CPU GAUGE
SWITCH FEELING

MODEL-RX-FL

SERIES

Instruction Manual

Be sure to read through this instruction manual before using the product.

This instruction manual is very important for using the product properly.

Always keep it near the product and refer to it at any time whenever you need.

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INTRODUCTION

Thank you for purchasing the CPU Gauge RX-FL Series.

The RX-FL Series is a digital push-pull gauge and has such features as: Converting analog data input from a load cell (*1) into digital data using an A/D converter, measuring the major values (*2) of switch feeling measurement, displaying the track values digitally, outputting data to external instruments, etc.
Read through this instruction manual carefully and make full use of the RX-FL Series.

NOTES
*1: Load detecting sensor
*2: Onward peak value (CP), onward bottom value (CL), return bottom value (RL), return peak value (RP), click value (Cc), and click ratio (Cr)

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SAFETY INSTRUCTIONS

This section describes the instructions important to ensure the safety.
Be sure to observe these instructions. The symbols and their meanings are as shown below.

DANGER Indicates an urgent situation that is likely to result in death or serious injury of the user and/or enormous damages to the product depending on the structure, material or circumstances, if the instruction should be ignored and the product should be used improperly.

WARNING Indicates an urgent situation that is likely to result in death or serious injury of the user, if the instruction should be ignored and the product should be used improperly.

CAUTION Indicates an urgent situation that is likely to result in slight injury of the user, if the instruction should be ignored and the product should be used improperly.

DANGER

 Do not recharge the battery for 24 hours or more.	If this instruction is disobeyed, the built-in battery may overheat excessively. Depending on circumstances, it may break, resulting in a fire.
 Use the AC adapter supplied with the product. Do not use any other instrument.	If this instruction is disobeyed, a trouble may occur in the electric circuits or the like, resulting in a fire.
 Recharge the battery or use the product on the specified voltage only.	Disobedience to this instruction may result in a fire, electric shocks or electrocution.

WARNING

 Be careful about scattering of test piece.	The test piece may scatter and cause injury. Pay great attention to the safety of the user and operation environments.
 Do not use a flawed or deformed jig.	If a flawed or deformed jig is used, it may break or slip, resulting in injury. If a test piece drops onto your foot, it is very dangerous.
 Connect the plug of the AC adapter with the AC outlet to the very end.	If the plug is connected loosely with the AC outlet, it may short-circuit, resulting in a fire, electric shocks or electrocution.

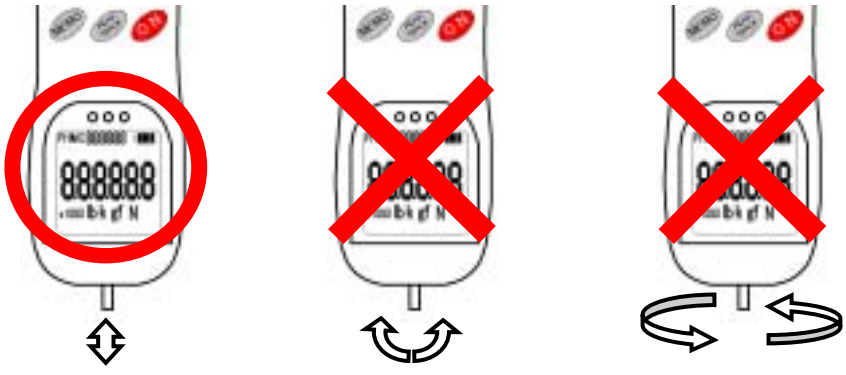
CAUTION

Do not connect or disconnect the AC adapter plug with a wet hand.	Disobedience to this instruction may result in electric shocks or electrocution.
Do not disconnect the plug of the AC adapter by pulling the cable.	If this instruction is disobeyed, the cable may break, resulting in electric shocks or electrocution.
Never attempt to disassemble, repair or modify the product.	If you attempt to disassemble, repair or modify the product, it may malfunction, resulting in injury.

CAUTION

Do not apply a load over the maximum measurement capacity.	If an excessive load is applied, the sensor may break. If a greater load is applied, the case or internal parts of the gauge may break, resulting in an accident.
Do not use or store the product in the environments shown on the right.	- Environment subject to spattering of water - Environment subject to dew condensation - Dusty environment - Environment subject to spattering of oil or chemicals
Use the gauge within the allowable temperature range.	If the gauge is used over or below the specified temperature range, it may malfunction. The guaranteed temperature range is from 5°C to 40°C.
Pay attention to the length of the set screws.	Use M-4 screws to install this gauge on another instrument. Make sure that the screws have 6-mm or shorter threads. Using screws with threads longer than 6 mm may damage the gauge case.

Do not apply a bending or twisting force to the load shaft.



Bending force Twisting force

CHECKING CONTENTS

Make sure that the following are supplied.

1. Gauge body (*1): 1
2. AC adapter (*2): 1
3. Warranty sheet: 1
4. Instruction manual (this book): 1
5. Measurement attachments (*3): 5

NOTES

*1: Check the model of the product you purchased.

*2: 100 VAC type -- Model-761

220 VAC type -- Model-762 (Export model)

*3: Models 022AL, 023AL, 024AL, 025AL, and 026AL

(See the section "REFERENCE" in " Measurement attachments ".)

BEFORE USING PRODUCT

<Recharging>

Use the AC adapter supplied with the product. Do not use any other instrument.

If this instruction is disobeyed, a trouble may occur in the electric circuits or the like, resulting in a fire.

The built-in battery (NiCd battery) has been charged before shipment. However, it may have been discharged during transportation. Connect the supplied AC adapter with the gauge in order to recharge the battery before using the gauge.

- Connect the supplied AC adapter with the AC adapter connector of the gauge, and plug the AC adapter into an 100 VAC outlet .(*1)
- When connect the AC adapter, and electricity is supplied by an outlet of AC 100V (*1), Start charge to exclusive battery (NiCd battery).(*2)
- Recharging stops automatically after completion of recharging. However, do not recharge the battery for 24 hours or more for safety. Normally, the battery in the low-charge condition will be fully recharged in approximately 7 hours. In the fully recharged condition, the gauge runs for approximately 12 hours continuously.
- It is possible to carry out measurement while recharging the battery, unless the battery voltage is excessively low.

NOTES

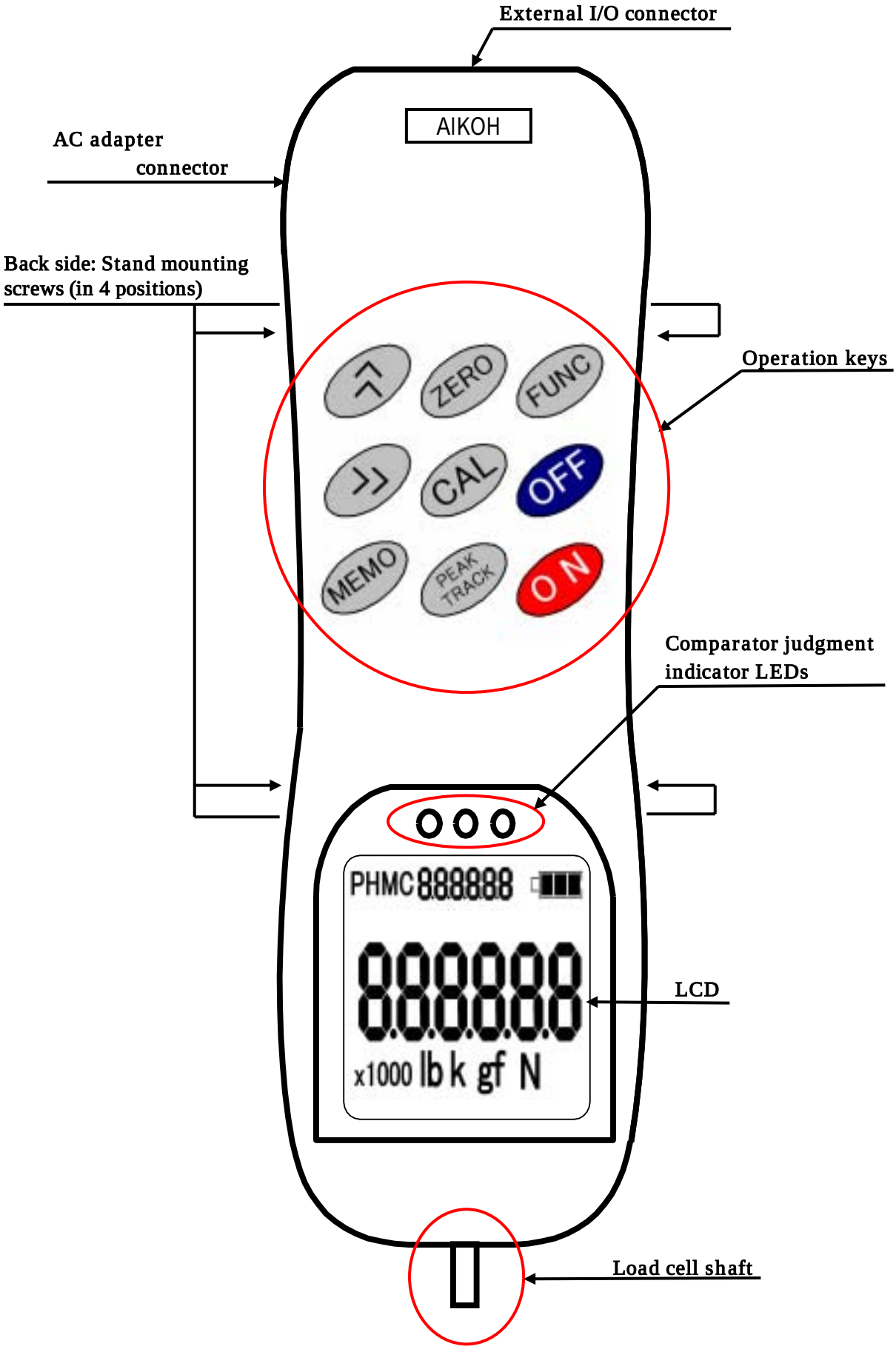
*1: Plug the AC adapter into a 220 V outlet, if it is designed for the voltage of 220 VAC.

*2: When the AC adapter is plugged, the displayed remaining battery capacity may sometimes decrease. This phenomenon does not imply any trouble.

The built-in battery (NiCd battery) is consumable.

Normally, the built-in battery may be recharged approximately 300 times, which depend on the use conditions. If the gauge runs for shorter time or does not run at all even though the battery is recharged for the specified time, the battery need be replaced. Ask the shop you purchased this product or Aikoh's office or agent to replace the battery.

COMPONENT PARTS



FUNCTIONS OF COMPONENT PARTS

Load cell shaft : Detects variance of the load. If a load over the maximum measurement capacity is applied to this shaft, the load detecting element may be broken.

LCD : Displays the conditions and results of measurement.

Operation keys

: Pressing this key turns on power.

: Pressing this key turns off power. (*1)

: Moves to the function setting mode. Serves as an auxiliary key of each function.

: Alternates the feeling measurement mode and track mode.

: Serves as a determination key in the function setting mode.
Outputs memory data to a printer, etc.

: Resets the displayed load to zero and brings the gauge into the ready condition. (*2)

: Stores measured data (*3) in the memory unit after completion of measurement.
Starts printing when a printer is connected with the gauge.


: Changes the unit (*4), outputs memory data to the printer, and so forth.


: Selects the measurement items when memory data are displayed.
(See the section "Memory Data Display Function" below.)

NOTES

*1: The 

key may not work in the function setting mode, when measurement results are displayed, etc.

*2: The zero resetting function does not work while a load is being applied.

*3: Pressing the MEMO key stores six measurement results in the feeling measurement mode or track values in the track mode.

*4: The unit N (Newton) is only available on models for domestic use in Japan, where the SI units are in effect.

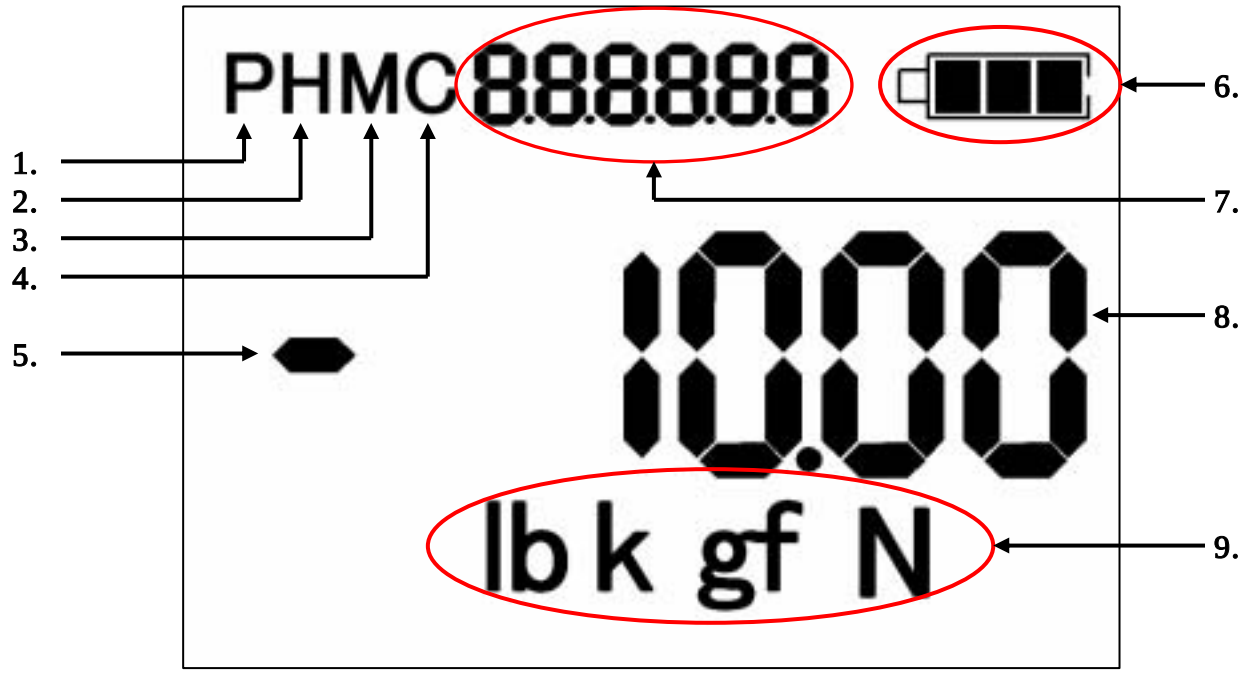
Comparator judgment indicator LEDs : Indicates the Low, Good and High judgment results of the value displayed on the main screen when the comparator judgment function is active.
(See the section "Comparator Judgment Function" below.)

External I/O connector : Connect an external instrument (such as a printer or RS-232C interface).
(See the section "External I/O Connector Pin Assignment" below.)

AC adapter connector : Connect the supplied AC adapter when executing continuous operation or recharging the built-in battery.

Stand mounting screws (4 positions) : Use these screws to mount this gauge on the measurement stand or the like.

DISPLAY UNIT



1.:P: Feeling measurement mode indicator ... When "P" is lit, the feeling measurement mode is selected. When it is off, the track mode is selected.

2.:H: External contact holding indicator ..... "H" is lit when input to the external contact varies. (See the section "External Contact Holding Function" below.)

3.:M: Memory indicator ..... "M" is lit when measured data are stored in the memory. The quantity of memory data is displayed in the sub display field.

4. :C: Validity of comparator judgment function ..... "C" is lit when the comparator judgment function is activated. (See the section "Comparator Judgment Function" below.)

5. :Negative (-) sign indicator ..... The negative (-) sign is displayed when a tensile load is applied. The positive (+) sign is not displayed when a compression load is applied.

6. :Remaining battery capacity indicator ..... The current remaining capacity of the battery is displayed in three levels.

7. :Sub display field ..... Auxiliary data in setting, quantity of memory data, data in feeling measurement, etc. are displayed in this field.

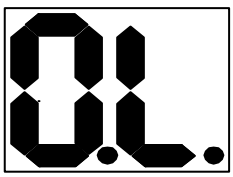
8. :Main display field ..... Load values are mainly displayed in this field. Items, values, etc. are displayed in setting.

9. :Unit indicator .....The unit of the load is displayed in setting.(*1) During operation, one of the units lb, kgf and N is displayed.

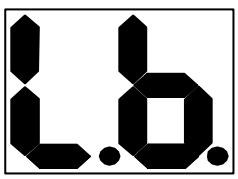
NOTE

*1: The unit N is only displayed on models for domestic use in Japan, where the SI units are in effect. One of lb, kgf and N is displayed on export models for overseas countries.

Special Display

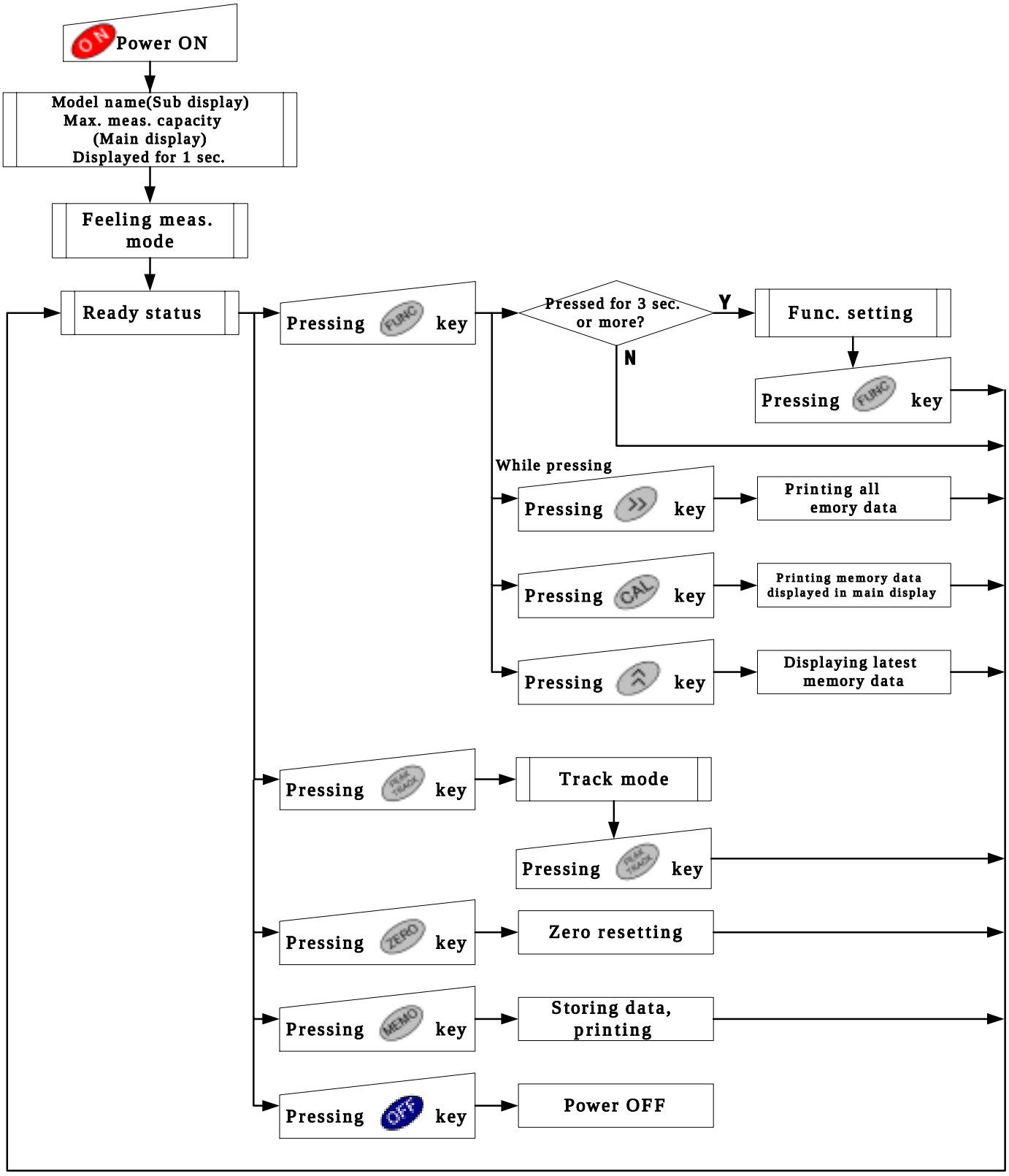


Overload (O. L.)
The symbol on the left is displayed in the main display area when a load exceeding the maximum measurement capacity is applied to the load cell shaft.



Low battery (L. b.)
The symbol on the left is displayed in the main display area when the remaining battery capacity is too low and measurement is disabled.

SIMPLE OPERATION FLOWCHART



* See the corresponding pages for the operation procedures in each mode.

FUNCTION SETTING MODE

Set values necessary for each function or mode are set in this mode.

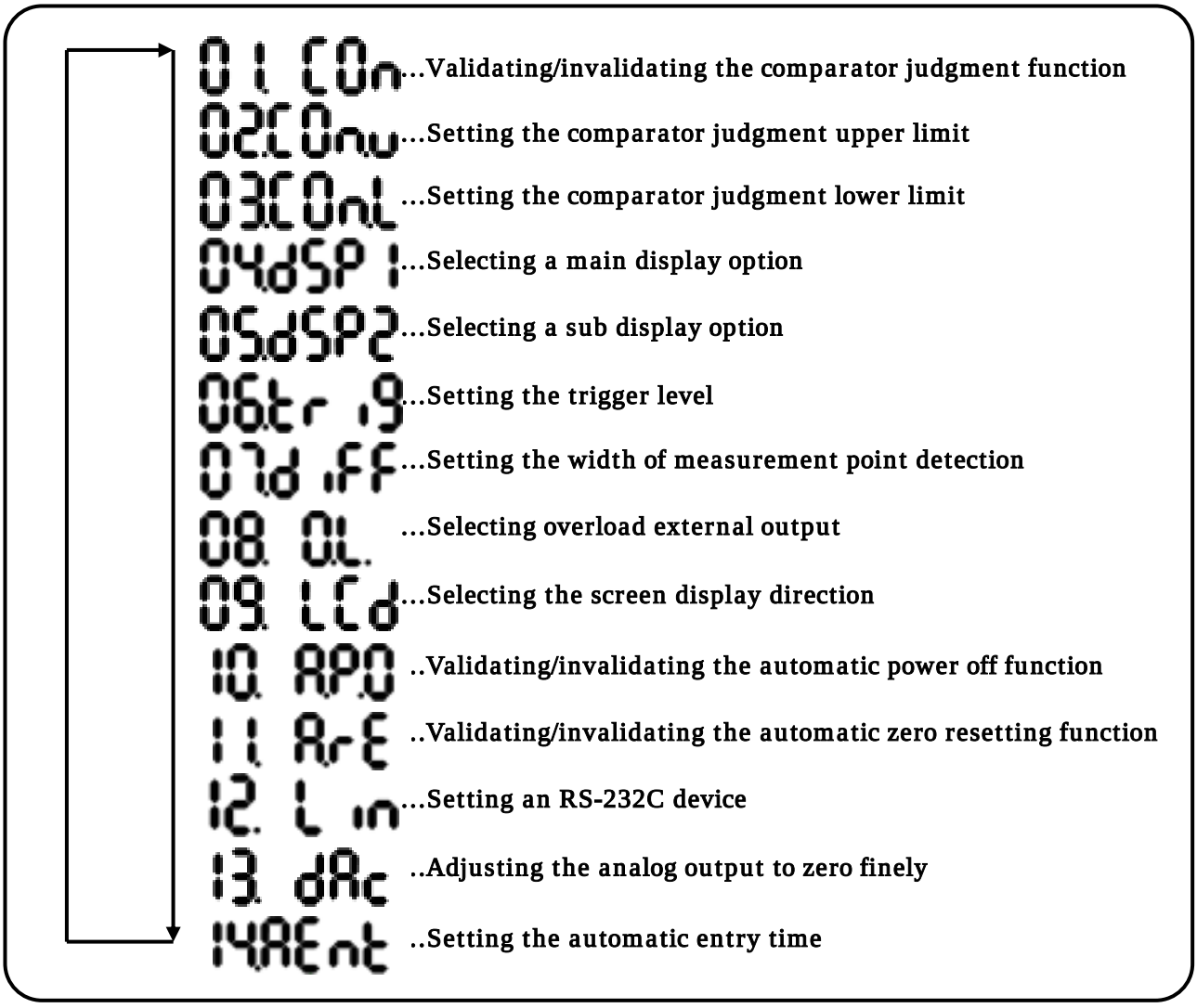
FUNC ... Press this key for three seconds or more in the ready status to enter the function setting mode.

Option List and Flow of Selection

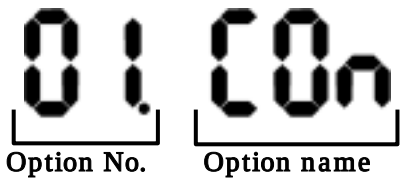
... Changes the options in the main display area one by one.

CAL ... Opens the screen for setting the option displayed in the main display area.

FUNC ... Returns to the ready status.



Displayed Options



Option No. .....Indicates the display order on the main display area.

Option name ...Indicates the name of the option.

Key Operation for Setting Options

- Setting by selection


... Changes the selectable options one by one.

- Setting by inputting numeric values


... Changes the value of the blinking digit from 0 to 9 by one.


... Shifts the blinking digit by one from left to right.


... Alternates the negative sign and no sign (i.e., positive sign).


... Enters the option and value displayed in the main display area, and then returns to the option selection display.


... Returns to the option selection display without entering the option and value displayed in the main display area.

NOTE: Setting is not changed if the  and  keys are mistaken. Be careful.


Validating/invalidating the comparator judgment function
(See the section "Comparator Judgment Function" below.)

Select whether to validate or invalidate the comparator judgment function.

Available options:  ... Validates,  ... Invalidates

Default setting: 


Setting the comparator judgment upper limit
(See the section "Comparator Judgment Function" below.)

Set the upper limit (threshold value) in the displayed unit when the comparator judgment function is validated.

Setting range: + maximum measurement capacity ←→ - maximum measurement capacity
NOTE: The upper value must not equal to or less than the lower limit shown below.


Setting the comparator judgment lower limit
(See the section "Comparator Judgment Function" below.)

Set the lower limit (threshold value) in the displayed unit when the comparator judgment function is validated.

Setting range: + maximum measurement capacity ←→ - maximum measurement capacity
NOTE: The lower value must not equal to or more than the upper limit shown above.

Selecting a main display option
(See the section "Feeling Mode Measurement Mode" below.)

Select a measurement option to be displayed in the main display area in the feeling measurement mode.

Available options:

 ...Onward peak load

 ...Onward lowest load

 ...Return lowest load

 ...Return peak load

 ...Click load

 ...Click ratio

 ...No measurement options to be displayed

NOTE: The current track value is displayed if there are no options to be displayed.

Default setting: 

Selecting a sub display option
(See the section "Feeling Mode Measurement Mode" below.)

Select a measurement option to be displayed in the sub display area in the feeling measurement mode.

Available options:

 ...Onward peak load

 ...Onward lowest load

 ...Return lowest load

 ...Return peak load

 ...Click load

 ...Click ratio

 ...No measurement options to be displayed

NOTE: The number of memory data is displayed if there are no options to be displayed though data are stored in the memory.

Default setting: 

06tr .9 Setting the trigger level
(See the section "Feeling Mode Measurement Mode" below.)

Set the threshold value of starting measurement in the displayed unit in the feeling measurement mode.

Setting range: + maximum measurement capacity ←→ - maximum measurement capacity
Default setting: 0.5% of the maximum measurement capacity (Equivalent value)

07d .FF Setting the width of data detection
(See the section "Feeling Mode Measurement Mode" below.)

Set the width of measurement point detection in the displayed unit in the feeling measurement mode.

Setting range: + maximum measurement capacity ←→ - maximum measurement capacity
Default setting: 0.1% of the maximum measurement capacity (Equivalent value)

08 OL. Selecting overload external output
(See the section "Overload External Output Function" below.)

Set a signal to be output to the external I/O connector in the case of an overload.

Available options: uOn ...Outputs the Up signal if the positive load is overloaded.
Outputs the Down signal if the negative load is overloaded.

LOn ...Outputs the Down signal if the positive load is overloaded.
Outputs the Up signal if the negative load is overloaded.

NOTE: For details, see the section "Overload External Output Function" below.

Default setting: LOn

09 LCd Selecting the screen display direction

Select the display direction on the display areas.

Available options: UP ... Selects the upward direction.

dn ... Selects the downward direction.

Default setting: dn

10. APO Validating/invalidating the automatic power off function
(See the section "Automatic Power Off Function" below.)

Select whether to validate or invalidate the automatic power off function.

Available options: On ... Validates, OFF ... Invalidates

Default setting: On

11. ArE Validating/invalidating the automatic zero resetting function
(See the section "Automatic Zero Resetting Function" below.)

Select whether to validate or invalidate the automatic zero resetting function

Available options: On ... Validates, OFF ... Invalidates

Default setting: OFF

12. L in Setting an RS-232C device

Set an RS-232C device to be connected with the external I/O connector.

Available options: PC ...Connecting a PC, Prn ... Connecting a printer

(See the section "Printers" in "Options" below.)

Default setting: Prn

13. dAc Adjusting the analog output to zero finely

Adjust the 0 mV level of the analog load values output through the external I/O connector finely.
* For details, see the section "Analog Output Function" below.

Operation keys:  ... Every press of this key subtracts 8 from the value.

 ... Every press of this key adds 8 to the value.

... Resets the value to 0.

Setting range: -32000 ←→ +32000
Default setting: 0

Setting the automatic entry time
(See the section "Feeling Mode Measurement Mode" below.)

Set the time of saving measured data and waiting for the next measurement in seconds in feeling measurement.

Setting range: 0, 0.1, 0.2, 0.4, 0.7, 1, 2, 4, 7, and 10 seconds
Default setting: 0

NOTE: When 0 is set, display is held and the next measurement is not enabled until the ZERO key is pressed.
Measured data are not saved in this condition.
However, they may be saved by pressing the MEMO key.

TRACK MODE

Do not apply a load over the maximum measurement capacity.	If an excessive load is applied, the sensor may break. If a greater load is applied, the case or internal parts of the gauge may break, resulting in an accident.

- The track value of an input load is always displayed and output in the track mode.

PEAK TRACK ... Pressing this key in the feeling measurement mode changes the mode into the track mode.
In the track mode, the feeling mode indicator (P) is off.

Functions Available in Track Mode

- Data memory function
- Automatic zero resetting function
- External contact holding function
- Analog output function
- Overload external output function
- Automatic power off function
- External zero resetting function
- Memory data display function
- Comparator judgment function
- Printer output function

FEELING MEASUREMENT MODE

	Do not apply a load over the maximum measurement capacity.	If an excessive load is applied, the sensor may break. If a greater load is applied, the case or internal parts of the gauge may break, resulting in an accident.
	Fix the gauge on a test stand, etc. and carry out measurement in the stable conditions. Using the gauge in an unstable condition may result in a failure in proper	

-Feeling of key switches, etc. is measured and six kinds of data (shown below) are obtained in the feeling measurement mode

... Pressing this key in the track mode changes the mode into the feeling measurement mode. In the feeling measurement mode, the feeling mode indicator (P) is lit.

- The gauge starts up in this mode when it is turned on.
- The gauge enters the ready status immediately after the mode is changed.

Functions Available in Feeling Measurement Mode

- Data memory function
- External zero resetting function (when other than 0 is displayed)
- Analog output function
- Overload external output function
- Automatic power off function
- Memory data display function
- Comparator judgment function
- Printer output function

Detection Items

CP ...Onward peak load

CL ...Onward lowest load

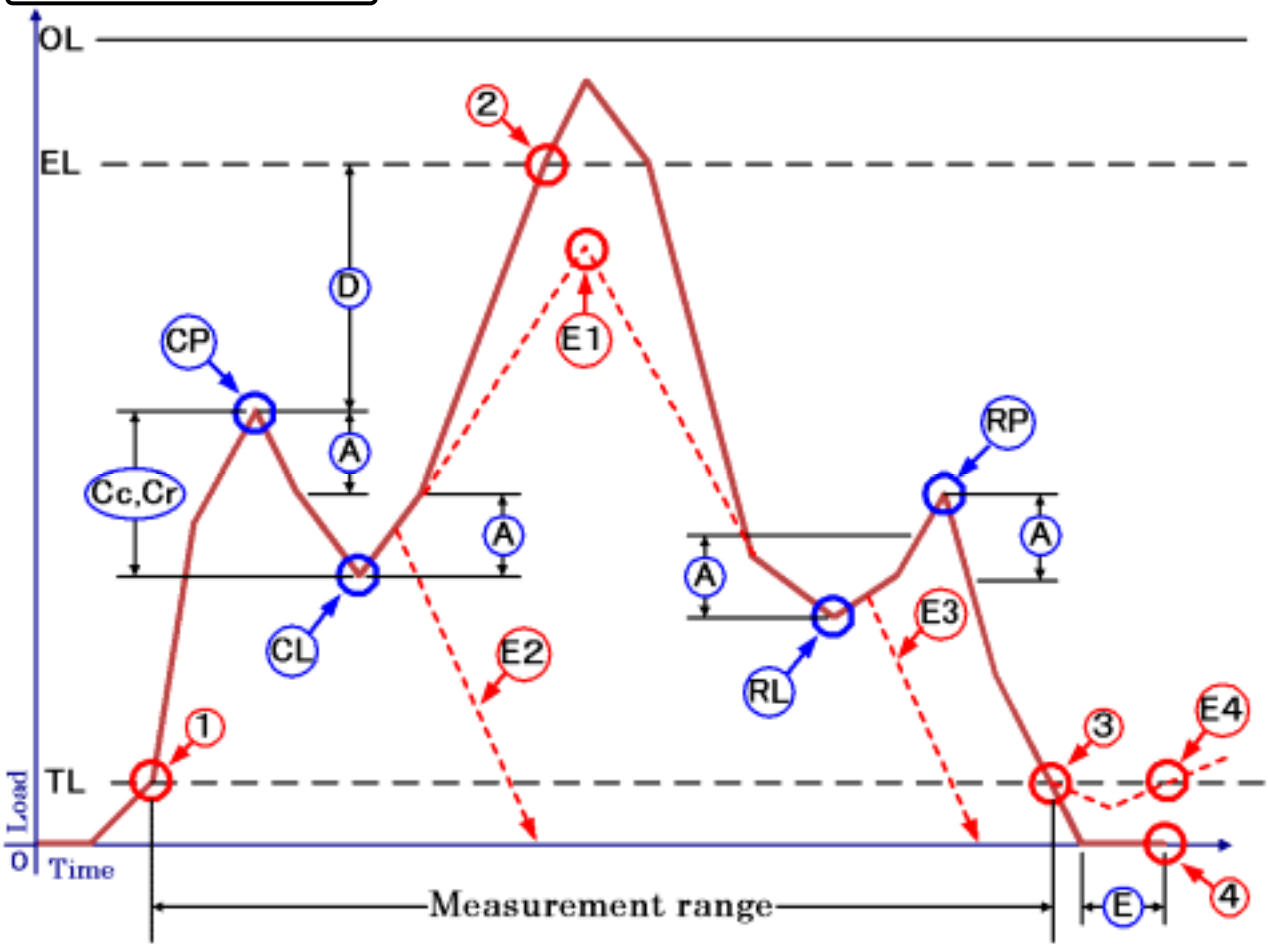
RL ...Return lowest load

RP ...Return peak load

Cc ...Click load
(Onward peak load - onward lowest load)

Cr ...Click ratio
(Click load - onward peak load)

Concept of Measurement



Terms

TL (trigger level) ..... The gauge starts measurement when the load exceeds this trigger level in the ready status. It finishes measurement and judges hether measurement ends normally or abnormally when the load lowers below the trigger level during measurement.
Set the trigger level in the procedures shown in the section "Setting Trigger Level" in "FUNCTION SETTING MODE".

EL (end level) ..... The gauge starts return measurement after it detects the onward lowest (CL) value and then the load reaches the end level.

D ..... After the onward peak value is detected, the gauge sets the value 1.5 times as high as the onward peak as the EL value.

OL (overload) ..... The gauge generates a long buzzer sound while the load is over the OL level.
NOTE: "O.L" is not displayed at this time.
NOTE: The gauge starts return measurement if it detects the OL level after detecting the onward lowest (CL) value.

A (data detection width) ..... When detecting data, the gauge makes sure that the difference from the peak load (lowest load) reaches this detection width and determines the detected value.
Set this value in the procedures shown in the section "Setting Data Detection Width" in "FUNCTION SETTING MODE".
NOTE: The gauge cannot detect data properly unless the appropriate data detection width is set.

E (automatic entry time waiting) ..... The gauge makes sure that the load returns close to zero after completion of measurement and then stands by for the preset time.
Set this value in the procedures shown in the section "Setting Automatic Entry Time" in "FUNCTION SETTING MODE".

Measurement Time Chart

When measurement ends normally

① ...Measurement starts when the load exceeds TL in the ready status.
The gauge generates a short buzzer sound once.
- Detecting CP
- Detecting CL

② ... Return measurement starts, since the load exceeds EL (OL) after the onward lowest (CL) value is detected. The gauge generates a short buzzer sound once.
- Detecting RL
- Detecting RP

③ ... Measurement ends normally, since the load is lower than TL and four values are detected normally. The gauge generates a short buzzer sound once.
- Calculating Cc
- Calculating Cr
- Maing sure that the load has returned close to 0
- Waiting for automatic entry time

④ ... When the automatic entry time has elapsed, data totalization and output processing are carried out. The gauge generates a short buzzer sound once.

One cycle of measurement is completed, and the gauge enters the ready status. (*1)

*1: If the automatic entry time is set to 0,
the gauge keeps detected data displayed but does not enter the ready status.
(See the section "Setting Automatic Entry Time" in "FUNCTION SETTING MODE".)

When measurement ends abnormally... gauge generates a short buzzer sound once.

E1 ... The load lowers below TL without exceeding EL (OL) after detecting the onward lowest (CL) value.

E2
E3
No data are detected and the load lowers below TL, though the load exceeded TL and measurement started.

E4 ... The load exceeds TL without returning close to 0 after completion of measurement.

CALIBRATION MODE

...The calibration mode is used to calibrate the gauge.

The Model-RX-FL gauge has been properly calibrated in the factory before shipment and needs no special calibration unless otherwise required

Our company assumes that the customer has good understanding about this instruction manual and takes the responsibility of executing calibration.
Our company will not accept further inquiries about calibration.

Be sure to enter the calibration mode from the track mode.

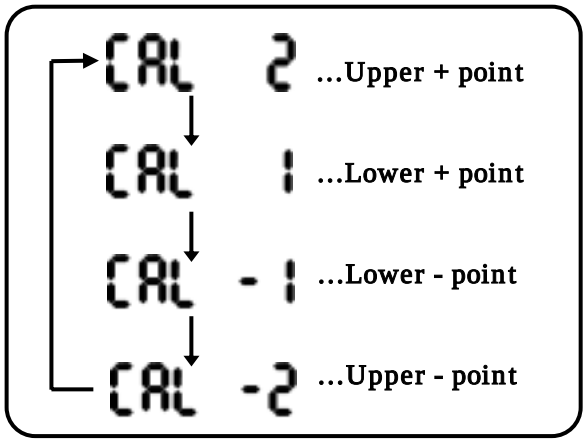
Do not use a flawed or deformed jig.	If a flawed or deformed jig is used, it may break or slip, resulting in injury. If a test piece drops onto your foot, it is very dangerous.
Do not apply a load over the maximum measurement capacity.	If an excessive load is applied, the sensor may break. If a greater load is applied, the case or internal parts of the gauge may break, resulting in an accident.
Never carry out operation without using the reference weight. If the load fluctuates during operation, accurate calibration is disabled. In order to prevent abnormal calibration, setting is only allowed in the range of ±10% or less of the weight.	
Fix the gauge on a test stand, etc. and carry out measurement in the stable conditions. Using the gauge in an unstable condition may result in a failure in proper measurement.。	

- Two positive (+) points plus two negative (-) points (four points in all) or points 1 to 4 may be calibrated in this mode.

CAL ... Press this key for three seconds or more in the ready status to enter the calibration mode.

Switching Calibration Points

... Switches the calibration points.



CAL ... Moves to setting of the displayed calibration point.

ZERO ... Sets the origin, i.e., the reference of the load data, when the this key is held for three seconds or more

FUNC ... Terminates the calibration mode and returns to the ready status.

Simple Calibration Example: RX-FL-1 (10 N)

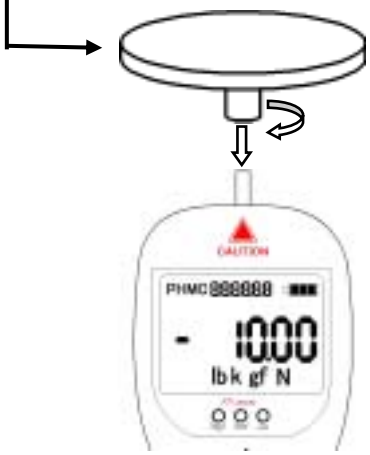
1. Fix the gauge to the test stand, etc.
2. Make sure that the gauge is turned on and in the ready status.
3. Attach a jig.

> ! Use a jig that weighs not more than ±10% of the maximum load capacity.

Attach a jig (attachment) for applying the reference load to the gauge.
Set the origin shown in step 4 below in this condition.

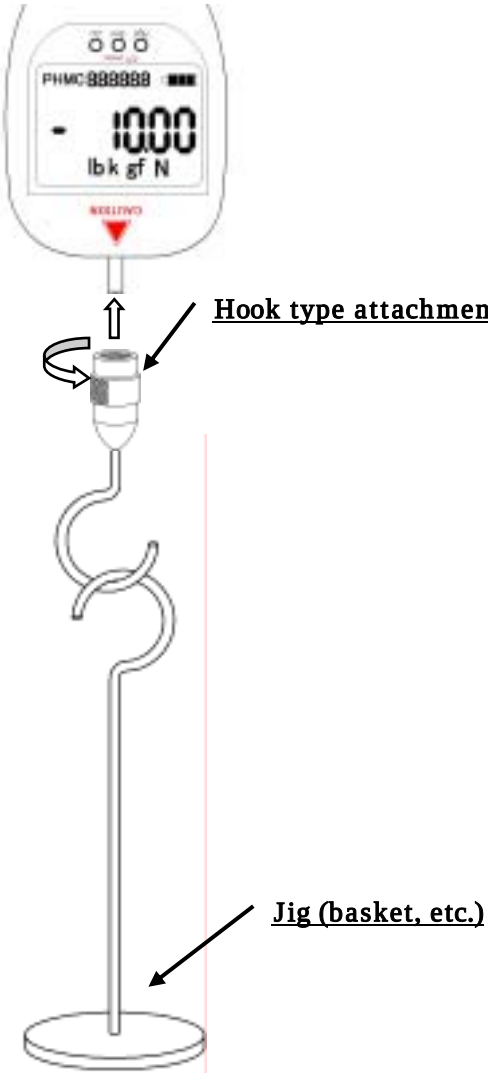
- Setting on the + (compression) side

When a compression load is applied,
the gauge displays a positive (+) value.
Use the Aikoh round flat compression table (Model-CP-U40/80), etc.



- Setting on the - (tensile) side

When a tensile load is applied,
the gauge displays a negative (-) value.
Hang a jig (basket, etc.) on
a hook type attachment, etc.



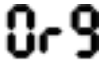
NOTE: The gauge has threads to mount an attachment.
Screw the attachment firmly to the very end.

4. Set the origin.

> Carry out work in the condition where a stable track value is displayed.
> If you attempt to carry out setting in the condition where a load over ±10% of the maximum load capacity is applied, an error occurs.
> Setting is not completed and the gauge returns to the ready status.

Make sure that the gauge is in the calibration mode.

Hold the ZERO key for three seconds or more.



(Org) is displayed for approximately one second and the gauge returns to the ready status.

Press the CAL key to enter the calibration mode again, and carry out the following.

5. Setting each calibration point

> Use the reference weight that weighs more than half the maximum load capacity.

5-1 Input the value of the reference weight to be used. (10.000 N)

- Setting on the + (compression) side

  Press the CAL key in the condition

  where 

  is displayed. Input a value.

- Setting on the - (tensile) side

  Press the CAL key in the condition

  where 

  is displayed. Input a value.

- Changing the value

  ^^ ... Changes the value of the blinking digit from 0 to 9 by one.

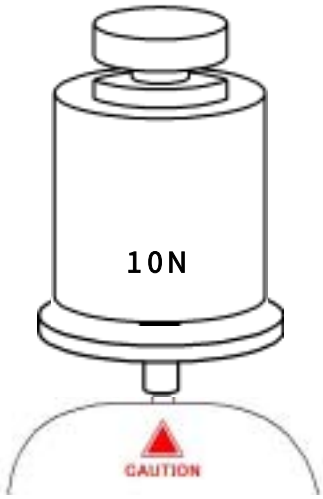
  >> ... Shifts the blinking digit by one from left to right.

NOTE: If you attempt to carry out calibration at the maximum load capacity (10 N in this example), the value has already been set and need be changed.

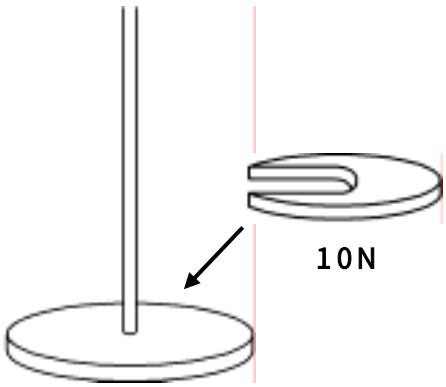
5-2 Apply the load to the gauge using the reference weight (10 N).

If the weight drops when putting it on the jig, it causes an accident. Be very careful.

- Setting on the + (compression) side



- Setting on the - (tensile) side



5-3 Press the CAL key shortly. The applied load is set as an input value.

NOTE: The buzzer sounds shortly three times unless proper setting is carried out.
Retry operation from step 5-1 in such a case.

6. Make preparation for measurement and check.
Remove the reference weight and jig to release the gauge from the load.
Turn off power once, and turn it on again.
Press the ZERO key to reset.
Make sure that the displayed value is zeroed.
Make sure that calibration is completely using the reference weight without fail.

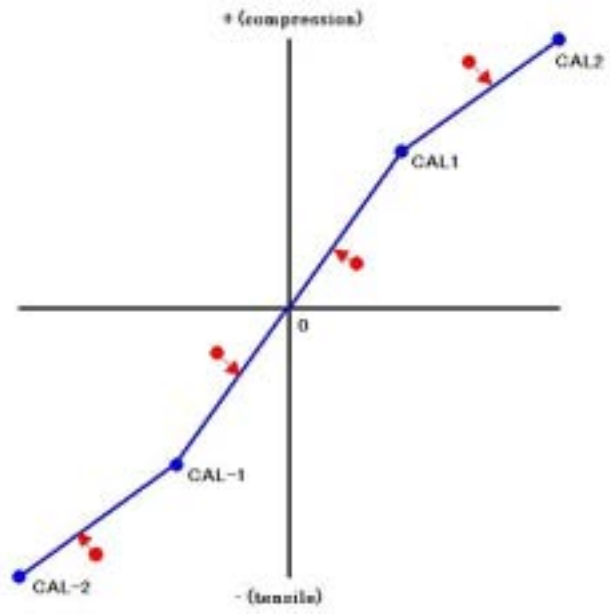
If calibration is finished halfway, accurate measurement is disabled.
Be sure to complete it to the end.

- This section merely shows a simple calibration example.
- If the weight of the reference weight is different from the set value, proper measurement is disabled.
Set the correct value before executing calibration.
- It is recommended that the load calibration should be done by our company once a year in order to guarantee the accuracy of the gauge.
(Our company may also issue a traceability certificate.)

- About Calibration Points -

> **!** Be sure to use CAL2 or CAL-2 for calibration of one or two points.
> One-point or two-point calibration using CAL1 or CAL-1 only is disabled.

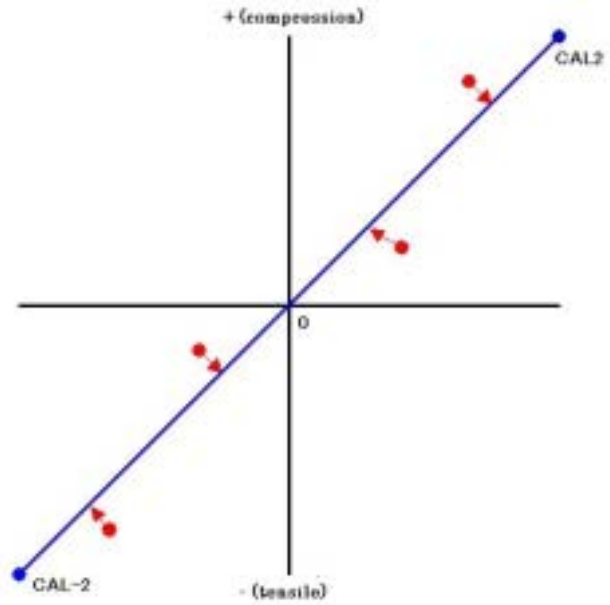
- Four-Point Calibration -



: Load before calibration

: Load after calibration

- Two-Point Calibration -



: Load before calibration

: Load after calibration

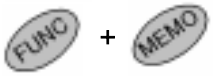
DETAILS OF FUNCTIONS

Data Memory Function

This function is used to save data in the memory unit built in the gauge.
The gauge stores memorized data even after the power is turned off.
This function is also used to output measured data to a printer, etc. in a batch.

Key operations: 

..... Saves the current data. (*1)



... Deletes all memory data stored currently.

- Cautions -
- Once data are saved in a certain mode, they cannot be saved in any other mode.
  Delete the memory before saving data in another mode.
- It is possible to save data in the same unit. Delete the memory if the unit is changed.
- The quantity and details of data to be saved differ with the measurement modes.
  In the feeling measurement mode ... Quantity of data that may be saved: 150
  Save data: 1 data, 6 items (CP, CL, RL, RP, Cc & Cr)
  (See the section "FEELING MEASUREMENT MODE".)
  In the track mode ..... Quantity of data that may be saved: 500
  Save data: Track display data

*1: The memory indicator (M) is lit and the quantity of save data is displayed in the main display area for approximately one second if no data were stored in the memory.
Hereinafter, the quantity of save data is displayed in the sub display area.
Data are also output to the printer simultaneously if it is connected with the external I/O connector. (See the section "Printer Output Function".)

Automatic Power Off Function

This function turns off power automatically if any key operation is not done or the displayed load does not change for five minutes or more.

- Cautions -
- If the automatic power off function is activated in the condition where a PC is connected with the gauge, some trouble may occur in such a case that the PC acquires data automatically, for example.
  It is recommended that the automatic power off function should be deactivated in such a case.

Automatic Zero Resetting Function

This function, if activated, resets the value to zero at an interval of approximately two seconds when some values are detected due to vibrations even though no load is applied.

- Cautions -
- This function is available in the track mode only.

External Zero Resetting Function

This function resets the value to zero and nulls the display when the reset signal is input to the external I/O connector.

Pin assignment : Pin 29: Reset signal input pin...(ZERO IN)
Pin 30: Digital ground.....(GND)
(See the section "External I/O Connector Pin Assignment".)

-The display is nulled when the above shown pins are short-circuited with the optional cable (RX-OP-1), etc. Short-circuiting these pins causes absolute zero resetting.

- Cautions -
- "0" remains displayed if these pins are short-circuited continuously.
- The display null function is available in the track mode only.
- This function is not available if data are stored in the memory.

External Contact Holding Function

This function holds the track value when the contact signal is input to the external I/O connector.

Pin assignment: Pin 28: Contact signal input pin...(HOLD IN)
Pin 30: Digital ground.....(GND)
(See the section "External I/O Connector Pin Assignment".)

- When the contact signal is input to the above shown pins through the optional cable (RX-OP-1), etc. and its status changes, the track value at that time is held.
The external contact hold indicator (H) is lit in the display area.
Contact status : Open → close: Held
Close → open: Held.
Close → close: Not held.
Open → open: Not held.
- Press the 

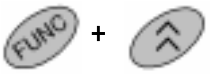
key to reset the held value.

The external contact hold indicator (H) goes out when the held value is reset.

- Cautions -
- This function is available in the track mode only.
The external contact hold indicator (H) changes if the contact signal varies in the feeling measurement mode.

Memory Data Display Function

This function displays the latest data stored in the memory unit on the main display area.



+ ... Moves to this function from the ready status

Key operations:  ... Returns to the ready status.

 ... Deletes the displayed data from the memory and returns to the ready status. (*1)

 ... Changes the displayed items from CP in the order of CP, CL, RL, RP, Cc and Cr if the data are saved in the feeling measurement mode. The names of the items displayed in the main display area are displayed in the sub display area at that time.

*1: Six-item data per measurement cycle are deleted in the feeling measurement mode.

- Cautions -

- Note that data deleted with the  key may not be restored.

Analog Output Function

This function outputs analog voltage corresponding to the load applied currently through the external I/O connector.

Output voltage: Approx. ±2 V/F.S. (maximum measurement capacity)
Pin assignment : 1 ... Analog output (±2 V/F.S.)
2 ... Analog ground (A. GND)
(See the section "External I/O Connector Pin Assignment".)

- To bring the output voltage close to 0 V

Connect a digital voltmeter, etc. with the above shown pins using the optional cable (RX-OP-1), etc. and adjust the output voltage close to 0 V in the procedures shown in section "Adjusting Analog Output to Zero Finely".

- Cautions -

- This function is not linked with the measured values (CP, CL, etc.) in the feeling measurement mode.

Comparator Judgment Function

This function judges the applicable data as High, Good or Low according to the preset upper and lower limits, and displays and outputs the judgment result.

Applicable data : Track mode ..... Judges the track value displayed in the main display area.
Feeling measurement mode ... Judges the measured value displayed in the main display area.(*1)

*1: The comparator judgment function does not work when no is displayed in the main display area.

Judgment result display : The judgment result is displayed in the comparator judgment display area.

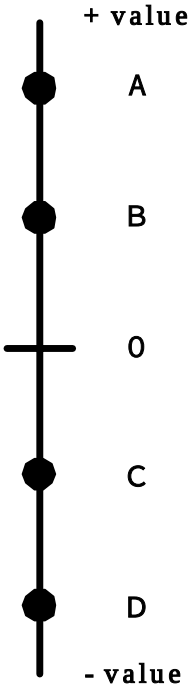
Low ... Lit when the judgment result lowers below the lower limit.
Good ... Lit when the judgment result is between the upper and lower limits.
High ... Lit when the judgment result exceeds the upper limit.

Judgment result output : The judgment result is output through the external I/O connector and optional cable (RX-OP-5, etc.) connected with it.

Pin assignment : 21 ... Low judgment result output pin....(LOW)
22 ... Good judgment result output pin...(GOOD)
23 ... High judgment result output pin...(HIGH)
24 ... Common ground.....(COM)
* All outputs are open collector outputs.

- Cautions -
- Note that data to be judged differ with the track mode and feeling measurement mode.
- Judgment is not done if the upper and lower limits are the same value or the data to be judged is 0, even though the comparator judgment function is activated.

-- Concept of Upper and Lower Limits -



1. When both the upper and lower limits are in the positive (compression) area (like A and B in this example), the greater value A is the upper limit and B is the lower limit.

2. When both the upper and lower limits are in the negative (tensile) area (like C and D in this example), the value D, whose absolute value is greater, is the upper limit and C is the lower limit.

3. When the upper limit and lower limit are on the opposite sides (like B and C in this example), the value B on the positive side is the upper limit and the value C on the negative side is the lower limit, regardless of the magnitude of the values.

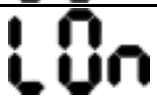
Overload External Output Function

This function outputs signals to the external I/O connector and optional cable (RX-OP-5, etc.) connected with it, if a load over the maximum measurement capacity is input.

Pin assignment : 25 ... OVER LOAD UP
26 ... OVER LOAD DOWN
27 ... Common ground (OVER LOAD COM)
(See the section "External I/O Connector Pin Assignment".)

* All outputs are open collector outputs.

Relationship between overload output setting & pin No.

Setting	Load input direction	Pin No.
	Positive side (Compression)	25
	Negative side (Tensile)	26
	Positive side (Compression)	26
	Negative side (Tensile)	25

- Cautions -

- Note that the output signals differ with the "overload output setting".

> ! Improper setting may cause breakdown.
> Check the setting carefully.

Printer Output Function

This function outputs data stored in the memory to a connected printer.

Key operations :  +  ... Outputs all stored data.

 +  ... Outputs the data displayed in the main display area among stored data. (*1 & *2)

 ..... Outputs the latest data.

*1: All data are output if track values are stored.

*2: No data are output if  is set in the main display area.

- Cautions -

- Data may sometimes be printed improperly, depending on the "RS-232C connection setting". Check the setting.
- The output data, output format, etc. depend on the connected printer. (See the section "External Instruments and Output Data".)

REFERENCE

About Data Communication

Connecting the exclusive cable (*1) with the external I/O connector allows data communication with a PC, etc.

- Select " PC " in "Setting RS-232C Connection" to connect a PC with the gauge.
- When " PC " is selected above, the gauge changes the communication conditions to enable high-speed communication with the PC.
- The gauge uses RS-232C interface for data communication. Thus, it cannot carries out communication properly with the PC unless the communication conditions of the PC are not suitable to those of the gauge.
- The communication conditions of this gauge are as shown below and they are unchangeable. Set the communication conditions of the PC properly.
- Communication conditions

  - Baud rate: 38400 bps
  - Start bit: 1 bit (*2)
  - Data bit: 8 bits
  - Parity bit: None
  - Stop bit: 1 bit

*1: See the section "Options".

*2: If the PC has no setting function, no setting is required.

Communication Command List

General	Command (Hex. code)	Description	Response to command			
Command delimiter		Added to the end of a command or data as an end mark of a packet.				
	CR(0DH)	Starts analysis of a command.				
	LF(0AH)	Unnecessary between the gauge and PC, in principle.				
Data delimiter	SP(20H)	Used to separate data if a packet sent by the gauge contains several data.				
Response to command	NG	An incorrect command is received.				
	NO	There is no corresponding data.				
	OK	A command is accepted normally.				
	DT	Corresponding data. There is data to be returned to an accepted command.				
Data reading	RDVR	Reads out the version No. of the gauge program.	-	-	-	DT
	RDFL	Outputs measured values (six: CP, CL, RL, RP, Cc and Cr) stored after feeling measurement.	-	NO	-	DT
	RDMDL	Reads out the allowable overload.	-	-	-	DT
	RDF0	Reads out the displayed track value.	-	-	-	DT
	RDF1	Reads out the instantaneous track value.	-	-	-	DT
	RDF1R1	Starts continuous data output. (Hex. data)	-	-	-	DT
	RDF1RE	Stops continuous data output.	-	-	-	-
	RDTKF1	Reads out stored track values in a batch.	-	NO	-	DT
	RDTKF4	Reads out data from the memory buffer in a batch.	-	NO	-	DT
	RDYS1	Reads out set 1 of the comparator set values.	-	NO	-	DT
	RDYS2	Reads out set 2 of the comparator set values.	-	NO	-	DT
	RDMD	Mode check command (TRACK/PEAK)	-	-	-	DT
Data writing	WRFZ	Nulls the load and resets the peak value.	-	-	OK	-
	WRUNKG	Selects the kg measurement unit.	-	-	OK	-
	WRUNN	Selects the N measurement unit.	-	-	OK	-
	WRUNLB	Selects the lb measurement unit.	-	-	OK	-

External Instruments and Output Data

Operation	Instrument	Setting	Data type	Output data
When feeling measurement finishes (*1)	BL-58RS II (SANEI)	Prn	Feeling measurement data	A
			Track data	No
		PC	Feeling measurement data	Err
			Track data	Err
	DP-1VR(MITSUTOYO)	(*2)	Feeling measurement data	B
			Track data	No
	PC (RS-232C)	Prn	Feeling measurement data	Err
			Track data	Err
		PC	Feeling measurement data	C
			Track data	No
When  key is pressed	BL-58RS II (SANEI)	Prn	Feeling measurement data	A
			Track data	D
		PC	Feeling measurement data	Err
			Track data	Err
	DP-1VR(MITSUTOYO)	(*2)	Feeling measurement data	B
			Track data	E
	PC (RS-232C)	Prn	Feeling measurement data	Err
			Track data	Err
		PC	Feeling measurement data	No
			Track data	No
When  +  keys are pressed	BL-58RS II (SANEI)	Prn	Feeling measurement data	F
			Track data	G
		PC	Feeling measurement data	Err
			Track data	Err
	DP-1VR(MITSUTOYO)	(*2)	Feeling measurement data	H
			Track data	I
	PC (RS-232C)	Prn	Feeling measurement data	Err
			Track data	Err
		PC	Feeling measurement data	No
			Track data	No
When  +  keys are pressed	BL-58RS II (SANEI)	Prn	Feeling measurement data	J
			Track data	G
		PC	Feeling measurement data	Err
			Track data	Err
	DP-1VR(MITSUTOYO)	(*2)	Feeling measurement data	K
			Track data	I
	PC (RS-232C)	Prn	Feeling measurement data	Err
			Track data	Err
		PC	Feeling measurement data	No
			Track data	No
When DATA key is pressed(*3)	BL-58RS II (SANEI)	Prn	Feeling measurement data	No
			Track data	No
		PC	Feeling measurement data	No
			Track data	No
	DP-1VR(MITSUTOYO)	(*2)	Feeling measurement data	H
			Track data	I
	PC (RS-232C)	Prn	Feeling measurement data	No
			Track data	No
		PC	Feeling measurement data	No
			Track data	No

Output data	
A	The latest data stored in the memory are output in the order of the memory No., item name, measured value (6 items), and comparator judgment result. (*4)
B	Among the latest data stored in the memory, the measured value of the item set in the main display area is only output.。
C	Measured value (6 items) stored after completion of measurement are output.
D	The latest data stored in the memory are output in the order of the memory No., track value and comparator judgment result. (*4)
E	Among the latest data stored in the memory, the track value is output.
F	All data stored in the memory are output in the order of the memory No., item name, measured value (6 items), and comparator judgment result. (*3)
G	All data stored in the memory are output in the order of the memory No., track value and comparator judgment result. (*4)
H	Among the latest data stored in the memory, measured values (6 items) are output.
I	Among the latest data stored in the memory, track values are output.
J	Among the latest data stored in the memory, the memory No., item name, measured value, and comparator judgment result (*4) of the item set in the main display area are only output.
K	Among the latest data stored in the memory, the measured value of the item set in the main display area is only output.
No	No data is output.
Err	Output data are indefinite, since the communication conditions of the instrument are not suitable to those of the gauge.

*1: AOutput only when AutoEnter is set to a value other than 0.
*2: Not influenced by the Prn/Pc setting when the DP-1VR is connected.
*3: This key is provided on the DP-1VR.
*4: Comparator judgment result is output only when the comparator function is validated only.

Data Output Examples

<Output data A>

```
0001 CP + 1.467  N    G
     CL + 1.117  N
     RL + 1.046  N
     RP + 1.396  N
     CC + 0.350  N
     CR + 23.85  %
```

<Output data D & G>

```
0001 + 1.467  N    G
0002 + 1.417  N    L
0003 + 1.446  N    G
0004 + 1.496  N    H
0005 + 1.450  N    G
0006 + 1.466  N    G
          .
          .
          .
0500 + 1.450  N    G
```

<"RDF1R4" command>

```
0001 + 1.467  N    G
     + 1.117  N
     + 1.046  N
     + 1.396  N
     + 0.350  N
     + 23.85  %
0002 + 1.472  N    H
     + 1.117  N
     + 1.046  N
     + 1.396  N
     + 0.350  N
     + 23.85  %
0003 + 1.467  N    G
     + 1.117  N
     + 1.046  N
     + 1.396  N
     + 0.350  N
     + 23.85  %
0004 + 1.467  N    G
     + 1.117  N
     + 1.046  N
     + 1.396  N
     + 0.350  N
     + 23.85  %
          .
          .
          .
0150 + 1.451  N    L
     + 1.117  N
     + 1.046  N
     + 1.396  N
     + 0.350  N
     + 23.85  %
```

<Output data C>
("RDFL" command)

```
+00.108 kgf
+00.046 kgf
+00.114 kgf
+00.363 kgf
+00.062 kgf
+057.40 %
```

<Output data J>

```
0001 CP + 1.467  N    G
0002 CP + 1.472  N    H
0003 CP + 1.465  N    G
0004 CP + 1.463  N    G
0005 CP + 1.467  N    G
0006 CP + 1.451  N    L
```

<"RDF1R1" command>

```
0000
0001
FFF0
FFF1
0002
0003
0004
0005
0006
0007
0008
0009
000A
000B
000C
000D
000E
000F
0010
0000
FFF1
FFF2
FFF3
FFF4
FFF5
  .
  .
  .
  .
```

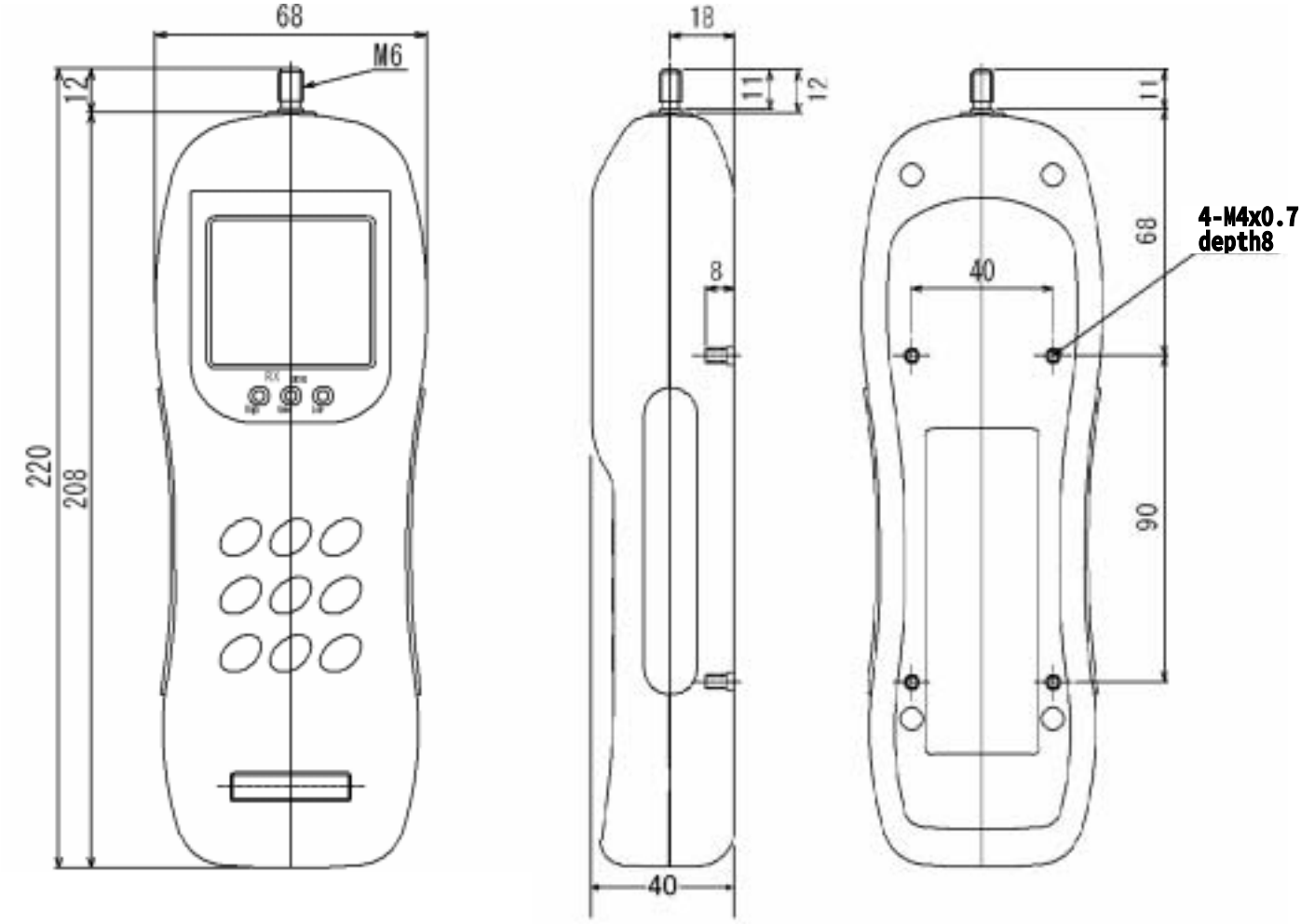
<Output data F>

```
0001 CP + 1.467  N    G
     CL + 1.117  N
     RL + 1.046  N
     RP + 1.396  N
     CC + 0.350  N
     CR + 23.85  %
0002 CP + 1.472  N    H
     CL + 1.117  N
     RL + 1.046  N
     RP + 1.396  N
     CC + 0.350  N
     CR + 23.85  %
0003 CP + 1.467  N    G
     CL + 1.117  N
     RL + 1.046  N
     RP + 1.396  N
     CC + 0.350  N
     CR + 23.85  %
0004 CP + 1.467  N    G
     CL + 1.117  N
     RL + 1.046  N
     RP + 1.396  N
     CC + 0.350  N
     CR + 23.85  %
          .
          .
          .
0150 CP + 1.451  N    L
     CL + 1.117  N
     RL + 1.046  N
     RP + 1.396  N
     CC + 0.350  N
     CR + 23.85  %
```

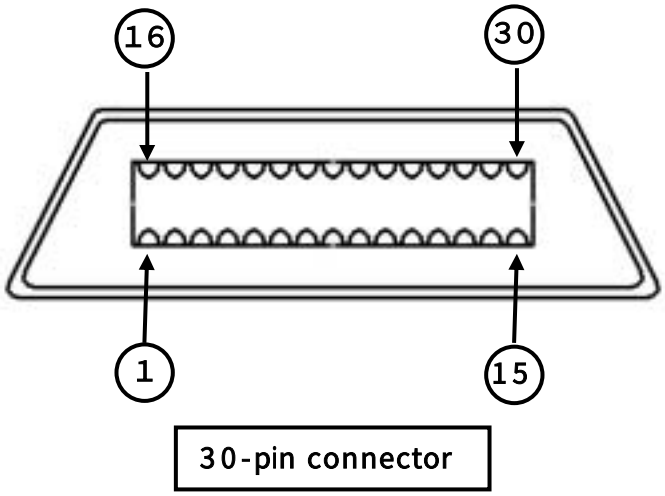
<Output data B, H, I & K>

```
 1    1.467
 2    1.417
 3    1.446
 4    1.496
 5    1.450
 6    1.466
 7    1.463
 8    1.451
 9    1.472
10    1.465
          .
          .
          .
```

Profile Drawing (Unit: mm)



External I/O Connector Pin Assignment

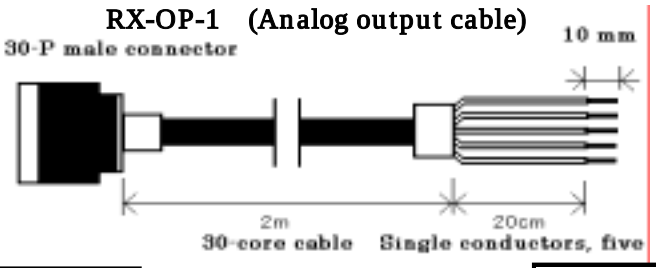


1	Analog output ±2 V/F.S.	Analog output
2	Analog ground	
3	RD	RS-232C
4	RTS	
5	TD	
6	CTS	
7	D.GND	
8	GND	
9	Nc	
10	Nc	
11	Nc	
12	Nc	
13	DP DATA	MITSUTOYO printer DP-1VR Use pin 8 for GND.
14	DP CK	
15	DP RDY IN	
16	DP REQ IN	
17	Nc	
18	Nc	
19	Nc	
20	Nc	
21	COMPARATE LOW	Comparator judgment output
22	COMPARATE GOOD	
23	COMPARATE HIGH	
24	COMPARATE COM	
25	OVER LOAD UP	Overload output
26	OVER LOAD DOWN	
27	OVER LOAD COM	
28	HOLD IN	External holding External zero resetting
29	ZERO IN	
30	GND	

Options

Optional cables

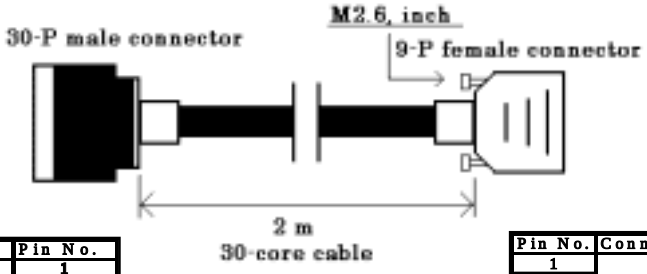
RX-OP-1 (Analog output cable)



Connector shape		Pin No.
Connector model No.	DHA-PC30-3G (DDK) male	1
Case model No.	DHA-HPA30 (DDK)	2
Number of poles	30	3
		4
		5
		6
		7
		8
		9
		10
		11
		12
		13
		14
		15
		16
		17
		18
		19
		20
		21
		22
		23
		24
		25
		26
		27
		28
		29
		30

Signal	Wire color	Termination
±2 V/F.S. output	Red	Solder plated
Analog GND	Black	Solder plated
HOLD IN	Gray	Solder plated
ZERO IN	Blue	Solder plated
GND	Brown	Solder plated

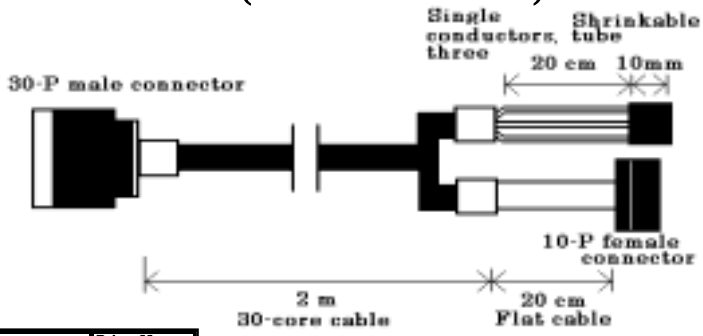
RX-OP-2 (RS-232C cable)



Connector shape		Pin No.
Connector model No.	DHA-PC30-3G (DDK) male	1
Case model No.	DHA-HPA30 (DDK)	2
Number of poles	30	3
		4
		5
		6
		7
		8
		9
		10
		11
		12
		13
		14
		15
		16
		17
		18
		19
		20
		21
		22
		23
		24
		25
		26
		27
		28
		29
		30

Pin No.	Connector shape	
1		
2	Connector type	D-sub, 9-P female connector
3		
4		
5		
6	Number of poles	9
7		
8		
9		

RX-OP-3 (Printer cable DP-1VR)



Connector shape		Pin No.
Connector model No.	DHA-PC30-3G (DDK) male	1
Case model No.	DHA-HPA30 (DDK)	2
Number of poles	30	3
		4
		5
		6
		7
		8
		9
		10
		11
		12
		13
		14
		15
		16
		17
		18
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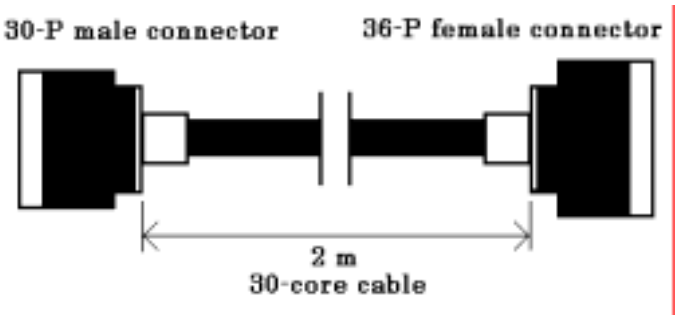
		20
		21
		22
		23
		24
		25
		26
		27
		28
		29
		30

Pin No.	Connector shape	
1		
2	Connector type (HIROSE CONNECTOR)	HIF3BA-10D 2.54R For flat cable
3		
4		
5		
6	Number of poles	10
7		
8		
9		
10		

Signal	Wire color	Termination
HOLD IN	Gray	Shrinkable tube
ZERO IN	Blue	
GND	Brown	

RX-OP-5 (External control cable)



Connector shape		Pin No.
Connector model No.	DHA-PC30-3G (DDK) male	1
Case model No.	DHA-HPA30 (DDK)	2
Number of poles	30	3
		4
		5
		6
		7
		8
		9
		10
		11
		12
		13
		14
		15
		16
		17
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		20
		21
		22
		23
		24
		25
		26
		27
		28
		29
		30

Pin No.	Connector shape	
1		
2		
3	Connector & case set model No.	57-60360 (DDK)
4		
5		
6	Number of poles	36
7		
8	Accessory connector	
9		
10	Connector & case set model No.	57-60360 (DDK)
11		
12		
13		
14		
15		
16		
17		
18		
19		
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22		
23		
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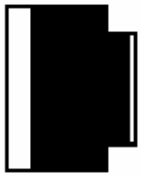
34		
35		
36		

Accessory

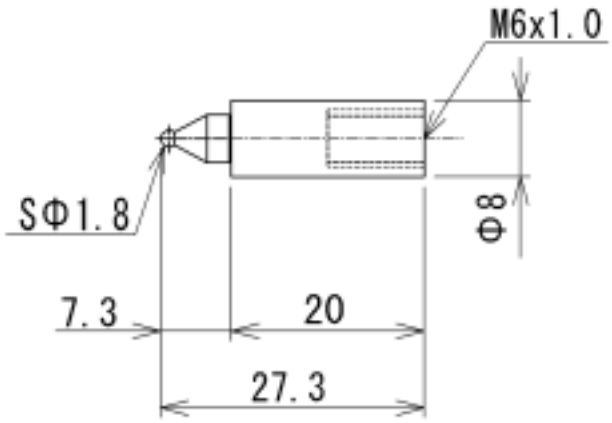
36-P male connector



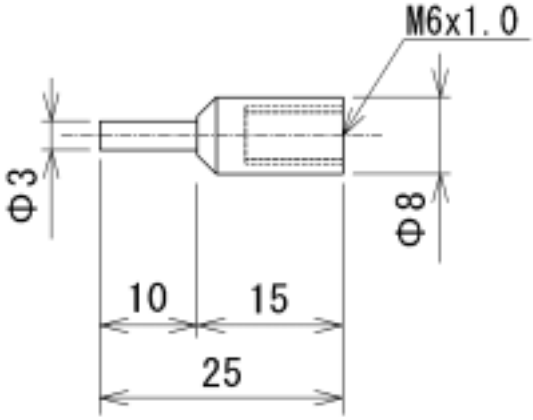
Measurement attachments

Material: Aluminum

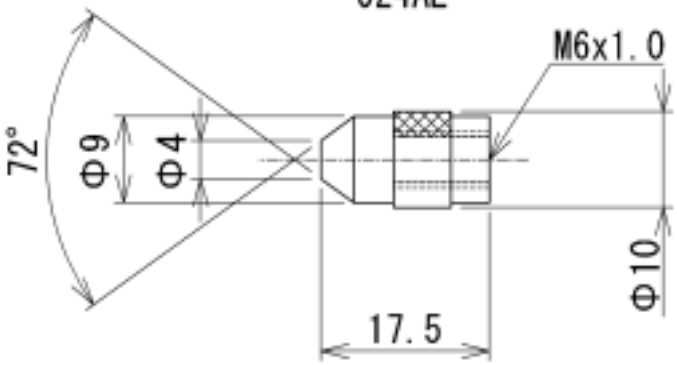
022AL



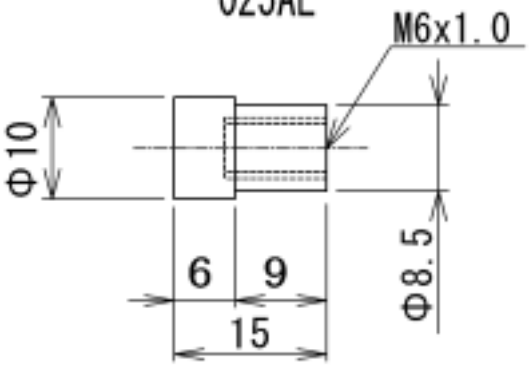
023AL



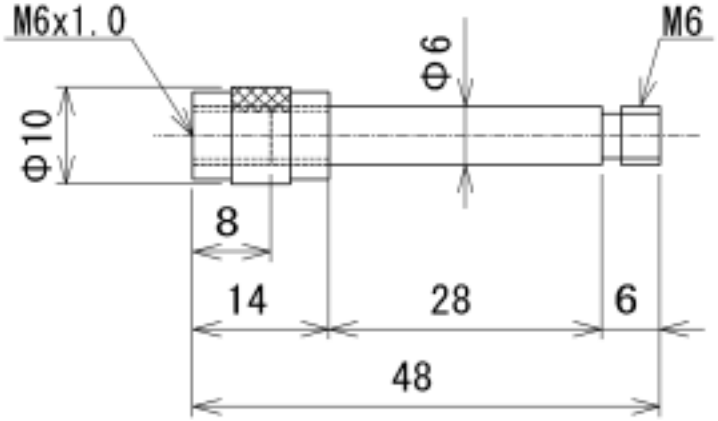
024AL



025AL



026AL



Printers

- Model : DP-1VR
- Type : Digimatic Mini processor
- Manufacturer : Mitsutoyo Co., Ltd.
- Outside dimensions : 94 W x 201 D x 75.2 H mm

- ✧ Use the optional cable RX-OP-3 to connect this printer with the gauge.
- ✧ Contact Mitsutoyo Co., Ltd. for the operation method, setting, etc.

- Model : BL-58RSII or BL2-58
- Type : Thermal line dot printer
- Manufacturer : Sanei Electric Co., Ltd.
- Outside dimensions : 106 W x 76.6 H x 173 D mm
- Weight : Approx. 400 g (Printer only)

- ✧ Use the optional cable RX-OP-2 to connect this printer with the gauge.

Specifications

Model	RX-FL-1	RX-FL-2
Max. meas. capacity	±10.00 N	±20.00 N
	±1000.0 (*1)	±2000 (*1)
	±2.205 lb (*1)	±4.409lb(*1)
Unit	N, kg, lb (*1)	
Functions	Feeling measurement Track load value, data memory, auto power off Ext. hold input, ext. zero reset input Ext. analog output, ext. data output Ext. overload output Comparator judgment display & ext. output	
Meas. accuracy	±0.2%/F.S.	
Sampling freq.	100 Hz (Sampling at 5 ms)	
A/D converter	16-bit, sampling at 100 kHz	
Processor	16-bit, single chip microprocessor	
Display	7-segment LCD	
Display refreshing freq.	5 times/sec.	
Allowable load	150%/F.S.	
Auto power off time	Approx. 5 minutes	
Data memory q'ty (*2)	Feeling measurement data: 150/set	
	Track values: 500 values	
Analog output	Approx. ±0.2 V/F.S.	
Ext. data interface	Exclusive printer I/O (*3)	
	RS-232C I/O (*4)	
Ext. connector	30-P half-pitch connector	
Operating temp. range	0 to 40°C	
Guarantee temp. range	5 to 40°C	
Power supply	Exclusive battery (NiCd, 4.8 V), exclusive adapter (*5)	
Continuous run time	Approx. 12 hours	
Outside dimensions	208 H x 68 W x 40 D mm (Projections not included)	
Weight	Approx. 450 g (Body only)	

(*1): The unit N (Newton) is only available on models for domestic use in Japan.
(*2): Either feeling measurement data or track values are stored.
(*3): Digimatic Mini processor DP-1VR (made by Mitsutoyo Co., Ltd.)
(*4): Line thermal printer BL-58RSII (made by Sanei Electric Co., Ltd.)
(*5): 100 VAC input - 6 VDC output (Model-761)
220 VAC input - 6 VDC output (Model-762 for overseas countries)