HAKKO

HAKKO THERMO METER 191

INSTRUCTION MANUAL

1. Specifications

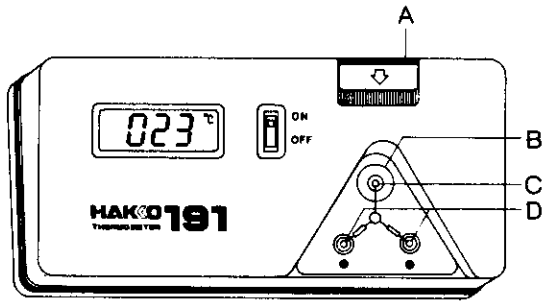
❶ Body

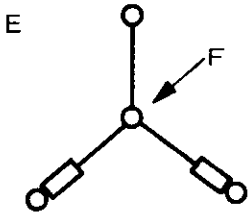
	Centigrade Type	Fahrenheit Type
No.	191	191B
Resolution	1°C	1°F
Range of Measurement	0℃~600℃	0°F~1200°F
Applied Sensor	K (CA) Thermocouple	
Precision	±5℃	±10°F
Display	a) 3.5—digit Liquid Crystal Display b) Battery Alarm ▮□□□ c) Burnout -1□□□	
Power Supply	006P, 9V Dry Battery	
Battery Life	More than 150 hours	
Outer Dimensions	160(W)×45(H)×80(D)mm 6.3 ×1.8 ×3.1 in	
Weight	Approx. 200g (0.441 lbs.)	
Environmental Temperature Range	0℃~40℃ 0°F~104°F	

❷ Accessories

- 10 Sensors
- 006P 9V Dry Battery
- Ring Plate

2. Name of Parts





A. Slide Button
B. Ring Plate
C. Slide Pole
D. Terminal
E. Sensor
F. Measuring Point

3. Operating Instruction

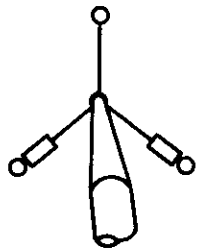
❶ Open the battery case on the back of the unit and insert the battery.
Be sure the battery is properly aligned.

❷ Attach the ring plate to the slide pole.

❸ Attach the red side of the sensor to the red terminal and blue side to the blue terminal. Push the slide button and attach the remaining to the terminal.

❹ Turn the power switch on and check the diplay. When the display indicates room temperature, it's ready for use.

❺



Place fresh solder on the tip and apply the tip to the point to be measured.
The temperature will be displayed in 2to 3 seconds.

❻ Turn the unit off while it is not use.

4. Precaution

❶ The sensors are made of very thin (0.2φ) CA wire. Handle them with care. Do not apply heavy pressure or they will break.

❷ The body is made of plastic. Do not touch the body with the soldering tip.

❸ The measuring point is coated with a special metal alloy which will wear away after repeated measurements, resulting in inaccurate readings. Replacing the sensor with a new one will restore the measuring accuracy. The sensor has a useful life of approximately 50 readings.

❹ Use alcohol to remove any flux adhering to the terminal. Do not use thinner or benzine.

HAKKO U.S.A.

191 AND 191B CALIBRATION INSTRUCTIONS

Tools Required: 1 ea. Room Temperature Thermometer ± 1°F
1 ea. Regulated DC Power Supply or Thermometer Calibrator
(Such as a Yokogawa Model 2422 11)
1 ea. #1 Phillips Screwdriver

1. Let the unit set a room temperature (68°F ± 6° or 23°C ± 3°) for at least 30 minutes.
2. Remove the 4 Phillips screws holding the 2 halves of the case together.
3. Leaving the battery in place, take the 2 halves apart.
4. Remove the 2 Phillips screws securing the PCB.
5. Turn the PCB over so that the component side of the board is accessible.
6. Remove the sensor wire from the posts on the cover and put a jumper wire across the red and blue sensor posts.
7. Turn the power switch "on".
8. Note the room temperature and adjust the VR1 potentiometer (see figure 1) so that the digital display is the same as the room temperature. CAUTION: Do not touch the sensor RTH 1 (see figure 1) during this process. Doing so will cause an erroneous reading on the digital display during adjustment.
10. Attach the leads from the regulated DC power supply to the sensor posts on the 191 or 191B: positive (+) lead tot he red post and negative (-) lead to the blue post. If you are using a thermometer calibrator, skip instruction 11 and follow the instructions for the unit. Use the VR2 to adjust the reading on the digital display.
11. Using the chart below, apply the three different voltages. The 191 display should read the given temperature on the chart plus room temperature. If there is any discrepancy between the 191 digital display and the chart below, adjust the VR2 until the digital display is correct. The factory tolerance on the 191 is ±5°F(±3°C). **Note:** When calibrating the 191B follow the same procedure as with the 191 and convert to degrees fahrenheit.

191 (°C)	191B (°F)	mV Setting
300° + Room Temp in °C	→ Convert to °F	12.207
400° + Room Temp in °C	→ Convert to °F	16.395
500° + Room Temp in °C	→ Convert to °F	20.640

12. If the unit cannot be calibrated, please call Hakko for an RMA number and send it back for repair.
13. Screw the PCB back into place.
14. Screw the 2 halves of the case back together making sure the black plate covering the switch is in place.

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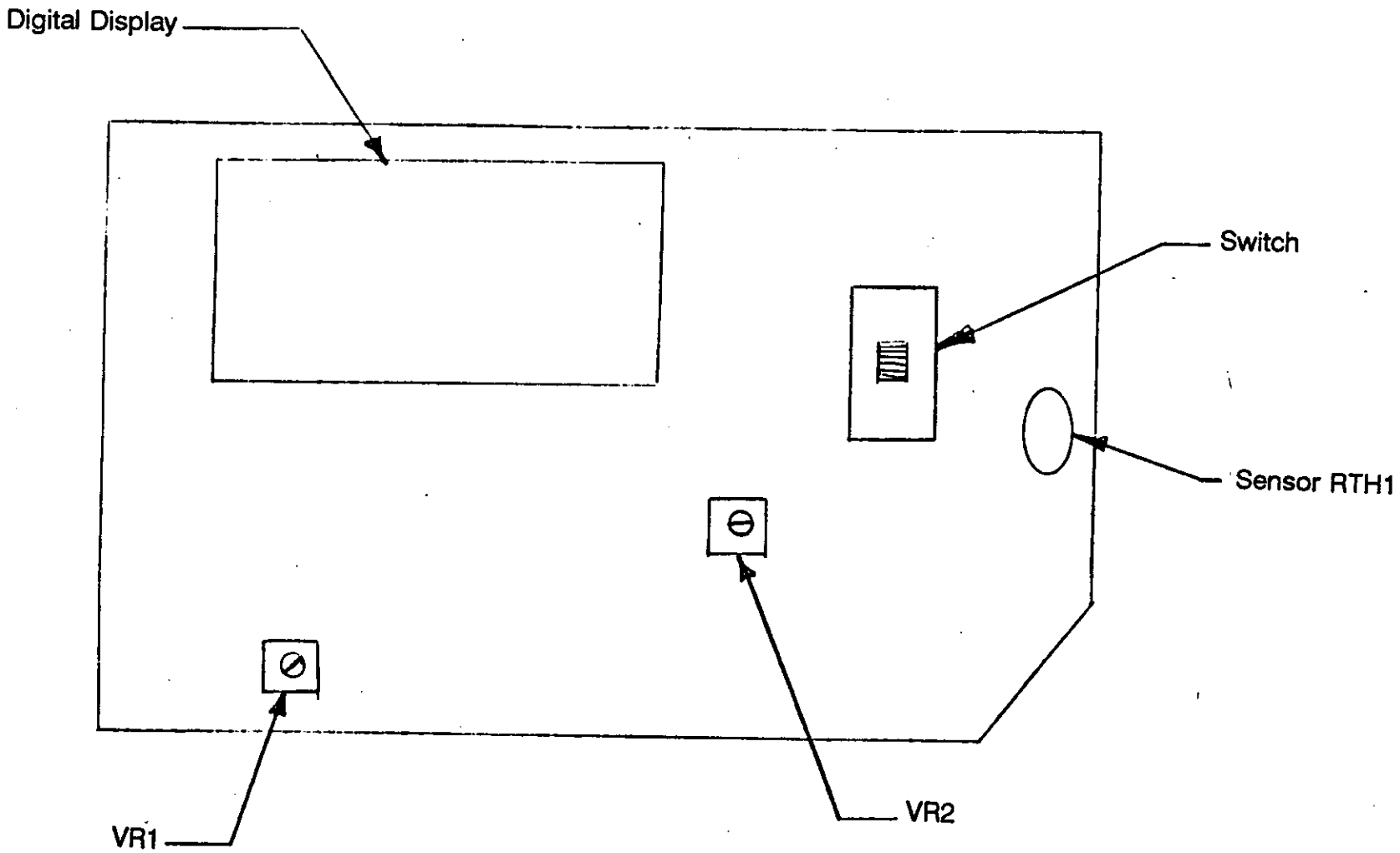
Figure 1

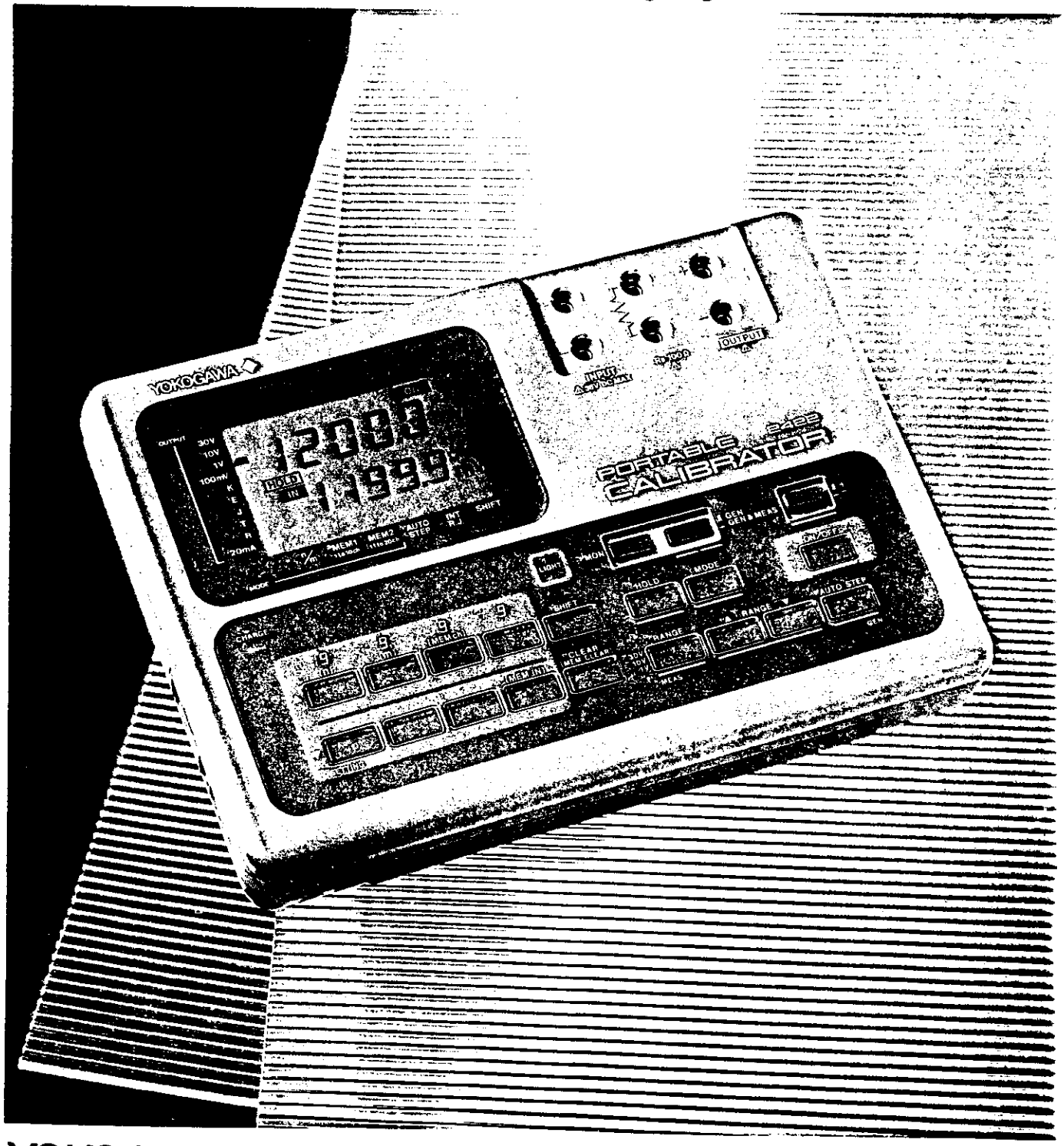
191 and 191B PCB



Portable Calibrator Model 2422

A new DC standard is now available which allows simultaneous use of precision source and measurement functions.

- Corresponds to DC V, DC mA and thermocouple e.m.f. (Types K, E, J, T and R)
- Small, light and Ni-Cd battery powered with EL back lighting.



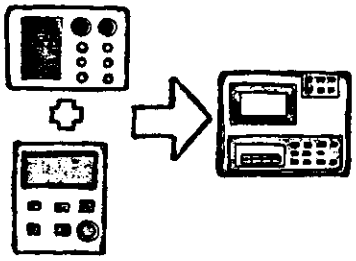
YOKOGAWA

Bulletin 2422-E

Standard DC source and DVM functions are combined into one unit. Because it is so compact, this intelligent portable calibrator displays its real capability in the field.

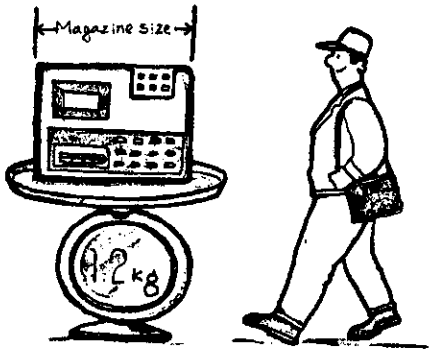
Simultaneous displays for output generation and input measurement

The Model 2422 is equipped with a measuring function in addition to the DC standard generator function which is capable of generating DCV, DCmA and thermo-e.m.f. This combination produces simultaneously displaying of both generation and measurement values on its LCD display unit. The Model 2422 calibrator can cope with a wide range of applications which in the past have required a standard generator and a DVM.



Small and light weight

Because the Model 2422 is the size of a magazine and weighs only 1.2kg (2.7lbs), it has superior portability which makes it ideal for field use.



Auto stepping output function

Since the auto stepping output function is provided to output dividing and set-value memory functions, it is very useful for shortening service time when instruments such as measuring and industrial instruments are repeatedly adjusted and calibrated.

Output dividing function

The Model 2422 is supplied with an output dividing function which can divide and set the output set-value freely from 1 to 15, and is therefore most suitable for checking recorder linearity.

Set-value memory function

Output set-values corresponding to a maximum of 20 channels can be stored. Frequently used set-values can be generated through one-touch key operation.

Direct thermometer calibration

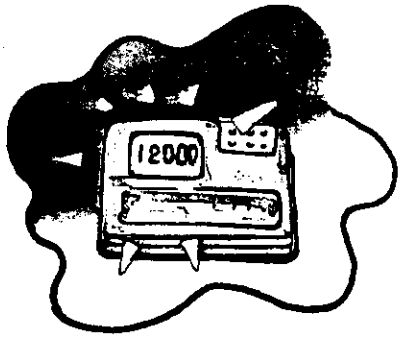
The Model 2422 can generate DC voltage equal to thermo-e.m.f. by directly setting the temperature using any of the 5 most frequently used thermocouple types (Types K, E, J, T and R). In addition, an optional reference junction (RJ) sensor is available for calibration.

Built-in Ni-Cd battery/AC power drive

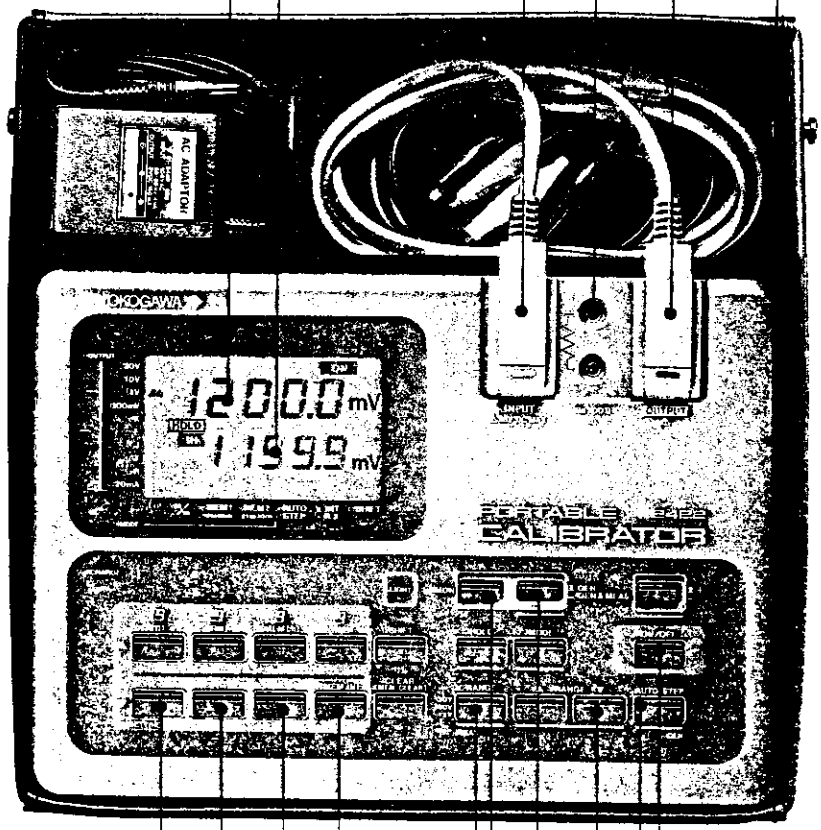
The Model 2422 has a built-in Ni-Cd battery to provide the portability required of a field calibrator. It is also supplied with an AC adapter which enables it to use AC power supplies.

EL back lighting

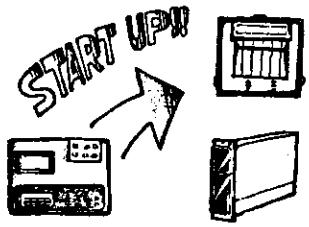
The Model 2422 employs a large, EL back-lit display unit on which set values and measured values can be easily read, even under low light conditions.



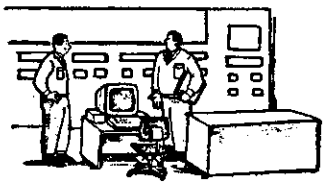
The Model 2422 can cope with a wide range of applications such as field servicing as well as equipment testing and inspection in any lab.



■For industrial instrument servicing and start-up



■For research, development and experimenting at manufactures of various electric equipment and appliances, as well as production machinery.

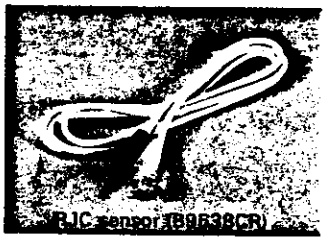


■On the production lines of manufacturers of various electric equipment and appliances, as well as with production machinery.

■For tests and experiments at universities and research institutes.

Models available:

Model Number	Description		Temp Unit
	AC Adapter	Corresponding thermocouple-e.m.f.	
2422 11	120 V	ANSI	°C/°F
2422 12	220 to 240 V	ANSI	°C
2422 21	220 to 240 V	DIN	°C


RJC sensor (B9638CR)


Terminal block (B9638BM)

Specifications:

	Range		Generating and measuring ranges	Accuray (23°C±5°C) *1	Resolution	Max. output	Remarks
Generation range	30 V 10 V 1 V 100 mV		0 to ±36.00 V 0 to ±12.000 V 0 to ±1200.0 mV 0 to ±120.00 mV	±(0.05% of rdg + 0.06% of range) ±(0.05% of rdg + 0.02% of range) ±(0.05% of rdg + 0.02% of range) ±(0.1% of rdg + 0.02% of range)	10 mV 1 mV 100 μV 10 μV	Approx. 5 mA Approx. 20 mA Approx. 20 mA —	— Internal resistance Approx. 5Ω
	TC	K	−200.0 to +1372.0°C −328 to +2502°F	±(0.1% of rdg +0.5°C)/±(0.1% of rdg + 2°F) *2	0.1°C 1°F	—	Internal resistance Approx. 5Ω
		E	−200.0 to +700.0°C −328.0 to +1292.0°F	±(0.1% of rdg + 0.5°C)/±(0.1% of rdg + 1.0°F) *2	0.1°C 0.2°F		
		J	−200.0 to +1000.0°C −328.0 to +1832.0°F				
		T	−200.0 to +400.0°C −328.0 to +752.0°F				
		R	−40 to +1769°C −40 to +3216°F	±(0.1% of rdg +1.5°C)/±(0.1% of rdg +2.7°F) *2	1°C 1°F		
	20 mA		0 to ±24.00 mA	±(0.05% of rdg + 0.06% of range)	10 μA	Approx. 12 V	—
	Reference resistance		100Ω	±0.2%	—	—	—
Measuring range	30 V 10 V 1 V		±36.00 V ±11.999 V ±1199.9 mV	±(0.05% of rdg + 0.06% of range)	10 mV 1 mV 100 μV	—	Input resistance Approx. 1 MΩ
	Simultaneous use of generation and measurement is possible. Input terminals are isolated from output circuit.						

*1) Voltage drop due to the load current through the attached lead is not included. Lead resistance is about 0.08 Ω.
*2) Accuracy at TC range does not include that of the RJC (reference junction compensation). Sensor accuracy is added for output correction due to changes in RJ temperature, output is corrected at the above 10 sec. intervals.

Setting time: Approx. 1 sec.
(In the generation only mode and when no RJC is provided.)
Divided output: Output=Set value×n/m
m (No. of division) ≦15
n=0, 1, 2 ... m
Set-value memory: 20 steps (10 steps×2, Excluding polarity signal)
With battery back-up
Auto step: n/m and memory channel automatic feed (However, within the same range)
Step time; 2, 5, 10, 20 sec.
Output monitor: Load current monitor at 1, 10 and 30 V ranges
Accuracy ±0.2 mA
Load voltage monitor in 20 mA range
Accuracy ±0.2 V
Output limiter: Activated under load of more than maximum output (Manual return). However, not activated at 100 mV and thermo-e.m.f. generation ranges.
Output setting: 4-digit UP/DOWN
Display: LCD 4½ digits
Simultaneous display of generation/measurement is available.
EL back-lit illumination

Dielectric strength: 500 V DC for 1 minute
(Between input and output terminals)
Operating ambient temperature/ humidity: 5 to 40°C, 20 to 80% RH
Power supply: AC adapter
Built-in Ni-Cd batteries
Charging time: Approx. 16 h
Operating time: Approx. 3 h (Max. load)
Auto power-OFF: Approx. 1 h
Dimensions and Weight: Approx. 257 × 182 × 40 mm: Approx. 1.2 kg (2.7 lbs)
Accessories: AC adapter, Output and Measuring cables (one set)
Carrying case, Instruction manual
Accessories separately sold: RJC sensor (B9638CR)
Terminal block (B9638BM)
RJC sensor specifications: Measuring range −10 to +50°C
Accuracy (Combination with 2422)
±0.5°C (23°C ±5°C)
±1°C (−10 to +50°C)
Cable length: Approx. 1.5 m

YOKOGAWA

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