MODEL 3568

Digital Ohm Meter

Instruction Manual

I-01679

TSURUGA ELECTRIC CORPORATION

Contents

1. Preface

We thank you for your purchase of our MODEL 3568. For safety and proper use of this product, please carefully read this instruction manual before the initial operation.
Model 3568 is is provided with a wide range from 300mΩ to 300kΩ and it can perform high precision measurement of high resolution 10μΩ.
Also provided as standard are the temperature compensation function, ratio display function and temperature conversion function which allows to measure the risen temperature of coil resistance.
With a comparator memory function of 30 patterns, it is also possible to preset the test conditions for plural numbers of test samples.
Four different types of optional data output interfaces such as RS-232C etc. are provided for the meter to serve a wide range of applications from stand alone use to systematized operation.

⚠ CAUTION

- **To avoid break-down, malfunction or deterioration of life time, do not use this product in such places where:**
  - **exposed to rain, water drops or direct sunlight.**
  - **high temperature or humidity, heavy dust or corrosive gas.**
  - **affected by external noise, radio waves or static electricity.**
- **Where there is constant vibration or shock**
- **Do not dismantle or modify this product.**

1.1 ●Preparations prior to use

1.1.1 Inspection

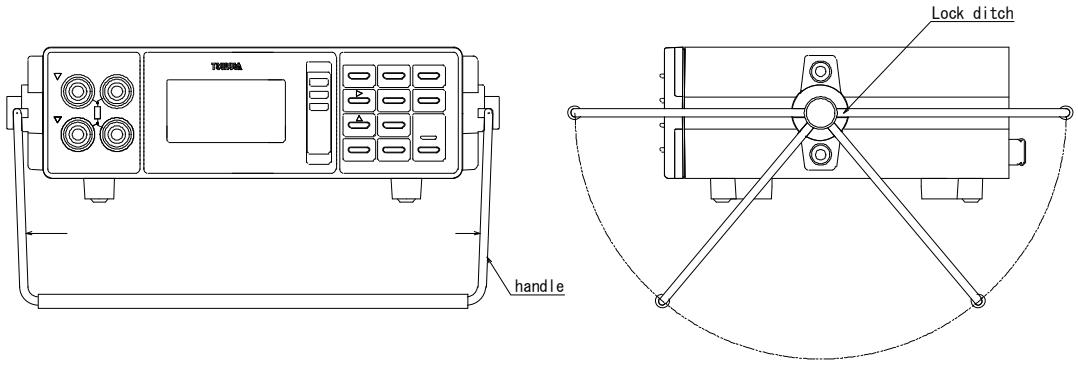
When the meter is delivered, please check whether it conforms to the ordered specifications and has not been damaged in transit. If any damage or inconvenience in operation is found, please inform us of the model name and serial number of the product.

1.1.2 Storage

When the meter is not in use for long time, store it in the place of low humidity where the meter is not exposed to the direct sunlight.
When the meter is stored for a long term, remove the batteries

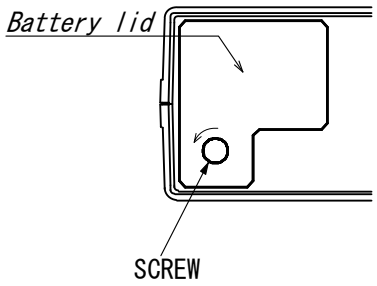
1.1.3 Handle

Set up the handle, by slightly expanding it as the arrows show and inserting it into the locking slot.



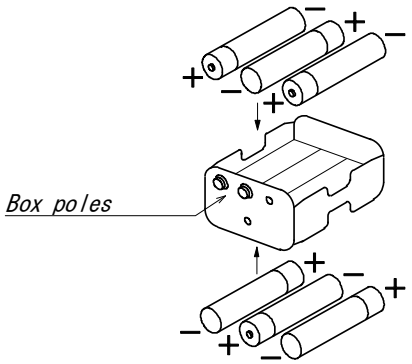
1.1.4 Loading of batteries

①Attachment/detachment of rear battery lid

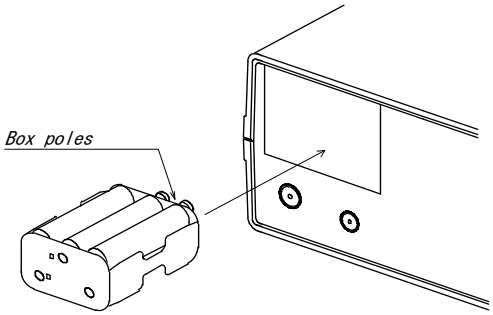


Attach or detach the lid by screwing

②Loading of batteries



Put a six LR6 or R6P batteries in the battery compartment, paying attention to their direction.

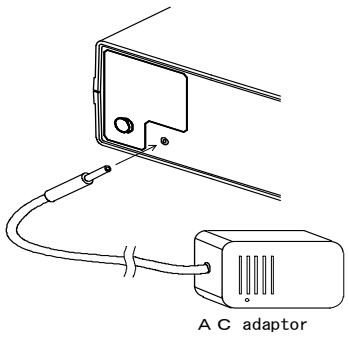


Insert the battery box, bringing its poles far side, and close the lid.

1.1.5 Battery alarm

- Full charged
- A little discharged
- Less charged
- (Blink)Batteries need to be replaced

1.1.6 Connection of AC adaptor

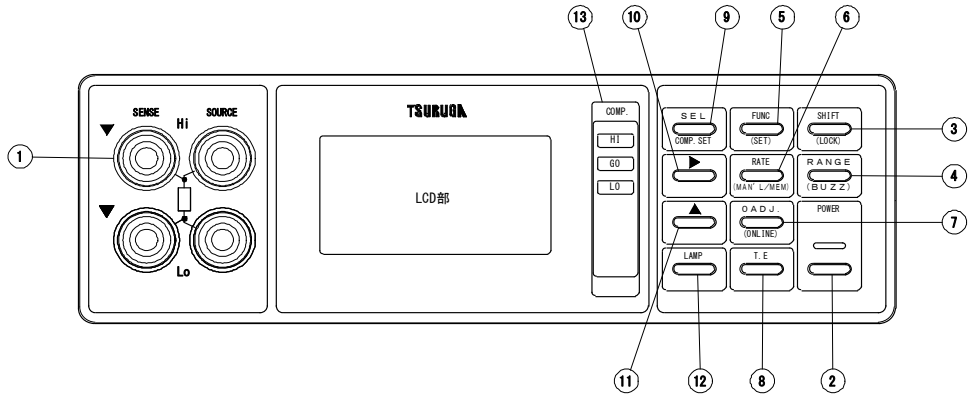


Take a power supply from the commercial power source with the AC adaptor.

Supply voltage of AC adaptor: 100~240V AC 50/60Hz

2. Name of parts and functions

2.1 ●Front panel



① Measuring terminals
SENSE Hi : ＋side terminal of voltage input.
SENSE Lo : －side terminal of voltage input.
SOURCE Hi : ＋side terminal of current output.
SOURCE Lo : －side terminal of current output.

② [POWER] key
Key for power supply. The green lamp is lit up when the tester is turned ON.

③ [SHIFT] key (LOCK)
Pressed when the functions indicated in orange color in ( ) are used.
When the key is pressed again, the function is cancelled.
While functioning, SHIFT mark is indicated.
(Switch to prohibit switch operation on the front panel. When it is pressed continuously for 3 seconds or more, prohibition or release can be done.
During the prohibition, LOCK lamp is lit up.)

④ [RANGE] key (BUZZER)
Key to select range 300mΩ~30kΩ or AUTO range.
(Key to select buzzer operation and volume setting.)

⑤ [FUNC] key (SET)
Key to switch over to the resistance measurement / temperatur measurement / temperature compensation /temperature conversion / ratio display.
(In memory mode, it is used to set the memory.)

⑥ [RATE] key (MAN'L/MEM))
Key to select a sampling rate.
(Key to switch over manual-mode/memory-mode.)

⑦ [0 ADJ] key (ONLINE)
ON/OFF key for zero adjustment function.
(On-line key for RS-232C.)

⑧ [TE] key
Key to select the memory and finish of temperature conversion.

⑨ [SEL] key COMP SET
Used for various setting.
Key to use for the comparator setting.

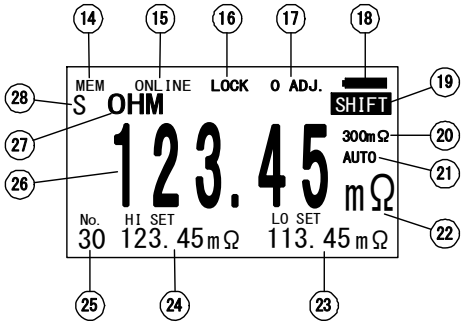
⑩ [▶] key
Used for various setting.

⑪ [▲] key
Used for various setting.

⑫ [LAMP] key
Key to turn ON/OFF the LCD back light.

⑬ HI Lamp
GO Lamp
LO Lamp
Red LED is lit up when the measured value is higher than high limit.
Green LED is lit up with good judgement.
Red LED is lit up when the measured value is lower than low limit.

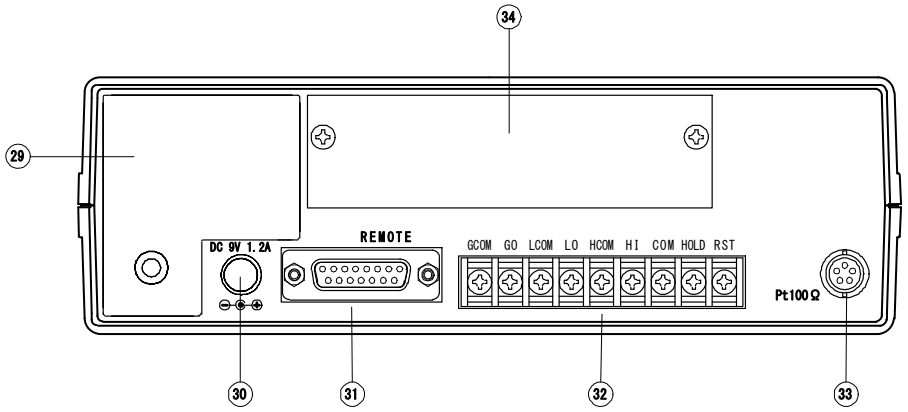
LCD WINDOW



⑭	MEM	It displays it in the memory mode.
	MAN'L	It displays it in the manual mode.
⑮	ONLINE	It displays it in the remote controlled.
⑯	LOCK	It displays it in the key lock.
⑰	0 ADJ	It displays it in zero adjustment operation.
⑱	＊＊＊	Battery Alarm.
⑲	SHIFT	Linked with SHIFT key.
⑳	Resistance range	Displays the range 300mΩ~30kΩ being measured.
㉑	AUTO	Displayed in AUTO range.
㉒	UNIT	Displays the unit being measured.
㉓	LO SET Display Window	Low limit of comparator is displayed.
	DEV SET	Deviation in ratio display is displayed.
㉔	HI SET Display Window	High limit of comparator is displayed.
	STD SET	Standard value in ratio display is displayed.
㉕	No. Display	Memory No. of memory mode is displayed.
		It is not displayed in the manual mode.
㉖	Display Window	Displays the measurement values and characters.
㉗	OHM	Resistance measurement.
	TEMP	Tmperature measurement.
	T.C	Tmperature compensation function.
	T.C RATIO	Ratio display of tmperature compensation function.
	OHM RATIO	Ratio is display of resistance measurement.
	TE T1	T1 action of the temperature conversion.
	TE T2	T2 action of the temperature conversion.
㉘	F	Lit up at sampling rate 20 times/sec.
	S	Lit up at sampling rate 4 times/sec.

＊ (Orange key) is enabled while the SHIFT key is displayed.

2.2 ●Rear panel



㉙ Battery Box

㉚ AC adaptor jack

㉛ REMOTE connector
Connector for remote control.

㉜ Input, output terminal blocks
Terminals for input of hold and input, and output of comparator.

㉝ Pt100Ω connector
Connector for connection of 3-wire system Pt100Ω resistance bulb.

㉞ Inlet for interface board
Section to fit an optional interface board.

3. Operation

3.1 ●Power supply

Turn ON the power switch on the front panel. A pilot lamp is lit up and the meter immediately enters the operable condition.
Although the meter will immediately be in operating status,
it is recommended to have a pre-heating time for 30 minutes or more.
The meter is provided with the function to retain the parameters, so it
memories the status of the followings even after the meter is switched OFF.

(1) Measuring function and range.
(2) Set values of comparator (30 program memories).
(3) Standard temperature and temperature coefficient of temperature compensation function.
(4) Standard resistance value of ratio display function.
(5) Status of key lock.
(6) Status of buzzer.
(7) Status of zero adjustment.

3.2 ●Connection of measuring terminals

Make a connection to the measuring terminals on the front panel (or rear panel) as ***Fig.3.2.1***shows.

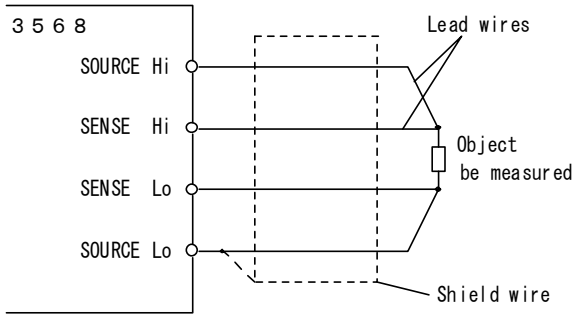


Fig.3.2.1

Note: Penetration of disturbing noise to the measuring terminals may cause instability or display or auto range operation. Prevent the noise by connecting with shield wire the shield side to SOURCE Lo.

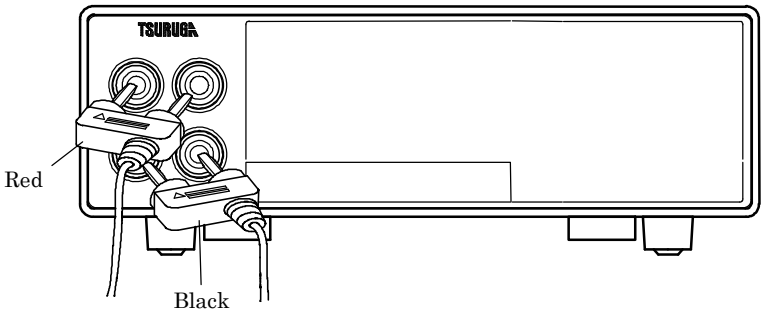
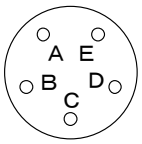
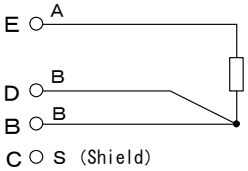


Fig.3.2.2 Connection of optional Kelvin clip (MODEL 5811-21).

3.3 ●Connection of temperature sensor

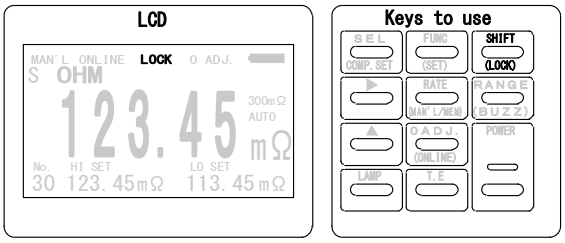
When the functions of temperature measurement, temperature compensation or temperature conversion is used, connect an optional Pt100Ω sensor (MODEL 5803-11) to the Pt100Ω connector on the rear panel.





3.4 ●Key lock

This is the switch to prohibit the key operation on the front panel so that the measuring condition can not be carelessly altered.
LOCK lamp is lit up during the key locking. When required to operate other switch, do it after releasing the key lock.



To make key lock

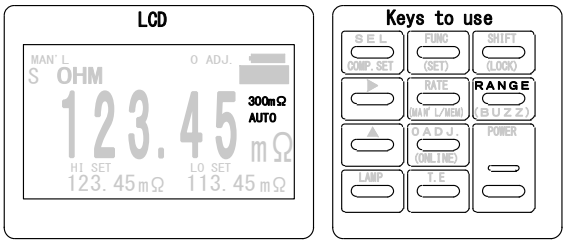
The key is locked when the SHIFT (LOCK) key is pressed for more than 3 seconds. While the key is locked, LOCK mark is displayed at the upper side of the LCD.

To release key lock

When the SHIFT (LOCK) key is pressed again for more than 3 seconds, the key lock is cancelled.

3.5 ●Change-over of measuring range

Select a measuring range (auto range or manual range) of resistance measurement.
This operation is disabled in memory mode and when the status is ONLINE or HOLD.



(1) Auto range

- The measuring range automatically steps up when the display value is 35000 or higher and steps down when the display value is less than 3000.
- AUTO mark and the resistance range automatically detected are displayed at the right of the LCD.

Selection of AUTO range

When the RANGE key is pressed at the 300kΩ range, AUTO lamp is lit up and the meter enters the auto ranging.

(2) Manual range

- The range is fixed at 300mΩ~300kΩ.
- The lamp of the selected range is lit up.

Change-over of range

Every time the RANGE key is pressed, the range mark (300mΩ~30kΩ) at the right of the LCD changes.Select the desired range.

3.6 ●Zero adjustment

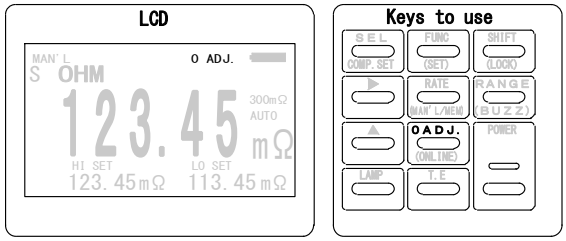
This is the function to suppress the resistance of tools and so on in resistance measurement.
The value currently measured is memorized as zero set value into the non-volatile memory and afterwards, the value from which the zero set value is suppressed is displayed.

Display value	=	Measured value	-	Zero set value

- This function is enabled in manual mode and memory mode of the resistance measurement, temperature compensation function, temperature conversion function and ratio display function.
- Zero set value is effective in all ranges.
- In case that the zero adjustment is made in the higher range, it may over-range in the lower range.
- Remote control is possible for this function.
- Remote control through the interface GP-IB, RS-232C or RS-485 is also possible.

Note: • This function can not be operated during the temperature measurement and the hold.
• Zero adjustment is not released even if the memory is changed in memory mode.

3.6.1 Key operation



A press of the 0 ADJ. key activates the operable condition of zero adjustment.
During the zero adjustment, 0 ADJ. mark is displayed at the upper side of the LCD.
Pressing again of the 0 ADJ. key cancels the zero adjustment.

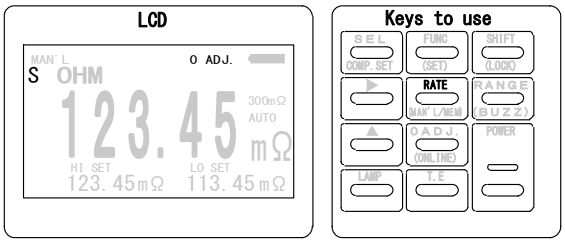
3.6.2 Remote operation

The zero adjustment is operable while the 0 ADJ pin on the rear panel REMOT connector is being ON.
When the pin is turned OFF, the function is released.
Note: Zero adjustment work set up with the key operation is released by making this pin OFF.

3.7 ●Selection of sampling rate

Make a choice of sampling rate with key operation on the front panel.

- Remote control through the interface GP-IB, RS-232C or RS-485 is possible.
- Selection is not possible during the hold function.



The sampling rate changes by pressing the RATE key

S→F→S	S lighting	:	4 times/sec.
	F lighting	:	20 times/sec.

3.8 ●Comparator operation

This is a digital comparator to make a comparison between displayed value and high or low limit value. 30 pairs of high and low limit value (No.1~No.30) can be memorized.

- Memory can be selected by REMOTE connector.
- Selection of memory can also be done through the interface RS-232C.

Note:
- During the setting of high or low limit and recalling of the memory, the sampling is stopped and the comparator output is held.
- Comparator does not operate at the temperature display.

3.8.1 Conditions for comparison

Display value ≧ High limit value (HI SET)	HI output
High limit (HI SET) ＞ Display value ＞ Low limit (LO SET)	GO output
Display value ≦ Low limit (LO SET)	LO output

Note: Comparator makes comparison with absolute value.
As an example, in case that the high limit is set to 100.00mΩ,
HI is output when 10.00Ω is displayed in the 300Ω range.

3.8.2 Comparator output

Open collector or relay contact output is output through the input/output terminals on the rear panel. (refer to the article 4.2)

Display : HI and LO : Red
GO : Green

3.8.3 Setting method

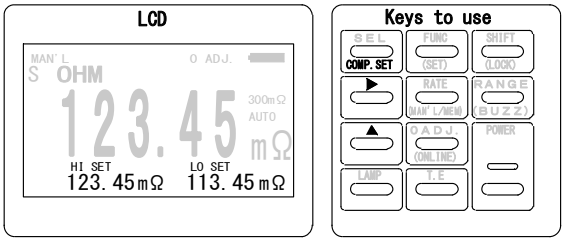
Comparator can not be set during the ONLINE, remote control through BCD data output interface and hold.

Adjustable range High limit : -19999~35000
Low limit : -19999~35000

Note: The unit and decimal point are set by [RANGE] key.

This article explains the method how to set the high and low limit values for the resistance value in manual mode.

- Refer to the article 5.5 for the setting of ratio display function.
- Refer to the article 3.11.2 for the setting in memory mode.
- When no key operation has been done for about 5 minutes during the setting, the meter returns to measurement mode.



Change over to manual mode

① (refer to the article 3.10)

Selection of function

② Change over to resistance measurement or temperature compensation function by [FUNC] key.

Setting of high limit

③ Press [COMP.SET] key.

A cursor moves to the highest digit of HI SET high limit value, at the lower side of the LCD.

Set a numeral with [►] and [▲] keys.

Move the cursor with [►] key, then the selected characters are reversely displayed.

Setting of low limit

④ Press [COMP.SET] key.

The highest digit of LO SET display blinks.

Set a numeral with [►] and [▲] keys.

Move the cursor with [►] key, then the selected characters are reversely displayed.

Setting of comparator range

⑤ Select the decimal point and unit with [RANGE] key.

Example shows that the HI SET is set to 123.45 mΩ, LO SET to 113.45m mΩ.

Finish of setting

⑥ Press [COMP.SET] key.

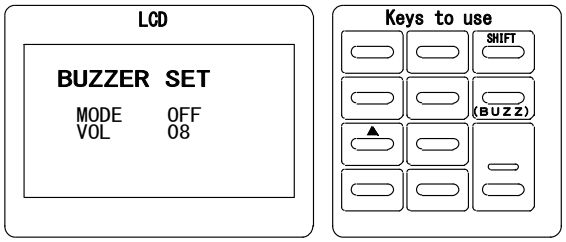
Note 1: When the high limit and low limit value is out of the range to set, ERROR mark is displayed at the item being out of the range, and the setting returns to ③ or ④.

3.9 ●Buzzer

Setting of buzzer is done with (BUZZ) key on the front panel.

- During the setting of buzzer, the sampling is stopped and the comparator output is held.
- Setting is disabled during ONLINE and hold.
- When no key operation has been done for about 5 minutes during the setting, the meter returns to measurement mode.

3.9.1 Setting method



Setting of buzzer

① Press [SHIFT] key.
SHIFT is displayed at the right of the LCD.

② Press (BUZZER) key.
The LCD changes to the screen for setting.

Selection of buzzer operation

③ Select with [▲] key.

Display	Operation
Good	Buzzer sounds at GO output.
HI nG	Buzzer sounds at HI output.
Lo nG	Buzzer sounds at LO output.
nG	Buzzer sounds at HI and LO output.
oFF	Buzzer is turned OFF.

Adjustment of sound volume

④ Press [SEL] key.
Buzzer sounds.
Adjust with [▲] key to a proper sound volume.
The volume is adjustable in 10 steps.

Example) Adjusted to buzzer OFF, sound volume 8.

Finish

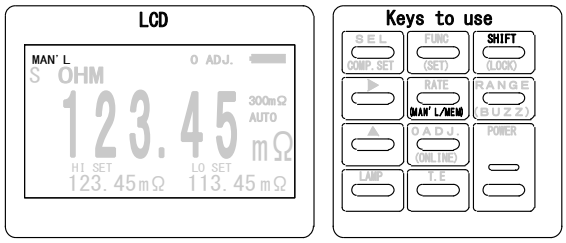
⑤ Press [SHIFT] key.
SHIFT is displayed at the right of the LCD.

⑥ Press (BUZZER) key.

3.10 ●Manual mode

In this mode, the temperature measurement, temperature conversion function etc. can be operated.

- It is not possible to change over to manual mode when the ONLINE is lit up by remote operation.



Operating procedures

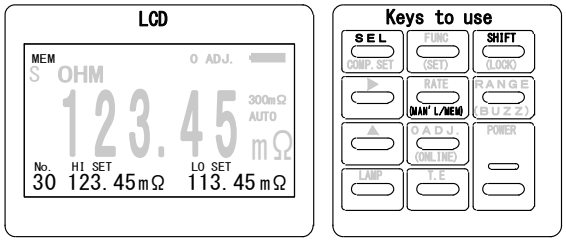
- Make a change of manual mode / memory mode with SHIFT key and (MAN'L/MEM) keys. In the manual mode, MAN'L mark is displayed at the upper side of the LCD, and the memory No. is not displayed.

3.11 ●Memory mode

In this mode, the measurement with either one of 30 stored memories is possible.
The sampling rate is common in this case.

3.11.1 Selection of memory

● By means of operation on the front panel



To enter memory mode

① Press SHIFT key.
SHIFT lamp is lit up.
② Press (MAN'L/MEM) key.
Memory No. is displayed.

To recall memory

③ Press SEL key.
Select a memory No. and call it.

To finish memory mode

④ Press SHIFT key.
SHIFT lamp is lit up.
⑤ Press (MAN'L/MEM) key.

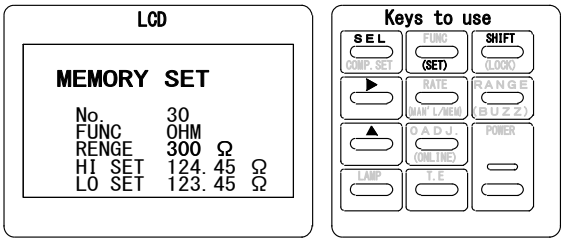
● By means of remote operation
Refer to Remote Connector (article 4.1).

3.11.2 Setting of memory

Set the meter to memory mode. When the memory mode is engaged by MEM signal through REMOTE connector, the setting of memory is not allowed.
The parameters which can be memorized into the memory are following three:

- Function (temperature measurement and temperature conversion function can not be set).
- Comparator setting
  (high limit and low limit value, standard value of ratio display function, deviation)
- Range of resistance measurement.

Note:
- Compensation temperature ℃ of temperature compensation function and temperature coefficient ppm of resistance can not be set. The values set in the manual mode remain as common value for the respective memory.
- Setting is not allowed in the ONLINE status.
- Setting is not allowed during the hold.
- During the setting, the sampling is stopped and the comparator output is held.
- When no key operation has been done for about 5 minutes during the setting, the meter returns to measurement mode.



Enter memory mode

① (Refer to article 3.11.1)

To set memory

② Press [SHIFT] key.
SHIFT is displayed at the right of the LCD.
Press (SET) key.
The LCD changes to the screen for setting.

Selection of memory No.

③ The cursor moves to No. mark, memory number.
Select a memory No. with [▲] key.

Example shows that the memory No.30 is selected.

Setting of function

④ Press [SEL] key.
The cursor moves to FUNC.
⑤ Select either one, OHM, T.C, T.C RATIO, OHM RATIO mark with [▲] key.

Example shows that the resistance measurement is selected.

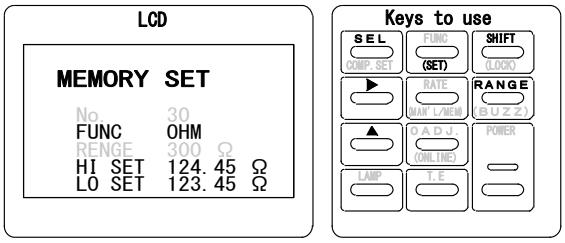
Setting of measuring range

⑥ Press [SEL] key.
The cursor moves to RANGE Resistance Range.
⑦ Select either one, 300mΩ~30kΩ or AUTO mark with [▲] key.

Example shows that the 300Ω range is selected.

Setting of comparator

＊④When the OHM, T.C is selected in the setting of functions.＊



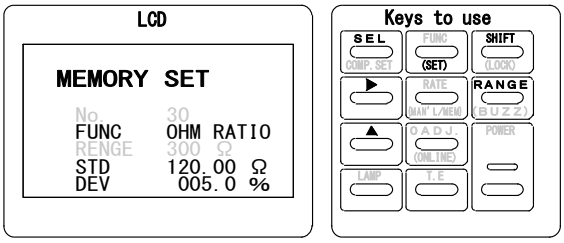
⑥ Press [SEL] key.
The cursor moves to the highest digit of HI SET high limit value.
Set a numeral with [▶] and [▲] keys.
Move the cursor with [▶] key, then the selected characters are reversely displayed.

⑦ Press [SEL] key.
The cursor moves to the highest digit of LOW SET high limit value.
Set a numeral with [▶] and [▲] keys.
Move the cursor with [▶] key, then the selected characters are reversely displayed.

⑧ Select the decimal point and unit with [RANGE] key.
Example shows that the high limit value is set to 124.45 mΩ,
low limit value to 123.45m mΩ, and the 300 Ω range is selected.

Setting of ratio display

＊④When the RATIO is selected in the setting of functions.＊



⑥ Press [SEL] key.
The cursor moves to the highest digit of STD Reference value.
Move the cursor with [▶] key, then the selected characters are reversely displayed.
Set a numeral with [▶] and [▲] keys.

⑦ Select the decimal point and unit with [RANGE] key.

⑧ Press [SEL] key.
The cursor moves to the highest digit of DEV deviation.
Set a numeral with [▶] and [▲] keys.
Move the cursor with [▶] key, then the selected characters are reversely displayed.

Example shows that the setting is made to 120.00Ω, deviation 5.0%.

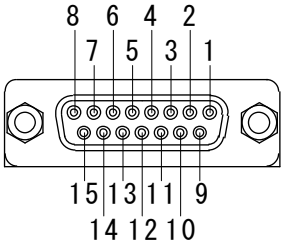
Finish

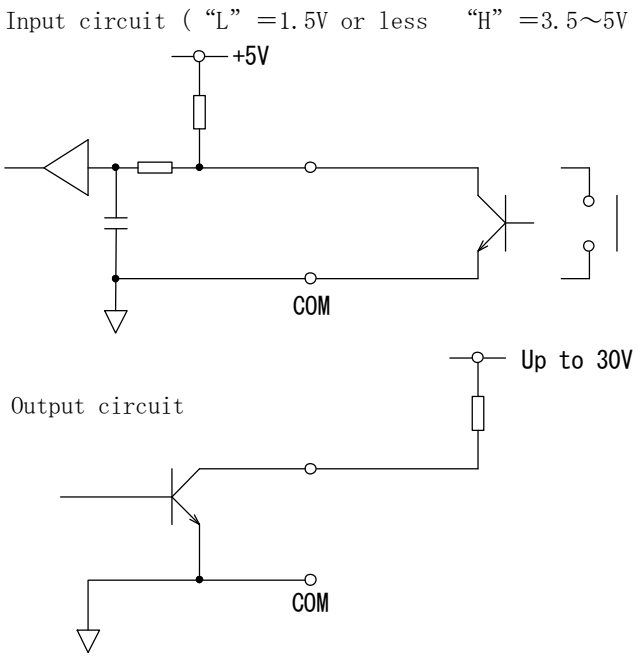
⑨ Press [SHIFT] key.
SHIFT is displayed at the right of the LCD.
Press (SET) key.

4. Remote control

4.1 ●Remote connector

4.1.1 Pin operation





(Dsub15pin)

Pin No.	Signal	Function
1	0 ADJ input	Zero adjustment is done by making this signal ON. (Refer to the article 3.6)
2	NC	Vacant pin.
3	MEM input	Memory mode is selected by turning this signal ON.
4	TRIG input	One shot sampling is done and the judgement result is output by making this signal ON during the hold, Min. ON time: 5 ms
5	SW input	Broken line detection & self-check is started by making this signal ON.
6	E0C output	Transistor output is turned ON when finished AD conversion.
7	CC ERR output	Transistor output is made ON when the current does not flow due to open circuit of SOURCE terminal, the error is detected in broken line detection & self-check and so on.
9 10 11 12 13	M-SEL0 M-SEL1 M-SEL2 M-SEL3 M-SEL4	Input a memory No. and recall memory in memory mode.
14	HOLD input	Same action as HOLD on input/output terminals is made. They are internally connected as common.
8, 15	COM	Common for input and output.

4.1.2 Remote operation of memory mode

① As long as MEM signal is kept ON, the mode is memory mode.
- When moved to the memory mode, ONLINE lamp is lit up.
- Memory No. being selected is displayed.

Note: In case that the code other than specified is selected, it is not allowed to enter the memory mode. Make an input of the code 1~30.

② Make an input of code of the memory No. and recall the memory.

Memory code table

Signal	Weight	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
M-SEL0	1		○		○		○		○		○		○		○		○
M-SEL1	2			○	○			○	○			○	○			○	○
M-SEL2	4					○	○	○	○					○	○	○	○
M-SEL3	8									○	○	○	○	○	○	○	○
M-SEL4	16																

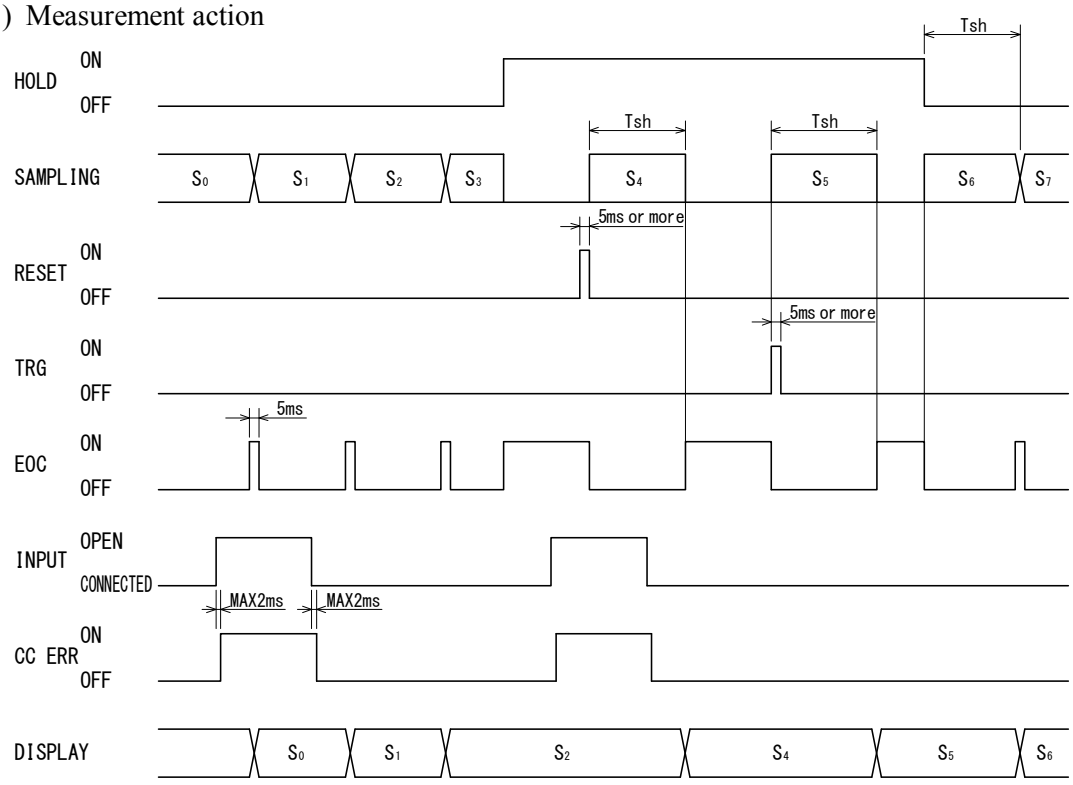
Signal	Weight	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
M-SEL0	1		○		○		○		○		○		○		○		○
M-SEL1	2			○	○			○	○			○	○			○	○
M-SEL2	4					○	○	○	○					○	○	○	○
M-SEL3	8									○	○	○	○	○	○	○	○
M-SEL4	16	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

○ : Makes ON
Blank : Turns OFF
0, 31 : No change

③ Turn OFF MEM signal.
- Moving to the manual mode, ONLINE lamp is turned OFF.
- Finishes the memory mode.

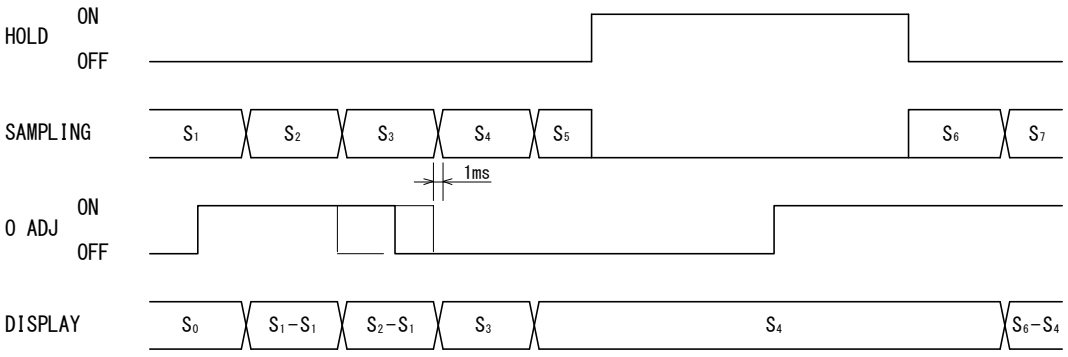
4.1.3 Timing chart of remote control

(1) Measurement action

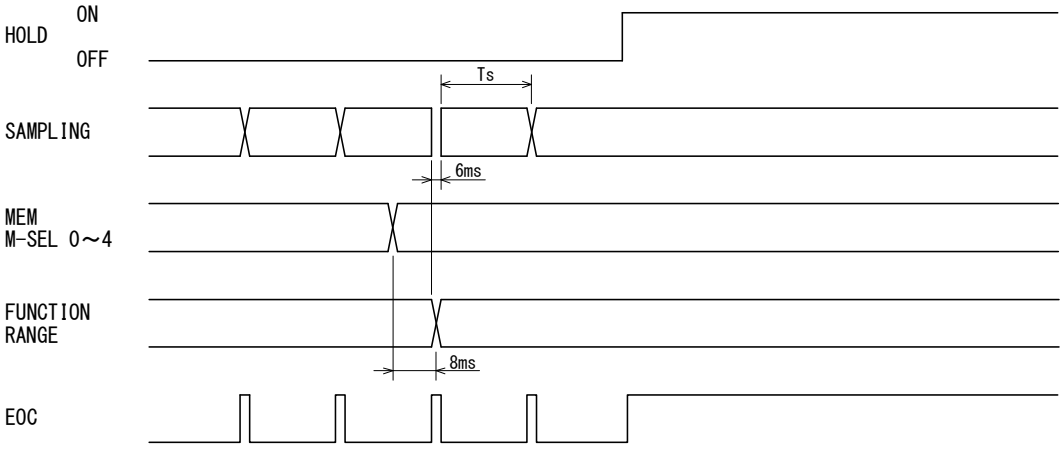


Tsh = Sampling rate + 3ms
Sampling rate: F = 50ms S = 250ms

(2) Zero adjustment



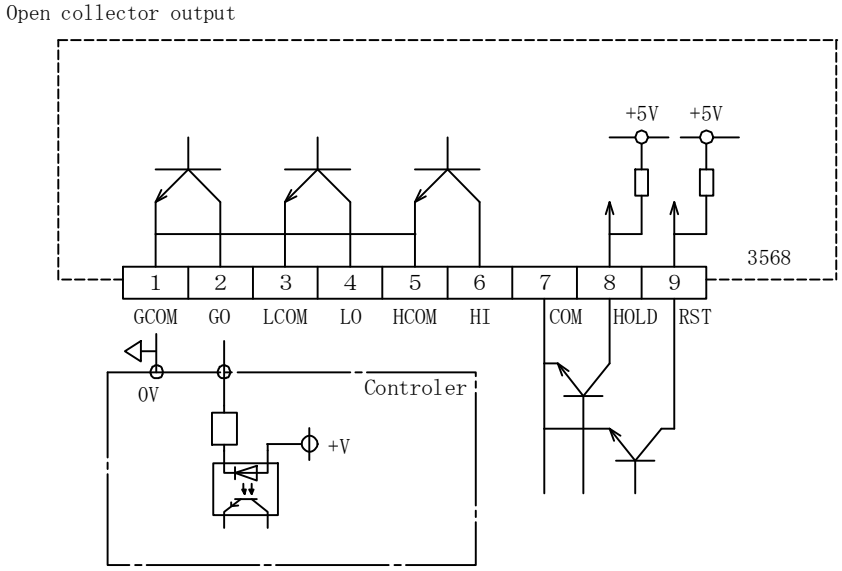
(3) Change-over of memory (change-over of memory/manual is the same)



Ts = Sampling rate

4.2 ●Remote control (input & output terminal block)

Terminal arrangement



(1) HOLD terminal (hold)
By short-circuiting the HOLD terminal on the rear panel to COM terminal, the display value, comparator output and BCD data output are held. During the hold operation, operation of all the switches is disabled.

(2) RST terminal (reset)
By short-circuiting the RST terminal on the rear panel to COM terminal, the comparator output is reset and the comparator display is turned OFF.

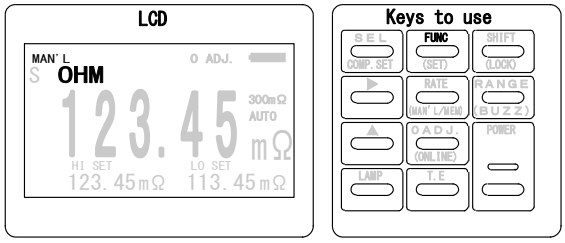
○ One shot sampling hold action
With the condition that HOLD is short-circuited, one shot sampling hold can be done by switching ON/OFF the RST. Do one shot sampling hold with the manual range.
In case of auto range, it may cause an error.

(3) Comparator output
Open collector output : HI, GO, LO, one for each, sink type
30V 30mA Max.

5. Setting Method

5.1 ●Resistance measurement

Operating procedures

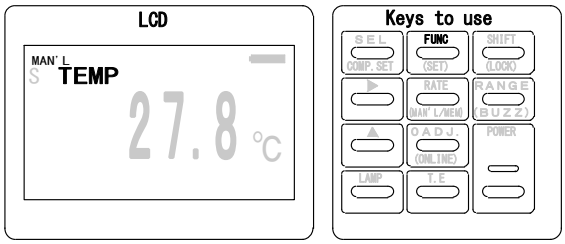


① Set to manual mode (Refer to the article 3.10).
② Select the resistance measurement with FUNC key.
OHM mark is displayed at the upper side of the LCD.
③ Make various setting depending upon requirement.
Measuring range (Refer to the article 3.5)
Zero adjustment (Refer to the article 3.6)
Sampling rate (Refer to the article 3.7)
Comparator (Refer to the article 3.8.3)
④ Start measurement.

- Remote control by means of GP-IB, BCD data output, RS-232C or RS-485 interface is possible.
- Operation is disabled during the memory mode, on-line and holding

5.2 ●Temperature measurement

Operating procedures



① Connect a temperature sensor (Pt100Ω) to the rear panel connector.
② Set to manual mode (Refer to the article 3.10).
③ Press FUNC key.
TEMP lamp is lit up.
④ Starts measurement.

- Remote control by means of BCD data output, RS-232C interface is possible.
- Operation is disabled during the memory mode, on-line and holding.
- Comparator does not operate.
- Setting of sampling rate is not possible.

5.3 ●Temperature compensation function

This function allows to convert the resistance of conductor, which is measured together with the ambient temperature, to the resistance value referred to the standard temperature and to display it. Standard temperature is adjustable in the range 0~149.9℃, and the temperature coefficient in the range 1000~4999ppm. In case of copper wire, for example, the standard temperature is set to 20℃ and the temperature coefficient at 3930ppm.
The ambient temperature is measured by connecting a Pt100Ω sensor.

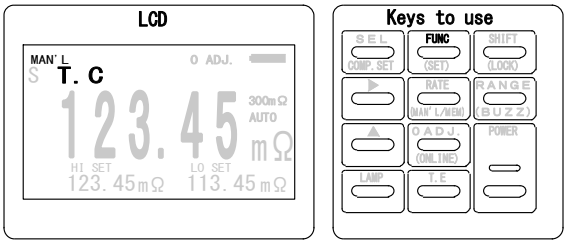
Calculation formula

$$R_T = \frac{Rt}{1 + \alpha_T \times 10^{-6} (t - T)} \ (\Omega)$$

t : Ambient temperature (range 0~40 ℃).
R_T : Compensation resistance (Ω).
Rt : Resistance value (Ω) at ambient temperature t ℃.
α_T : Temperature coefficient (adjustable range 1000~4999ppm).
T : Standard temperature (adjustable range 0.0~149.9℃).

Accuracy : Add ±0.3% of rdg. to the accuracy of resistance measurement.

Operating procedures



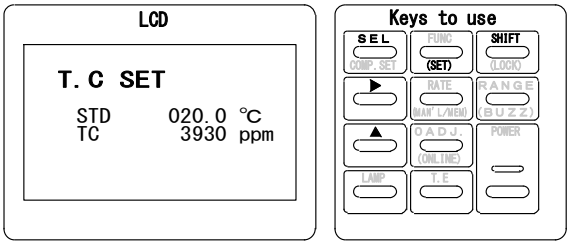
① Connect a temperature sensor (Pt100Ω) to the rear panel connector.
② Set to manual mode (Refer to the article 3.10).
③ Press [FUNC] key.
T.C lamp is lit up.

Note: When the temperature sensor is not connected or is over range due to broken line etc., Err-1 is displayed on the display and the comparator output HI or LO is simultaneously output.

④ Make various setting depending upon requirement.
Measuring range (Refer to the article 3.5)
Zero adjustment (Refer to the article 3.6)
Sampling rate (Refer to the article 3.7)
Comparator (Refer to the article 3.8.3)
⑤ Start measurement.
⑥ To cancel the temperature compensation function, select one of other functions with [FUNC] key.

5.3.1 Setting of standard temperature and temperature coefficient

- During the setting, the sampling is stopped and the comparator output is held.



Move to temperature compensation function

① Refer to the operating procedures.

Setting of standard temperature

② Press [SHIFT] key.
SHIFT is displayed at the right of the LCD.
Press (SET) key.
The LCD changes to the screen for setting.
The cursor moves to STD standard temperature.
Set standard value with [►] and [▲] keys.
The digit selected with [►] key blinks.

Adjustable range: 0.0~149.9℃

Setting of temperature coefficient

③ Press [SEL] key.
The highest digit of TC temperature coefficient display window blinks.
Set a numeral with [►] and [▲] keys.
The digit selected with [►] key blinks.

Example the standard temperature is set to 20℃ and the temperature coefficient at 3930ppm.

Adjustable range: 1000~4999ppm

Finish

④ Press [SHIFT] key.
SHIFT is displayed at the right of the LCD.
Press (SET) key.

Note: When the setting is out of adjustable range, blinking ERROR is displayed for the setting parameter in question for a while and returns to the setting ② or ③.

5.4 ●Temperature conversion function (Measurement of risen temperature of copper coil)

By measuring the resistance value of conductor coil at its initial condition and after its conductance test, the temperature of the conductor coil risen due to conductance is measured.

- Comparator can not be set.

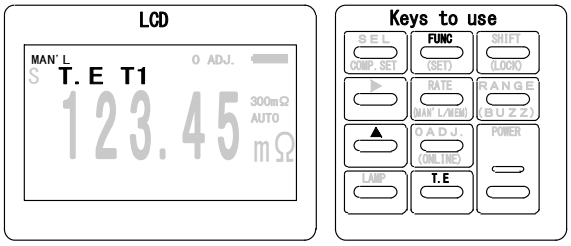
Display range of risen temperature: 0~±199.9℃

Calculation formula

$$T.E = \frac{R_2}{R_1}(235+T_1) - 235 - T_2 \quad (℃)$$

T.E : Risen temperature value (℃).
T_1 : Ambient temperature at the start of temperature test (range 0~40 ℃).
T_2 : Ambient temperature at the end of test (range 0~40 ℃).
R_1 : Resistance value (Ω) of coil at temperature T_1.
R_2 : Resistance value (Ω) of coil at temperature T_2.

Operating procedures



Measuring mode of T_1, R_1

① Set to manual mode (Refer to the article 3.10).
② Select the Temperature conversion function with [FUNC] key.
③ TE T1 mark is displayed at the upper side of the LCD.

Note: When the temperature sensor is not connected or is over range due to broken line etc., Err-1 is displayed on the display and the comparator output HI or LO is simultaneously output.

④ Make various setting depending upon requirement.
Measuring range (Refer to the article 3.5)
Zero adjustment (Refer to the article 3.6)
Sampling rate (Refer to the article 3.7)
⑤ Connect a test sample with Kelvin clip.

Memory of T_1, R_1

⑥ Press [T.E] key.
⑦ TE T2 mark is displayed at the upper side of the LCD.
Memorizes T_1, R_1 and moves to measurement of T_2, R_2.
Display window shows the risen temperature.

Conductance test of test sample

⑧ Remove the Kelvin clip from the test sample.
Perform the conductance test etc. of the test sample.

- When the power of the meter is turned off, it starts from ⑦.

Measurement of risen temperature

⑨ After completing the conductance test, connect the test sample with Kelvin clip and measure T_2, R_2.
Temperature risen due to the test is displayed.

Note: When the R1 is 0Ω (when making 0 with zero adjustment), ERR-2 is displayed on the display, and at the same time, the comparator output of HI and LO is output.

Hold of risen temperature

⑩ Press [TE] key.
The T.E END mark is displayed at the upper side of the LCD, and the display section.

- is held. By pressing the [TE] key again, it returns to ⑧.

⑪ With the [▲] key, it returns from T.E END to ③R1, R1 measurement.

Finish

- Select other function.
- [TE] key is pressed again, it returns to ⑧.

5.5 ●Ratio display function

The measured resistance R_X is compared to the standard resistance value R_S and its ratio is displayed in percentage.
Also, a comparative judgement is possible with deviation (±△%)

Display range : 0.0~199.9%
Adjustable range of deviation value (±△%) : 0.0~±100.0%

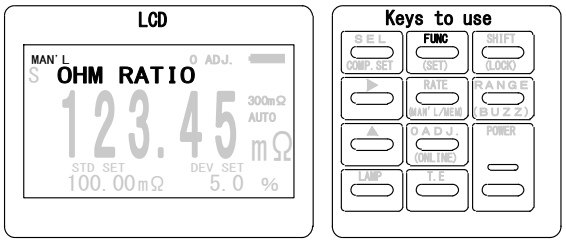
Calculation formula:

$$X = \frac{R_X}{R_S} \times 100\%$$

$$\triangle = \left(\frac{R_X}{R_S} - 1 \right) \times 100\%$$

X : Ratio (%)
R_S : Standard resistance (Ω)
R_X : Measured resistance (Ω)
△ : Deviation (%)

Operating procedures



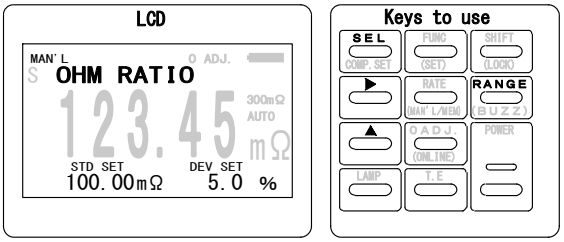
① Set to manual mode.
(Refer to the article 3.10)
② Select an action with FUNC key.
T.C RATIO mark : Display of ratio for the temperature compensation.
OHM RATIO mark : Display of ratio for the resistance measurement.
③ Make various setting depending upon necessity.
Measuring range (Refer to the article 3.5)
Zero adjustment (Refer to the article 3.6)
Sampling rate (Refer to the article 3.7)
④ Start measurement.

Finish

⑤ Select other function.

- Remote control by BCD data output interface is possible.

5.5.1 Setting of standard value and deviation



Move to ratio display function

① Refer to the operating procedures.

Setting of standard temperature

② Press [SEL] key.
The cursor moves to the highest digit of STD SET standard resistance (RS).
Set a numeral with [►] and [▲] keys.
Move the cursor with [►] key, then the selected characters are reversely displayed.

③ Select the decimal point and unit with [RANGE] key.

Adjustable range: -19999~35000

Setting of deviation

④ Press [SEL] key.
The cursor moves to the highest digit of DEV SET Deflection (△).
Set a numeral with [►] and [▲] keys.
Move the cursor with [►] key, then the selected characters are reversely displayed.

Adjustable range: 0.0~100.0%

Finish

⑤ Press [SEL] key.

Note: When the setting is out of adjustable range, blinking ERROR is displayed for the setting parameter in question for a while and returns to the setting ② or ④.

5.6 ●Character display

Display	Name	Explanation
OVER	Error 0	Over range measurement.
ERR-1	Error 1	Over ranged temperature measurement in temperature compensation and temperature conversion function.
ERR-2	Error 2	When Operation error
ERROR	Setting error	When setting parameter is out of range. Blinks for about 1 second.

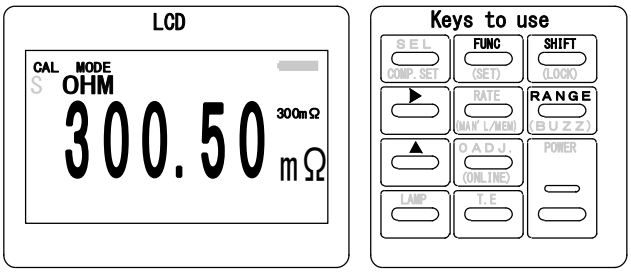
6. Calibration

6.1 ●Materials to prepare

To calibrate the 3568, prepare the following standard resistors for calibration.
For resistance measurement ranges: 300mΩ, 3Ω, 30Ω, 300Ω, 3kΩ, 30kΩ
For temperature measurement ranges: 100Ω (0℃), 172.17Ω (190℃)
Note: Select the calibration resistors whose accuracy secures the same of 3568.

6.2 ●Calibration method

6.2.1 Calibration of resistance measuring range

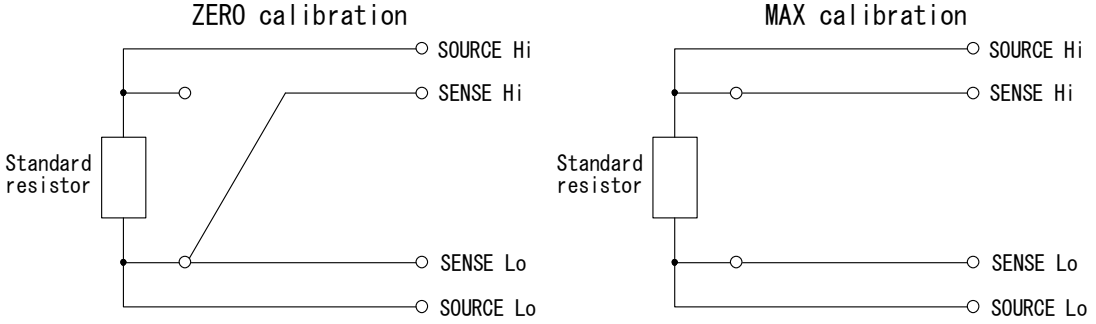


① Turn off the power supply switch, then pressing [SHIFT] and [FUNC] keys simultaneously, switch ON the power supply.
CAL MODE mark is displayed on the upper side of the LCD and enters into the calibration mode.
② OHM mark is displayed at the upper side of the LCD.
③ Connect the standard resistor with lead wires as the figure below shows.
Select the standard resistor to suit each measuring range.
④ ZERO is calibrated by pressing [▶] key, and MAX by [▲] key.
Make correct calibration for each range, Selecting it with [RANGE] key.
When the calibration is correctly done, Displayed under LCD for a while as CAL SUCCESS.
In case that CAL ERROR is displayed, it is out of the range to calibrate. Replace the resistor with that of correct value.

⑤ Standard resistance values for each range and display values are as follows.

Range	Standard resistance value	ZERO display value	MAX display value
300mΩ	300mΩ	0.00mΩ	300.00mΩ
3Ω	3Ω	0.0000Ω	3.0000Ω
30Ω	30Ω	0.000Ω	30.000Ω
300Ω	300Ω	0.00Ω	300.00Ω
3kΩ	3kΩ	0.0000kΩ	3.0000kΩ
30kΩ	30kΩ	0.000kΩ	30.000kΩ

⑥ When completed the calibration, turn OFF the power supply of the meter to release it from calibration mode. When the meter is powered ON again, it returns to measuring mode.



6.2.2 Calibration of temperature measuring range

① Entering the calibration mode, according to the calibration procedure ① for the resistance measurement range, press [FUNC] key, then the meter changes to the calibration mode of temperature measurement, displaying the TEMP mark on the upper side of the LCD.

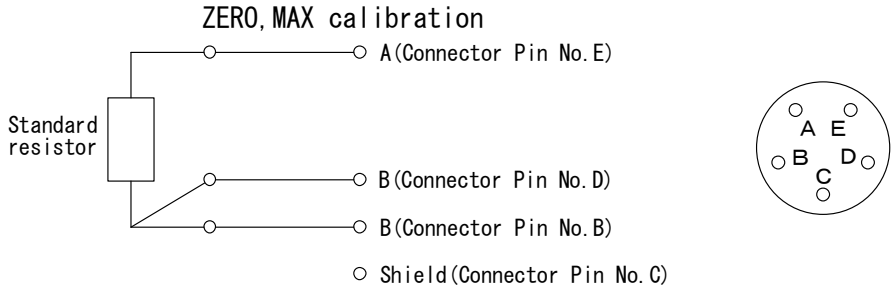
② Connect the standard resistor 100Ω as the figure below shows and press [►] key, then ZERO is calibrated.

③ In the same way, connect the resistor 172.17Ω and press [▲] key to calibrate MAX.

④ Display values at calibration is as follows.

ZERO **display value**	MAX **display value**
0.0℃	190.0℃

⑤ When completed the calibration, turn OFF the power supply of the meter to release it from calibration mode. When the meter is powered ON again, it returns to measuring mode.



7. Specifications

7.1 ●Model name

Model name	Description
3568	No data output
3568-03	With BCD data output (TTL level)
3568-04	With BCD data output (open collector)
3568-05	With RS-232C

7.2 ●Measuring range & accuracy

■ Resistance measurement (at SLOW sampling)

Measuring range	300mΩ	3Ω	30Ω	300Ω	3kΩ	30kΩ
Resolution	10μΩ	100μΩ	1mΩ	10mΩ	100mΩ	1Ω
Measuring current	100mADC		10mADC	1mADC	10μADC	
Max. measurement voltage applied	30mV	300mV			30mV	300mV
Accuracy ※	Note 1	±(0.08% of rdg.＋3 digits)				
Temperature coefficient	±(0.01% of rdg.＋0.5 digits) / ℃					
Open terminal voltage	4VDC Max.					

Note 1: ±(0.1% of rdg.＋8 digits)

※Accuracy:Defined at 23℃±5℃, 45~75%RH.

When the sampling rate is FAST, 3 digits are added to the accuracy at SLOW.

■ Temperature measurement

Measuring range	-19.9~199.9℃
Resolution	0.1℃
Accuracy ※	±(0.2% of rdg.＋0.2℃)
Temperature coefficient	±(0.02% of rdg.＋0.02℃) / ℃
Sensor	Pt100Ω 3-wire system (lead wire resistance 5Ω or less)
Measuring current	Approx. 1mA

※Accuracy: Defined at 23℃±5℃, 45~75%RH.

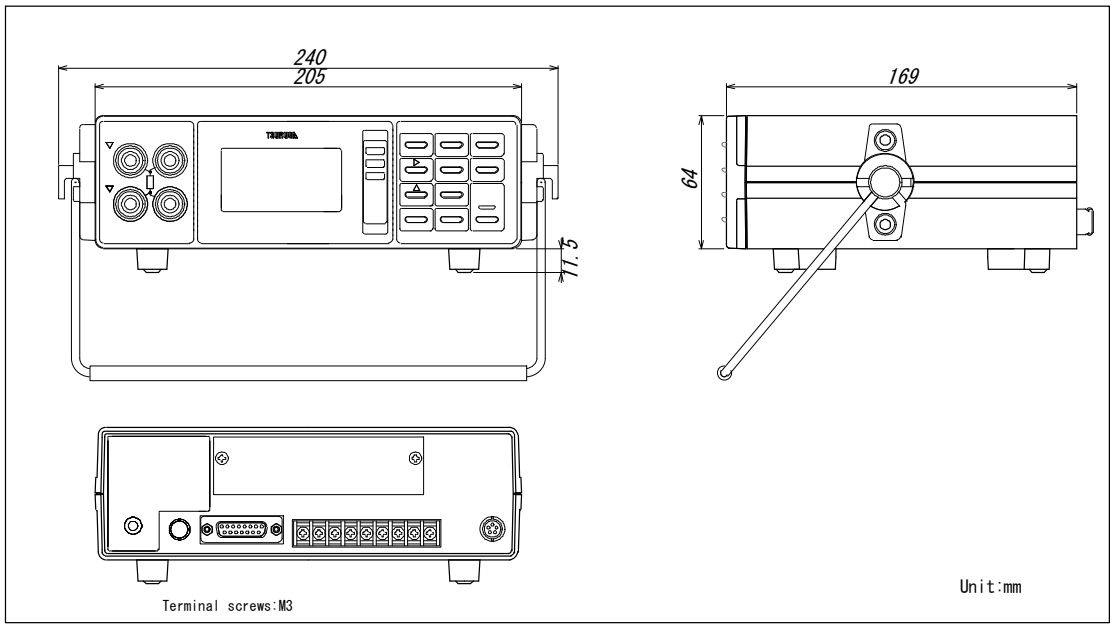
7.3 ●General specifications

Measuring system	:	4 terminals system (resistance measurement).
Tolerable max. apply voltage	:	100V, AC, DC for all ranges. (10VDC at temperature measuring rang)
Measuring cable resistance	:	3Ω or less.
Display	:	LCD. Resistance measurement : 35000 Temperature measurement : 199.9 Provided with zero suppress function.
Over-range display	:	OVER
Unit display	:	mΩ, Ω, kΩ, %, ℃
Sampling rate	:	SLOW : (4 times/sec.) FAST : (20 times/sec.)
Response speed	:	SLOW : approx. 500ms FAST : approx. 100ms
Parameter retention	:	Function, ranges, values etc. are memorized in EEPROM. Re-writable times 100,000 times Retention period 10 years
Insulation resistance	:	Whole terminals – Enclosure 500VDC 100MΩ or more
Withstanding voltage	:	Whole terminals – Enclosure 1500V AC for 1 minute Measuring terminals – Output terminals 500V AC for 1 minute
Power supply voltage	:	U3 alkaline dry batteries LR6 6 pc. U3 manganese dry batteries R6P 6 pc. Or Special AC adapter
Continuous	:	Alkaline dry batteries LR6 Approx. 7 hours(Renge of 300mΩ,3Ω) Approx.12 hours(Renge of other) Manganese dry batteries R6P Approx.1.5 hours(Renge of 300mΩ,3Ω) Approx. 3 hours(Renge of other)
Operating ambient temperature:		0~50 ℃
Storage temperature	:	-20~70 ℃
Weight	:	Approx. 1kg.
Accessories	:	Kelvin clip (5811-21) ……... 1pc. Control input connector …… 1pc. Instruction manual …… 1pc. Special AC adapter …… 1pc. LR6 alkaline batteries …… 6pc.

7.4 ●Table of initial set values (at delivery from factory)

Measuring range	300Ω
Memory 1~30	Resistance measurement, 300Ω range
Comparator	HI SET: 300.00Ω, LO SET: 000.00Ω
Ratio display function	STD SET: 300.00Ω DEV SET :10.0%
Temperature compensation function	Standard temperature: 020.0℃ Temperature coefficient: 3930ppm
Key lock	OFF
Buzzer	OFF setting, sound volume 5
Zero adjustment	OFF

7.5 ●External dimensions



7.6 ●Interface (option)

○Following optional interfaces are prepared for use with Model 3568.
For handling of each interface, please refer to respective instruction manual of these interface.

BCD data output board (TTL) : 5811-03D
BCD data output board (open collector) : 5811-04D
RS-232C interface board : 5811-05D

○Others

Lead for calibration of resistance : 5811-51
Lead for calibration of temperature : 5811-52
Temperature sensor : 5803-11

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