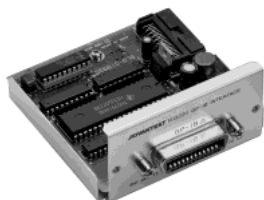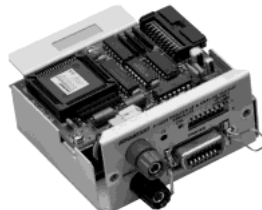## R13220, R13015, R13223, R13016, R13221, R15807, R13222

R13220
GPIB Interface Unit

R13015
BCD Data Output Unit

R13223
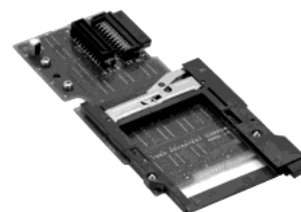**Printer I/F & Analog Output Unit**

R13016
Digital Comparator Unit

R13221
Printer Interface Unit

R15807
Battery Unit

R13222
Memory Card Interface Unit

R13220 GPIB Interface Unit

Electrical specifications: Conforms to IEEE488-1978 and IEC625-1.
Mechanical specifications: Conforms to IEEE488-1978.
Connector: 24-pin Amphenol
Interface specifications: SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT1, C0, and E2
Code system: ASCII code
Address designation: 31 talker/listener addresses can be set from the front panel of the main unit.

R13015 BCD Data Output Unit

Output data: BCD parallel code
Output data contents: Measured data, decimal point, polarity and unit (output only at first display unit)
Print command signal output: TTL-level positive logic (with a pulse width of approx. 1 ms)
External start signal:
    A (Data output): TTL-level positive logic
    (with a pulse width of 100 μs to 10 ms)
    B (Remote control input): TTL-level negative logic
    (with a pulse width of 100 μs to 10 ms), Input impedance of approx. 10 kΩ
External control: Function, range, buzzer on/off, sampling mode, sampling rate, null calculation and comparator calculation
Connector: Data output DHA-RC50 DDK
    Remote input 57-40240 DDK

R13223 Printer I/F & Analog Output Unit

Printer I/F section: Same as the R13221.
Analog output section
Output voltage: 0 V to +0.999 V (+1 V output at the time of IVFS calibration)
Number of conversion digits: 8 to 9 types of digits can be selected by means of the DIP switch on the accessory panel (rear panel of the main unit)
Conversion output: Can be selected from NORMAL, OFFSET NORMAL, ABSOLUTE, or OFFSET ABSOLUTE.
Conversion accuracy: ±0.2% of the full scale (0°C to 50°C), 85% RH or less, for 1 year)
Output impedance: Approx. 180 Ω
Output terminal: Binding post

R13016 Digital Comparator Unit

Comparison level: Upper and lower limits (HIGH LIMIT/LOW LIMIT
Determination condition:
    HIGH   Measured data > HIGH LIMIT
    PASS   HIGH LIMIT ≥ Measured data ≥ LOW LIMIT
    LOW   Measured data < LOW LIMIT
Level setting: Set from the front panel of the main unit.
END signal: TTL-level, negative logic (with a pulse width of approx. 1 ms)
Contact output: Optical MOS relay HI, PASS, LO
Contact capacity: Allowable switching voltage of 50 V and allowable switching current of 0.1 A
Dielectric strength: 200 V (between input/output signal and chassis)
Transistor output: Open-collector output
    Maximum collector voltage/current of 50 V/0.3A
Buzzer output: Generated when the comparison result is HIGH, PASS, LOW or HIGH/LOW.
Connector: 57-40140 DDK

R13221 Printer Interface Unit

Output code: Centronics
Output data contents: Measured data, decimal point, polarity and unit
Printing interval: Continuous, 5 seconds to 4 hours
Setting: Set from the main unit panel.
Connector: 57-40140 DDK

R15807 Battery Unit

Built-in battery : 12 V lead storage battery
Capacity : 1.8 Ah
Charging method : Fully charged for approx. 12 hours with the main unit power turned off and power supply connected.
Low-battery indication : Displayed on the front panel of the main unit. Goes on for a remaining time of 2 hours. Does not affect main unit specifications.
Weight : 1 kg maximum

R13222 Memory Card Interface Unit

Available card : A09507 (64 kbytes): SRAM card conforming to JEIDA ver.4 (with attribute information)
Memory contents : Measured data and panel settings are stored with DOS format. (Up to 128 files and up to 4000 data items are stored.)

TR21142
Input Block

TR21143
Input Block

TR19001
Auto Channel Selector

TR13206A
GPIB Adaptor

TR21142 Input Block

This 2-channel/2-wire input block enables differential temperature measurement using the same thermocouple type, in addition to DC voltage difference measurement using the same voltage range setting from 20 mV to 2000 mV.

TR21143 Input Block

This input block is intended for use in combination with the TR19001 Auto Channel Selector and enables execution of measurement channel increment, decrement and automatic scan commands.

TR19001 Auto Channel Selector

One or more of these units, used in combination with the TR21143 Input Block enables each channel selector unit to input and automatically switch up to 10 channels (5 channels for 3/4-wire inputs). Up to four of these units may be connected, expanding the input capability to 40 channels. The use of the TR13206 GPIB Adaptor Unit enables the channel selection of these units to be externally controlled.

——— **Specifications** ———

No. of channels: 10 (5 for 3- or 4-wire configuration)
Up to four TR19001's may be connected, enabling expansion up to 40 channels.
Input signal:
DC Voltage: ±20 mV, ±200 mV, ±2 V, ±20 V, Ranges
Resistance: 200 Ω, 2000 Ω, 20 k Ω, 200 k Ω, and 2000 k Ω ranges (2/3/4-wire configuration)
Thermocouple temperature: Conforms to TR2114/2114H specifications.
Resistance bulb temperature: 2-, 3-, and 4-wire
Signal path resistance: 1 Ω or less (2-wire), 0.15 Ω or less (3 wire) (For 3-wire measurement, a resistance difference of 0.15 Ω (0.5°C) is added to the accuracy of the main unit.)
Dimensions: Approx. 185 (W) × 40 (H) × 260 (D) mm
Weight: 1.4 kg max.

TR13206A GPIB Adapter

This unit is useful when using the TR2114H as an automatic measurement system with GPIB control. It features full remote control of the entire measurement section of the TR2114H.

——— **Specifications** ———

Electrical specifications: Conforms to IEEE 488-1978 and IEC 625-1 standards
Mechanical specifications: Conforms to IEEE 488-1978 standard
Interface functions: SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT1, C0, E2

Digital Multimeters

TR1100 Series

The main requirement for precise temperature measurement is an accurate thermometer. There are many other factors, however, to obtain the optimum precision for your purpose, you must choose the best sensor and use it properly according to its characteristics.

If you are using a thermocouple, the precision varies widely depending on the element wire selected, deterioration due to environmental conditions, periodic inspections, repairs and replacement. The optimum temperature measuring unit must be selected by taking into account the state of the specimen (gas, liquid or solid), measuring status, environmental conditions, measurement range, thermal capacity and requested precision.

Temperature Measuring Sensor Selection Guide (For other temperature sensors, consult ADVANTEST.)

Classification	Model	Description	Temperature measurement range*1	Reference page
Sheath-type thermocouple	TR1101-100	T (CC)	-200 to +300°C	227
	TR1101-110	J (IC) Sheath outer diameter: 1.6 mm ø	-200 to +600°C	
	TR110x1-120	E (CRC) Sheath length: 150 mm	-200 to +600°C	
	TR1102-100	T (CC)	-200 to +300°C	227
	TR1102-110	J (IC) Sheath outer diameter: 1.6 mm ø	-200 to +600°C	
	TR1102-120	E (CRC) Sheath length: 600 mm	-200 to +600°C	
	TR1102-130	K (CA) Testable type (0°C or more)	-200 to +600°C	
	TR1103-100	T (CC)	-200 to +300°C	227
	TR1103-110	J (IC) Sheath outer diameter: 1.6 mmø	-200 to +600°C	
	TR1103-120	E (CRC) Sheath length: 150 mm	-200 to +600°C	
	TR1103-130	K (CA) Shielded	-200 to +600°C	
Sheath-type platinum resistance bulb	TR1104-001	JPt 100 Ω Sheath outer diameter: 3.2 mmø, 150 mm sheath length:	-200 to +200°C	226
	TR1104-002	JPt 100 Ω Sheath outer diameter: 1.0 mm ø, 150 mm sheath length:	-200 to +200°C	
Internal temperature detecting sensor	TR1104-010	JPt 100 Ω probe, needle-shaped	-200 to +200°C	226
Ultra-low temperature detecting sensor	TR1105	Chrome-gold +0.07% iron (element wire)	4 to 280K	226
	TR1106	Normal silver-gold +0.07% iron (element wire)	4 to 40K	
Surface temperature detection sensor	R1107A-01	E (CRC) Probe-type general-purpose sensor with 25 mm ø head	0 to +500°C	225
	R1107A-02	E (CRC) Probe-type general-purpose sensor with 12 mm ø head	0 to +400°C	
	R1107A-03	E (CRC) Probe-type L-shaped sensor with 12 mm ø head	0 to +250°C	
	R1107A-04	E (CRC) Probe-type L-shaped sensor with 12 mm ø head	0 to +400°C	
	R1107A-05	E (CRC) Probe-type general-purpose sensor with 12 mm ø head	0 to +300°C	
	TR1108-001	T (CC) Sheet type	-200 to +150°C	225
	TR1108-010	JPt 100 Ω Sheet type	-50 to +150°C	225

* 1 The measuring temperature range means the range covered by each sensor.

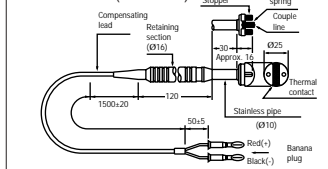R1107A-01

R1107A-03

R1107A-02

TR1108-001

TR1108-010

R1107A/TR1108 Series
Surface Temperature Sensors

Specifications

R1107A-01	R1107A-01	R1107A-02	R1107A-03	R1107A-04	R1107A-05
Application	Research and experiment	Field measurement	Research and experiment	Field measurement	Field measurement
Shape	General-purpose sensor for static surface	General-purpose sensor for static surface	L-shaped couple line and hold part right angles for static surface	L-shaped couple line gand hold part right angles for static surface	General-purpose sensor for static surface
Head diameter	25 mm ø	12 mm ø	12 mm ø	12 mm ø	12 mm ø
Temperature measurement range (heat-sensitive range)	0°C to 500°C	0°C to 400°C	0°C to 250°C	0°C to 400°C	0°C to 300°C
Operating temperature range (hold and cable sections)	0°C to +90°C				
Thermocouple type	E (CRC)				
Class	JIS C1602-1981 class 0.75 class (± 2.5°C or 0.75% of measured temperature, whichever is larger.)				
Cable length	Approx. 1.5 m				
Remarks	Couple (general-purpose or L-shaped) for static surface made by Anritsu Keiki or equivalent				
Type	N-171E-00	N-321E-00	N-314E-00	N-324E-00	N-331E-00

Specifications

	TR1108-001	TR1108-010
Temperature measurement range (heat-sensitive part)	-200 to +150°C	-50 to +150°C (Measuring current: 2mADC)
Operating temperature range (cable part)	0 to +90°C	0 to +90°C
Sensing element	T (CC) thermocouple	Platinum resistance bulb (JPt 100)
Class	JIS-1602-1981 class 0.75	JIS-C-1989 class B
Tolerance	±1°C or ± 0.75% of measured temperature, whichever is larger. (0°C to +150°C)	JIS -50 to +100°C 0.8°C ± 0.015 (t-100)°C/100 to +150°C
Response speed	Approx. 0.1 s (90% of the value in 25°C static water)	Approx. 0.2 s (90% of the value in 25°C to 100°C static water)
Structure	Sheet type (sheet-type thermocouple covered with an insulating paper)	Sheet type (shielded with silicon rubber)
Sheet size	7 x 7 x 0.2 (thickness) mm	7 x 12 x 1 (thickness) mm
Mounting on curved surface	Not possible	Not possible
Mounting method	Sticking, solderless contact, taping or pressure	Sticking, pinching or taping
Connected conductor	Glasswool-insulated thermocouple Approx. 5 m	Three-core silicon-insulated conductor Approx. 2 m
Remarks	Thermocouple sheet PR6452/A/OO type from PHILIPS is used.	R060-13SP from Chiba Seisakusho or equivalent

*The measurement accuracy of the thermometer is not included.
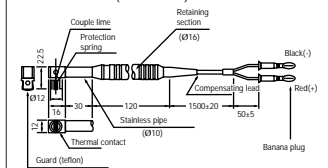
R1107A-01 overview and dimensions (Unit: mm)
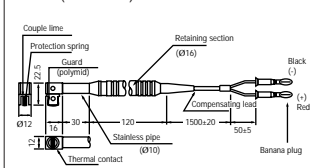

R1107A-02 overview and dimensions (Unit: mm)
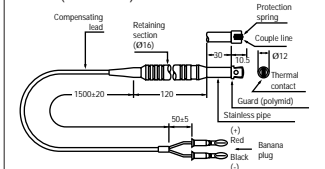
R1107A-03 overview and dimensions (Unit: mm)

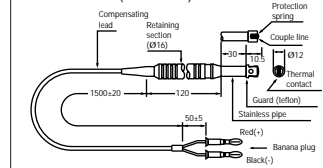R1107A-04 overview and dimensions (Unit: mm)

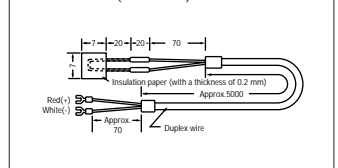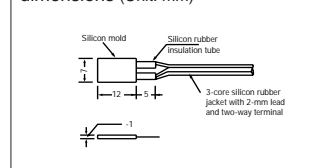R1107A-05 overview and dimensions (Unit: mm)

TR1108-001 overview and dimensions (Unit: mm)

TR1108-010 overview and dimensions (Unit: mm)

Digital Multimeters

TR1100 Series

TR1104-010

TR1104 Series

TR1105/1106
Thermocouple for Very Low Temperature Measurement

———— Specifications ————
Ingredients and applicable temperature range
Structure and shape: Shielded thermocouple (element wire

Ingredients		TR1105	TR1106
	+ leg	Chrome	Normal Silver
	- leg	Gold +0.07% iron (Au-0.07% Fe)	Gold +0.07% iron (Au-0.07% Fe)
Measurement range		4 K to 280 K	4 K to 40 K

shielded with polyester for insulation) wound round bobbin
Length: 10 m each
Element wire diameter: 0.2 mm (0.24 mm when shielded)
Accessory: NBS reference table
 Electromotive forces at the melting points of liquid nitrogen and
 hydrogen
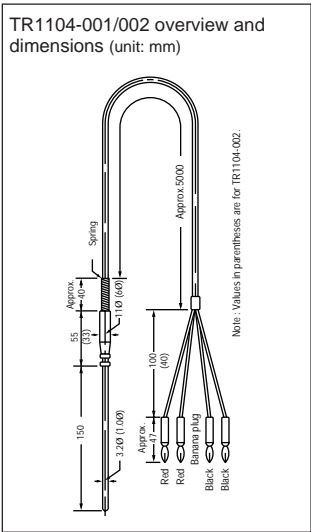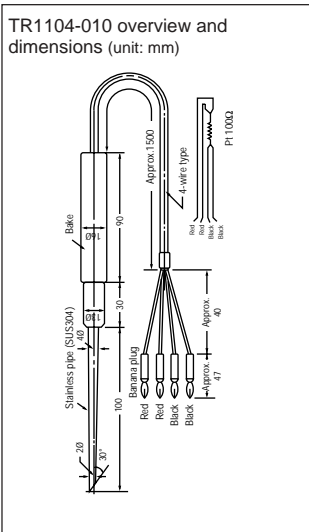
TR1104-010
Internal Temperature Measuring Sensor

———— Specifications ————
Sensing element: Platinum resistance bulb (JPt), 100 Ω (0°C)
Conductor type: 4-wire type
Measuring temperature range: -200°C to +200°C
Class: Class A for middle temperature measurement according to JIS
 C1604-1989 (for middle temperature)
Tolerance: ±0.15°C ±0.2% of measured temperature (0°C to 200°C)
Rated current: 2 mA
Connection cable: Four-wire cable, Approx. 1.5 m
Heat-sensitive part length: Approx. 50 mm from sheath end
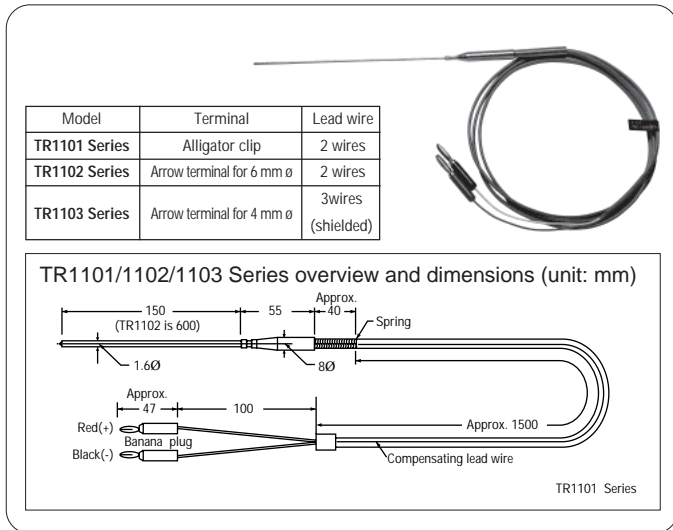
TR1104 Series
Sheath-Type Platinum Resistance Bulb

	TR1104-001	TR1104-002
Class	JIS-C1604-1989 (for middle-range temperature), class A	
Tolerance *1	±0.15°C ± (0.2% of measured temperature) (0°C to 200°C)	
Measured temperature range	-200 to +200°C	
Sensing element	Platinum resistor bulb (JPt), 100 Ω (0°C)	
Rated current	2 mA	
Lead type	4-wire	
Sheath length	150 mm	
Sheath diameter	3.2 mm ø	1.0 mm ø
Sheath material	Stainless SUS316	Stainless SUS304
Response speed *2	Typ. 6 seconds	Typ. 1 second
Heat-sensitive part length	Approx. 20 mm from sheath end	Approx. 15 mm from sheath end
Cable length	Approx. 1.5 mm	

*1 The measurement accuracy of the thermometer is not included.

*2 90% of the response speed obtained when inserted into boiled water (100°C) from room
 temperature

TR1104-010 overview and
dimensions (unit: mm)

TR1104-001/002 overview and
dimensions (unit: mm)

* TR1104-002 has no spring.

Accessories for Temperature Measuring Sensors and Thermometers

TR1100 Series, TR7021

Model	Terminal	Lead wire
TR1101 Series	Alligator clip	2 wires
TR1102 Series	Arrow terminal for 6 mm ø	2 wires
TR1103 Series	Arrow terminal for 4 mm ø	3wires (shielded)

TR1101/1102/1103 Series overview and dimensions (unit: mm)

TR1101/1102/1103 Series
Sheath-Type Thermocouples

The TR1101/1102/1103 Series sheath-type thermocouples consist of a very thin metal pipe, thermocouple wires and insulation material. The gap between the metal pipe and thermocouple wires is filled with the insulation material to make it airtight and prevent the gases in the air or high temperature from corroding the thermocouple, changing the electromotive force or cutting the wires. The sheath-type thermocouples are easy to set or bend because their outer diameter is small; they have many other advantages.
The optimum thermocouple can be selected from five types according to the temperature measuring range and operating environments.

— **Specifications** —

Class: JIS C1602-1981 class 0.75 (JIS C1602-1974 class 0.25 for PR thermocouple)
Sheath outer diameter: 1.6 mm ø
Sheath length: 150 mm (TR1101/1103 Series), 600 mm (TR1102 Series)
Hot junction type: Non-ground type
Logarithm: 1
Bend radius: Two or more times R of sheath outer diameter
Sheath material: Stainless SUS316 (inconel for PR thermocouple)
Response speed: Approx. 0.4 s typ. (90% of the value when the resistance bulb is dipped into 100°C boiling water after being at room temperature)
Insertion depth: 15 to 20 times the length from the tip to the middle of the sheath
Cable length: Approx. 1.5 m
Temperature range and tolerance: (* **Measurement accuracy of thermometer not included.**)

Model	Thermocouple type	Measurement temperature range (°C)	Class	Tolerance
TR1101/1102/1103-100	T (CC)	-200 to +300	JIS class 0.75	±1°C or ±0.75% of measured temperature
TR1101/1102/1103-110	J (IC)	-200 to +600	JIS class 0.75	±2.5°C or ±0.75% of measured temperature
TR1101/1102/1103-120	E (CA)	-200 to +600	JIS class 0.75	
TR1101/1102/1103-130	K (CRC)	-200 to +600	JIS class 0.75	

Note: The tolerance is either the value in °C or % whichever is larger. It is applied only when the measured temperature is above 0°C.

TR7021
Automatic Reference Cold Contact Compensator

This unit is a reference cold contact compensator for temperature measurement using thermocouples. With the capability to retain the internal temperature to 0°C, it has easier operability than conventional ice-type contacts and realizes cold contact compensation with high accuracy.

— **Specifications** —

Set reference temperature: 0°C
Sensor insertion hole: 7 mm ø × 4
Reference temperature accuracy:

Ambient temperature	Reference temperature stability	Ambient temperature	Reference temperature stability
5°C	0 to 0.005°C	20°C	0 to 0.02°C
10°C	0 to 0.01°C	25°C	0 to 0.025°C
15°C	0 to 0.015°C	30°C	0 to 0.03°C

Control temperature variation: ±0.001°C to ±0.005°C
Power supply: 100 VAC ± 10%, 50/60 Hz, 125 VA or less
Dimensions: Approx. 180(W) × 280(H) × 260(D) mm
Weight: Approx. 14.5 kg max.