

Operation Manual for the A7000 Series

Frequency Measurement: A7X19-X



CAUTIONS

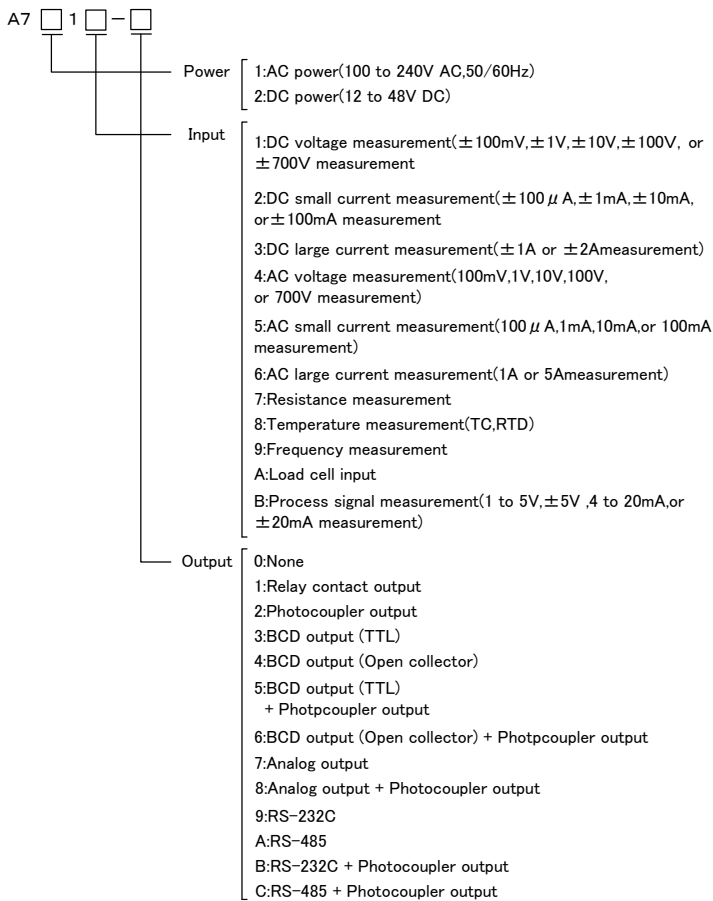
- (1) Application of voltage or current exceeding the maximum allowable value to the input section may damage the instrument.
- (2) Use the supply voltage in the allowable range. Using it out of this range may result in fire, electric shock, or an instrument failure.
- (3) Please note that the information contained in this manual is subject to change due to product improvements without notice.
- (4) Every effort has been made to ensure accuracy in the presentation of this manual. However, should you have any questions or should any errors or omissions come to your attention, please contact your sales representative or our sales office directly.
- (5) After reading, keep this manual nearby so that you can refer to it as needed.

1. Check before Use

Thank you for purchasing our A7000 series. The operator who uses the instrument should keep this manual on hand. When you receive the product, make sure that you have all the parts and that none have been damaged during transportation. If any part is damaged or missing, contact your sales representative or our sales office directly.

1.1. Type Configuration

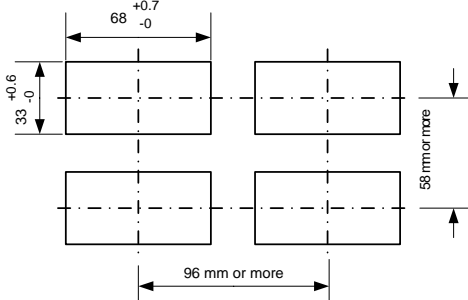
The type configuration of the A7000 series is as shown below. Check that there is no difference in the type or specifications between the product you ordered and the product you have received.



2. Mounting Method

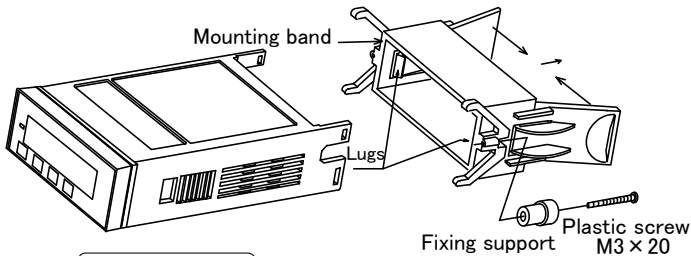
2.1. Panel Cutout Dimensions

For panel cutout made when mounting the A7000 series measuring unit, follow the figure below.



2.2. Panel Mounting Method

To mount the A7000 series measuring unit onto a panel, remove the mounting band from the main unit, fit the unit into the panel from the front of the panel, and fix it using the mounting band removed from the rear of the panel. If you wish to increase the strength of the mounting, attach fixing supports with screws as shown in the figure below. For fixing supports and screws, contact your sales representative or our sales office.

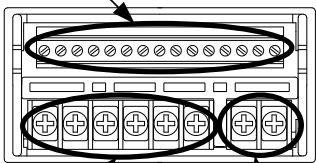


CAUTIONS

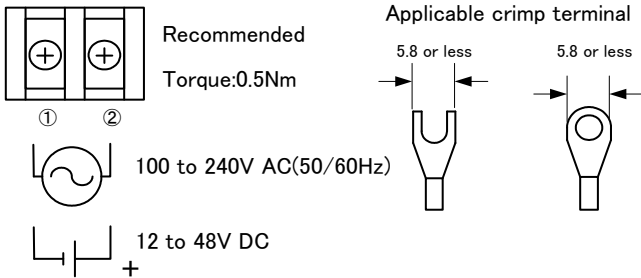
- (1) Mount the instrument securely on a surface that will be able to bear its weight. Insufficient strength for mounting or incorrect mounting may result in the instrument falling and injuring personnel.
- (2) The A7000 series has no power switch. Connecting power to the instrument makes the product immediately operable.
- (3) If the instrument is installed inside equipment to heat radiation, etc., and ensure that the in-equipment temperature does not rise above 50°C.

3. Description of Terminals and Connection

Output section (different configuration for BCD output)

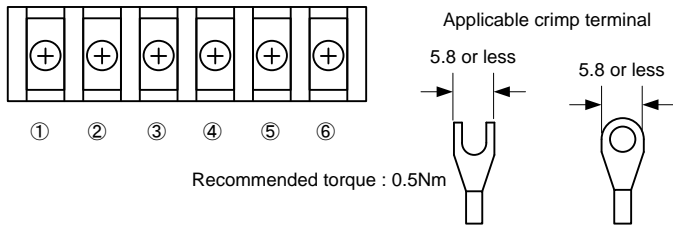


3.1. Connecting Power



| Terminal No. | Name | Description |
|--------------|-------|--|
| 1 | Power | Power connection terminal. 0V for DC driving |
| 2 | Power | Power connection terminal. +V for DC driving |

3.2. Connecting Input Signal

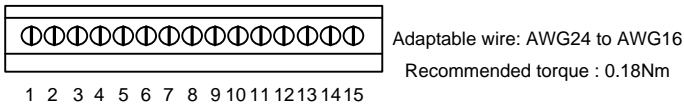


| Terminal No. | Name | Description |
|--------------|---------|---|
| 1 | Vrms HI | Input terminal of AC voltage type (500 Vrms maximum) |
| 2 | HI | +side input terminal of open collector, logic, or magnet type |
| 3 | LO | -side input terminal of open collector, logic, or magnet type |
| 4 | +EXC | Sensor power output terminal (+side) |
| 5 | -EXC | Sensor power output terminal (-side) |
| 6 | Vrms LO | Input terminal of AC voltage type (500 Vrms maximum) |

* In the A7000 series, the range for use and the input type needs to be set using scaling data. The unit is set to 13 ranges and open collector input at factory shipment.

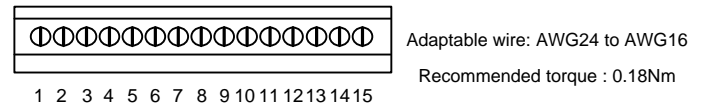
3.3. Connecting Various Output Signals

3.3.1. Relay Contact Output Unit



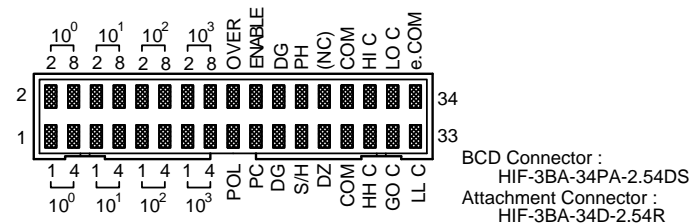
| Term. No. | Name | Description |
|-----------|--------|--|
| 1 | P.SEL1 | Pattern Select terminals. Enabled when they have the same potential as, or are shorted with, terminal COM. * They are disabled unless pattern select is set up for terminal control using condition data. |
| 2 | P.SEL2 | Pattern1 Pattern2 Pattern3 Pattern4 Pattern5 Pattern6 Pattern7 Pattern8 |
| 3 | P.SEL3 | P1 OFF ON OFF ON OFF ON OFF ON P2 OFF OFF ON OFF ON OFF ON ON P3 OFF OFF ON OFF ON OFF ON ON |
| 4 | S/H | Start/Hold terminal. Enabled when it has the same potential as, or is shorted with, terminal COM. |
| 5 | PH | Peak Hold terminal. Enabled when it has the same potential as, or is shorted with, terminal COM. |
| 6 | DZ | Digital Zero terminal. Enabled when it has the same potential as, or is shorted with, terminal COM. * This terminal is disabled unless digital zero is set up for terminal control using condition data. |
| 7 | COM | Common terminal for external control. (It has the same potential as input LO.) |
| 8 | HH a | The a-contact output terminal of HH output relay |
| 9 | c | COM terminal for HH and HI output relays |
| 10 | HI a | The a-contact output terminal of HI output relay |
| 11 | c | COM terminal of GO output relay |
| 12 | GO a | The a-contact output terminal of GO output relay |
| 13 | LO a | The a-contact output terminal of LO output relay |
| 14 | c | COM terminal for LO and LL output relays |
| 15 | LL a | The a-contact output terminal of LL output relay |

3.3.2. Photocoupler Output Unit



| Term. No. | Name | Description |
|-----------|--------|--|
| 1 | P.SEL1 | Pattern Select terminals. Enabled when they have the same potential as, or are shorted with, terminal COM. * They are disabled unless pattern select is set up for terminal control using condition data. |
| 2 | P.SEL2 | Pattern1 Pattern2 Pattern3 Pattern4 Pattern5 Pattern6 Pattern7 Pattern8 |
| 3 | P.SEL3 | P1 OFF ON OFF ON OFF ON OFF ON P2 OFF OFF ON OFF ON OFF ON ON P3 OFF OFF ON OFF ON OFF ON ON |
| 4 | S/H | Start/Hold terminal. Enabled when it has the same potential as, or is shorted with, terminal COM. |
| 5 | PH | Peak Hold terminal. Enabled when it has the same potential as, or is shorted with, terminal COM. |
| 6 | DZ | Digital Zero terminal. Enabled when it has the same potential as, or is shorted with, terminal COM. * This terminal is disabled unless digital zero is set up for terminal control using condition data. |
| 7 | COM | Common terminal for external control. (It has the same potential as input LO.) |
| 8 | HH c | Collector output terminal of HH output photocoupler |
| 9 | eCOM | Common emitter terminal for HH and HI output photocouplers |
| 10 | HI c | Collector output terminal of HI output photocoupler |
| 11 | eCOM | Emitter terminal of GO output photocoupler |
| 12 | GO c | Collector output terminal of GO output photocoupler |
| 13 | LO c | Collector output terminal of LO output photocoupler |
| 14 | eCOM | Common emitter terminal for LO and LL output photocouplers |
| 15 | LL c | Collector output terminal of LL output photocoupler |

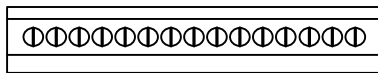
3.3.3. BCD Unit



| Term. No. | Name | Description |
|-----------|---------------------|---|
| 1-4 | 10 ⁰ 1-8 | Bit-1 to bit-8 outputs of BCD 10 ⁰ digit |
| 5-8 | 10 ¹ 1-8 | Bit-1 to bit-8 outputs of BCD 10 ¹ digit |
| 9-12 | 10 ² 1-8 | Bit-1 to bit-8 outputs of BCD 10 ² digit |
| 13-16 | 10 ³ 1-8 | Bit-1 to bit-8 outputs of BCD 10 ³ digit |
| 17 | POL | BCD polarity output |
| 18 | OVER | BCD overrange warning output |
| 19 | PC | BCD printout command output |
| 20 | ENABLE | BCD enable terminal. BCD output becomes high impedance or transistor is turned OFF when this terminal has the same potential as, or is shorted with, terminal DG. |
| 21,22 | DG | Common terminal for BCD outputs |
| 23 | S/H | Start/Hold terminal. Enabled when it has the same potential as, or is shorted with, terminal COM. |
| 24 | PH | Peak Hold terminal. Enabled when it has the same potential as, or is shorted with, terminal COM. |
| 25 | DZ | Digital Zero terminal. Enabled when it has the same potential as, or is shorted with, terminal COM. * This terminal is disabled unless digital zero is set up for terminal control using condition data. |
| 26 | NC | Connect nothing to this terminal. |
| 27,28 | COM | Common terminal for external control. (It has the same potential as input LO.) |
| 29 | HH c | Collector output terminal of HH output photocoupler |
| 30 | HI c | Collector output terminal of HI output photocoupler |
| 31 | GO c | Collector output terminal of GO output photocoupler |
| 32 | LO c | Collector output terminal of LO output photocoupler |
| 33 | LL c | Collector output terminal of LL output photocoupler |
| 34 | eCOM | Photocoupler's common emitter terminal |

* For models A7X1X-3 and -4, terminals 29 to 34 are NC. Connect nothing to these terminals.

3.3.4. Analog Output Unit



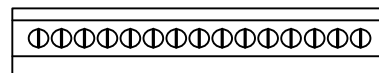
Adaptable wire: AWG24 to AWG16
Recommended torque : 0.18Nm

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

| Term. No. | Name | Description |
|-----------|--------|---|
| 1 | V.OUT | Voltage Output terminal (0 to 1 V, 0 to 10 V, 1 to 5 V) |
| 2 | A.OUT | Current Output terminal (4 to 20 mA) |
| 3 | AO.COM | Common terminal for analog outputs |
| 4 | S/H | Start/Hold terminal. Enabled when it has the same potential as, or is shorted with, terminal COM. |
| 5 | PH | Peak Hold terminal. Enabled when it has the same potential as, or is shorted with, terminal COM. |
| 6 | DZ | Digital Zero terminal. Enabled when it has the same potential as, or is shorted with, terminal COM. * This terminal is disabled unless digital zero is set up for terminal control using condition data. |
| 7 | COM | Common terminal for external control. (It has the same potential as input LO.) |
| 8 | HH c | Collector output terminal of HH output photocoupler |
| 9 | eCOM | Common emitter terminal for HH and HI output photocouplers |
| 10 | HI c | Collector output terminal of HI output photocoupler |
| 11 | eCOM | Emitter terminal of GO output photocoupler |
| 12 | GO c | Collector output terminal for GO output photocoupler |
| 13 | LO c | Collector output terminal of LO output photocoupler |
| 14 | eCOM | Common emitter terminal for LO and LL output photocouplers |
| 15 | LL c | Collector output terminal of LL output photocoupler |

* For model A7X1X-7, terminals 8 to 15 are NC. Connect nothing to these terminals.

3.3.6. RS-485 Unit



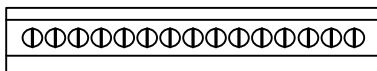
Adaptable wire: AWG24 to AWG16
Recommended torque : 0.18Nm

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

| Term. No. | Name | Description |
|-----------|------|---|
| 1 | (+) | Non-inverse output |
| 2 | (-) | Inverse output |
| 3 | SG | Common terminal for communications function |
| 4 | TERM | Terminating resistor terminal (200 Ω). When turning it ON, short it with terminal 5. |
| 5 | TERM | Terminating resistor terminal (200 Ω). When turning it ON, short it with terminal 4. |
| 6 | S/H | Start/Hold terminal. Enabled when it has the same potential as, or is shorted with, terminal COM. |
| 7 | PH | Peak Hold terminal. Enabled when it has the same potential as, or is shorted with, terminal COM. |
| 8 | NC | Connect nothing to this terminal. |
| 9 | COM | Common terminal for external control. (It has the same potential as input LO.) |
| 10 | HH c | Collector output terminal of HH output photocoupler |
| 11 | HI c | Collector output terminal of HI output photocoupler |
| 12 | GO c | Collector output terminal of GO output photocoupler |
| 13 | LO c | Collector output terminal of LO output photocoupler |
| 14 | LL c | Collector output terminal of LL output photocoupler |
| 15 | eCOM | Photocoupler's common emitter terminal |

* For model A7X1X-A, terminals 10 to 15 are NC. Connect nothing to these terminals.

3.3.5. RS-232C Unit



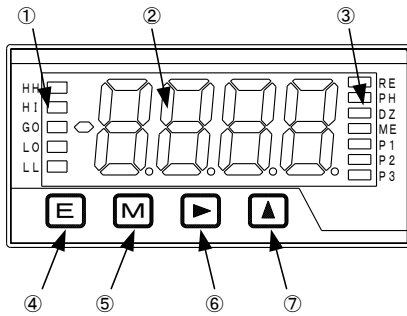
Adaptable wire: AWG24 to AWG16
Recommended torque : 0.18Nm

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

| Term. No. | Name | Description |
|-----------|------|---|
| 1 | RXD | Receive terminal |
| 2 | TXD | Transmit terminal |
| 3 | SG | Common terminal for communications function |
| 4 | NC | Connect nothing to this terminal. |
| 5 | NC | Connect nothing to this terminal. |
| 6 | S/H | Start/Hold terminal. Enabled when it has the same potential as, or is shorted with, terminal COM. |
| 7 | PH | Peak Hold terminal. Enabled when it has the same potential as, or is shorted with, terminal COM. |
| 8 | NC | Connect nothing to this terminal. |
| 9 | COM | Common terminal for external control. (It has the same potential as input LO.) |
| 10 | HH c | Collector output terminal of HH output photocoupler |
| 11 | HI c | Collector output terminal of HI output photocoupler |
| 12 | GO c | Collector output terminal of GO output photocoupler |
| 13 | LO c | Collector output terminal of LO output photocoupler |
| 14 | LL c | Collector output terminal of LL output photocoupler |
| 15 | eCOM | Photocoupler's common emitter terminal |

* For model A7X1X-9, terminals 10 to 15 are NC. Connect nothing to these terminals.

4. Part Names and their Functions



| Location | Name | Main Functions | | | | | | | | | |
|----------|------------------|---|--|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----|
| ① | Judgment Monitor | Indicates judgment results when the unit is used as a meter relay. | | | | | | | | | |
| ② | Main Monitor | Displays measured values or menu names or information for setting up parameters. | | | | | | | | | |
| ③ | Function Monitor | RE | Lights up if the unit enters a remote control status using the communication function. | | | | | | | | |
| | | PH | Lights up if peak hold, valley hold, or peak - valley hold is activated. | | | | | | | | |
| | | DZ | Lights up if digital zero is activated. | | | | | | | | |
| | | ME | Lights up if digital zero backup is activated. | | | | | | | | |
| | | P1 | Pattern 1 | Pattern 2 | Pattern 3 | Pattern 4 | Pattern 5 | Pattern 6 | Pattern 7 | Pattern 8 | |
| | | P2 | OFF | ON | OFF | ON | OFF | ON | OFF | ON | |
| | | P3 | | OFF | ON | | | OFF | ON | | ON |
| ④ | Enter | Shifts the unit to the parameter setting mode. | | | | | | | | | |
| ⑤ | Mode | Shifts the unit to mode change during parameter settings or to max./min./ (max. min. value) display in measurements (When pressed for a prolonged time). | | | | | | | | | |
| ⑥ | Shift | Used to change the objective digit during parameter settings or make DZ control in measurements (When pressed for a prolonged time). | | | | | | | | | |
| ⑦ | Increment | Used to change a numerical value or content during parameter settings, make pattern select in measurement (When pressed for a prolonged time), or perform special operations. | | | | | | | | | |

5. Setting Parameters

5.1. List of Parameters

5.1.1. Condition Data

| Menu Display | Parameter Name | Initial Value | P.L. | Settable Range or Alternatives | Main Setting Target and Precautions |
|---------------|----------------------------------|---------------|------|--------------------------------|---|
| MAV (MAV) | Number of moving averaging times | 1 | 0 | 1/2/4/8/16/32 | Selects the number of moving averaging times. (Small filtering effect 1 (OFF) ⇔ 2 ⇔ 4 ⇔ 8 ⇔ 16 ⇔ 32 Large filtering effect) |
| SWD (S.WD) | Step wide | 1 | 0 | 1/2/5/10 | Selects a display change width to limit variations in display. (If this parameter is set to "5," the least significant digit displays only "0" or "5.") |
| CLR (CLR) | Display color | red | 1 | red/green | Selects display color. * Only when no meter relay is available. |
| CLRT (CLR.T) | Display color type | Auto | 1 | Auto/MANU | Selects either automatic setting (red for HI and LO and green for GO) or manual setting for display color type. * Only when a meter relay is available |
| HHCL (HH.CL) | HH display color | red | 1 | red/green | Selects red or green for display color applied during HH judgment. * Only when CLR.T is in MANU. |
| HLCL (HI.CL) | HI display color | red | 1 | red/green | Selects red or green for display color applied during HI judgment. * Only when CLR.T is in MANU. |
| GOCL (GO.CL) | GO display color | green | 1 | red/green | Selects red or green for display color applied during GO judgment. * Only when CLR.T is in MANU. |
| LOCL (LO.CL) | LO display color | red | 1 | red/green | Selects red or green for display color applied during LO judgment. * Only when CLR.T is in MANU. |
| LLCL (LL.CL) | LL display color | red | 1 | red/green | Selects red or green for display color applied during LL judgment. * Only when CLR.T is in MANU. |
| BLN (BLNK) | Display blank level | off | 0 | off/LV1/LV2/LV3/on | Selects display brightness. (Bright OFF ⇔ LV1 ⇔ LV2 ⇔ LV3 ⇔ ON Extinguished) |
| PVH (PVH) | PH select | PH | 0 | PH/VH/PVH | Selects the type (peak hold, valley hold, or peak - valley hold) activated when the PH function is enabled. |
| PS (PS) | Pattern Select | 1 | 0 | 1/2/4/8 | Selects the number of patterns available for the pattern select function. |
| LINE (LINE) | Linearize | off | 0 | off/2/4/8/16 | Selects the enable/disable of the linearize function and the number of correction points. |
| PON (P.ON) | Power-on delay time | 0 | 0 | 0 ~ 9 | Sets the time (setpoint x 1 sec.) taken from power ON to when measurement actually starts. |
| PRO (PRO) | Protect level | L41 | 3 | L40/L41/L42/L43 | Selects the protect level for preventing erroneous operation (High LV3 ⇔ LV2 ⇔ LV1 ⇔ LV0 Low). |
| U-NO (U-NO.) | ----- | off | 0 | off/on | Use the unit with this parameter set to OFF. |
| PVHT (PVH.T) | Peak hold type | A | 0 | A/b | Selects the action type of peak hold (A: real display, B: result display). |
| DZC (DZ.C) | Digital zero control | SW | 0 | SW/TERM | Selects the digital zero control method (SW: front panel keys, TERM: external control terminals). |
| PSC (PS.C) | Pattern select control | SW | 0 | SW/TERM | Selects the pattern select control method (SW: front panel keys, TERM: external control terminals). * Only when external control is provided |
| BCDL (BCD.L) | BCD output logic | NLoL | 0 | NLoL/PLoL | Selects the BCD output logic (N: negative logic, P: positive logic). * Only when BCD output is provided |
| BAUD (BAUD) | Baud rate | 9600 | 1 | 2400/4800/9600 19200/38400 | Selects the communication function's Baud rate. * Only when the communication function is provided |
| DATA (DATA) | Data length | 7 | 1 | 7/8 | Selects the communication function data length. * Only when the communication function is provided |
| P.BIT (P.BIT) | Parity bit | E | 1 | E/o/n | Selects the communication function parity bit. * Only when the communication function is provided |
| STP.B (STP.B) | Stop bit | 2 | 1 | 1/2 | Selects the communication function stop bit. * Only when the communication function is provided |
| T- (T-) | Delimiter | crLF | 1 | crLF/cr | Selects the communication function delimiter. * Only when the communication function is provided |
| ADR (ADR) | Address | 01 | 1 | 01 ~ 99 | Selects the RS-485 function's device ID. * Only when the RS-485 function is provided |

5.1.2. Scaling Data

| Menu Display | Parameter Name | Initial Value | P.L. | Settable Range or Alternatives | Main Setting Target and Precautions |
|---------------------|----------------------|---------------|------|--------------------------------|--|
| rAnC (RANG) | Input range | 13 | 1 | 11/12/13 | Selects the input range. |
| ISEL (ISEL) | Input type | a.c. | 1 | a.c./LoC/NAC/rNS | Selects the input type. *Note that input terminals vary depending on the actual input range. |
| PS (PS) | Pre-scale | 01.00 | 2 | 0.01 ~ 10.00 | Sets the pre-scale. |
| PPr (PPR) | Pulse pre revolution | 001 | 2 | 0.01 ~ 100 | Sets the pules pre revolution. |
| dLHc (DLHI) | Digital limiter HI | 9999 | 0 | -9999 ~ 9999 | Sets the high limit of the displayable range. (A value exceeding the digital limiter HI setpoint is not updated and is held at the set value.) |
| dLLo (DLLO) | Digital limiter LO | -9999 | 0 | -9999 ~ 9999 | Sets the low limit of the displayable range. (A value lower than the digital limiter LO setpoint is not updated and is held at the set value.) |
| AOUL (A.OUT) | Analog output type | 0-1 | 1 | 0-1/0-10/1-5/4-20 | Selects the analog output's output range. * Only when analog output is provided |
| AOHc (AOHI) | Analog output HI | 9999 | 1 | -9999 ~ 9999 | Sets the relationship between display and analog output. * Only when analog output is provided |
| AOLO (AOLO) | Analog output LO | 0 | 1 | -9999 ~ 9999 | |
| dP (DP) | Decimal point | | 2 | Set to any digit | Sets the decimal-point display position. |

5.1.3. Comparator Data

| Menu Display | Parameter Name | Initial Value | P.L. | Settable Range or Alternatives | Main Setting Target and Precautions |
|---------------------|------------------------|---------------|------|--------------------------------|---|
| coNt (COM.T) | Comparison output | oU | 1 | oU/Err | Selects high and low judgments (O/U) or tolerance judgments (ERR) for comparison action type. |
| HH-5 (HH-S) | HH judgment value | 5000 | 2 | -9999 ~ 9999 | Sets HH-side judgment value. * Only when COM.T is in O/U |
| HL-5 (HI-S) | HI judgment value | 1000 | 2 | -9999 ~ 9999 | Sets HI-side judgment value. * Only when COM.T is in O/U |
| Lo-5 (LO-S) | LO judgment value | 500 | 2 | -9999 ~ 9999 | Sets LO-side judgment value. * Only when COM.T is in O/U |
| LL-5 (LL-S) | LL judgment value | 0 | 2 | -9999 ~ 9999 | Sets LL-side judgment value. * Only when COM.T is in O/U |
| nVAL (N.VAL) | Nominal value | 5000 | 2 | -9999 ~ 9999 | Sets the nominal value. * Only when COM.T is in ERR |
| Err1 (ERR1) | Tolerance 1 | 500 | 2 | 0.00 ~ 1000 | Sets tolerance 1. * Only when COM.T is in ERR |
| Err2 (ERR2) | Tolerance 2 | 1000 | 2 | 0.00 ~ 1000 | Sets tolerance 2. * Only when COM.T is in ERR |
| HH-H (HH-H) | HH hysteresis | 0 | 1 | 0.00 ~ 999 | Sets HH-side hysteresis (applied to the inner side of a setpoint). * Only when COM.T is in O/U |
| HL-H (HI-H) | HI hysteresis | 0 | 1 | 0.00 ~ 999 | Sets HI-side hysteresis (applied to the inner side of a setpoint). * Only when COM.T is in O/U |
| Lo-H (LO-H) | LO hysteresis | 0 | 1 | 0.00 ~ 999 | Sets LO-side hysteresis (applied to the inner side of a setpoint). * Only when COM.T is in O/U |
| LL-H (LL-H) | LL hysteresis | 0 | 1 | 0.00 ~ 999 | Sets LL-side hysteresis (applied to the inner side of a setpoint). * Only when COM.T is in O/U |
| Er1H (ER1.H) | Tolerance-1 hysteresis | 1 | 1 | 0.00 ~ 999 | Sets tolerance-1 hysteresis (applied to the inner side of a setpoint). * Only when COM.T is in ERR |
| Er2H (ER2.H) | Tolerance-2 hysteresis | 1 | 1 | 0.00 ~ 999 | Sets tolerance-2 hysteresis (applied to the inner side of a setpoint). * Only when COM.T is in ERR |
| HH-L (HH-L) | HH logic | no | 0 | no/nc | Sets HH output logic (N.O: normally open, N.C: normally closed). * When power is OFF, output is always open (OFF). |
| HL-L (HI-L) | HI logic | no | 0 | no/nc | Sets HI output logic (N.O: normally open, N.C: normally closed). * When power is OFF, output is always open (OFF). |
| Lo-L (GO-L) | GO logic | no | 0 | no/nc | Sets GO output logic (N.O: normally open, N.C: normally closed). * When power is OFF, output is always open (OFF). |
| Lo-L (LO-L) | LO logic | no | 0 | no/nc | Sets LO output logic (N.O: normally open, N.C: normally closed). * When power is OFF, output is always open (OFF). |
| LL-L (LL-L) | LL logic | no | 0 | no/nc | Sets LL output logic (N.O: normally open, N.C: normally closed). * When power is OFF, output is always open (OFF). |

5.2. Display and Character Representation

0 1 2 3 4 5 6 7 8 9 - /
 0 1 2 3 4 5 6 7 8 9 - /
 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 A b c d e f g h i j k l m n o p q r s t u v w x y z

5.3. Parameter Types and Protect Levels

The A7000 series parameters are classified into the following groups depending on the main objective:

Condition data: A group of parameters that set basic actions such as sampling rate and operation type of each control

Scaling data: A group of parameters relating to measurements such as a measurement range and scaling

Comparator data: A group of parameters relating to comparison output such as the comparison output operation type or judgment values

Shift data: A group of parameters relating to the function that forcibly shifts an indicated value

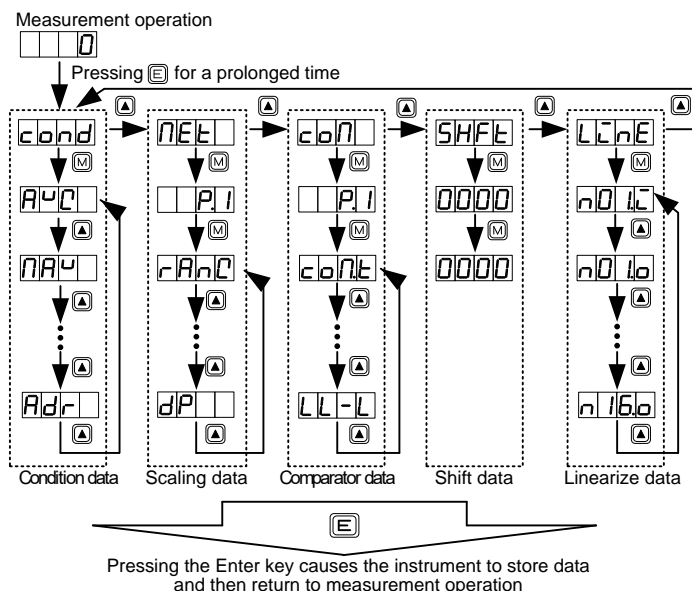
Linearize data: A group of parameters relating to the function that corrects the linearity of an input value and indicated value

Each parameter has a protect level that has been set up. Setting the protect level of condition data allows the settable protect level of parameters to be limited. (For the settable protect level of each parameter, see P.L for the list of parameters in 5.1.)

For the protect levels, the higher the level value, the more the number of parameters whose setting is disabled increases. If the protect level is set to LV3, which is the highest level, all parameters are disabled from being set with the exception of protect level change.

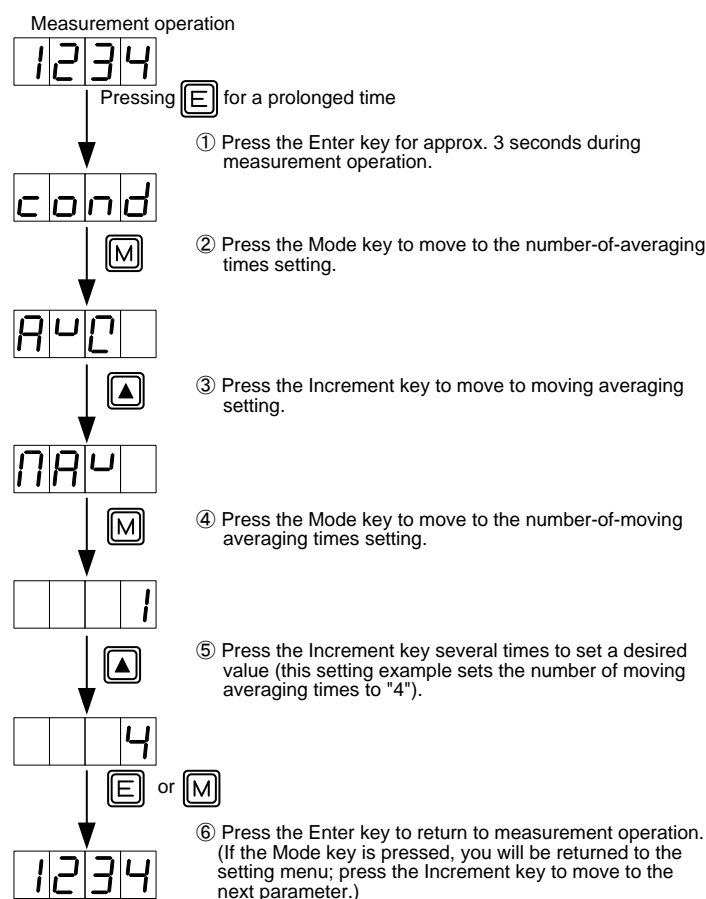
* At factory shipment, the protect level is set to LV1. (In this case, only settings relating to display color, scaling, or judgment values can be made).

5.4. Shifting to the Parameter Setting Mode



5.5. Condition Data Setting Procedure

This section describes an example of setting the number of moving averaging times as a typical example. Take the same steps for other parameters.



5.6. Scaling Data Setting Procedure

This section describes the concept of scaling data and an example of setting a input type as a typical example. Take the same steps for other parameters.

* The digital limiter is the function that limits an input value to the relevant set value even if a signal higher than or lower than the indicated value set to DLHI or DLLO respectively is input. The setting condition is $DLHI > DLLO$, and if this condition is not met, Err5 is caused, returning the display to DLHI.

Determining the revolution speed (rpm) using the rotary encoder set to 50 pulses per minute:

- Determine the measurement range by calculating the maximum frequency. The figure below shows an example where the revolution rises to a maximum speed of about 600 rpm.

$$50 \times 600 \div 60 = 500$$

Number of pulses per second

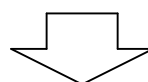
Revolution speed per second

Number of pulses per revolution at the rotary encoder

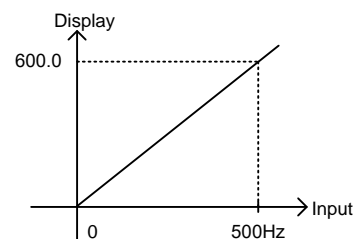
- Since the number of pulses determined in ① is 500 per second (500 Hz), set the range to range 11.
- The display unit shows 5000 if 500 Hz pulse input is measured under range 11 (when PS=1 and PPR=1 by default). Therefore, the parameters should be set as PS=2 and PPR=1 so that the decimal point is positioned in the 10^1 digit (600.0 is indicated 500 Hz input).

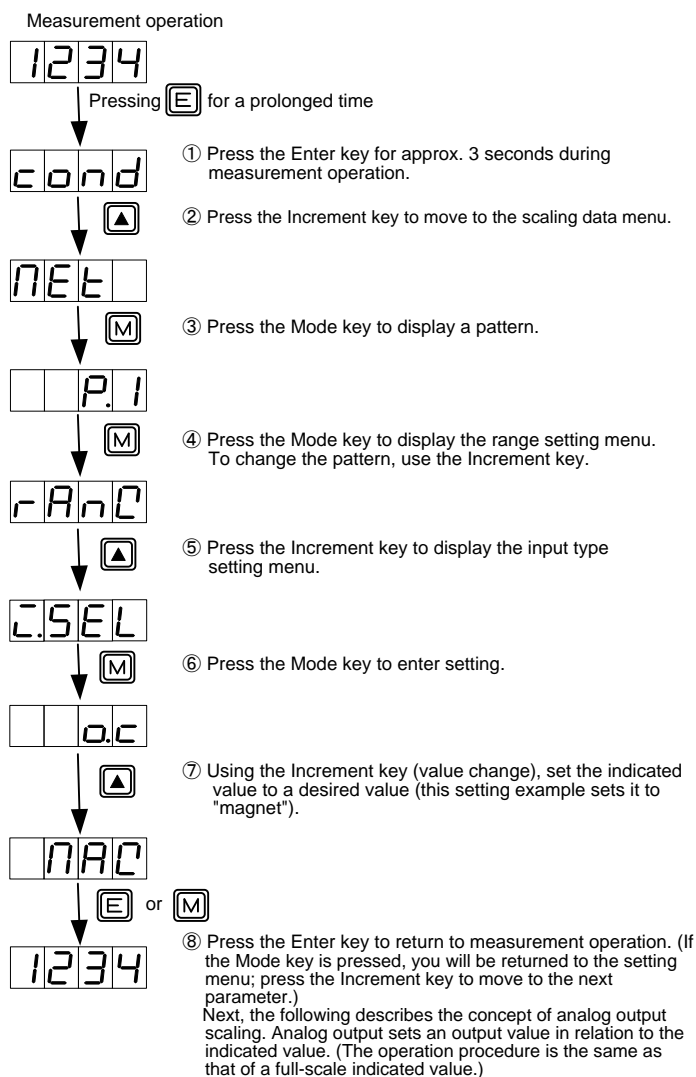
Input signal : 500Hz (open collector)

Display : 600.0

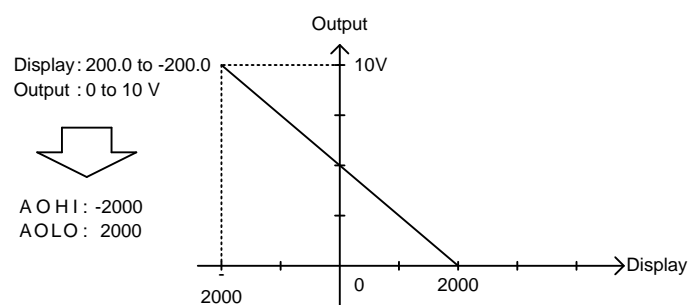


RANG: 11
I.SEL: O.C
P S: 1.2
P P R: 1
DLHI: 9999
DLLO: -9999
D E P: Lights up at the 10^1 place.





Next, the following describes the concept of analog output scaling. Analog output sets an output value in relation to the indicated value. (The operation procedure is the same as that of a full-scale indicated value.)



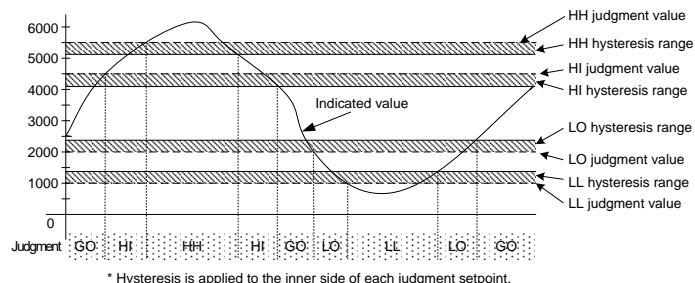
* If both AOHI and AOLO are set to the same value, Err6 is caused, returning the display to AOHI.

5.7. Comparator Data Setting Procedure

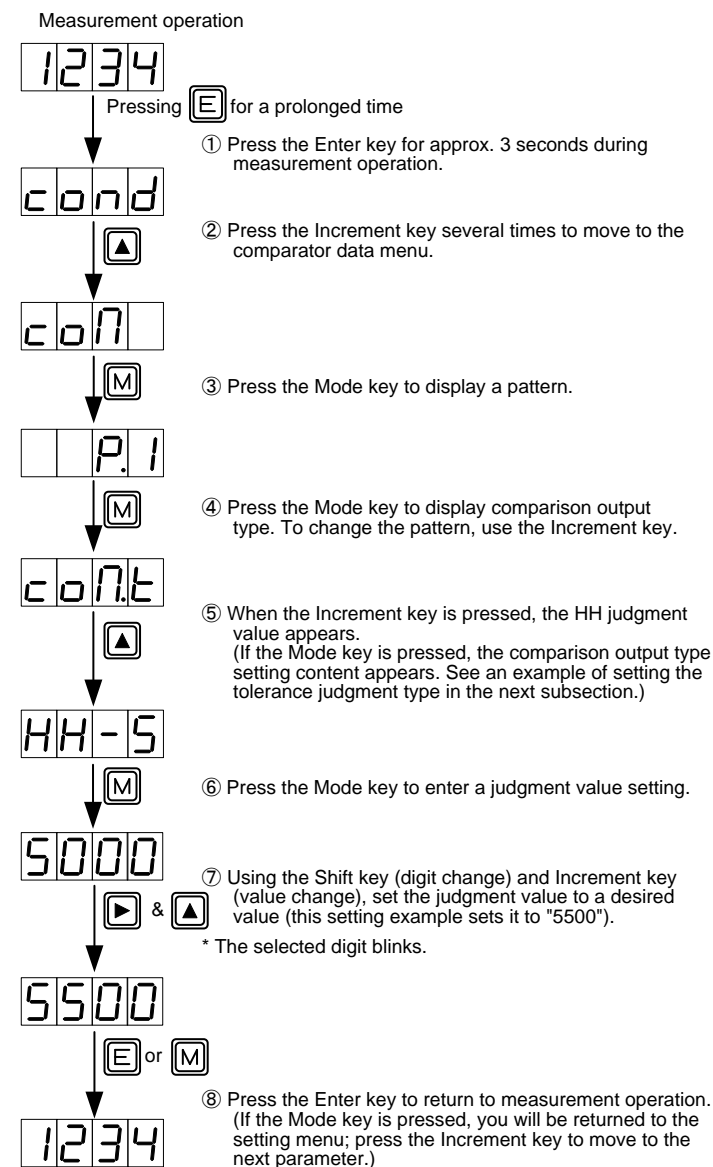
The A7000 can comparison operation a vertical judgment or a tolerance judgment with the comparison output type of a comparator data setup.

5.7.1. High and Low Judgment Type

The high and low judgment type allows you to directly set judgment values in numerical values, which are checked against the indicated value for judgment. It allows setting of four stages of judgment points: HH, HI, LO, and LL.



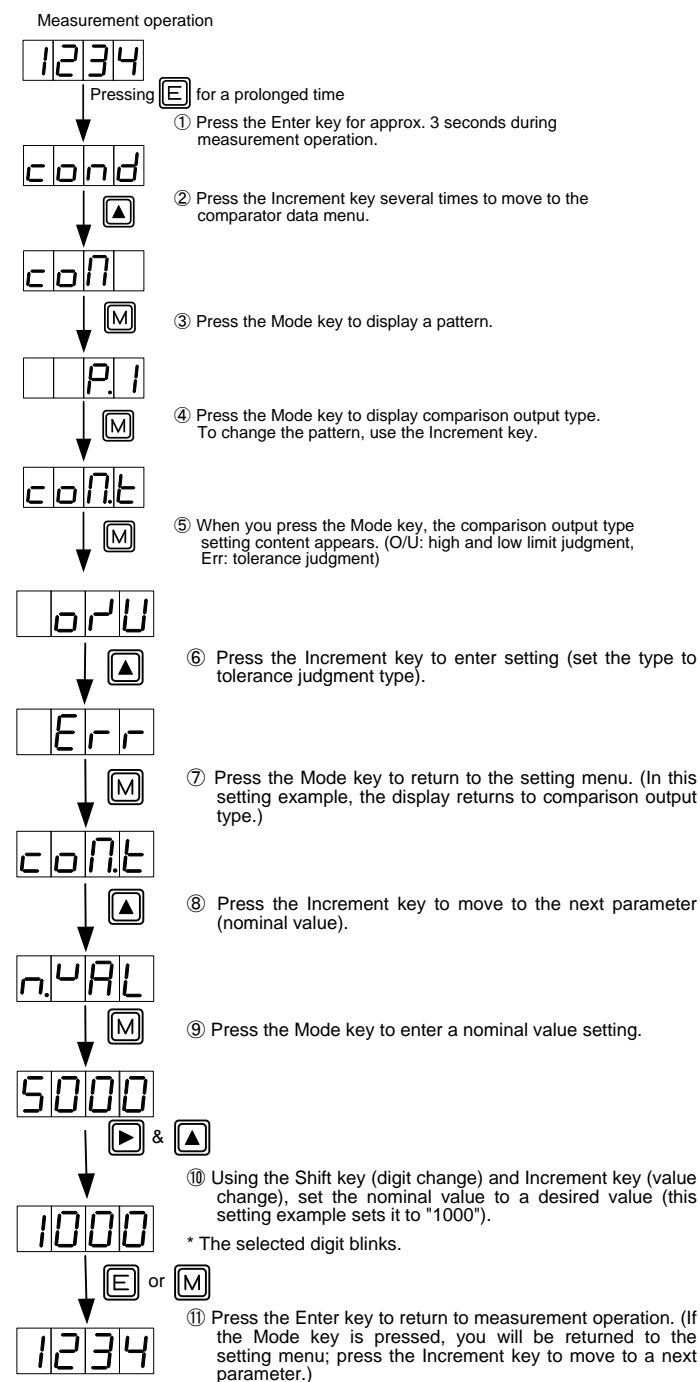
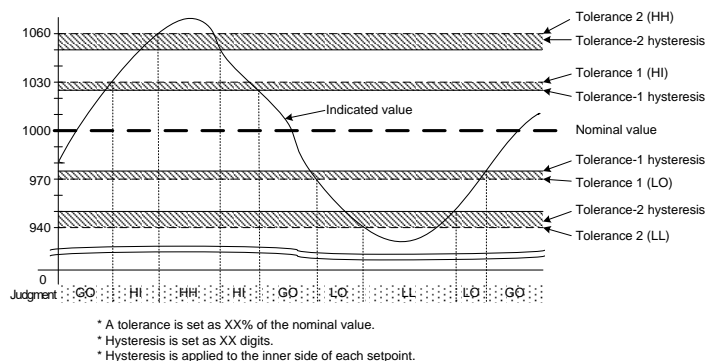
* The setting conditions are $(HH \text{ judgment value} - HH \text{ hysteresis}) > HI \text{ judgment value}$, $(HI \text{ judgment value} - HI \text{ hysteresis}) > (LO \text{ judgment value} + LO \text{ hysteresis})$, and $LO \text{ judgment value} > (LL \text{ judgment value} + LL \text{ hysteresis})$. If any of these conditions is not met, Err0 is caused, returning the display to the HH judgment value setting.



5.7.2. Tolerance Judgment Type

The tolerance judgment type allows you to set a nominal value and its tolerances ($\pm XX\%$) to make judgment on the basis of the judgment values calculated from these values within the instrument. You can set one nominal value and two tolerance values.

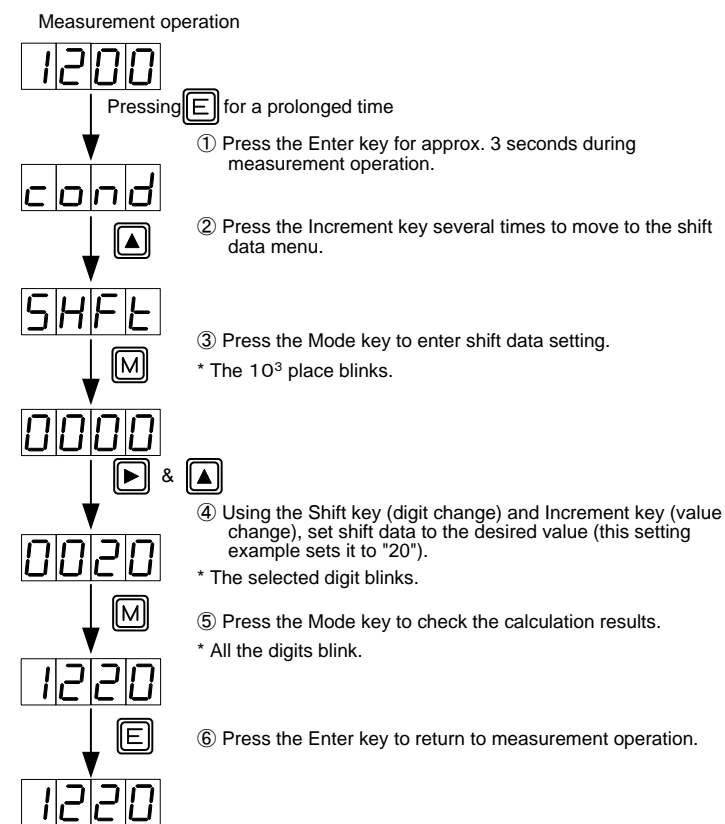
For example, if the nominal value is set to 1000 and tolerances 1 and 2 are set to 3% and 6% respectively, internal judgment values are 1060 for HH judgment value, 1030 for HI judgment value, 970 for LO judgment value, and 940 for LL judgment value.



5.8. Shift Data Setting Procedure

The shift function allows you to arbitrarily shift the display without changing the inclination of an input signal. A setting example below shows how to shift the indicated value by 20 digits.

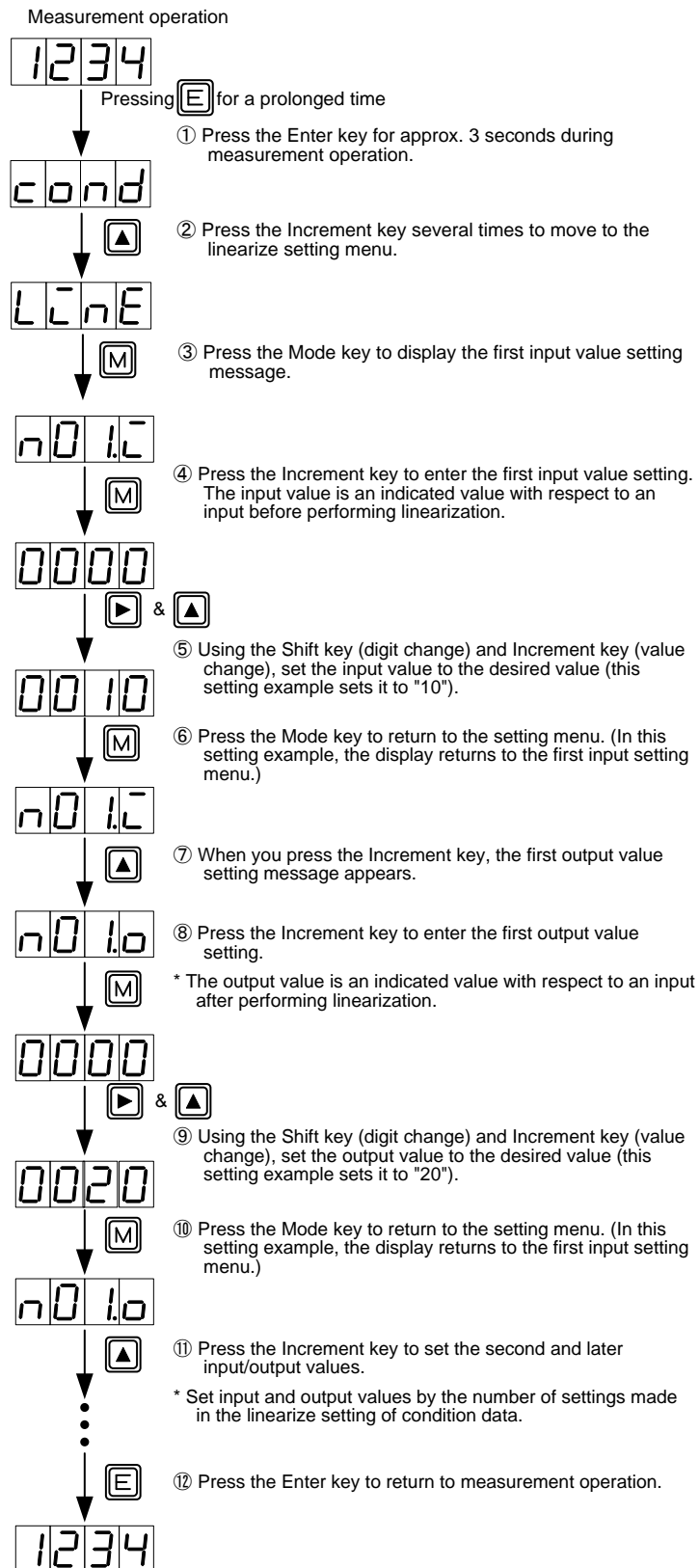
* The shift function is available (settable) when the condition data's protect level is "0."



5.9. Linearize Data Setting Procedure

The linearize function corrects the linear relationship between an input and the display at any point to change the inclination of the linear relationship. Linearize data is set using the input value (indicated value before correction) and output value (indicated value after correction) of any point.

* The linearize function is available only when you have selected any item other than OFF in linearize setting of condition data.



* The setting conditions are N-1 < N-2 N-15 < N-16, and if these conditions are not met, Err7 occurs. In this case, make the setting again.

6. External Control Function

6.1. Each External Control Terminal

Internal circuit: pull-up at approx. 5 V (resistance value: approx. 10 k Ω)

Control signal HI level: 4.2 to 5 V with respect to terminal COM

Control signal LO level: 0 to 0.4 V with respect to terminal COM

Caution: The COM terminal of the external control circuit and the LO terminal of the input circuit have the same potential in terms of direct current.

6.2. Pattern Select Function

The pattern select function allows scaling data and comparator data to be stored in a maximum of eight patterns and lets you set any pattern for use. Pattern select control is achieved by terminal control and front panel key-based operation, depending on condition data setting. For terminal control, short circuiting the P.SEL1 to P.SEL3 terminals with the terminal COM, or making these terminals have the same potential, allows P-1 and up to P-8 to be switched. Also, for front panel key-based operation, pressing the Increment key for approx. 3 seconds allows a pattern to be switched.

| Terminal Name | Pattern 1 | Pattern 2 | Pattern 3 | Pattern 4 | Pattern 5 | Pattern 6 | Pattern 7 | Pattern 8 |
|---------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| P.SEL1 | Open | Shorted | Open | Shorted | Open | Shorted | Open | Shorted |
| P.SEL2 | | Open | Shorted | | | Open | Shorted | |
| P.SEL3 | | | Open | | | Open | | |

* In default, front panel key-based operation is enabled. If you wish to perform terminal control, set it up using condition data.

6.3. Start/Hold Function

The start/hold function holds the display at any timing, which can be set in type A or type B using condition data. Type A is the free run mode, in which you short the S/H terminal with terminal COM or make these terminals have the same potential from the free-run status to hold the indicated value and comparison judgment value. Type B is the one-shot mode. In this mode, you short the S/H terminal with terminal COM or make these terminals have the same potential from a hold status to output the indicated value and comparison judgment value once. For this, see the timing chart below.

6.4. Peak Hold Function

The peak hold function holds one of the maximum values (peak hold), minimum values (valley hold), and maximum value - minimum value - (peak valley hold) and produces output in relation to it (switching of these values is set up using condition data). The peak hold function can be activated by shorting the PH terminal with the terminal COM or making these terminals have the same potential.

6.5. Digital Zero Function(Display Reset Function)

In frequency input, the digital zero function becomes a display reset function. When an input is a low-frequency signal, the digital zero function can be used as a forced reset if no signal is input at all. The display reset (digital zero) function can be activated or deactivated by terminal control or front panel key-based operation, depending on the setting of condition data. For terminal control, the DZ and COM terminals are short-circuited or made to have the same potential to activate the display reset function. For front panel key-based operation, press the Shift key for approx. 3 seconds to activate it.

* In the default, front panel key-based operation is enabled. To perform terminal control, set it up using condition data.

7. Output Function

7.1. Comparison Output Function

The A7000 series allows four judgment values of HH, HI, LO, and LL to be set up with respect to the measured value (indicated value) and the judgment result to be output by relay contact output or photocoupler (when the comparison output unit has been installed). For the contact rating, etc., see the output specifications.

7.2. BCD Output Function

The A7000 series can output BCD signals with respect to the indicated value (when the BCD output unit has been installed). BCD output logic can be selected using condition data.

7.3. Analog Output Function

The A7000 series can output an analog signal with respect to the indicated value (when the analog output unit has been installed). There are four types of outputs: 0 to 1 V, 0 to 10 V, 1 to 5 V, and 4 to 20 mA, which can be selected using scaling data. Also, any scaling can be applied.

7.4. RS-232C Function

The A7000 series allows RS-232C function to be incorporated (when the RS-232C unit has been installed). For the RS-232C function, see the separate Communications Function Operation Manual.

7.5. RS-485 Function

The A7000 series allows RS-485 function to be incorporated (when the RS-485 unit has been installed). For the RS-485 function, see the separate Communications Function Operation Manual.

8. Specifications and Outer Dimensions

8.1. Input Specifications

| Range | Measurement range | Error (23□ ± 5□ ; 35 to 85%) | Renewal time of a display |
|-------|-------------------|---------------------------------|---------------------------|
| 11 | 0.1 to 999.9Hz | ± (0.2% of FS) | 1 to 10s |
| 12 | 1Hz to 9.999kHz | | 1s |
| 13 | 10Hz to 99.99kHz | | 100ms |

Pre-scale : 0.01 to 10.00
Pulse per revolution : 1 to 100
Sensor power : 12V DC ±10□ 50mA

| Input type | Input voltage level |
|----------------|------------------------------------|
| Open collector | LO□ 1.5V or less (5V, 5kΩ pull up) |
| Logic | LO□ 1V or less, HI□ 2.5 to 15V |
| Magnet | 0.3 to 30Vp-p |
| Voltage | 50 to 500Vrms |



CAUTION

The sensor power supply will be cut off (open) when a load exceeding the rated value is connected to it (entering protective mode). To recover from protective mode, the power must be turned off and then on.

8.2. Common Specifications

Display: 7-segment LED display (character height: approx. 16 mm)
Polarity display: Automatically indicated when the calculation result is negative
Display range: -9999 to 9999
Overrange warning: "OVER" or "-OVER" indication in response to an input signal exceeding the display range
Decimal point: Settable to any digit position
Zero indication: Leading zero suppression
External control: P.SEL1 - 3, HOLD, PH, DZ (depending on output units)
Operating temperature and humidity ranges: 0 to 50 °C, 35 to 85% R.H (no condensation)
Storage temperature and humidity ranges: -10 to 70 °C, 60% R.H or less
Power: AC power unit... 100 to 240 V AC ±10%, DC power unit ... 12 to 48 V DC ±10%
Power consumption: 8 VA max. (AC power unit) 7 W max. (DC power unit)
Outer dimensions: 72 mm (W) x 36 mm (H) x 118 mm (D)
Weight: Approx. 160 g
Withstand voltage (AC power): Power terminal to input terminal, COM, comparison output, BCD, analog output, or RS communications terminal 1500 V AC for 1 minute
Withstand voltage (DC power): Power terminal to input terminal, COM, comparison output, BCD, analog output, or RS communications terminal 500 V DC for 1 minute
Withstand voltage (common): Input terminal to comparison output, BCD, analog output, or RS- communications terminal 500 V DC for 1 minute Case to each terminal 1500 V AC for 1 minute
Insulation resistance: 500 V DC at 100 MΩ or more between the noted terminals

8.3. Output Specifications

8.3.1. Comparison Output

Control method: Microcomputer-based calculation method
Judgment value setting range: -9999 to 9999
Hysteresis: Settable in the range of 1 to 999 digits with respect to each judgment value
Comparison action: Depending on sampling rate
Setting conditions: High-high limit judgment value > high limit judgment value > low limit judgment value > low-low limit judgment value

Comparison conditions:

| Comparison Conditions | Judgment |
|---|----------|
| ResultsIndicated value > high-high limit judgment value > high limit judgment value | HH, HI |
| High-high limit judgment value ≥ indicated value > high limit judgment value | HI |
| High limit judgment value ≥ indicated value ≥ low limit judgment value | GO |
| Low limit judgment value > indicated value ≥ low-low limit judgment value | LO |
| Low limit judgment value > low-low limit judgment value > indicated value | LO, LL |

Comparator relay: Contact rating
125 V AC, 0.3 A (resistive load)
30 V DC, 1 A (resistive load)
Number of contacts
Relay contact x 5
Mechanical life
50 million times or more
Electrical life
100,000 times or more (resistive load)
Photocoupler output: Output rating
Sink current 50 mA max. Voltage applied: 30 V max.
Output saturation voltage 1.2 V or less at 50 mA
Output quantity
Photocoupler x 5

8.3.2. BCD Outputs

●TTL output
Measured data: Tri-state parallel BCD
Polarity signal: 1 level for negative indication
Excess signal: 1 level for excess indication
Printout command signal (PC): Positive pulse output after completion of measurement (PC width depends on sampling)
Output logic: Switchable (PC logic not switchable)
Output signal: TTL level fan-out = 2, COMS compatible
●Open collector output (NPN type)
Measured data: Transistor ON when negative logic is logic 1
Polarity signal: Transistor ON for negative indication
Excess signal: Transistor ON for excess indication
Printout command signal (PC): Transistor ON after completion of measurement (PC width depends on sampling)
Output logic: Switchable (PC logic not switchable)
Transistor output capacity: Voltage 30 V max., Current 10 mA max.
Output saturation voltage 1.2 V or less at 10 mA
●Enable
Enable input: Shorting the ENABLE terminal with the DG terminal or making these terminals have the same potential causes BCD output to be high impedance (TTL) or transistor to be turned OFF.
Control signal HI level: 3.5 to 5 V with respect to DG terminal
Control signal LO level: 0 to 1.5 V with respect to DG terminal
Input current: -0.5 mA

8.3.3. Analog Output

Conversion method: PWM conversion

Resolution: 13 bits or equivalent

Scaling: Digital scaling

Response rate: Approx. 0.5 seconds

| Output Type | Resistive Load | Accuracy | Ripple |
|-------------|-----------------------|--------------------|---------------------|
| 0 to 1 V | 10 k Ω or more | $\pm(0.5\%$ of FS) | $\pm 50\text{mVpp}$ |
| 0 to 10 V | 10 k Ω or more | | |
| 1 to 5 V | 10 k Ω or more | | |
| 4 to 20 mA | 550 Ω or less | | $\pm 25\text{mVpp}$ |

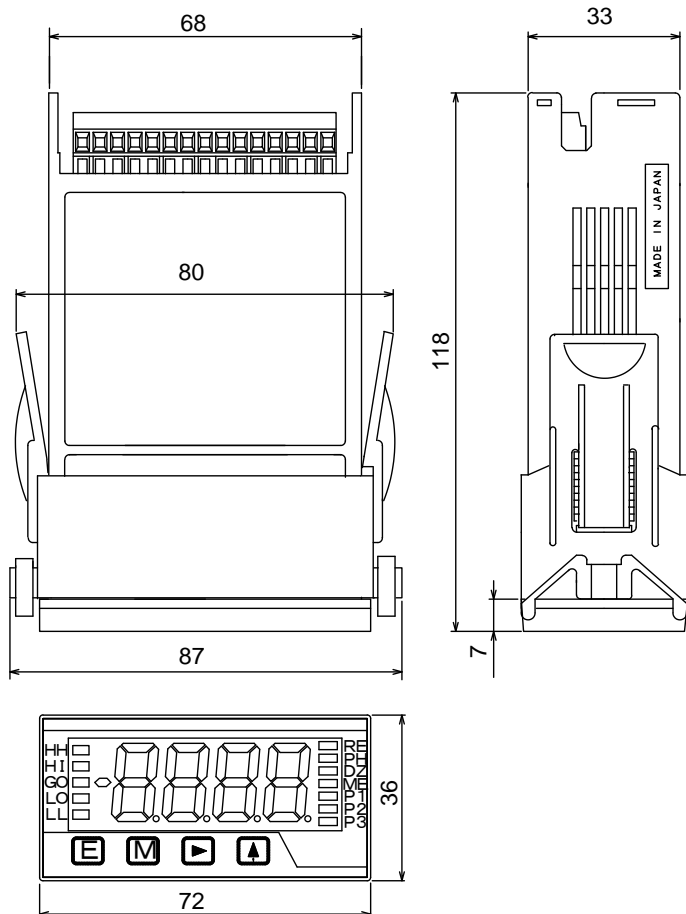
* A ripple of 4 to 20 mA is caused at a resistive load of 250 Ω and output of 20 mA.

8.3.4. Communication Function

| | RS-232C | RS-485 |
|--------------------------------------|---|---|
| Synchronous System | Start-stop transmission system | |
| Communication System | Full duplex | Two-line semi-duplex (polling selecting system) |
| Transmission Rate | 38400bps/19200bps/9600bps/4800bps/2400bps | |
| Start Bit | 1bit | |
| Data Length | 7 bits/8 bits | |
| Error Detection | Even parity/odd parity/none | |
| | BCC (block check character) checksum | |
| Stop Bit | 1 bit/2 bits | |
| Character Code | ASCII codes | |
| Data Communication Control Procedure | Non-procedural | |
| Signal Name in Use | TXD, RXD, SG | Non-inverse (+), inverse (-) |
| Number of Units Connected | 1 | A maximum of 31 meters |
| Line Length | 15 m | 500 m maximum |
| Delimiter | CR+LF/CR | |

* For more information on the communications function such as the send/receive format and commands, see the separate A7000 Communications Function Operation Manual.

8.4. Outer Dimensions



9. Timing Chart

Start/hold type A

Renewal time *1
of a display

S/H terminal

P.C (BCD defined)

Comparison
output updating

*4

*1 Set sampling

As for the frequency measurement unit, indication update time is sampling time.

11 range : 1~10s

12 range : 1s

13 range : 100ms

*2 P.C signal output width

For the frequency measuring unit, the P.C signal output width is always approx. 30 ms.

*4 Comparison output delay time

Relay output: 10 ms maximum, photocoupler output: 200 μs maximum

10. Error Messages

10.1. Error Display during Measurement or Setting

| Display | Description |
|---------|---|
| | Indicates that a signal exceeding the measurement range has been applied. |
| | Indicates that an input signal once exceeded the measurement range, but has returned to the measurable range with the peak hold function activated. |
| | Indicates that the unit is waiting for an A/D converter input or that power-ON delay time is valid. |
| | Indicates that each judgment value of comparator data or the size of hysteresis parameters does not meet the conditions. |
| | Indicates that the full scale input value and offset input value of scaling data have the same value. |
| | Indicates that digital limiter HI and digital limiter LO of scaling data have the same value. |
| | Indicates that analog output HI and analog output LO of scaling data have the same value. |
| | Linearize data error |

10.2. Error Display in the Event of Problem in Memory

| Display | Description |
|---------|---|
| | Memory switch area, checksum error of main memory |
| | Calibration data area, checksum error of main memory |
| | Memory switch area, checksum error of sub-memory |
| | Calibration data area, checksum error of sub-memory |
| | Condition data area, checksum error Press the Mode key for a prolonged time to load the initial values. |
| | Scaling data area, checksum error (for each pattern) Press the Mode key for a prolonged time to load the initial values of each pattern. |
| | Comparator data area, checksum error (for each pattern) Press the Mode key for a prolonged time to load the initial values of each pattern. |
| | Calibration data area, checksum error (for each pattern) Press the Mode key for a prolonged time to load the initial values of each pattern. |
| | Shift data area, checksum error Press the Mode key for a prolonged time to load the initial values. |
| | Linearize data area, checksum error Press the Mode key for a prolonged time to load the initial values. |

* Turning power ON with the Enter key and Mode key held down causes all the parameters to return to the initial values (defaults).

11. Warranty and After-sales Service

11.1. Warranty

The warranty period of the product is one year from the date of delivery. If a failure occurs during this period that is clearly judged to be caused by a defect ascribable to Watanabe Electric Industry, we will repair the failure or replace any defective parts without charge.

11.2. After-sales Service

The product has been manufactured, tested, and inspected with strict quality control management before shipment. Should the product break down, contact (send it to) your sales representative or our sales office directly. (In this case, write a detailed description of the problem and enclose it with the product.)

watanabe

WATANABE ELECTRIC INDUSTRY CO., LTD.

6-16-19, Jingumae, Shibuya-ku, Tokyo 150-0001, Japan

Phone: (81)3-3400-6141

Homepage <http://en.watanabe-electric.co.jp/>