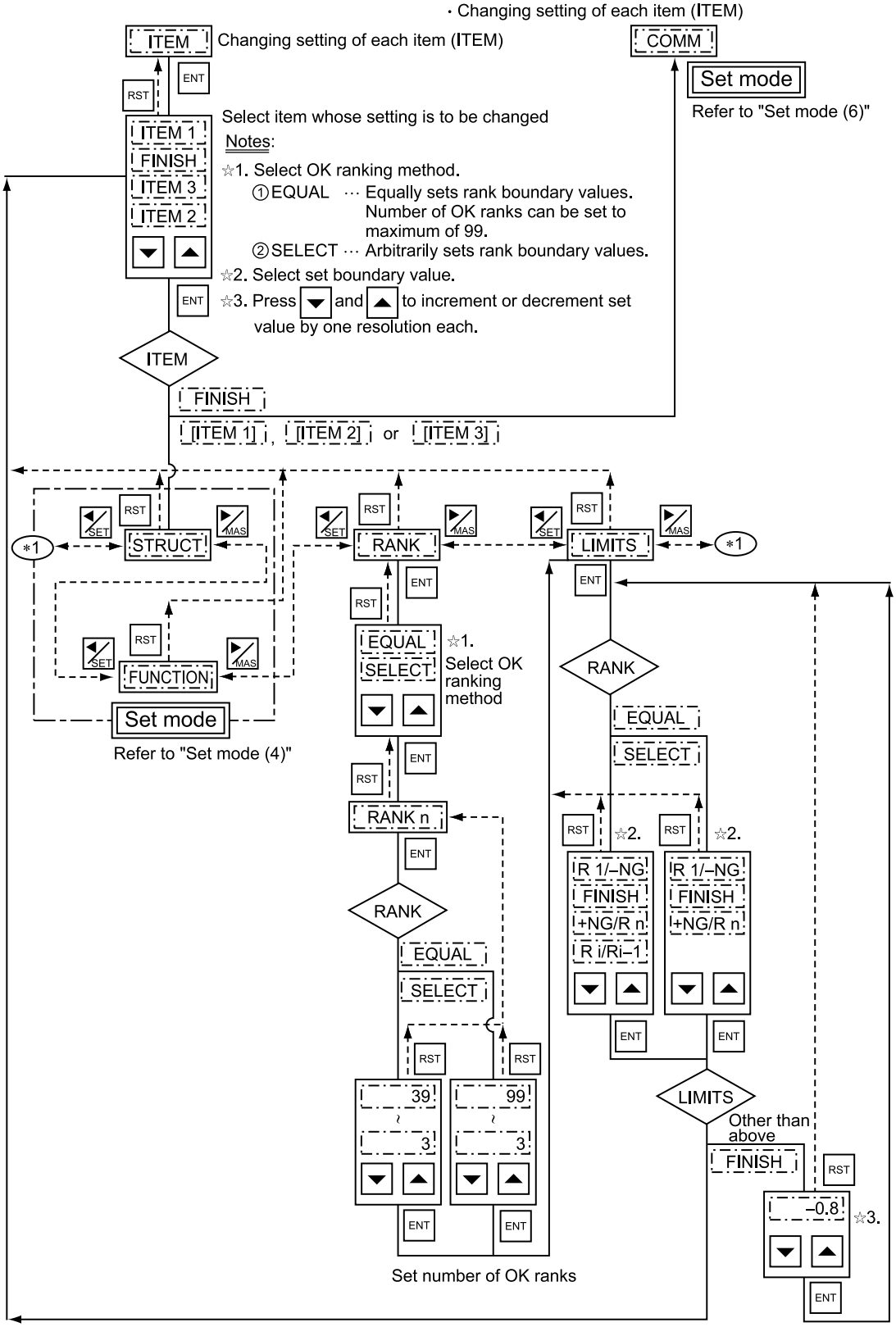
☆3. Enter measured value of maximum master.

☆4. Enter measured value of minimum master.

Set mode (4)

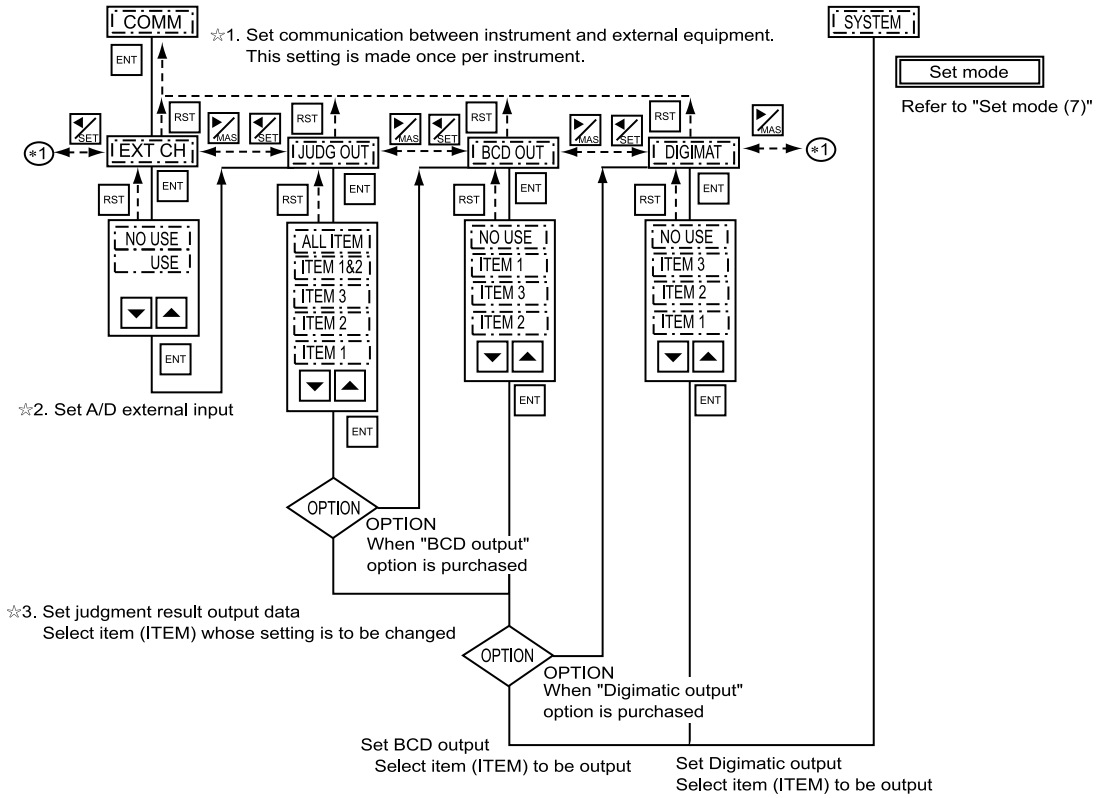

ITEM
Change setting of each item
• Changing setting of each item
ENT
RST
[ITEM 1]
FINISH
[ITEM 3]
[ITEM 2]
☆1.
Select item whose setting is to be changed
ITEM
FINISH
[ITEM 1], [ITEM 2] or [ITEM 3]
COMM
Set mode
Refer to "Set mode (6)"
∗1
STRUCT
FUNCTION
RANK
LIMITS
∗1
Set mode
Refer to "Set mode (5)"
SET
MAS
[MAS 1]
FINISH
[ITEM 2]
[ITEM 1]
[MAS 2]
☆2. Select item constitutive data.
When [ITEM 1] was selected in ☆1, [MAS 1] and [MAS 2] can be selected.
When [ITEM 2] was selected in ☆1, [MAS 1], [MAS 2], and [ITEM 1] can be selected.
When [ITEM 3] was selected in ☆1, [MAS 1], [MAS 2], [ITEM 1], and [ITEM 2] can be selected.
ITEM
FINISH
MAS 1
MAS 2
[ITEM 1]
[ITEM 2]
BYPASS
+PEAK
–PEAK
TIR
TIR/2
MAX
min
MAX –min
(M – m)/2
(M + m)/2
ABS
☆4
Select one item
12+0.000
1+00.000
M2+0.000
M1+1.000
☆3. Set sign (+/–) and operation coefficient (0.000 to 9.999) of input data.
Enter XX+0.000 for data not to be used.
Press SET and MAS to select input digit, and press ▼ and ▲ to change value of that digit.
☆4. Select measuring function.
① BYPASS ···Normally measure
② +PEAK ···Measure maximum value from start to end of measurement
③ –PEAK ···Measure minimum value from start to end of measurement
④ TIR ···Measure difference between maximum and minimum values from start to end of measurement
⑤ TIR/2 ···Measure TIR/2 from start to end of measurement
⑥ MAX ···Measure maximum data that constitutes item being set
⑦ min ···Measure minimum data that constitutes item being set
⑧ MAX–min ···Measure difference between maximum and minimum values of item being set
⑨ (M–m)/2 ···Measure (maximum – minimum)/2 of item being set
⑩ (M+m)/2 ···Measure (maximum + minimum)/2 of item being set
⑪ ABS ···Measure absolute value

Set mode (5)


· Changing setting of each item (ITEM)
ITEM
Changing setting of each item (ITEM)
COMM
Set mode
Refer to "Set mode (6)"
RST
ENT
ITEM 1
FINISH
ITEM 3
ITEM 2
Select item whose setting is to be changed
Notes:
☆1. Select OK ranking method.
①EQUAL ··· Equally sets rank boundary values. Number of OK ranks can be set to maximum of 99.
②SELECT ··· Arbitrarily sets rank boundary values.
☆2. Select set boundary value.
☆3. Press ▼ and ▲ to increment or decrement set value by one resolution each.
ITEM
FINISH
ITEM 1, ITEM 2 or ITEM 3
SET
MAS
*1
STRUCT
RANK
LIMITS
FUNCTION
Set mode
Refer to "Set mode (4)"
EQUAL
SELECT
☆1.
Select OK ranking method
RANK n
RANK
39
3
99
3
Set number of OK ranks
R 1/–NG
FINISH
+NG/R n
R i/Ri–1
☆2.
LIMITS
Other than above
FINISH
–0.8
☆3.

Set mode (6)

Here is described following:
• Changing setting of external input and output



Notes:

☆2. Set A/D external input.

NO USE ··· A/D external input is not to be used

USE ··· A/D external input is to be used

☆3. Select item (ITEM) for which judgment result is to be output.

ALL ITEM ··· Judgment result is to be output for all measurement items. Refer to page 24.

ITEM 1&2 ··· Judgment result is to be output for Items 1 and 2. Refer to page 25.

ITEM 1 ··· Judgment result is to be output for Item 1. Refer to pages 26 to 28.

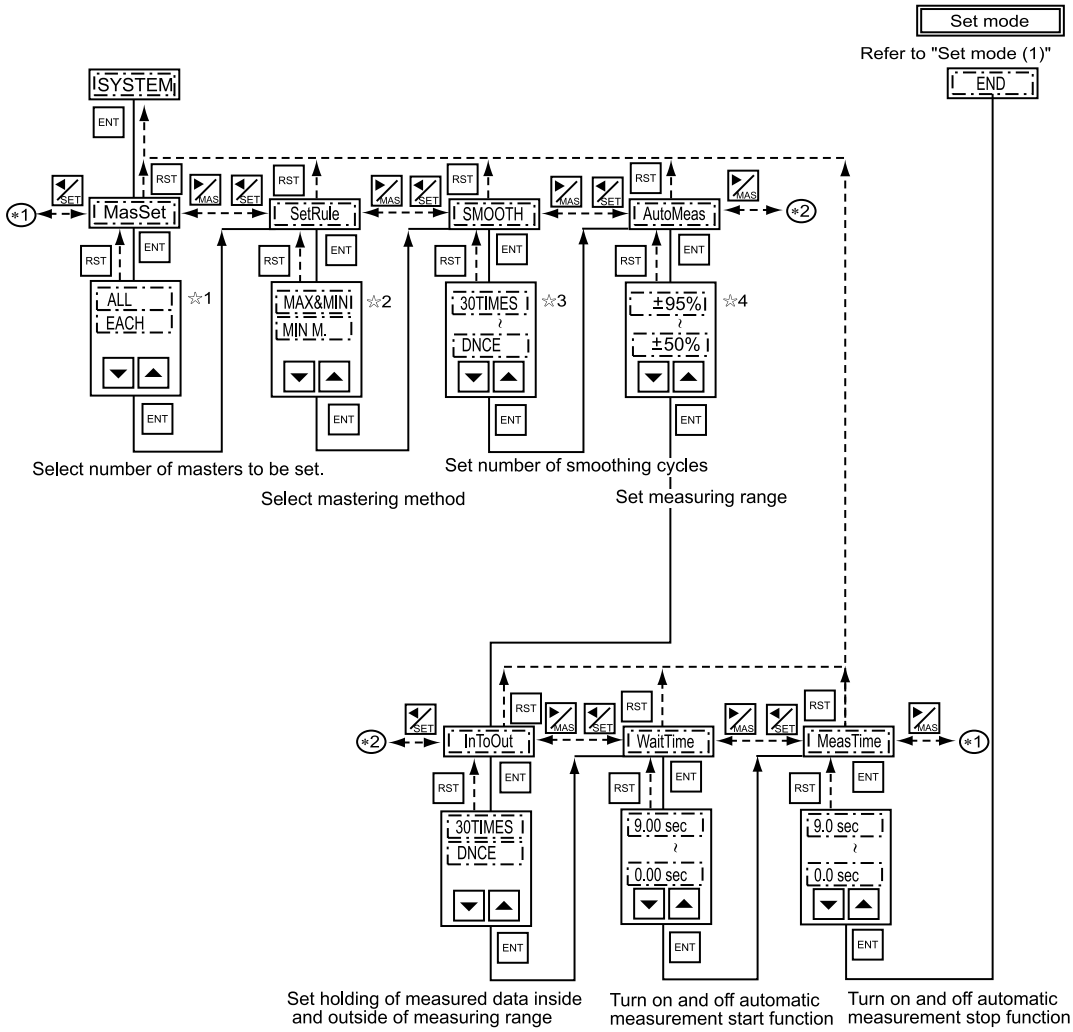
ITEM 2 ··· Judgment result is to be output for Item 2. Refer to pages 26 to 28.

ITEM 3 ··· Judgment result is to be output for Item 3. Refer to pages 26 to 28.

Set mode (7)

Here is described following:

- Selecting number of masters to be set
- Selecting mastering method (operation in "master mode"
- Setting number of smoothing cycles
- Setting measuring range
- Holding measured data inside and outside of measuring range
- Turning on and off automatic measurement start function
- Turning on and off automatic measurement stop function



Notes:

Settings made in ☆4 to☆7 are effective only during peak measurement.

☆1. Select number of masters to be set as follows:

ALL ··· Select for setting all masters at a time.

EACH ··· Select for setting each master separately.

☆2. Select mastering method (operation in master mode) as follows:

MAX&MIN ··· Select for setting both maximum and minimum masters.

MIN ··· Select for setting minimum master alone.

☆3. Set number of smoothing cycles as follows:
Number of smoothing cycles can be set between 1 and 30 cycles.

☆4. Set measuring range as follows:
Set percentage of indicating range that is to be used as measuring range.

☆5. Hold measured data inside and outside of measuring range as follows:

RESET ··· Measured data is reset.

HOLD ··· Measured data is held until it falls within measuring range.

☆6.Turn on and off automatic measurement start function as follows:
When using automatic measurement start function, set stabilizing timer at between 0.01 and 9.00 sec.
When not using automatic measurement start function, set stabilizing timer at 0.00 sec.

☆7. Turn on and off automatic measurement stop function as follows:
When using automatic measurement stop function, set measuring timer at between 0.1 and 9.0 sec.
When not using automatic measurement stop function, set measuring timer at 0.0 sec.

14. Work Sheet

DEG2000 Work Sheet No. 1

Manufacture No.:

Setting description / Program					PROG 1	PROG 2	PROG 3	PROG 4
Input module			MODULE					
Indicating range			I-RANGE					
Resolution			RESOLUTION					
XDUCER	CH. A	A/D polarity and coefficient						
		D/A ZERO	ZERO ADJ					
		D/A GAIN	GAIN ADJ					
	CH. B	A/D polarity and coefficient						
		D/A ZERO	ZERO ADJ					
		D/A GAIN	GAIN ADJ					
	CH. C	A/D polarity and coefficient						
	CH. D	A/D polarity and coefficient						
MASTER	MAS 1	XDUCER used	INPUT					
		Maximum master value	MAX M.					
		Minimum master value	MIN M.					
	MAS 2	XDUCER used	INPUT					
		Maximum master value	MAX M.					
		Minimum master value	MIN M.					
ITEM	ITEM 1	Item constitutive data (Sign and coefficient input)	STRUCT	MAS 1				
				MAS 2				
		Measuring function	FUNCTION					
		OK ranking method	RANK					
		No. of OK ranks	RANK n					
		LIMITS (3 OK ranks)	+NG/+OK					
		*For 4 or more OK ranks, write on work sheet No.2.	+OK/OK					
			OK/-OK					
			-OK/-NG					

Setting description / Program					PROG 1	PROG 2	PROG 3	PROG 4
ITEM	ITEM 2	Item constitutive data (Sign and coefficient input)	STRUCT	MAS 1				
				MAS 2				
				ITEM 1				
		Measuring function	FUNCTION					
		OK ranking method	RANK					
		No. of OK ranks	RANK n					
		LIMITS (3 OK ranks) *For 4 or more OK ranks, write on work sheet No.2.	+NG/+OK					
			+OK/OK					
			OK/-OK					
			-OK/-NG					
	ITEM 3	Item constitutive data (Sign and coefficient input)	STRUCT	MAS 1				
				MAS 2				
				ITEM 1				
				ITEM 2				
		Measuring function	FUNCTION					
		OK ranking method	RANK					
		No. of OK ranks	RANK n					
		LIMITS (3 OK ranks) *For 4 or more OK ranks, write on work sheet No.2.	+NG/+OK					
			+OK/OK					
			OK/-OK					
			-OK/-NG					

DEG2000 Work Sheet No. 2

Manufacture No.

Setting description / Program item				PROG 1			PROG 2			PROG 3			PROG 4		
				ITEM 1	ITEM 2	ITEM 3	ITEM 1	ITEM 2	ITEM 3	ITEM 1	ITEM 2	ITEM 3	ITEM 1	ITEM 2	ITEM 3
ITEM	Rank boundary value	LIMITS	R1/-NG												
			+NG/Rn												
			R2/R1												
			R3/R2												
			R4/R3												
			R5/R4												
			R6/R5												
			R7/R6												
			R8/R7												
			R9/R8												
			R10/R9												
			R11/R10												
			R12/R11												
			R13/R12												
			R14/R13												
			R15/R14												
			R16/R15												
			R17/R16												
			R18/R17												
			R19/R18												
			R20/R19												
			R21/R20												
			R22/R21												
			R23/R22												
			R24/R23												
			R25/R24												
			R26/R25												
			R27/R26												
			R28/R27												
			R29/R28												
			R30/R29												
			R31/R30												
			R32/R31												
			R33/R32												
			R34/R33												
			R35/R34												
			R36/R35												
			R37/R36												
			R38/R37												
			R39/R38												

Setting description \ Program item			PROG 1			PROG 2			PROG 3			PROG 4		
			ITEM 1	ITEM 2	ITEM 3	ITEM 1	ITEM 2	ITEM 3	ITEM 1	ITEM 2	ITEM 3	ITEM 1	ITEM 2	ITEM 3
COMM	A/D external input	EXT CH												
	Judgment result output	JUDG OUT												
	BCD output	BCD OUT												
	Digimatic output	DIGIMATI												
SYS-TEM	No. of masters to be set	MasSet												
	Mastering method	SetRule												
	No. of smoothing cycles	SMOOTH												
	Measuring range	AutoMeas												
	Holding measured value outside of measuring range	InToOut												
	Stabilizing timer	WaitTime												
	Measuring timer	MeasTime												