

# General Specifications

Model CA150  
HANDY CAL

## GS CA150-01E

### ■ General

The Handy Calibrator CA150 is a comprehensive source and measure instrument for your calibration and equipment checking needs at maintenance sites. The CA150 can simultaneously source and measure voltage, current, resistance, TC (Thermocouple), RTD (Resistance Temperature Detector) and pulse signals, so you no longer need to prepare many instruments. In addition, direct keys for function selection make operation smoother and prevent incorrect measurement by erroneous operations.

### ■ Features

● **Simultaneous source and measurement**  
With a single CA150, it is possible to check the operation of TCs, RTDs, and various other sensors as well as process devices such as transmitters, temperature controllers, and signal converters during a regular inspection or when a problem has occurred. By itself, the CA150 can generate signals for input to equipment, and check output signals from equipment.

● **Highly accurate and multi-functional source and measurement**

High accuracy: 0.02% for the source function and 0.02% for the measurement function (DCV range)  
Source and measurement functions: DC voltage, DC current, resistance, frequency, temperature (TC and RTD) and 24 VDC power supply function for transmitters

● **Sweep Functions (Automatic Output Functions)**  
The following automatic output functions are available: Step sweep function, Linear sweep function, and Program sweep function

### ■ Functions

#### Source and Measurement

● **Source and Measurement of Voltage/Current**  
The CA150 can generate voltage/current of up to 30 V / 22 mA DC and measure up to 35 V / 100 mA DC.

● **SINK Function**  
The "SINK" function can draw current from an external voltage source to the plus terminal of the source function. Thus, the CA150 can be used in a loop test, for example, as a simulator for transmitters.

● **Source response speed**  
1 V, 10 V, 500 Ω (Excitation current: 1 mA or less), RTD (Excitation current: 1 mA or less)

Source response: 5 ms  
Source response other than the above: 300 ms  
When RTD is used, it is possible to respond to pulse-driven transmitters, etc. within 5 ms as long as the excitation current is 1 mA or less.

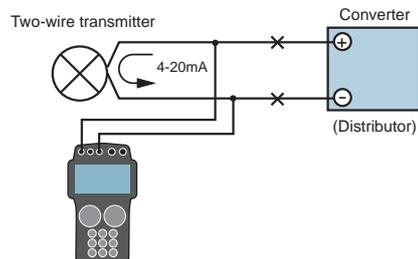
(Reference: Yokogawa's YTA series Temperature Transmitter)



CA150 HANDY CAL

● **Loop power supply function**  
It is possible to measure current signals while supplying loop power supply to a two-wire transmitter.

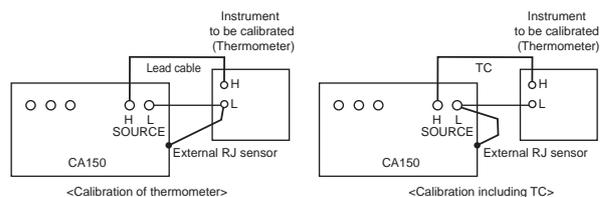
#### Example of Connection



● **Equivalent Output of TC/RTD**  
Outputs are available for 10 types of TC (Type K, E, J, T, N, L, U, R, S and B), RTD (Pt100, JPt100) outputs are also available. The CA150 can be used for maintenance of process industrial instruments or various thermometers.

● **Reference Junction Compensation Sensor for TC measurement**  
For reference junction compensation when TC is used, use the external RJ sensor (model: B9108WA) sold separately.

#### Example of External RJ Sensor Connection



● **Multi Temperature measurement**

The CA150 can be used as a multi-thermometer because measurements can be made using ten types of TC and two kinds of RTD. For RTD, 3-wire measurement is also available.

● **Source and Measurement of Pulses**

The source frequency can be set in the range of 1 Hz to 50 kHz, and the measurement frequency in the range of 1 Hz to 11 kHz. This is useful for checking a flow meter or receiver.

● **Source of Voltage Pulses**

The CA150 can source voltage pulses (amplitude: +0.1 V to +11 V, zero base waveform).

Only measurement is possible for contact input.

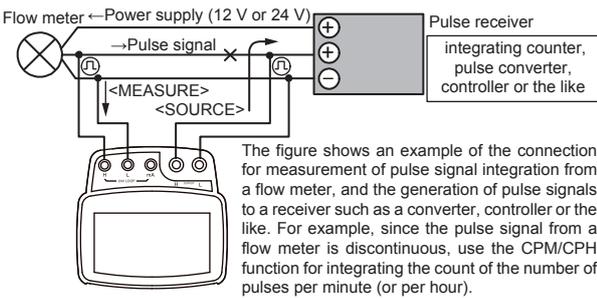
● **Pulse Cycle Function**

A set pulse can be output, which is suitable for checking an integrating counter (any value of frequency and amplitude can be set).

● **CPM (Count/min), CPH (Count/hour) Function**

In MEASURE mode (functions for measurement), the number of pulses per minute or hour is counted. This is useful for integrating discontinuous pulse signals from a flow meter.

**Example of connection**



■ **Additional Function**

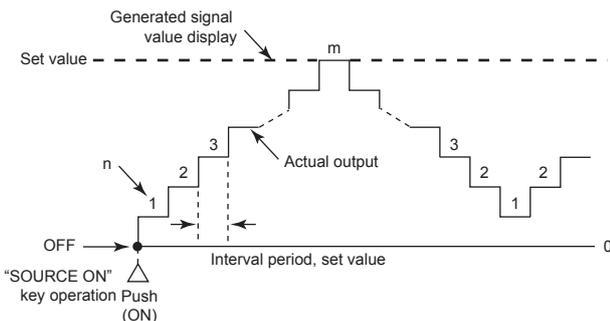
● **Divided Output (n/m) Function**

The divided output (n/m) function outputs a value n/m times the setpoint of a voltage, current, resistance, TC or RTD signal.

When inputting the step of an instrument input value within the range of zero to full scale, bothersome calculations for step are not required.

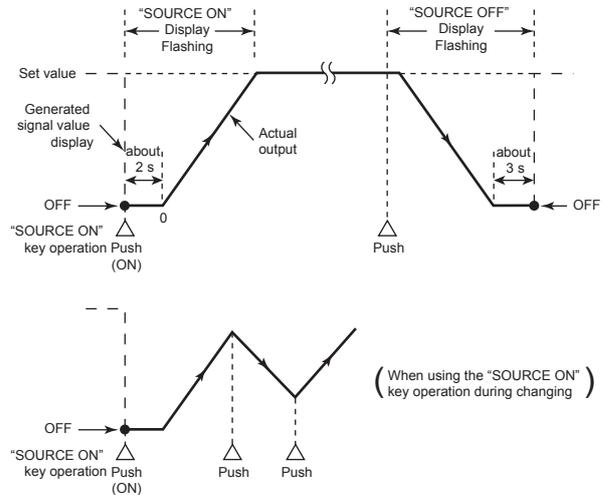
● **Step Sweep Function**

Set divided output(n/m) to be generated automatically as shown in the figure below: "m" is setting step number from 1 to 19. "n" is setting source start step number from 0 to 19.



● **Linear Sweep Function**

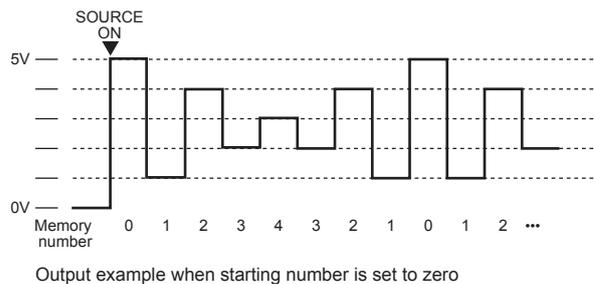
The sweep function linearly increases or decreases the output.



● **Program Sweep Function**

This function automatically generates any output pattern which was set in order in the memory numbers. It is possible to output in sequence with the same function and in the same range corresponding to each memory number.

Memory number MEM No.	FUNCTION	RANGE	Generated signal value (set value)
0	DCV	10V	5.0000V
1	DCV	10V	1.0000V
2	DCV	10V	4.0000V
3	DCV	10V	2.0000V
4	DCV	10V	3.0000V
5	Not used	Not used	Not used
⋮	⋮	⋮	⋮
99	⋮	⋮	⋮



● **Memory Function**

1. Setting Memory Function  
This function saves the setting conditions.
2. Data Memory Function  
This function saves the measurement or source value displayed.

● **Communication Function**

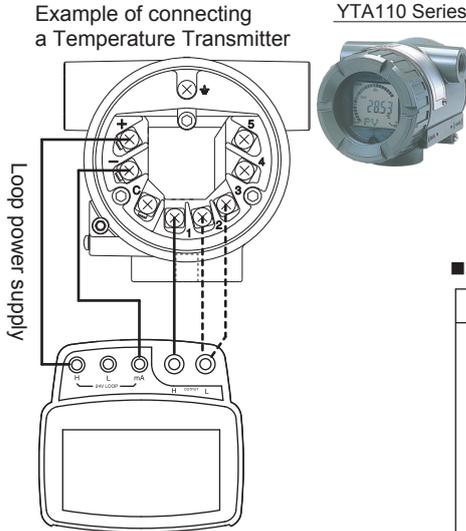
By connecting the communication cable (RS-232), you can read internal memory data and measured values, or set the generated signal from a personal computer.

**Example of connection**

● **Example of connecting a temperature transmitter**

Operation check of Yokogawa Temperature Transmitter

YTA110 Series calibration: Pt100 input

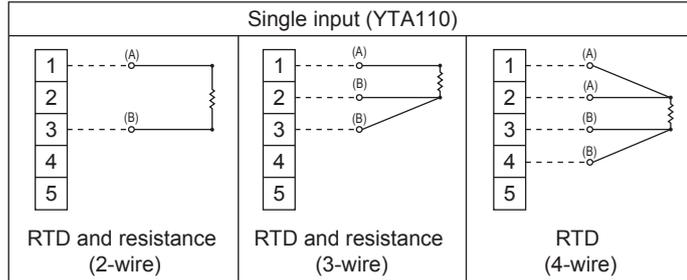


Example of connection:  
YTA 110 series temperature transmitter

Connecting method:  
Connect the loop power supply of the CA150 to YTA +, - terminals.  
Connect the source cable to the YTA input terminals.  
(See the following example of connecting YTA input terminals.)

Features: The input can be changed while monitoring the output with the connected transmitter's power supply, allowing operation checks to be performed with easy connection.

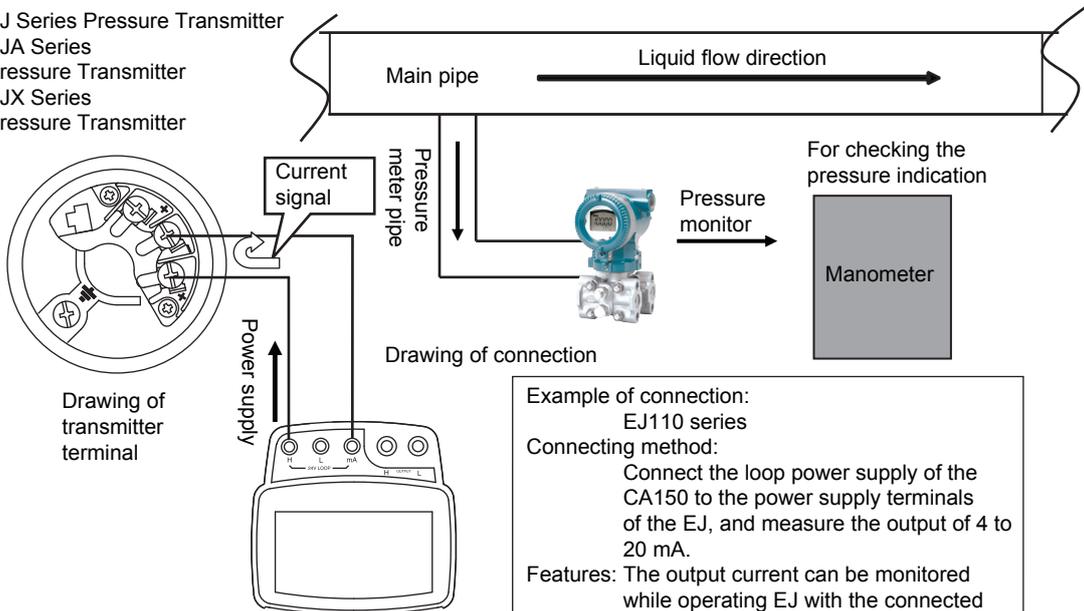
■ Example of connecting YTA sensors (drawing of YTA input terminals)



● **Example of connecting a pressure transmitter**

Operation check of Yokogawa Pressure Transmitter

EJ Series Pressure Transmitter  
EJA Series Pressure Transmitter  
EJX Series Pressure Transmitter



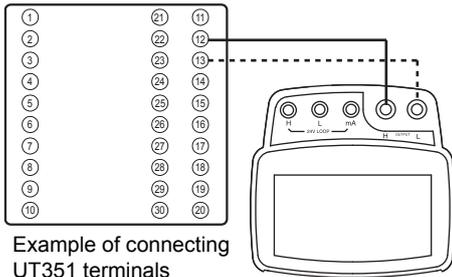
Example of connection:  
EJ110 series

Connecting method:  
Connect the loop power supply of the CA150 to the power supply terminals of the EJ, and measure the output of 4 to 20 mA.

Features: The output current can be monitored while operating EJ with the connected loop power supply. Actual pressure has to be checked by the pressure indication of the manometer.

● Example of connecting a temperature controller / indicating controller

Calibration and operation check of Yokogawa's UT series indicating controller and UP series program indicating controller.

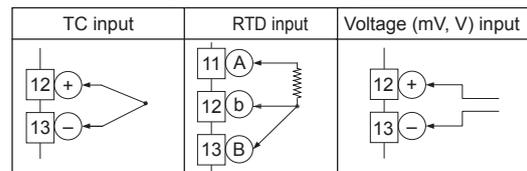


Example of connecting UT351 terminals

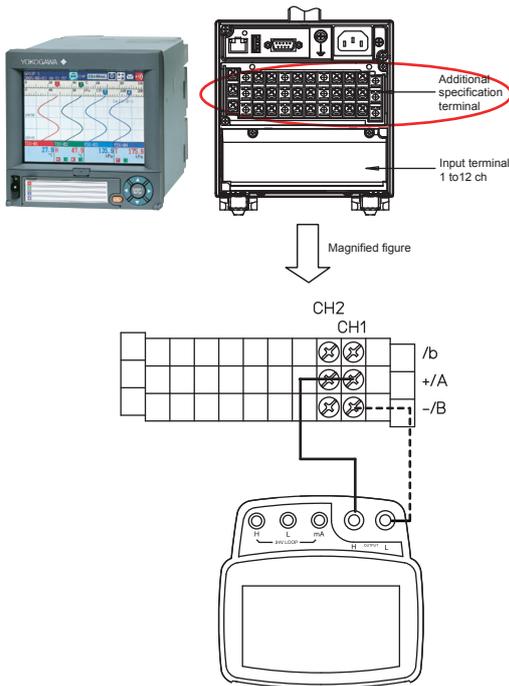
Example of connection:  
 UT351 series temperature controller  
 Connecting method:  
 Connect the source cable of the CA150 to the sensor input terminals of UT (See the following example of connecting measurement input terminals.), and check the indication.  
 Features: The CA150 has many functions, so a single CA150 can be used as an indicator for universal inputs.

■ Example of connecting UT/UP

Measurement input



● Example of connecting the DAQSTATION DX 1000



Example of connection: DX1000  
 DC voltage/TC  
 Connecting method:  
 Connect to the input terminals of the DX1000. (See the magnified figure.)  
 Generate a specified source value, and check the displayed indication.  
 Features: Due to the CA150's multi-functions, models with universal input functions can be supported by a single CA150. The CA150 is ideal for checking before product development testing, recording work, etc.

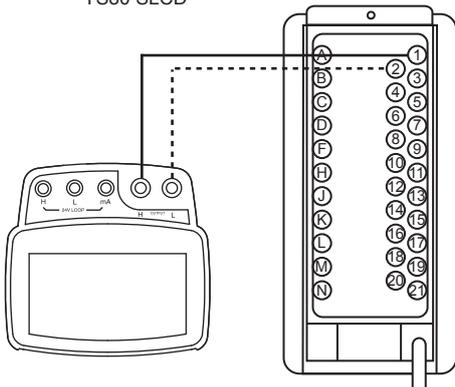
● Example of connecting the YS series

Yokogawa YS80 series



YS80 SLCD

Drawing of terminal connections



Example of connection:  
 YS80 SLCD  
 Connecting method:  
 Connect the source cable of the CA150 to SLCD's measurement terminals. (See the following example of connecting YS80 SLCD terminals.), and check the indications  
 Features: Suitable for checking cascade operation, etc., as a support device for programming, etc., or as a field check device when starting up.

■ Example of connecting YS80 SLCD

Terminal designation	Description	Terminal designation	Description
1	+> Process variable input (1 to 5 V DC)	17	+> Communications *1
2	->	18	->
3	+> Cascade set point input (1 to 5 V DC)	19	+> Deviation alarm output
4	->	20	->
5	+> Tracking input (1 to 5 V DC)	21	- Fail output (neg. terminal)
6	->	A	+> Manipulated output *2 (4 to 20 mA DC)
7	+> Feedforward input (1 to 5 V DC)	B	->
8	->	C	+> Manipulated output (1 to 5 V DC)
9		D	->
10		F	+> Set point signal (1 to 5 V DC)
11	+> Instrument mode switching	H	->
12	->	J	+> Input high limit alarm
13	+> C, A/M contact output	K	->
14	->	L	+> Input low limit alarm
15	+> C/A, M contact output	M	->
16	->	N	+ Fail output (pos. terminal)

\*1: Use shielded twisted-pair cable Model SCCD.

\*2: If these terminals are not used, connect them together.

## ■ Specifications

### Source

Accuracy = ± (% of setting + μV, mV, μA, Ω, °C, CPM, Hz, kHz) at 23±5°C

	Range	Source Range	Accuracy	Setting Resolution	Remarks
DCV source	100 mV	0 to ±110.000 mV	±(0.02% +10 μV)	1 μV	Output resistance: Approx. 6.5 Ω
	1 V	0 to ±1.10000 V	±(0.02% +0.05 mV)	10 μV	Maximum output: 10 mA Output resistance: Approx. 30 mΩ
	10 V	0 to ±11.0000 V	±(0.02% +0.5 mV)	0.1 mV	Maximum output: 10 mA Output resistance: Approx. 30 mΩ
	30 V	0 to ±30.00 V	±(0.02% +10 mV)	10 mV	Maximum output: 10 mA
DCmA source	20 mA	0 to +22.000 mA	±(0.025% +3 μA)	1 μA	Maximum load: 24 V
mA SINK	20 mA SINK	0 to -22.000 mA	±(0.025% +6 μA)	1 μA	External power supply: 5 to 28 V
Resistance source	500 Ω	0 to 550.00 Ω	±(0.02% +0.1 Ω)	0.01 Ω	Excitation current: 1 to 5 mA*2 or maximum output: 2V
	5 kΩ	0 to 5.5000 kΩ	±(0.05% +1.5 Ω)	0.1 Ω	Excitation current:0.1 to 0.5 mA or maximum output: 2V
	50 kΩ	0 to 55.000 kΩ	±(0.1% +50 Ω)	1 Ω	Excitation current: 0.01 to 0.1 mA or maximum output: 2V
RTD output *1	PT 100 JPT 100	-200.0 to 850.0°C -200.0 to 500.0°C	±(0.025% +0.3°C)	0.1°C	Excitation current: 1 to 5 mA*2
TC output *1 *3	K	-200.0 to 1372.0°C	±(0.02% +0.5°C) However, -200.0 to -100.0°C ±(0.02% +0.8°C)	0.1°C	*3 TC source accuracy does not include RJ sensor accuracy.  RJ Sensor Specification Measurement range: -10 to 50°C  Accuracy (when combined with main unit) 18 to 28°C: ±0.5°C  Other than 18 to 28°C: ±1°C
	E	-200.0 to 1000.0°C	±(0.02% +0.4°C) However, -200.0 to -100.0°C ±(0.02% +0.6°C)		
	J	-200.0 to 1200.0°C	±(0.02% +0.4°C) However, -200.0 to -100.0°C ±(0.02% +0.7°C)		
	T	-200.0 to 400.0°C	±(0.02% +0.5°C) However, -200.0 to -100.0°C ±(0.02% +0.8°C)		
	N	-200.0 to 1300.0°C	±(0.02% +0.5°C) However, -200.0 to 0°C ±(0.02% +1.0°C)		
	L	-200.0 to 900.0°C	±(0.02% +0.5°C)		
	U	-200.0 to 400.0°C	±(0.02% +0.5°C) However, -200.0 to 0°C ±(0.02% +0.7°C)		
	R	0 to 1768°C	± (0.02% +1.2°C) However, 0 to 100°C ± (0.02% +2°C)		
	S	0 to 1768°C	± (0.02% +1.2°C) However, 0 to 100°C ± (0.02% +2°C)		
B	600 to 1820°C	± (0.02% +1°C) However, 600 to 1000°C ± (0.02% +1.5°C)			
Pulse output	CPM	1.0 to 1100.0 CPM	±0.5 CPM	0.1 CPM	Output voltage (+0.1 V to +11 V) ±10% (zero base waveform) Maximum load current: 10 mA Pulse number Continuous, 1 to 60,000 cycles
	100 Hz	1.00 to 110.00 Hz	±0.05 Hz	0.01 Hz	
	1000 Hz	90.0 to 1100.0 Hz	±0.5 Hz	0.1 Hz	
	10 kHz	0.9 kHz to 11.0 kHz	±0.1 kHz	0.1 kHz	
	50 kHz	9 kHz to 50 kHz	±1 kHz	1 kHz	

Temperature coefficient: When in the ranges of  $0 \leq T < 18^\circ\text{C}$  and  $28 < T \leq 40^\circ\text{C}$ , add the accuracy shown above  $\times (1/10) / ^\circ\text{C}$ .  
The above accuracy ranges are for values obtained when the instrument has been left for two hours after charging ends (or is stopped).

\*1: ITS-90 or IPTS-68 can be set with the internal settings.

\*2: Excitation current  $I_s$ : When less than 0.1 mA to 1 mA, then add  $\{0.05 / I_s \text{ (mA)}\} (\Omega)$  or  $\{0.12 / I_s \text{ (mA)}\} (^\circ\text{C})$ .

### About Accuracy during Charging

Accuracy is affected by the heat generated during charging or immediately after charging ends (is stopped). Refer to the accuracy values shown in “Source during Charging” on the next page.

**Source during Charging**

Accuracy = ± (% of setting + μV, mV, μA, Ω, °C) at 23±5°C

	Range	Source Range	Accuracy	Setting Resolution	Remarks
DCV source	100 mV	0 to ±110.000 mV	±(0.04% +25 μV)	1 μV	Output resistance: Approx. 6.5 Ω
	1 V	0 to ±1.10000 V	±(0.035% +0.1 mV)	10 μV	Maximum output: 10 mA Output resistance: Approx. 30 mΩ
	10 V	0 to ±11.0000 V	±(0.035% +1 mV)	0.1 mV	Maximum output: 10 mA Output resistance: Approx. 30 mΩ
	30 V	0 to ±30.00 V	±(0.035% +20 mV)	10 mV	Maximum output: 10 mA
DCmA source	20 mA	0 to +22.000 mA	±(0.04% +7 μA)	1 μA	Maximum load: 24 V
mA SINK	20 mA SINK	0 to -22.000 mA	±(0.045% +10 μA)	1 μA	External power supply: 5 to 28 V
Resistance source	500 Ω	0 to 550.00 Ω	±(0.035% +0.5 Ω)	0.01 Ω	Excitation current: 1 to 5 mA*2 or maximum output: 2V
	5 kΩ	0 to 5.5000 kΩ	±(0.065% +5 Ω)	0.1 Ω	Excitation current: 0.1 to 0.5 mA or maximum output: 2V
	50 kΩ	0 to 55.000 kΩ	±(0.12% +150 Ω)	1 Ω	Excitation current: 0.01 to 0.1 mA or maximum output: 2V
RTD output *1	PT 100 JPT 100	-200.0 to 850.0°C -200.0 to 500.0°C	±(0.075% +0.6°C)	0.1°C	Excitation current: 1 to 5 mA*2
TC output *1 *3	K	-200.0 to 1372.0°C	±(0.03% +0.8°C) However, -200.0 to -100.0°C ±(0.03% +1.0°C)	0.1°C	*3 TC source accuracy does not include RJ sensor accuracy.  RJ Sensor Specification Measurement range: -10 to 50°C  Accuracy (when combined with main unit) 18 to 28°C: ±0.5°C  Other than 18 to 28°C: ±1°C
	E	-200.0 to 1000.0°C	±(0.03% +0.8°C) However, -200.0 to -100.0°C ±(0.03% +1.0°C)		
	J	-200.0 to 1200.0°C	±(0.03% +0.8°C) However, -200.0 to -100.0°C ±(0.03% +1.0°C)		
	T	-200.0 to 400.0°C	±(0.03% +0.9°C)		
	N	-200.0 to 1300.0°C	±(0.03% +1.0°C) However, -200.0 to -100.0°C ±(0.03% +1.7°C)		
	L	-200.0 to 900.0°C	±(0.03% +0.8°C)		
	U	-200.0 to 400.0°C	±(0.03% +0.6°C) However, -200.0 to 0°C ±(0.03% +1.2°C)		
	R	0 to 1768°C	±(0.03% +2°C) However, 0 to 100°C ±(0.03% +3.5°C)	1°C	
	S	0 to 1768°C	±(0.03% +2°C) However, 0 to 100°C ±(0.03% +3.5°C)		
	B	600 to 1820°C	±(0.03% +2°C) However, 600 to 1000°C ±(0.03% +2.8°C)		

Temperature coefficient: Add the accuracy in normal state × (1/10)°C.

**Measurement**

Accuracy = ± (% of setting + μV, mV, μA, Ω, dgt, °C) at 23±5°C

	Range	Source Range	Accuracy	Setting Resolution	Remarks
DCV measurement	500 mV	0 to ±500.000 mV	±(0.02% + 50 μV)	10 μV	Input resistance: 1000 MΩ or greater.
	5 V	0 to ±5.0000 V	±(0.02% + 0.5 mV)	0.1 mV	Input resistance: Approx. 1 MΩ
	35 V	0 to ±35.000 V	±(0.025% + 5 mV)	1 mV	
DCmA measurement	20 mA	0 to ±20.000 mA	±(0.025% + 4 μA)	1 μA	Input resistance: Approx. 20 Ω or less
	100 mA	0 to ±10.000 mA	±(0.04% + 30 μA)	10 μA	
Resistance measurement *4	500 Ω	0 to 500.00 Ω	±(0.055% + 0.075 Ω)	0.01 Ω	Measurement current: Approx. 1 mA
	5 kΩ	0 to 5.0000 kΩ	±(0.055% + 0.75 Ω)	0.1 Ω	Measurement current: Approx. 100 μA
	50 kΩ	0 to 50.000 kΩ	±(0.055% + 10 Ω)	1 Ω	Measurement current: Approx. 10 μA
Pulse measurement	100 Hz 1000 Hz 10 kHz	1.00 to 110.00 Hz 1.0 to 1100.0 Hz 0.001 to 11.000 kHz	±2 dgt	0.01 Hz 0.1 Hz 0.001 kHz	Maximum input: 30 Vpeak Sensitivity: 0.5 Vp-p or greater Input resistance: Approx. 100 kΩ Contact input: Max. 100 Hz
	CPM CPH	0 to 100000 CPM 0 to 100000 CPH	— —	1 CPM 1 CPH	
TC input	K E J T N L U	-200.0 to 1372.0°C -200.0 to 1000.0°C -200.0 to 1200.0°C -200.0 to 400.0°C -200.0 to 1300.0°C -200.0 to 900.0°C -200.0 to 400.0°C	±(0.05% + 1.5°C) / -100.0°C or more ±(0.05% + 2°C) / -100.0°C or less	0.1°C	*5
	R S	0 to 1768°C 0 to 1768°C	±(0.05% + 2°C) / 100°C or more ±(0.05% + 3°C) / 100°C or less	1°C	
	B	600 to 1820°C	±(0.05% + 2°C) However, 600 to 1000°C ±(0.05% + 3°C)		
RTD input *4	PT100 JPT100	-200.0 to 850.0°C -200.0 to 500.0°C	±(0.05% + 0.6°C)	0.1°C	
Loop power supply			24 V ±2 V		Maximum current: 22 mA

Temperature coefficient: When in the ranges of  $0 \leq T < 18^\circ\text{C}$  and  $28 < T \leq 40^\circ\text{C}$ , add the accuracy shown above  $\times (1/10) / ^\circ\text{C}$ . The above accuracy ranges are for values obtained after the instrument has been left for two hours after charging ends (or is stopped).

\*4: When using three-wire method (3W).

\*5: In the case of a load during source output, accuracy can be affected by internal heat.

Add as a coefficient the temperature of the part of the value obtained with the temperature monitor function that exceeds  $23 \pm 5^\circ\text{C}$ . (The temperature monitor function is a function for displaying the temperature measured with the built-in RJ sensor.)

**About Accuracy during Charging**

Accuracy is affected by the internal heat during charging or immediately after charging ends (is stopped). Refer to the accuracy values shown in "Measurement during Charging" on the next page.

**Measurement during Charging**Accuracy =  $\pm$  (% of setting + mV,  $\mu$ A,  $\Omega$ ,  $^{\circ}$ C) at  $23 \pm 5^{\circ}$ C

	Range	Source Range	Accuracy	Setting Resolution	Remarks
DCV measurement	500 mV	0 to $\pm 500.000$ mV	$\pm(0.035\% + 0.1$ mV)	10 $\mu$ V	Input resistance: 1000 M $\Omega$ or greater.
	5 V	0 to $\pm 5.0000$ V	$\pm(0.035\% + 1$ mV)	0.1 mV	Input resistance: Approx. 1 M $\Omega$
	35 V	0 to $\pm 35.000$ V	$\pm(0.025\% + 7$ mV)	1 mV	
DCmA measurement	20 mA	0 to $\pm 20.000$ mA	$\pm(0.04\% + 6$ $\mu$ A)	1 $\mu$ A	Input resistance: Approx. 20 $\Omega$ or less
	100 mA	0 to $\pm 100.00$ mA	$\pm(0.055\% + 40$ $\mu$ A)	10 $\mu$ A	
Resistance measurement *4	500 $\Omega$	0 to 500.00 $\Omega$	$\pm(0.09\% + 0.15$ $\Omega$ )	0.01 $\Omega$	Measurement current: Approx. 1 mA
	5 k $\Omega$	0 to 5.0000 k $\Omega$	$\pm(0.09\% + 1.5$ $\Omega$ )	0.1 $\Omega$	Measurement current: Approx. 100 $\mu$ A
	50 k $\Omega$	0 to 50.000 k $\Omega$	$\pm(0.09\% + 20$ $\Omega$ )	1 $\Omega$	Measurement current: Approx. 10 $\mu$ A
TC input	K E J T N L U	-200.0 to 1372.0 $^{\circ}$ C -200.0 to 1000.0 $^{\circ}$ C -200.0 to 1200.0 $^{\circ}$ C -200.0 to 400.0 $^{\circ}$ C -200.0 to 1300.0 $^{\circ}$ C -200.0 to 900.0 $^{\circ}$ C -200.0 to 400.0 $^{\circ}$ C	*6	0.1 $^{\circ}$ C	*5
	R S B	0 to 1768 $^{\circ}$ C 0 to 1768 $^{\circ}$ C 600 to 1820 $^{\circ}$ C	*6	1 $^{\circ}$ C	
RTD input *4	PT100 JPT100	-200.0 to 850.0 $^{\circ}$ C -200.0 to 500.0 $^{\circ}$ C	$\pm(0.09\% + 1.2^{\circ}$ C)	0.1 $^{\circ}$ C	

Temperature coefficient: Add the accuracy in normal state  $\times (1/10)^{\circ}$ C.\*6: When the temperature measured with the temperature monitor function is in the ranges of  $0 \leq T < 18^{\circ}$ C and  $28 < T \leq 40^{\circ}$ C, add the accuracy in the normal state  $\times (1/10) / ^{\circ}$ C as a temperature coefficient, which is obtained from the temperature of the part exceeding  $23 \pm 5^{\circ}$ C.

## ● General and Common Specifications

- Source unit response time:  
300 msec (time from start of voltage change to when voltage enters accuracy range)  
However, the time is 5 msec for 1 V, 10 V, 500  $\Omega$  (excitation current: 1 mA), and RTD (excitation current: 1 mA) ranges
- Source unit voltage limiter:  
Approximately 32 V
- Source unit current limiter:  
Approximately 25 mA
- Switching of output polarity:  
+  $\longleftrightarrow$  -
- Load condition:  
0.01  $\mu$ F or less (DCV,  $\Omega$ , TC, RTD, PULSE)  
100  $\mu$ H or less (DCA)
- Divided output (n/m) function:  
Output = setting value  $\times$  (n/m) where n = 0 to m and m = 1 to 19
- Step sweep function:  
The n value is sent automatically when the n/m function is selected. The interval time is approximately 5 seconds / 10 seconds
- Linear sweep function:  
The sweep time is approximately 16 seconds / 32 seconds
- Memory function:
- 1) Setting: Up to 21 settings for startup such as the function and range can be saved from the setting screen.  
At startup, it is possible to select initial settings or switch output.
  - 2) Data: 100 items of data can be saved (sets of items such as date, source function, range, source value, measurement function, range, and measurement value)  
Multiple data can be continuously output (program sweep function)
- Loop check function (current can be measured while supplying 24 V with two wires)
- Measurement unit maximum input:  
Voltage terminal: 42 V DC,  
Current terminal: 120 mA
- Current terminal input protection:  
Fuse: 125 mA/250 V
- Measurement display update rate:  
Approximately once per second
- CMRR: Approximately 120 dB (50/60 Hz)  
NMRR: Approximately 60 dB (50/60 Hz)
- Serial interface:  
RS232
- Display: Segmented LCD
- Backlight: LED backlight, auto off after 10 minutes
- Warm-up time:  
Approximately 5 minutes
- Power supply:  
Six AA-size alkaline batteries  
Dedicated NiMH battery or dedicated AC adapter (optional)  
The charging time is approximately 6 hours.

Battery life: When measurement is on and output is 5 V DC/10 k $\Omega$  or greater: Approximately 8 hours for alkaline batteries and 10 hours for the dedicated NiMH battery

Auto power off:  
Approximately 10 minutes (can be disabled)

Insulation resistance:  
50 M $\Omega$  or more at 500 V DC between the input terminals and output terminals

Withstanding voltage:  
350 V AC for 1 minute between the measurement terminals and source terminals

Operating temperature/humidity ranges:  
0 to 40°C, 20 to 80% RH (no condensation)

Storage temperature/humidity ranges:  
-20 to 60°C, 90% RH or less (no condensation)

Dimensions:  
Approximately 251  $\times$  124  $\times$  70 mm

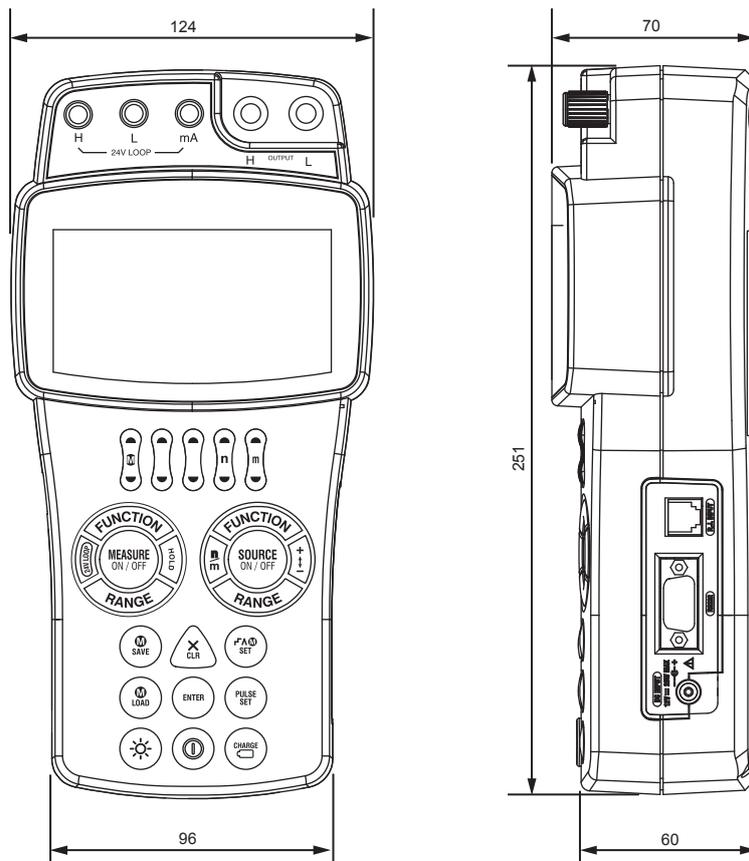
Weight: Approximately 1000 g

Accessories:  
Source lead cables, measurement lead cables, carrying case, fuse (spare), terminal adapter, alkaline batteries (six), user's manual, ferrite core (two).

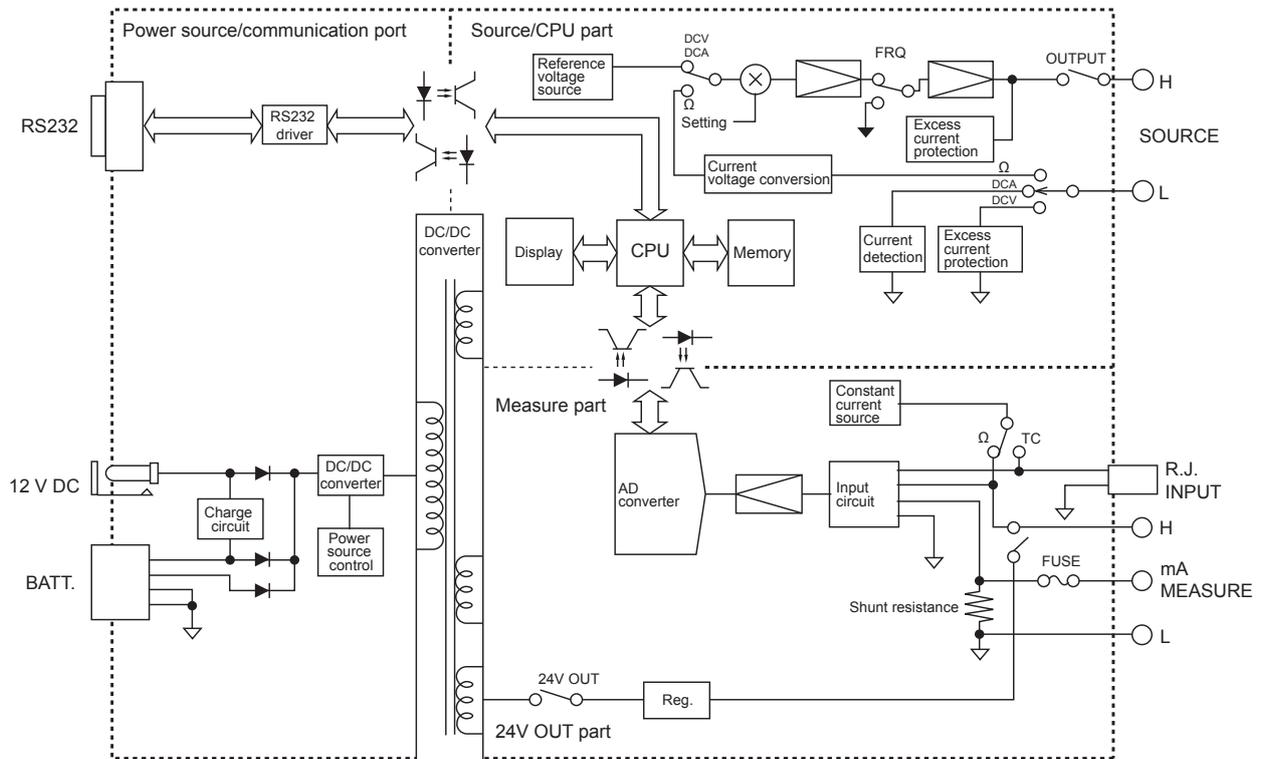
Safety standards:  
EN61010-1  
Pollution degree 2  
Measurement category I

EMC: EN61326 Class B  
EN55011 Class B Group 1  
EN61000-3-2  
EN61000-3-3  
Conditions of EMC:  
Use an AC adapter (94010), an RJ sensor, RS232 cable (Shielded cable, less than 30 m) and the included lead cable.  
For the lead cable, wind a designated ferrite core (A1193MN) two turns toward the main body of the instrument.

## External Dimensions



## Block Diagram



## ■ Supplied Accessories and Optional Accessories (sold separately)

### ● Supplied Accessories

	Lead cable for source	Lead cable for measurement	Carrying case	Terminal adapter
<b>Product name</b>				
<b>Model name</b>	98020	RD031	93026	99022
<b>Remark</b>	One set of 1 red and 2 black cables Length: Approx. 1.7 m	One set of 1 red and 1 black cables Length: Approx. 1.0 m	Lead cables for source/measurement, terminal adapter, 6 spare batteries, fuse, AC adapter and Instruction Manual can be stored.	Used for temperature measurement.

### ● Optional Accessories (sold separately)

	AC adapter	RJ sensor	Accessory storage case	NiMH battery	Main body case										
<b>Product name</b>															
<b>Model name</b>	94010	B9108WA	B9108XA	94015	93027										
<b>Remark</b>	<table border="1"> <tr> <td>-D</td> <td>For UL/CSA Standard</td> </tr> <tr> <td>-F</td> <td>For VDE Standard</td> </tr> <tr> <td>-H</td> <td>For GB Standard</td> </tr> <tr> <td>-R</td> <td>For SAA Standard</td> </tr> <tr> <td>-S</td> <td>For BS Standard</td> </tr> </table>	-D	For UL/CSA Standard	-F	For VDE Standard	-H	For GB Standard	-R	For SAA Standard	-S	For BS Standard	For reference junction compensation	Lead cables, RJ sensor, etc. can be stored.	NiMH battery Dedicated	With strap and accessory storage case
-D	For UL/CSA Standard														
-F	For VDE Standard														
-H	For GB Standard														
-R	For SAA Standard														
-S	For BS Standard														