

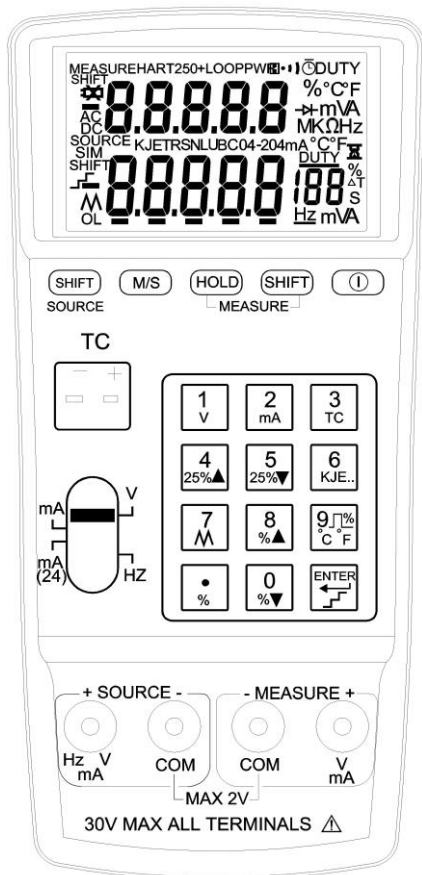


Instruction Manual

RS-135

4-20mA Loop Calibrator & Thermometer

EN



This unit passes the following tests:



EN 61326-1 : 2013

Safety Symbols



Please read the statement thoroughly to prevent injury or loss of life, and prevent damage to this product.



Earth (ground)



DC (Direct Current)



Conforms to relevant European Union directives.



Do not dispose of this instrument as unsorted municipal waste. Contact a qualified recycler for disposal.



Please remove all the test leads before performing maintenance, cleaning and battery replacement, etc.





Table of Contents

FEATURES:	1
APPLICATIONS:	1
I. PANEL DESCRIPTION	2
II. OPERATION	7
1. VOLTAGE SOURCE	7
1a. 0~24V	7
2. CURRENT SOURCE	9
2a. SOURCE (4~20mA, 0~24mA)	9
2b. LED Brightness Testing (0~24mA)	10
3. FREQUENCY SOURCE (Hz)	12
3a. 3Vpp, 1~20KHz, Square Wave	12
3b. DUTY	13
4. VOLTAGE MEASURE	14
4a. DC 0~24V	14
5. CURRENT MEASURE	16
5a. DC 0.005~24mA	16
5b. LOOP+ MEASURE and Supply 24V Loop	18
6. TEMPERATURE MEASURE	19
6a. Measure TC Thermocouple Signals	19
6b. Select TYPE and Temperature units	20
III. SCANNING FOR SOURCE	21
1. VOLTAGE SCANNING FOR SOURCE	21
1a. Functions of Voltage Scanning for SOURCE	21
1b. Connections and LCD displays for Auto-Ramp and Auto-Step	22



2. CURRENT SCANNING FOR SOURCE	24
<i>2a. Functions of Current Scanning for SOURCE.....</i>	24
<i>2b. Connections and LCD displays for Auto-Ramp and Auto-Step</i>	25
IV. ELECTRICAL SPECIFICATIONS	27
V. GENERAL SPECIFICATIONS	30
VI. MAINTENANCE & CLEANING.....	31
LIMITED WARRANTY	32



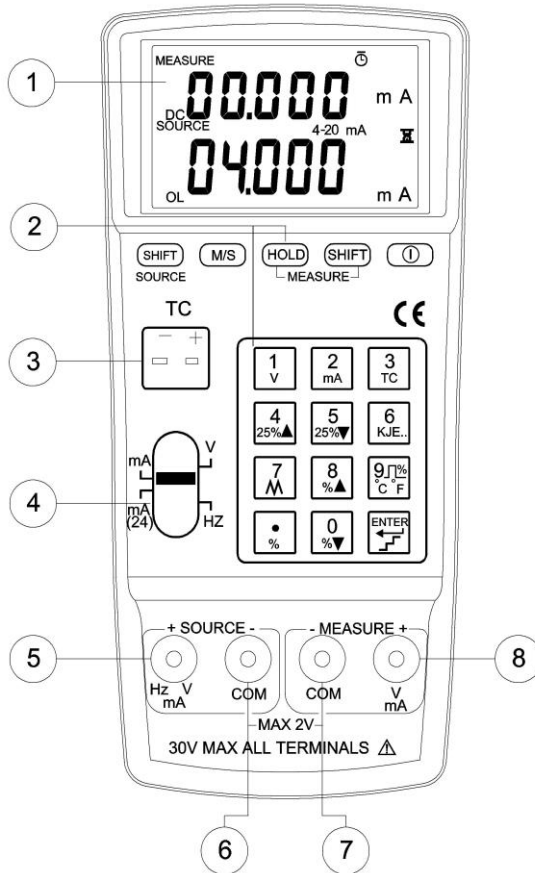
FEATURES:

1. **Source 4~20mA, 0~24mA** with 1 μ A resolution (1K Ω load, 24V loop supply), basic accuracy 0.025%.
2. **Source 0~24.000V** with 1mV resolution.
3. **Source frequency 1~20000Hz** square wave with programmable duty cycle (1~99%).
4. **Auto step** and **auto ramp** for sourcing mA, V.
5. Easy fixed 25% up and down, or programmable percentage (1~99%) increase and decrease (mA, V).
6. **Measure DC mA** with loop power (24V output).
7. **Measure DC V**.
8. **Measure Temperature** ($^{\circ}$ C, $^{\circ}$ F) of 11 types of thermocouples (K, J, E, T, R, S, N, L, U, B and C).
9. Calibrator grade precision temperature measurement with 0.1 $^{\circ}$ C & 0.1 $^{\circ}$ F resolution.
10. Detection of thermocouples disconnection.
11. Source and Measure at the same time.
12. Warning for overload, output open (mA) or short (V).
13. Short circuit protection for output.
14. Battery power indication (%) when turn on the calibrator.

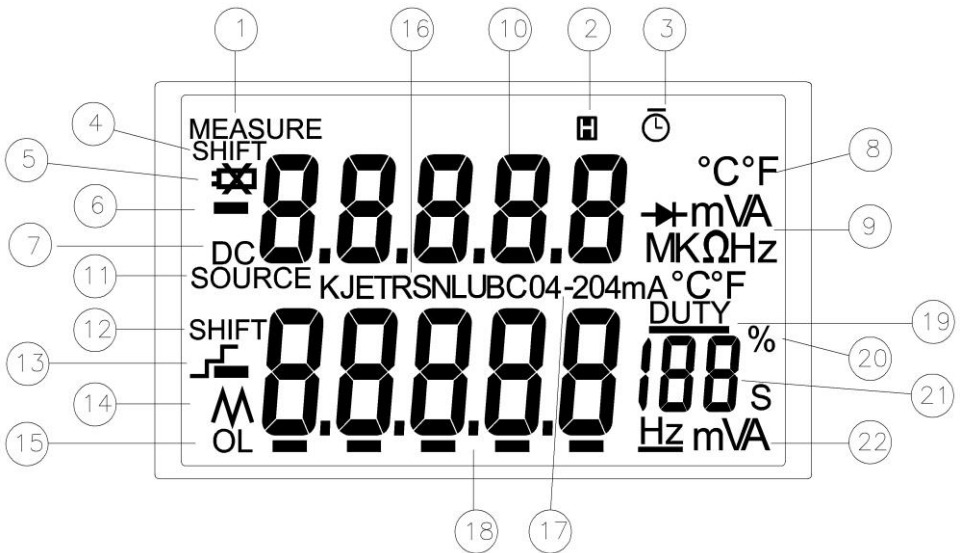
APPLICATIONS:

1. **Calibration of 4~20mA** panel meters.
2. **LED brightness testing (0~24mA)**.
3. **Temperature calibration** of panel meters or instruments for 11 types of thermocouples.

I. PANEL DESCRIPTION













- | | |
|-----------------------------------|-----------------------------|
| 1. LCD display | 5. Output terminal (+) |
| 2. Function buttons | 6. Output terminal (-) |
| 3. Temperature input socket | 7. V, mA input terminal (+) |
| 4. Output function sliding switch | 8. Input terminal (-) |










1. "MEASURE" symbol appears when under MEASURE mode.
2. HOLD symbol appears when MEASURE data is held.
3. Symbol indicates Auto-power-off.
4. This symbol appears when sub-functions of MEASURE are being used.
5. Low battery symbol.
6. Negative symbol for MEASURE value.
7. Symbol indicates the MEASURE is for DC.
8. Temperature units for MEASURE.
9. Status of MEASURE function.
10. MEASURE value display.



-
11. "SOURCE" symbol appears when under SOURCE mode.
 12. This symbol appears when sub-functions of SOURCE are being used.
 13. Symbol indicates % step function output.
 14. Symbol indicates 0~100% ramp scanning of output.
 15. Warning symbol for Output overload (or there is no connection on SOURCE terminals).
 16. Symbol indicates the type of thermocouples.
 17. mA Current output range.
 18. SOURCE value display.
 19. Symbol indicates "duty cycle" of frequency output.
 20. % for step output or duty cycle % of frequency output (SOURCE).
 21. Value display for %, or Battery power indication, or Sourcing percentage.
 22. Status of SOURCE function.

Buttons	Functions
	Power on/off
	SHIFT (black): Select a range/function under MEASURE mode.
	Hold the present value under MEASURE mode. Keep pressing it and turn on the power at the same time to disable Auto-power-off.
	Switch button for selecting MEASURE or SOURCE or MEASURE+SOURCE.
	SHIFT (blue): Select a function under SOURCE mode.
	<ol style="list-style-type: none"> MEASURE mode: press SHIFT (black) and then this button to enter DCV measure. SOURCE mode: press it to enter number 1.
	<ol style="list-style-type: none"> MEASURE mode: press SHIFT (black) and then this button to enter DC mA measure. SOURCE mode: press it to enter number 2.
	<ol style="list-style-type: none"> MEASURE mode: press SHIFT (black) and then this button to enter Temperature measure. SOURCE mode: press it to enter number 3.
	<ol style="list-style-type: none"> SOURCE mode (V, mA) : press SHIFT (blue) and then this button to increase 25% (0% → 25% → 50% → 75% → 100%). SOURCE mode: press it to enter number 4.
	<ol style="list-style-type: none"> SOURCE mode (V, mA) : press SHIFT (blue) and then this button to decrease 25% (100% → 75% → 50% → 25% → 0%). SOURCE mode: press it to enter number 5.

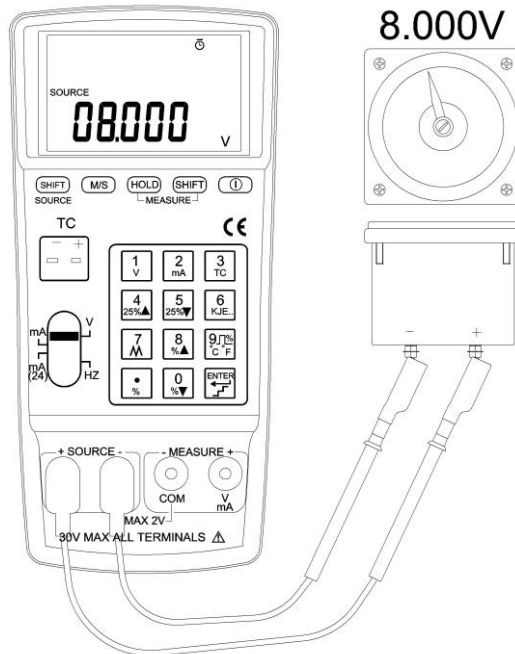
	<ol style="list-style-type: none"> 1. MEASURE temperature range: press SHIFT (black) and then this button to select the type of thermocouples (K, J, E, T, R, S, N, L, U, B, C). 2. SOURCE mode: press it to enter number 6.
	<ol style="list-style-type: none"> 1. SOURCE mode: press SHIFT (blue) and then this button to perform an Auto-ramp sourcing of whole range. Press any button to stop Auto-ramp sourcing. 2. SOURCE mode: press it to enter number 7.
	<ol style="list-style-type: none"> 1. SOURCE mode: press SHIFT (blue) and then this button to increase % of the range. 2. SOURCE mode: press it to enter number 8.
	<ol style="list-style-type: none"> 1. MEASURE mode: press SHIFT (black) and then this button to select the temperature unit (°C or °F) 2. SOURCE mode: press SHIFT (blue) + this button to enter DUTY cycle of output frequency. 3. SOURCE mode: press it to enter number 9.
	<ol style="list-style-type: none"> 1. SOURCE mode: press SHIFT (blue) and then this button to decrease % of the range. 2. SOURCE mode: press it to enter number 0.
	<ol style="list-style-type: none"> 1. SOURCE mode: press SHIFT (blue) and then this button to set up the increase/decrease % of the range. 2. SOURCE mode: press it to enter decimal point.
	<ol style="list-style-type: none"> 1. SOURCE mode: press ENTER button after key in a value. 2. SOURCE mode: press SHIFT (blue) and then this button to enter Auto step sourcing; press them again to enter Pause step sourcing.

II. OPERATION

1. Voltage SOURCE

1a. 0~24V

1. Turn on the power. Turn the sliding switch to V.
2. Press M/S button to select SOURCE (output) mode.
3. Type in a voltage value (including decimal point); then press ENTER.
4. Connect the banana plugs of Test leads to SOURCE terminals (red to +, black to -).
5. Then connect the other ends (prods or alligator clips) of Test leads to the object for calibration.
6. Perform voltage SOURCE function (refer to the scanning operation).





Remark:

1. The max. output is 24.000V.
2. Type in a voltage value (including decimal point), press ENTER, then the calibrator will output this voltage value.
3. When the output value is <1 and >0 , please type in "0." first.

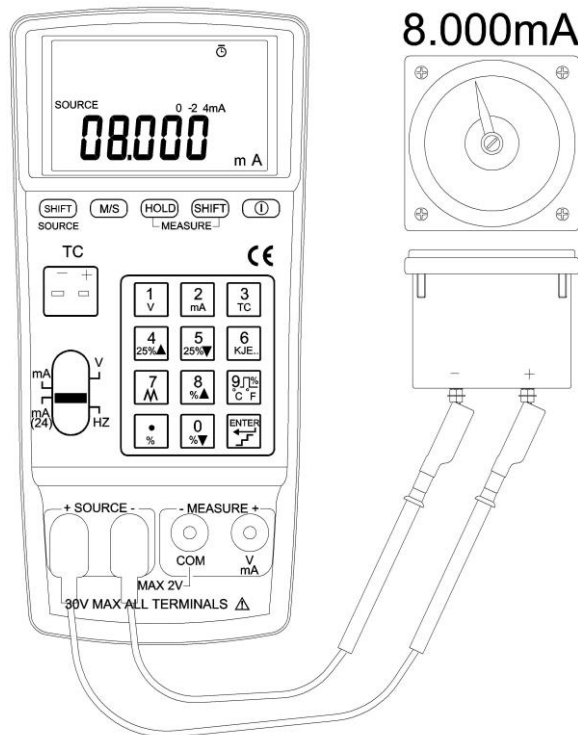
Warning:

1. Do not make an input with voltage potential or connect any charged circuitry to SOURCE (terminals) to prevent from damaging the calibrator.
2. When there is a short circuit or overload at the output terminals, the calibrator can not output the correct voltage. Please remove connecting leads and check when there is a symbol of OL.

2. Current SOURCE

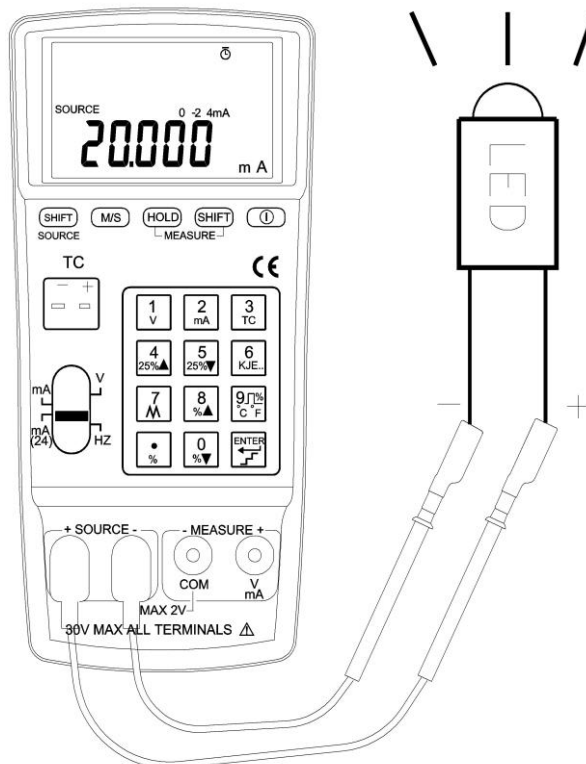
2a. SOURCE (4~20mA, 0~24mA)

1. Turn on power. Turn sliding switch to mA range (4~20mA) or mA (24).
2. Press M/S button to select SOURCE (output) mode.
3. Type in a current value (including decimal point); then press ENTER.
4. Connect the banana plugs of Test leads to SOURCE terminals (red to +, black to -).
5. Then connect the other ends (prods or alligator clips) of Test leads to the object for calibration.
6. Perform current SOURCE function (refer to the scanning operation).



2b. LED Brightness Testing (0~24mA)

1. Turn on power. Turn sliding switch to mA (24).
2. Press M/S button to select SOURCE (output) mode.
3. Type in a current value (including decimal point); then press ENTER.
4. Connect the banana plugs of Test leads to SOURCE terminals (red to +, black to -).
5. Then connect the other ends (prods of alligator clips) of Test leads to LED.
6. Perform current SOURCE function (refer to the scanning operation).





Remark:


1. Users are allowed to type in max. 5 digits.
2. Type in a current value (including decimal point), press ENTER, then the calibrator will output this current value.
3. When the output value is <1 and >0 , please type in "0." first.

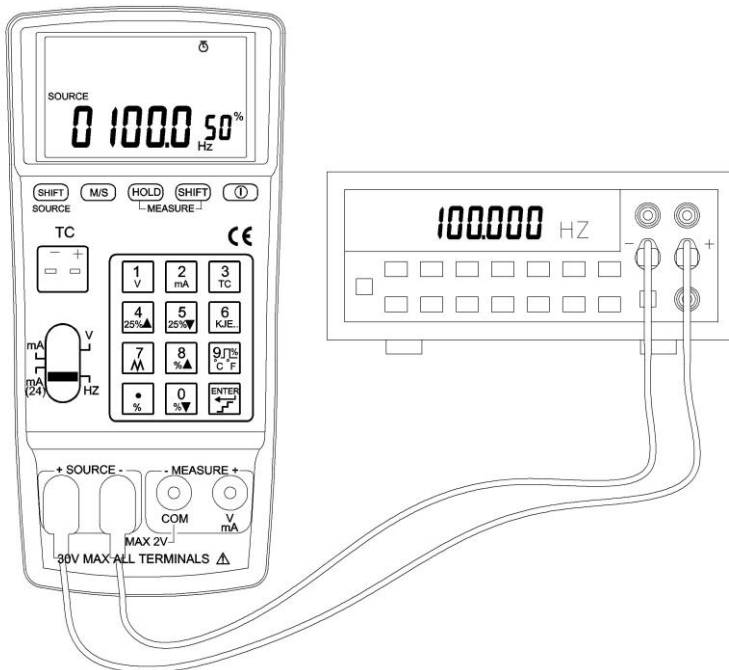
Warning:

1. Do not make an input or connect any charged device to SOURCE (terminals) to prevent from damaging the calibrator.
2. When there is an output open circuit or overload, the calibrator can not output the correct current. Please remove connecting leads and check when there is a symbol of OL.

3. Frequency SOURCE (Hz)

3a. 3Vpp, 1~20KHz, Square Wave

1. Turn on power. Turn sliding switch to Hz range.
2. Press M/S button to select SOURCE (output) mode.
3. Press SHIFT (blue) and then  to select DUTY% or HZ.
4. Type in a value (including decimal point) then press ENTER.
(If an unusual frequency value is typed in, the LCD will temporarily display -- % which means the calculation inside takes a longer time.)
5. Connect the banana plugs of Test leads to SOURCE terminals (red to +, black to -).
6. Then connect the other ends of Test leads to the object for calibration.



Remark:

1. Users are allowed to type in max. 5 digits.
2. Type in each parameter (including decimal point), press ENTER, then the calibrator will output the parameter values.
3. When the output value is <1 and >0 , please type in "0." first.

Warning:

1. Do not make an input or connect any charged device to SOURCE (terminals) to prevent from damaging the calibrator.
2. When there is an output short circuit or overload, the calibrator can not output the correct frequency.

3b. DUTY

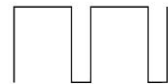
DUTY: for a square wave, users can decide the band width of the positive wave.



25%




50%

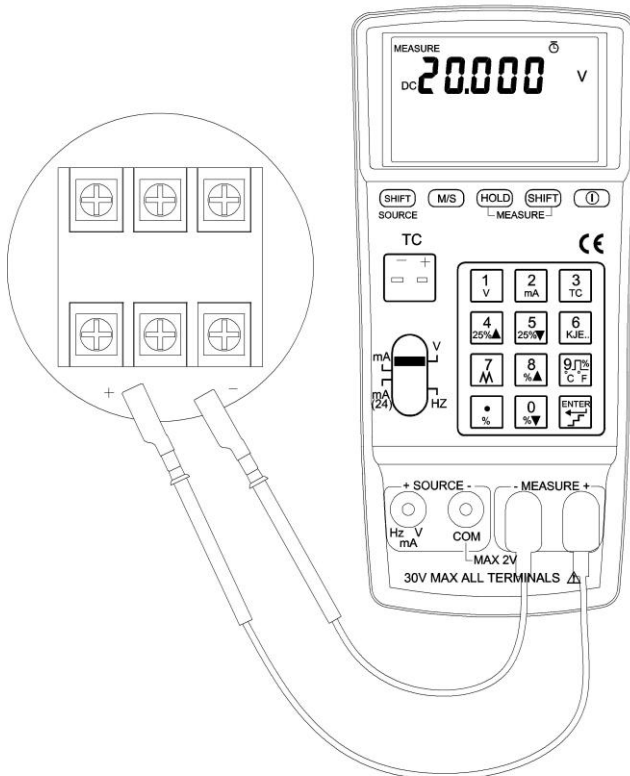


75%

4. Voltage MEASURE

4a. DC 0~24V

1. Turn on power.
2. Press M/S button to select MEASURE (input) mode.
3. Press SHIFT (black) and then  to select MEASURE DCV mode.
4. Connect the banana plugs of Test leads to MEASURE terminals (red to V, black to COM). Then connect the other ends (prods or alligator clips) of Test leads to the object for measurement.
5. LCD will display the DCV measurement value.





Remark:

The measurement result is 5-digit (including decimal point and negative sign).

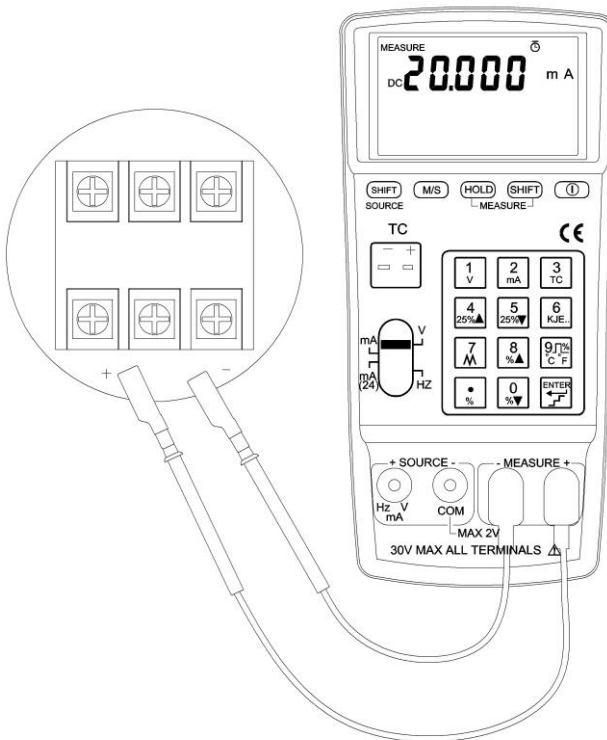
Warning:

Do not measure over DC 30V for MEASURE (terminals) to prevent from damaging the calibrator.

5. Current MEASURE

5a. DC 0.005~24mA

1. Turn on power.
2. Press M/S button to select MEASURE (input) mode.
3. Press SHIFT (black) and then 2
mA to select MEASURE DCmA mode.
4. Connect the banana plugs of Test leads to MEASURE terminals (red to mA, black to COM). Then connect the other ends (prods of alligator clips) of Test leads to the object for measurement.
5. LCD will display the DCmA measurement value.





Remark:

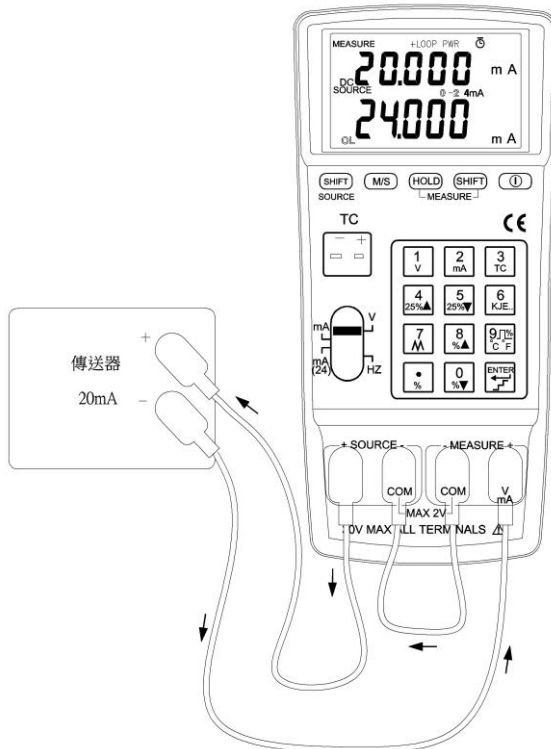
The measurement result is 5-digit (including decimal point and negative sign).

Warning:

Do not make connections to MEASURE and TC at the same time. Always connect to only one (MEASURE or TC) to prevent from damaging the calibrator.

5b. LOOP+ MEASURE and Supply 24V Loop

1. Turn on power. Turn sliding switch to mA (24) range.
2. Press M/S button to select MEASURE (input) + SOURCE (output) mode.
3. Press SHIFT (black) and then 2
mA to select MEASURE DCmA mode and SOURCE mode (setup 24mA output) – Dual mode function.
4. On the top of LCD will display LOOP+ PWR.
5. Connect the banana plugs of Test leads to below terminals: + (positive) to SOURCE “red” terminal; - (negative) to MEASURE “red” terminal.
6. Then connect the other ends (prods or alligator clips) of Test leads to the transmitter.
7. LCD will display the DCmA value of the transmitter.



6. Temperature MEASURE

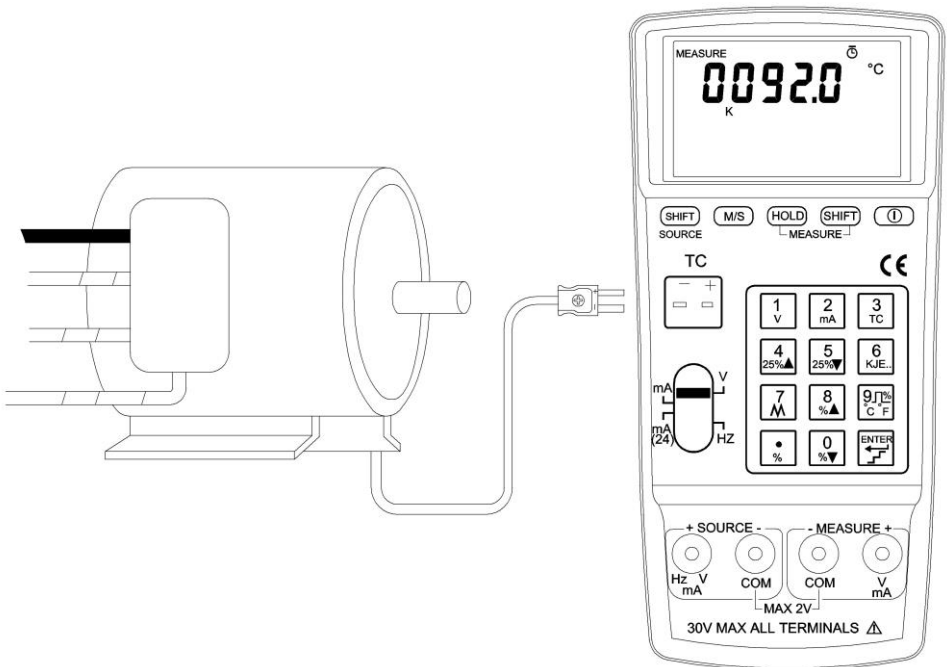
6a. Measure TC Thermocouple Signals

(for Types K, J, E, T, R, S, N, L, U, B, C)

1. Turn on power.
2. Press M/S button to select MEASURE (input) mode.
3. Press SHIFT (black) and then

3
TC

 to select MEASURE TC mode.
4. Connect the mini plug of Thermocouples to MEASURE TC sockets. And then connect the other end to the object for measurement.
5. LCD will display the temperature measurement value.
6. Please refer to the next page for “Select TYPE and temperature units”.





**Remark:**

The measurement result is 5-digit (including decimal point and negative sign).

Warning:

1. The Input TC terminals are for measuring mV, do not measure over 30V for MEASURE (terminals) to prevent from damaging the calibrator.
2. Do not make connections to MEASURE and TC at the same time. Always connect to only one (MEASURE or TC) to prevent from damaging the calibrator.

6b. Select TYPE and Temperature units








1. Press SHIFT (black) and then  to select TC TYPE.
2. Press SHIFT (blue) and then  to select °C or °F.

III. SCANNING FOR SOURCE

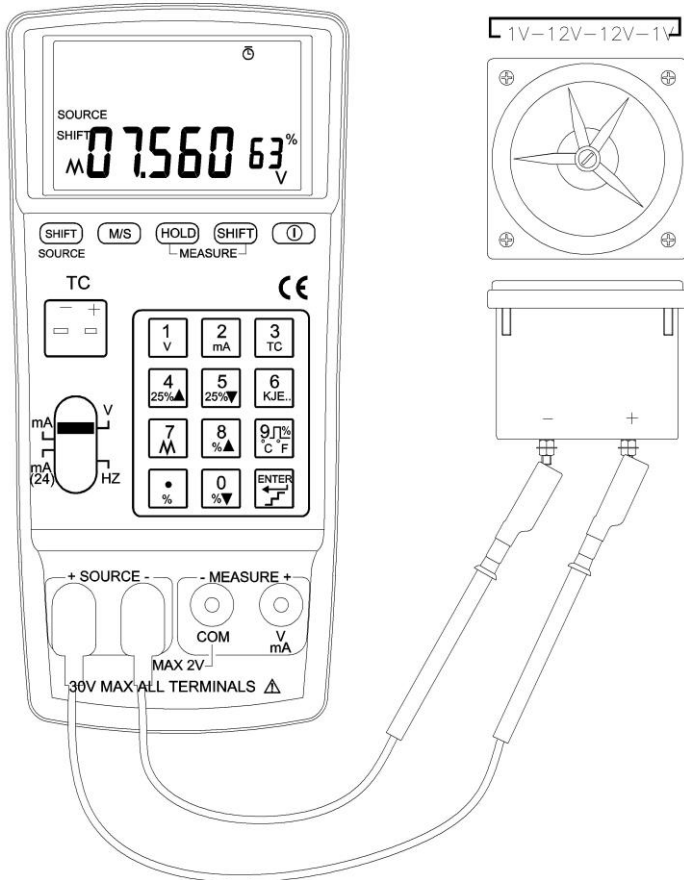
1. Voltage Scanning for SOURCE

1a. Functions of Voltage Scanning for SOURCE

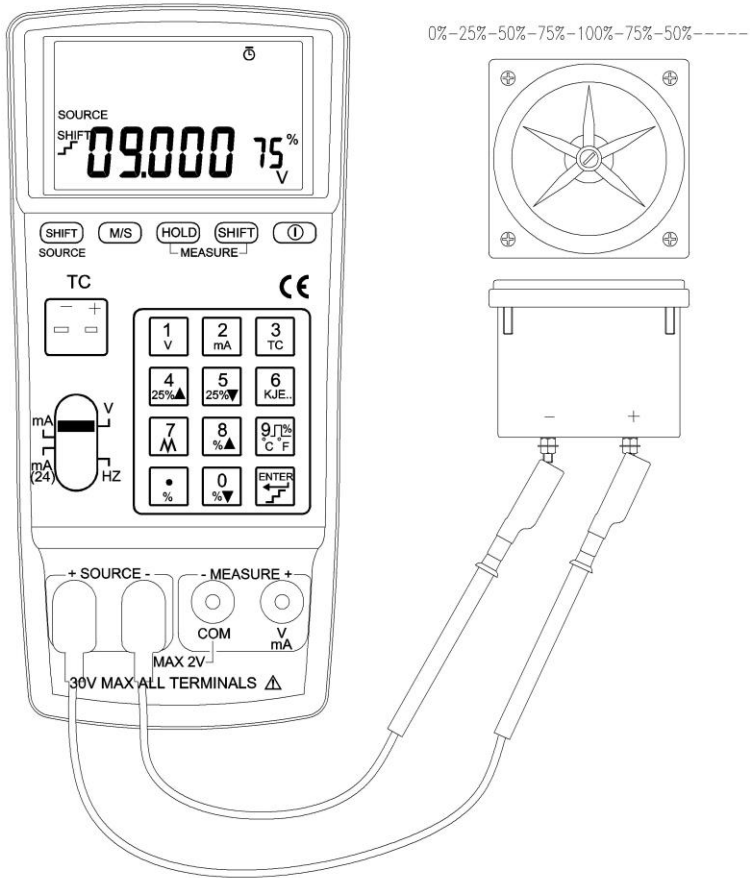
Press SHIFT (blue) then the lower left of LCD will display various functions (see the descriptions on below).

SHIFT (blue) +	Functions
	Auto-Ramp scanning 1% 2%.... 100% 99%.... 2% 1%. Press again to HOLD/CONTINUE scanning.
	Auto-Step scanning 0% 25% 50% 75% 100%(increase and decrease progressively). Press again to HOLD/CONTINUE scanning.
	Press SHIFT (blue) and then this button once to increase 25%.
	Press SHIFT (blue) and then this button once to decrease 25%.
	Set up the increase/decrease percentage.
	Manual Multi-step scanning: increase progressively per the setup %.
	Manual Multi-step scanning: decrease progressively per the setup %.

1b. Connections and LCD displays for Auto-Ramp and Auto-Step



Auto-Ramp Scanning










Auto-Step Scanning

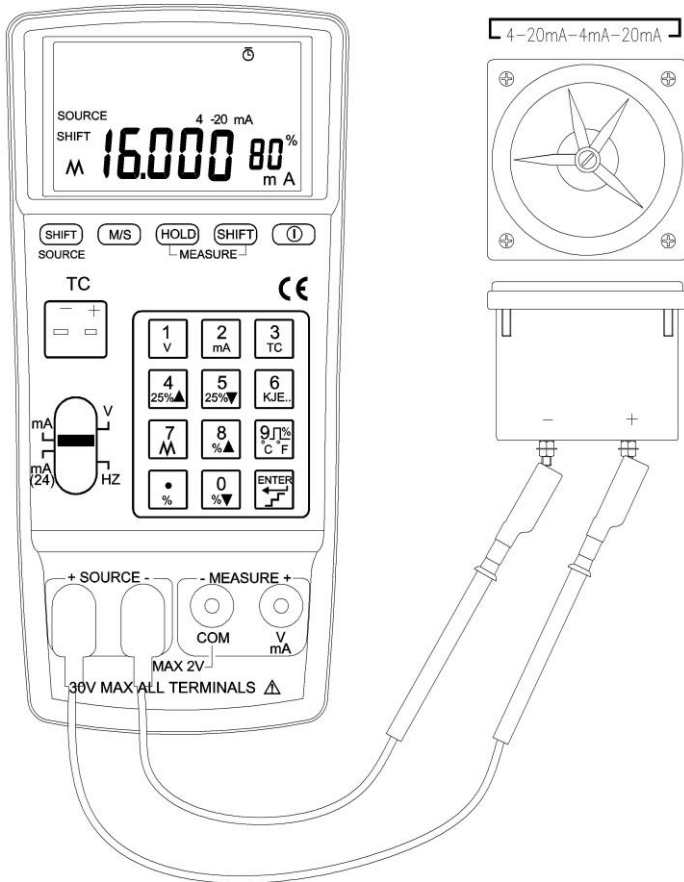
2. Current Scanning for SOURCE

2a. Functions of Current Scanning for SOURCE

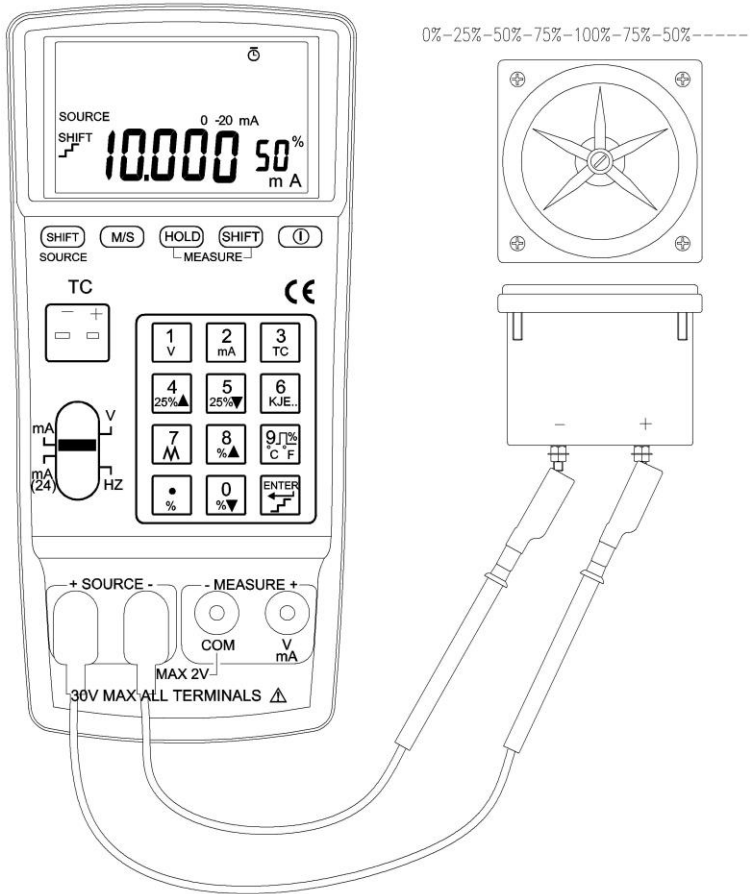
Press SHIFT (blue) then the lower left of LCD will display various functions (see the descriptions on below).

SHIFT (blue) +	Functions
	Auto-Ramp scanning 1% 2%.... 100% 99%.... 2% 1%. Press again to HOLD/CONTINUE scanning.
	Auto-Step scanning 0% 25% 50% 75% 100%(increase and decrease progressively). Press again to HOLD/CONTINUE scanning.
	Press SHIFT (blue) and then this button once to increase 25%.
	Press SHIFT (blue) and then this button once to decrease 25%.
	Set up the increase/decrease percentage.
	Manual Multi-step scanning: increase progressively per the setup %.
	Manual Multi-step scanning: decrease progressively per the setup %.

2b. Connections and LCD displays for Auto-Ramp and Auto-Step



Auto-Ramp Scanning



Auto-Step Scanning

IV. ELECTRICAL SPECIFICATIONS

(23±5°C, 10 minutes after turning on the power)

DCmA SOURCE

(Max. load 1KΩ, Max. voltage supply 24V)

Range	Resolution	Accuracy
0~4mA	1μA	± 0.025% ±10μA
4~20mA	1μA	± 0.025% ±5μA
20~24mA	1μA	± 0.025% ±5μA

When output open, the LCD displays "OL".

DCV SOURCE

(Max. load 24mA, Short circuit protection < 25mA)

Range	Resolution	Accuracy
0~4V	1mV	± 0.05% ± 10mV
4~20V	1mV	± 0.05% ±5mV
20~24V	1mV	± 0.05% ±5mV

When output short circuit, the LCD displays "OL".

Frequency SOURCE

(TTL, Square wave, Duty cycle = 1~99%)

Range (Hz)	Resolution	Accuracy
1.0~1000.0Hz	0.1Hz	0.1Hz
1000~10000Hz	1Hz	1Hz
10000~20000Hz	1Hz	10Hz

DCmA MEASURE

Range	Resolution	Accuracy
0.005~4mA	1uA	±0.025%±5dgts
4~20mA	1uA	±0.025%±5dgts
20~24mA	1uA	±0.025%±5dgts

If reading of mA (measure) is less than 5 digits, it is displayed as 0.

**DCV MEASURE**

Range	Resolution	Accuracy
0~24V	0.001V	$\pm 0.025\% \pm 5\text{dpts}$

If reading of V (measure) is less than 5 digits, it is displayed as 0.



Temperature of Thermocouples

(MEASURE only, 0.1°C & 0.1°F Resolution, Internal Cold Junction Compensation, thermocouples accuracy not included, 3 minutes after plugging in thermocouples.)

	°C		°F	
	Range	Accuracy	Range	Accuracy
K	-200 to -150	2.0	-382 to -238	3.6
	-150 to 0	1.2	-238 to 32	2.1
	0 to 1000	0.8	32 to 1832	1.4
	1000 to 1370	1.2	1832 to 2498	2.1
J	-200 to -150	2.0	-382 to -238	3.6
	-150 to 0	1.0	-238 to 32	1.8
	0 to 1050	0.7	32 to 1922	1.2
E	-200 to -150	1.5	-382 to -238	2.7
	-150 to 0	0.9	-238 to 32	1.6
	0 to 850	0.7	32 to 1562	1.2
T	-200 to -150	1.5	-382 to -238	2.7
	-150 to 0	1.2	-238 to 32	2.1
	0 to 400	0.8	32 to 752	1.4
R	0 to 500	1.8	32 to 932	3.2
	500 to 1760	1.5	932 to 3200	2.7
S	0 to 500	1.8	32 to 932	3.2
	500 to 1760	1.5	932 to 3200	2.7
N	-200 to 0	1.5	-328 to 32	2.7
	0 to 1300	0.9	32 to 2372	1.6
L	-200 to 0	0.9	-328 to 32	1.6
	0 to 900	0.7	32 to 1652	1.2
U	-200 to 0	1.1	-328 to 32	1.9
	0 to 600	0.7	32 to 1112	1.2
B	600 to 800	2.2	1112 to 1472	3.9
	800 to 1000	1.8	1472 to 1832	3.2
	1000 to 1820	1.4	1832 to 3308	2.5
C	0 to 1800	1.0	32 to 3272	1.8
	1800 to 2310	1.5	3272 to 4190	2.7



V. GENERAL SPECIFICATIONS

Dimension	214.0 (L) x 98.7(W) x 56.0(H) mm 8.4" (L) x 3.9" (W) x 2.2" (H)
Weight	650g / 22.9oz (batteries included)
Operation Environment	0°C ~ 50°C , < 85% RH
Storage Environment	-20°C ~ 60°C , < 75% RH
Accessories	Carrying case x 1 User manual x 1 1.5V SUM-3 Battery x 5 K-type thermocouples (1M, single plug) x 1 Alligator clips x 2 (black and red) Test leads x 2 (black and red)



VI. MAINTENANCE & CLEANING

1. Servicing not covered in this manual should only be performed by qualified personnel. Repairs should only be performed by qualified personnel.
2. Periodically wipe the case and cable with a damp cloth and detergent; do not use abrasives or solvents.
3. Please remove the batteries if users won't use the meter for a long time.

Address of Agent, Distributor, Importer, or Manufacturer



Limited Warranty

This meter is warranted to the original purchaser against defects in material and workmanship for 3 years from the date of purchase. During this warranty period, RS Components will, at its option, replace or repair the defective unit, subject to verification of the defect or malfunction. This warranty does not cover fuses, disposable batteries, or damage from abuse, neglect, accident, unauthorized repair, alteration, contamination, or abnormal conditions of operation or handling.

Any implied warranties arising out of the sale of this product, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited to the above. RS Components shall not be liable for loss of use of the instrument or other incidental or consequential damages, expenses, or economic loss, or for any claim or claims for such damage, expense or economic loss. Some states or countries laws vary, so the above limitations or exclusions may not apply to you. For full terms and conditions, refer to the RS website.





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