

User's
Manual

TY520, TY530

Digital Multimeter
デジタルマルチメータ

保証書付

Tequipment
.NET



205 Westwood Ave
Long Branch, NJ 07740
1-877-742-TEST (8378)
Fax: (732) 222-7088
salesteam@Equipment.NET

Store this manual in a safe place for future reference.

この取扱説明書は、いつでも使用できるよう
大切に保管してください。

Japanese/
English

Thank you for purchasing our Model TY520, TY530 Digital Multimeter.

This user's manual describes the specifications and handling precaution for this Digital Multimeter.

Before using this Digital Multimeter, thoroughly read this manual to get a clear understanding on proper use.

Always observe the following instructions.

Failure to do so may result in electric shock or other dangers that may lead to serious injury or the loss of life.

Yokogawa is in no way liable for any damage resulting from the user's mishandling of the product.

For safe use of this product, the following safety symbols are used on the product:

■ **About This Manual**

- Every effort has been made to ensure accuracy in the preparation of this manual. However, should any errors or omissions come to the attention of the user, please contact Yokogawa.
- The contents of this manual are subject to change without prior notice because of improvement in performance or function.
- All rights reserved. No part of this manual may be reproduced in any form without Yokogawa's written permission.

Regarding Safe Use of This Product

For safe use of this product, the following safety symbols are used on the product and manual:



WARNING

This indicates that the operator must refer to an explanation in the instruction manual in order to avoid the risk of serious injury or the loss of life.



CAUTION

This indicates that the operator must refer to an explanation in the instruction manual in order to avoid the risk of injury or damage to the product.

Note

This indicates information that is essential for handling the instrument or should be noted in order to familiarize yourself with the instrument's operating procedures and/or functions.



Danger! Handle with Care

This symbol indicates that the operator must refer to an explanation in the instruction manual in order to avoid risk of injury or death of personnel or damage to the instrument.



Double Insulation

This symbol indicates double insulation or reinforced insulation.



Direct Current

This symbol indicates DC voltage/current.



Alternating Current

This symbol indicates AC voltage/current.



DC/AC

This symbol indicates AC and DC.



Fuse

This symbol indicates a fuse.



Ground

This symbol indicates ground (earth).



■ **Always observe the following instructions. Failure to do so may result in electrical shock or other dangers that may lead to serious injury or the loss of life.**

Testing leads

- Use the probes supplied by Yokogawa with this instrument.
- Do not use testing leads that have deteriorated or are defective.
Check testing leads continuity.
- Disconnect testing leads from the circuit under test before opening the casing to replace the batteries or for any other reason.
- Disconnect testing leads from the circuit under test before attaching/detaching the testing leads to/from the instrument.
- Disconnect testing leads from the instrument before opening the casing to replace the batteries or for any other reason.
- A cap is provided on the tip of a testing lead.
Use a testing lead with the cap on for safety (safety standards: EN 61010-031).

Casing

- Do not use the instrument if there is any damage to the casing or when the casing is removed.

Fuses

- Use fuses of the specified rating when the fuse is replaced.

Operating Environment

- Do not operate the instrument in an atmosphere where any flammable or explosive gas is present.
- Avoid using the instrument if it has been exposed to rain or moisture or if your hands are wet.

Disassembly

- No person, except personnel from Yokogawa, is authorized to disassemble this instrument.
-

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1. Overview

- **Display**

4-digit (LCD)

Maximum Reading: 6000

Bar graph indicator

- **Supports a variety of measurement function**

Measurement function

DC Voltage, AC Voltage, DC Current, AC Current, Resistance, Frequency, Temperature, Capacitor, Continuity Check, Diode Test

Other functions

Data Hold (D•H), Auto Hold (A•H), Range Hold (R•H),

Maximum value* (MAX), Minimum value* (MIN), Average value* (AVG),

Zero Adjustment (Capacitor, Resistance), Relative values, Save to Memory*, LCD backlight.

*: For model TY530 only

- **Switching detection modes**

Effective value (root mean square value) detection (RMS) and mean value detection (MEAN) can be switched during AC voltage measurement (TY530 only).

- **Low-pass filter**

The low-pass filter can be switched on/off during AC voltage or AC current measurement.

- **Communication: optional communication package is required** (TY530 only).

- Measurement data can be transferred to a PC using an optional USB communication package.

The data can be read by certain applications to make trend graphs or can be converted into Excel files.

- The data can also be output from an optional printer via an optional RS232 cable.

- **Safety design**

Complied standards: CE standards

Uses a current-input terminal shutter for preventing wrong input.

Uses high-performance UL-standard fuses.

2. Measurement Category



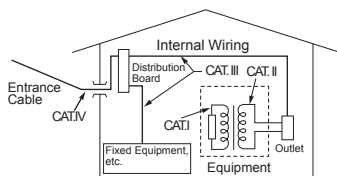
■ Measurement Category (CAT.)

The restrictions on the maximum voltage level for which the TY520, TY530 can be used, depend on the measurement categories specified by the safety standards.

Do not apply any input level higher than maximum allowable input.

AC/DC 1000V	CAT.III
AC/DC 600V	CAT.IV

Measurement category	Description	Remarks	
I	CAT. I	For measurements performed on circuits not directly connected to MAINS.	
II	CAT. II	For measurements performed on circuits directly connected to the low voltage installation.	Appliances, portable equipment, ect.
III	CAT.III	For measurements performed in the building installation.	Distribution board, circuit breaker, ect.
IV	CAT. IV	For measurements performed all the source of the low-voltage installation.	Overhead wire, cable systems, ect.



Note

Radiation immunity affects the accuracy of the TY520, TY530 under the conditions specified in EN61326-1.

Use of this instrument is limited to domestic, commercial, and light industry applications. If equipment generating strong electromagnetic interference is located nearby, the instrument may malfunction.

3. Specifications

3.1 General Specifications

Measurement function:

DC Voltage, AC Voltage, DC Current, AC Current, Resistance, Frequency, Temperature, Capacitor, Continuity Check, Diode Test

Other functions:

Data Hold (D•H), Auto Hold (A•H), Range Hold (R•H), Maximum value* (MAX), Minimum value* (MIN), Average value* (AVG), Zero Adjustment (Capacitor, Resistance), Relative values, Save to Memory*, LCD backlight.

*: For model TY530 only

Measuring method:

$\Delta\Sigma$ modulation

Display:

4-digit (LCD)/7-segment

Maximum Reading: 6000

Polarity Indicator: “-” Appears automatically when the polarity is negative

Overrange Indicator: “OL”

Low-battery Indicator: “” Appears when the batteries become low

Measurement cycle:

5 times per second

(except frequency measurement : one time per second, Resistance measurement (6M Ω /60M Ω) : 2.5 times per second, capacitor measurement (1000 μ F) : max.0.14 time per second)

Bar graph display approx 25 times per second (at AC, Ω)

Operating temperature and humidity ranges:

-10 to 55°C, 80%RH or less (no condensation)

70%RH or less at 40 to 55°C.

Storage temperature and humidity ranges:

-30 to 70°C, 70%RH or less (no condensation)

Temperature coefficient:

(Accuracy at 23 \pm 5°C \times 0.1) $^{\circ}$ C should be added.

(Temperature ranges: -10 to 18°C and 28 to 55°C)

Power supply:

AA-size (R6/LR6) 1.5V batteries: 4

Battery life:

Approximately 300 hours

(Operating hours of alkaline batteries when in DC voltage-mode.)

Note: The battery life varies depending on the operating conditions.

Insulation resistance : 1000V DC, 100M Ω or more

Withstand voltage: 6.88kVrms AC for five seconds
 (across input terminals and casing)

External dimensions: Approximately 90(W)×192(H)×49(D)mm

Weight: Approximately 570g (including batteries)

Complied standards: Safety standards
 EN61010-1, EN61010-031
 CAT.III (Max. input voltage: AC/DC1000V)
 CAT.IV (Max. input voltage: AC/DC600V)
 Pollution degree 2, indoor use,
 2000m max. above sea level

EMC standards
 EN61326-1 Class B
 EN55011 Class B Group 1

Effect of radiation immunity:

In the radio-frequency electromagnetic field of 3 V/m, accuracy is within five times the rated accuracy.

Standard accessories: Batteries : 4

Testing leads: 1set (Model 98015)

Fuse (included): 440mA/1000V (99015), 10A/1000V (99016)

User's manual: 1

Blank cover: 1

Optional accessories: Carrying case

93029

(for the main unit with testing leads and communication cable)

Testing leads (1set) 98015

Testing leads with alligator clip (1 set) 99014

Fuse

440mA/1000V 99015

10A/1000V 99016

Temperature probes 90050, 90051, 90055, 90056

Followings are for TY530 only.

Communication Package for DMM 92015 (Software, USB adapter and cable)

Printer Adapter and Cable 97016

Printer 97010

AC adapter (for printer, Europe) 94006

Thermal paper for printer (10 rolls) 97080

3.2 Accuracy

Test conditions:

Temperature and humidity: 23±5°C at 80%RH or less

Accuracy: ±(% of reading + digits)

Note: Each response time is a value to rated accuracy within selected range.

DC Voltage Measurement $\text{---} \text{V}$

Range	Resolution	Accuracy	Input Voltage	Maximum Input Resistance
600mV	0.1mV	0.09+2	10M Ω	1000V DC
6V	0.001V		11M Ω	
60V	0.01V		10M Ω	1000V rms AC
600V	0.1V			
1000V	1V	0.15+2		

NMRR: 60dB or more 50/60Hz±0.1%

CMRR: 120dB or more 50/60Hz(Rs=1k Ω)

Response time: 1 sec max.

AC Voltage Measurement $\sim \text{V}$

AC Coupling: RMS value detection, sine wave

MEAN value detection and RMS value calibration (TY530 only)

Range	Resolution	Accuracy			Input Impedance	Maximum Input Voltage
		50/60Hz	40Hz to 500Hz	500Hz to 1kHz		
600mV	0.1mV	0.5+5	1+5	1.5+5	10M Ω , <200pF	1000V rms AC
6V	0.001V				11M Ω , <50pF	
60V	0.01V					
600V	0.1V				10M Ω , <50pF	1000V DC
1000V	1V				-	

Accuracy: At 5 to 100% of range and 1000V range is 200 to 1000V.

less than 1500V peak

For non-sinusoidal waveforms, add ±(2% + 2% of F.S.), for Crest factor<3.

CMRR: 60dB or more DC to 60Hz (Rs=1k Ω)

4 counts or less is corrected to 0, Response time: 2 sec max.

DC Current Measurement $\text{---} \text{A}$

Range	Resolution	Accuracy	Voltage Drop	Maximum Input Current
600 μ A	0.1 μ A	0.2+2	< 0.12mV/ μ A	440mA Protected by a 440mA/1000V fuse.
6000 μ A	1 μ A			
60mA	0.01mA		< 3.3mV/mA	
600mA	0.1mA	0.5+5		10A Protected by a 10A/1000V fuse.
6A	0.001A			
10A	0.01A		< 0.1V/A	

Maximum measurement current : 440mA at 600mA range

Response time: 1 sec max.

AC Current Measurement [RMS] \sim A

RMS value detection, sine wave

Range	Resolution	Accuracy		Voltage Drop	Maximum Input Current
		50/60Hz	40Hz to 1kHz		
600 μ A	0.1 μ A	0.75+5	1.5+5	< 0.12mV/ μ A	440mA Protected by a 440mA/1000V fuse.
6000 μ A	1 μ A			< 3.3mV/mA	
60mA	0.01mA				
600mA	0.1mA				
6A	0.001A				
10A	0.01A			< 0.1V/A	10A Protected by a 10A/1000V fuse.

Accuracy: At 5 to 100% of range and 10A range is 2 to 10A.

Maximum measurement current : 440mA at 600mA range

For non-sinusoidal waveforms, add $\pm(2\% + 2\%$ of F.S.), for Crest factor<3.

4 counts or less is corrected to 0, Response time: 3 sec max.

Resistance Measurement Ω

Range	Resolution	Accuracy	Maximum Measuring Current	Open-loop Voltage	Input Protective Voltage
600 Ω	0.1 Ω	0.4+1	< 1.2mA	< 3.5V	1000V rms
6k Ω	0.001k Ω		<110 μ A		
60k Ω	0.01k Ω		<13 μ A		
600k Ω	0.1k Ω		<1.3 μ A		
6M Ω	0.001M Ω	0.5+1	<130nA	< 1.3V	
60M Ω	0.01M Ω	1+2 (0~40M Ω) 2+2 (40~60M Ω)			

Accuracy is specified after zero adjustment at 600 Ω to 6k Ω (Resistance)

Response time: 2 sec max. at 600 Ω to 600k Ω , 10 sec max. at 6M to 60M Ω

Continuity Check \rightarrow)

Range	Resolution	Range of Operation	Measuring Current	Open-loop Voltage	Input Protective Voltage
600 Ω	0.1 Ω	The buzzer turns on for resistances lower than 50 \pm 30 Ω .	Approx. <1.2mA	<3.5V	1000V rms

Diode Test \rightarrow ⚡

Range	Resolution	Accuracy	Measuring Current (Vf=0.6V)	Open-loop Voltage	Input Protective Voltage
2V	0.001V	1+2	Approx. 0.5mA	<3.5V	1000V rms

Temperature Measurement TEMP

Range	Resolution	Accuracy	Input Protective Voltage
-50 ~ 600°C	0.1°C	2+2°C	1000V rms

Use optional Temperature Probe: Thermocouple Type K

Capacitor Measurement 

Range	Resolution	Accuracy	Input Protective Voltage
10nF	0.01nF	2+10	1000V rms
100nF	0.1nF	2+5	
1μF	0.001μF		
10μF	0.01μF		
100μF	0.1μF	3+5	
1000μF	1μF		

Accuracy is specified after zero adjustment at 10n to 1μF (Capacitance).

Frequency Measurement Hz

AC Coupling, Maximum Reading 9999

Range	Resolution	Accuracy	Input Voltage
10.00 to 99.99Hz	0.01Hz	0.02+1	0.2 to 600Vrms
90.0 to 999.9Hz	0.1Hz		0.4 to 600Vrms
0.900 to 9.999kHz	0.001kHz		0.8 to 100Vrms
9.00 to 99.99kHz	0.01kHz		

4. Operation

4.1 Precautions Before Measurement

■ Examining Items Contained in the Package

After opening the package, be sure to examine the product as instructed below before use. Should the delivered product be the wrong model, lack any item, or show any flaw in its appearance, contact the vendor from which you purchased the product.

■ Precautions of Operation and Storage



CAUTION

- Insert the batteries in the instrument by referring to “6.1 Battery Replacement.”
- A Blank cover is provided on the upper part of back casing.
Don't remove the Blank cover except when the USB adapter or Printer adapter is connected (TY530 only).
- Do not use the instrument near noise-emitting equipment or where there may be a sudden change of temperature. Otherwise, the instrument may give an unstable reading or errors.

Removal of Dirt

Do not wipe the instrument using any solvent (chemicals) such as benzene or paint thinner, as this may damage or discolor the front panel.

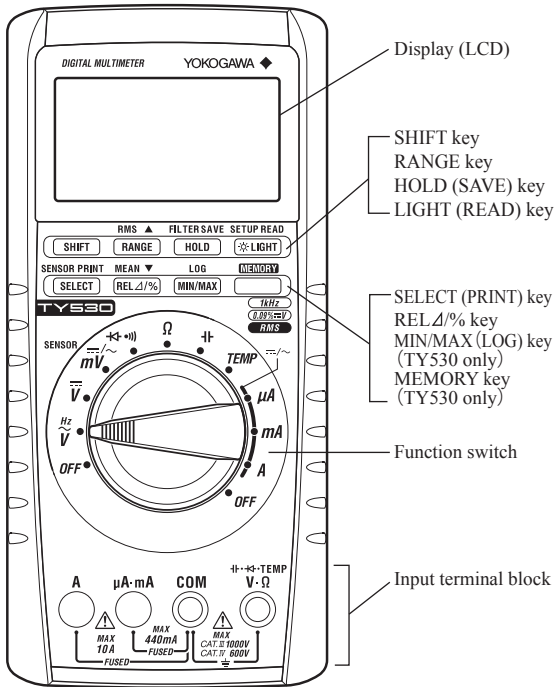
Use a dry cloth to clean the instrument.

Storage Conditions

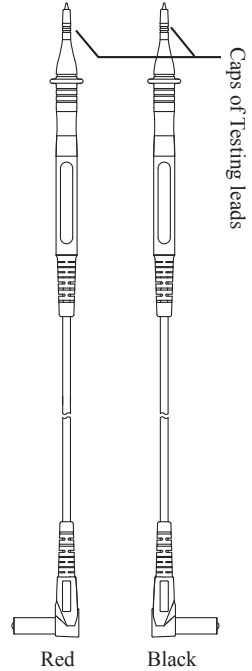
- Do not leave the instrument exposed to direct sunlight or in a hot and humid location such as the inside of a vehicle, for any prolonged length of time.
 - If the instrument will not be used for a prolonged period, remove the batteries.
-

4.2 Components

■ Panel Description



■ Testing leads



Actions indicated in parenthesis are available at Memory Function(TY530 only).



205 Westwood Ave
Long Branch, NJ 07740
1-877-742-TEST (8378)
Fax: (732) 222-7088
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1) Function switch

Turns off the power or select the measurement mode (function).

OFF	Turns off the power	Ω	Resistance measurement
\sim V	AC voltage (V) measurement	$\text{—} \text{—}$	Capacitor measurement
— V	DC voltage (V) measurement	TEMP	Temperature measurement
— / \sim mV	DC/AC voltage (mV) measurement (SENSOR mode)	μA mA A	DC/AC current measurement
— — —)	Continuity Check Diode Test		

2) SELECT key

Pressing this key in each measurement modes (function) described above selects other measurement modes (function).

\sim V	Frequency measurement
— / \sim mV	\sim AC voltage (mV) measurement (AC SENSOR measurement in the SENSOR mode)
—)	— — Diode Test
$\mu\text{A}/\text{mA}/\text{A}$	\sim AC current measurement

3) RANGE key

Allows the operator to select the measuring range.

- Fixed ranges : The display shows the “ R•H ” symbol.
The range increases every time this key is pressed.
- AUTO range : The display shows the “ AUTO ” symbol.
To return to the auto-ranging mode, hold down RANGE key for more than one second.

4) HOLD key

Selects between the DATA HOLD and AUTO HOLD functions.

To cancel functions, press this key once again.

- DATA HOLD: Holds the display readings.
The display shows the “ D•H ” symbol.
- AUTO HOLD: Holds the measured value when the testing leads are handled.
The display shows the “ A•H ” symbol.

5) LIGHT key

Press this key once to turn on the LCD backlight for approximately one minute.
The LCD backlight is lit for approximately one minute.
(To postpone turned on time, press this key once again.)
To cancel the function, hold down this key for more than one second.

6) REL Δ / % key

The instrument can calculate relative values or differences, and percentage values from the reference measurement values.

1 : Relative Calculation

The display shows the “ Δ ” symbol.
The sub-display shows the reference value.

2 : Percentage Calculation

The display shows the “ Δ ”, “%” symbol.
The sub-display shows the reference value.

7) MIN/MAX key (TY530 only)

Displays the minimum value (MIN), maximum value (MAX) and average value (AVG) during measurement.

Pressing this key starts recording and at the same time the display shows MIN/MAX/AVG to release AUTO POWER OFF.

8) MEMORY key (TY530 only)

Data can be stored in internal memory using this key.
Used when outputting to printer with the optional adapter and cable.

9) SHIFT key

While this key is pressed, “Shift” appears on the display.
Then pressing the following keys enables the following settings.

SHIFT +	LIGHT key	Set-up function
	RANGE key	Change to [RMS] mode (TY530 only)
	REL key	Change to [MEAN] mode (TY530 only)
	HOLD key	Turn filter on/off
	SELECT key	Switch to the SENSOR mode at the mV function

■ Display (LCD) Description

Symbol and Unit	Description
	Appears when in DC-mode measurement
	Appears when in AC-mode measurement
-	Appears when the polarity is negative
	Appears when in diode test
	Appears when in continuity check
\triangle	Relative calculation indicator
R · H	Fixed ranges indicator
AUTO	AUTO range indicator
D·H	DATA HOLD indicator
A·H	AUTO HOLD indicator
MAX MIN AVG	Lit when in MIN/MAX/AVG-mode (TY530 only)
AUTO OFF	Auto power off indicator
RMS	Appears in RMS mode
Filter	Appears while filter is on
Shift	Appears when the SHIFT key is pressed
nF, μ F	Unit for capacitance measurement
mV, V	Unit for voltage measurement
μ A, mA, A	Unit for current measurement
Ω , k Ω , M Ω	Unit for resistance measurement
$^{\circ}$ C	Unit for temperature measurement
Hz, kHz	Unit for frequency measurement
%	Unit for percentage calculation
mV (Sub-display)	Unit for SENSOR-mode measurement (Input voltage)
s (Sub-display)	Unit for recording time when in MIN/MAX/AVG-mode (TY530 only)
MEM	Appears in Memory mode (TY530 only)
SENSOR	Appears when in SENSOR mode measurement.
lx	Unit can be selected at the SENSOR mode only.
	Recording time indicator when in MIN/MAX/AVG-mode. (TY530 only)
	number of saved data indicator. (TY530 only)
	Reference value indicator when relative calculation.
	Input voltage value indicator from SENSOR in SENSOR-mode measurement.
	Appears when in DC SENSOR mode measurement
	Appears when in AC SENSOR mode measurement
OL	Overrange indicator
	Appears when the batteries become low
	Bar graph indicator, Range indicator

4.3 Measuring Instructions

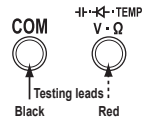


To avoid damage to instrument or equipment

- Before starting measurement, make sure that the position of function switch and the input terminals for connecting the testing leads are appropriate for the desired mode of measurement.
 - Temporarily remove the testing leads from the device under test before operating the function switch.
 - Verify proper operation on a known source before use or taking action as a result of the indication of the instrument.
-

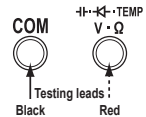
4.3.1 AC Voltage Measurement (\sim V, \sim mV)

- 1) Turn the function switch to the “ \sim V” or “mV” position.
- 2) Press the SELECT key when selecting the “mV”.
(“ \sim ” is displayed.)
- 3) Plug the testing leads into the input terminals.
- 4) Connect the testing leads to the circuit under test and then read the value when it stabilizes.



4.3.2 DC Voltage Measurement (--- V, --- mV)

- 1) Turn the function switch to the “ --- V” or “mV” position.
- 2) Plug the testing leads into the input terminals.
- 3) Connect the testing leads to the circuit under test and then read the value when it stabilizes.



Note

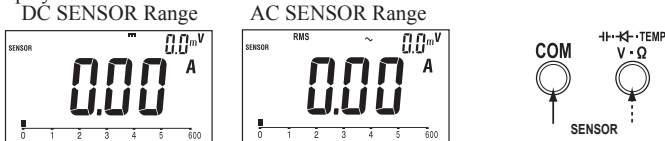
If “mV” range is selected and the testing leads are left open-circuited, the instrument may give a certain reading. This does not affect your measurement.

4.3.3 Measurements with SENSOR (SENSOR)

Settings for unit and conversion should be made in advance. Refer to <input, display and unit settings of SENSOR mode> mentioned at clause 4.6 Setup Function.

- 1) Turn the function switch to the “mV” position.
- 2) Get the instrument in the DC SENSOR mode with the SHIFT + SELECT keys. Press of the SELECT key again to use AC SENSOR.

Input voltage will be displayed on the sub-display, and values and units set according to “input, display and unit settings of SENSOR mode” mentioned at clause 4.6 will be displayed on the main display.



- 3) Connect the SENSOR to the input terminal.
- 4) Read the value when it stabilizes.

Press the SHIFT + SELECT keys to return to normal mV measurement.

<Example of measurements : To connect a current clamp sensor>

The sub display shows the output voltage of the current clamp sensor (mV) = input voltage of the instrument (mV).

The main display shows the current values (based on the preset setting of conversion with the setup function) detected by the current clamp sensor. The displayed values can be directly read.

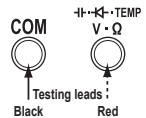
4.3.4 Resistance Measurement (Ω)



To avoid damage to instrument

Turn off the power to the circuit under test before starting measurement in order to prevent any excessive voltage from being applied to the instrument.

- 1) Turn the function switch to the “ Ω ” position.
- 2) Plug the testing leads into the input terminals.
- 3) Connect the testing leads to the circuit under test and then read the value when it stabilizes.



Note

Zero adjustment

Zero adjustment is recommended for correct measurement. After executing 1), 2) above, short the two testing leads. Press the REL key for adjust. (The display shows the “0.0 Ω ” value.) The value (zero adjustment) stores till turn off.

4.3.5 Continuity Check (·))

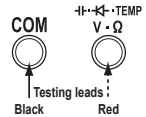


CAUTION

To avoid damage to instrument

Turn off the power to the circuit under test before starting measurement in order to prevent any excessive voltage from being applied to the instrument.

- 1) Turn the function switch to the “·))” position.
- 2) Plug the testing leads into the input terminals.
- 3) Connect the testing leads to the circuit under test. If the circuit is continuous (no more than approximately 50Ω), the buzzer sounds.



4.3.6 Diode Test (←|→)

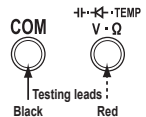


CAUTION

To avoid damage to instrument

Turn off the power to the circuit under test before starting measurement in order to prevent any excessive voltage from being applied to the instrument.

- 1) Turn the function switch to the “←|→·))” position.
Press the SELECT key to select Diode test.
(The display shows the ←|→ symbol.)
- 2) Plug the testing leads into the input terminals.
- 3) Connect the testing leads to the diode and then read the value when it stabilizes.



<Forward-bias Diode Test>

Connect the black testing lead to the cathode and the red testing lead to the anode.

Silicon diodes should give a reading of approximately 0.5V and light-emitting diodes a reading between approximately 1.5V and 2.0V.

<Reverse-bias Diode Test>

Connect the black testing lead to the anode and the red testing lead to the cathode.

Normally, the display shows the “ OL ” symbol, indicating that the diode under test is normal. The diode is defective if the display gives a certain voltage level.

Black testing lead Red testing lead

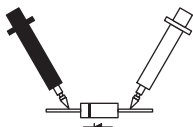


Figure 1 Forward-bias Diode Test

Red testing lead Black testing lead

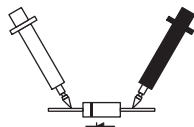


Figure 2 Reverse-bias Diode Test

4.3.7 Temperature Measurement (TEMP)



CAUTION

To avoid damage to instrument

Turn off the power to the circuit under test before starting measurement in order to prevent any excessive voltage from being applied to the instrument.

Note

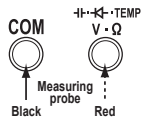
Optional Temperature probe is required for temperature measurement.

Temperature Probe: Thermocouple Type K

Model: 90050, 90051, 90055, 90056

Check the measurable range of respective probes.

- 1) Turn the function switch to the “ TEMP ” position.
- 2) Plug the measuring probe into the input terminals.
- 3) Contact the measuring probe to the under test and then read the value when it stabilizes.



4.3.8 Current Measurement ($\mu\text{A}/\text{mA}/\text{A}$)

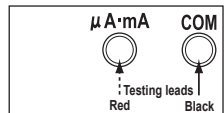
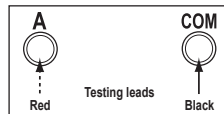


WARNING

To avoid damage to instrument or equipment

- Before starting measurement, make sure that the position of function switch and the input terminals for connecting the testing leads are appropriate for the desired mode of measurement.
- The maximum input current (limited by fuses) of the “ μA ” and “mA” ranges is 440 mA. Be sure not to exceed the limit in the 600 mA range.

- 1) Turn the function switch to the “ μA ”, “mA” or “A” position.
(If the magnitude of the current being measured is not known, select the “A” position. Make sure the current being measured is no more than 440mA before the “ μA ” or “mA” position is selected.)
- 2) Please select between DC and AC. When selecting AC, press the SELECT key.
- 3) Plug the black testing lead into the “COM” input terminal and the red testing lead into the “A” input terminal.
If the current is in the order of mA or less, plug the red testing lead into the “ $\mu\text{A} \cdot \text{mA}$ ” input terminal.
- 4) Connect the testing leads to the circuit under test and then read the value when it stabilizes.



4.3.9 Capacitor Measurement (—|—)

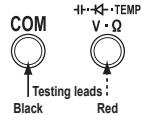


CAUTION

To avoid damage to instrument

- Turn off the power to the circuit under test before starting measurement in order to prevent any excessive voltage from being applied to the instrument.
- Before starting measurement, be sure to discharge the capacitor under check.

- 1) Turn the function switch to the “ --- ” position.
- 2) Plug the testing leads into the input terminals.
- 3) Open the testing lead and press the REL key in 10nF range to adjust the capacitance to zero. (The display shows “0.00”.)
- 4) Connect the testing leads to the circuit under test and then read the value when it stabilizes.



Note

The value (zero adjustment) remains displayed until power-off.

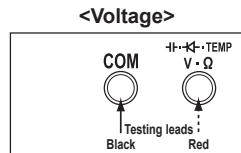
4.3.10 Frequency Measurement (Hz)



To avoid damage to instrument

Turn off the power to the circuit under test before starting measurement in order to prevent any excessive voltage from being applied to the instrument.

- 1) Turn the function switch to the “ $\sim V$ ” position.
- 2) Press the SELECT key to select the range of frequency. (The display shows the unit of frequency.)
- 3) Plug the testing leads into the input terminals.
- 4) Connect the testing leads to the under test and then read the value when it stabilizes.



4.3.11 Function to change RMS detection to/from MEAN detection mode (TY530 only)

The instrument has a function to change RMS detection to/from MEAN detection modes.

<Change to MEAN detection mode>

- 1) Select the appropriate AC Voltage measurement mode (ACV, ACmV) by using the function switch and the SELECT key.
- 2) Press the SHIFT key to display “Shift” on the display.
- 3) Then press the REL key to change to MEAN detection mode. “RMS” disappears on the display.

<Change to RMS detection mode>

- 1) Select the appropriate AC Voltage measurement mode (ACV, ACmV) by using the function switch and the SELECT key.
- 2) Press the SHIFT key to display "Shift" on the display.
- 3) Then press the RANGE key to change to RMS detection mode. "RMS" appears on the display.

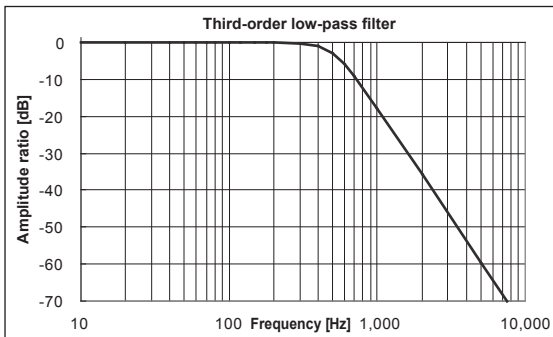
4.3.12 Function to turn the filter on/off

The instrument has a function to turn the filter on/off during AC measurement.

- 1) Select the appropriate AC measurement mode (ACV, ACmV, AC μ A, ACmA, ACA) by using the function switch and the SELECT key.
- 2) Press the SHIFT key to display "Shift" on the display.
- 3) Then press the HOLD key to turn the low-pass filter on.

While the filter is on, "Filter" appears on the display.

Refer to filter characteristics in the diagram below.



- 4) Repeat step 2) and 3) to turn the filter off.
("Filter" disappears from the display.)

4.3.13 AUTO HOLD Function

The instrument can automatically retain the measured value when the testing leads are handled as described below.

- 1) Press the HOLD key to select Auto hold function.
(The display shows the “A•H” symbol.)
- 2) Connect the testing leads to the circuit under test.
- 3) When the reading stabilized, the buzzer sounds.
- 4) Remove the testing leads from the circuit under test.
- 5) The display shows the measured value that is retained.

You can repeat steps 2) to 4) as many times as you like as long as the display shows the “A•H” symbol.

Note

- In DC/AC voltage measurement, the Auto hold function is only available for ranges greater than the 6V range.
 - This function is not available for Temperature, Capacitor, Continuity check and Frequency measurement.
 - The Auto hold function can not be applied to unstable signals.
-

4.3.14 Relative and percentage calculation

The instrument can calculate relative values or difference, and percentage values from the reference measurement values. (The range will be fixed.)

<Relative (REL) calculation>

Subtracts the reference value from the measured value to display the relative value or difference.

- 1) Take a measurement to set the reference value.
- 2) Press the REL Δ /% key.
(The display shows the “ Δ ” symbol and the sub-display shows the reference value.)
- 3) Take another measurement.

<Percentage (%) calculation>

Calculates and display the percentage value according to the following equation:

$$\% \text{ value} = (\text{measured value} - \text{reference value}) / \text{reference value}$$

- 1) Take a measurement to set the reference value.
- 2) Press the REL Δ /% key.
(The display shows the “ Δ ” symbol and the sub-display shows the reference value.)
- 3) Take another measurement.
Press the REL Δ /% key again. (The display shows the “%” symbol.)

4.3.15 MIN/MAX/AVG Function (TY530 only)

The minimum value (MIN), maximum value (MAX) and average value (AVG) during measurement are shown. (The range is fixed.) The average value is shown by dividing the integrated record data by the number of recording times.

Pressing this key starts recording and at the same time the display shows “MIN”, “MAX” and “AVG” to release AUTO POWER OFF.

<Recording time>

The timer is activated to show the elapsed time from the start and simultaneously the renewed time for MIN/MAX is also recorded.

The elapsed time is displayed as follows:

0 sec. to 99 min. and 59 sec.: steps of 1 sec.

100 min. or more: steps of 1 min.

Press the HOLD key to stop recording. (The display shows the “D•H” symbol.)

<To confirm the recording time>

For confirming the recording time, press the MIN/MAX key.

Subsequent pressing of this key repeats to display the present minimum value (MIN), maximum value (MAX) and average value (AVG).

Press the HOLD key once again to restart recording.

To cancel the confirming mode, hold down the MAX / MIN key for one second.

(“MAX” “MIN” “AVG” symbol disappears.)

Note

- No influence is exerted on the recorded data even if the test leads are disconnected while the recording is stopped.
 - If overload is recorded, the MIN or MAX display changes to “OL” display, resulting in incorrect average data.
 - For widely varying signal measurement, set the appropriate range in which the MAX or MIN does not change to “OL” display.
-

4.4 Memory Function (TY530 only)

<To save a Data in internal memory>

The instrument can save a data using with the following two types of modes.

SAVE-mode: Saves a data for one measurement by manual operation.

LOGGING-mode: Automatically saves a data from the start of logging.

Memory capacity

SAVE-mode: 100 data

LOGGING-mode: Logging data of one time 1,600data

Number of saved data

Number of saved data is 4-digit numbers. The instrument allocates the smallest number, between 0000 to 1599, that has not yet been used. Use the ▲ (RANGE) key or ▼ (RELΔ/%) key switches the number of saved data.

To save a Data (SAVE-mode)

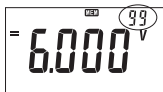
- 1) Press the MEMORY key. (The display shows the “MEM” symbol.)
- 2) Press the SAVE (HOLD) key.
(The sub-display shows the number of saved data.)
- 3) Press the SAVE (HOLD) key to save the data.
Another press of the SAVE (HOLD) key saves a data for the second time measurement or later.
- 4) To cancel the function, hold down the MEMORY key for one second.
 (“MEM” symbol disappears.)

Note

HOLD data can be saved.

Hold the display and save it according to the above steps.

The number of saved data



To save a Data (LOGGING-mode)

- 1) Press the MEMORY key. (The display shows the “ MEM ”symbol.)
- 2) Press the LOG (MIN/MAX) key.
(The sub-display shows the logging interval (period).)
Set the value with the ▲ (RANGE) key or ▼ (RELΔ/%) key.
The default setting is one second.
(The default settings can be changed. Refer to the Set-up function.)
The display shows “ FULL ” when the logging data is already saved.
When saving the new data, perform delete of data.
- 3) Press the LOG (MIN/MAX) key to start logging. (The “ MEM ”symbol is flashing.)
- 4) To cancel the function, hold down the MEMORY key for one second.
When memory capacity becomes full, the function is automatically canceled.
(“ MEM ” symbol disappears.)

Note

LOGGING-mode operation during HOLD-mode disables HOLD-mode.

To load a Data (SAVE-mode)

- 1) Press the MEMORY key. (The display shows the “ MEM ”symbol.)
- 2) Press the READ (LIGHT) key.
- 3) Press the SAVE (HOLD) key to select the number of saved data.
Select the number with the ▲ (RANGE) key or ▼ (RELΔ/%) key.
- 4) To cancel the function, hold down the MEMORY key for one second.
(“ MEM ” symbol disappears.)

To load a Data (LOGGING-mode)

- 1) Press the MEMORY key. (The display shows the “ MEM ”symbol.)
- 2) Press the READ (LIGHT) key.
- 3) Press the LOG (MIN/MAX) key to select the number of saved data.
Select the number with the ▲ (RANGE) key or ▼ (RELΔ/%) key.
- 4) To cancel the function, hold down the MEMORY key for one second.
(“ MEM ” symbol disappears.)

<To delete of saving data>

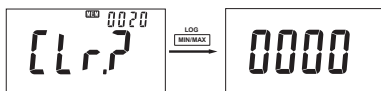
Delete method (SAVE-mode)

- To delete all data
- 1) Press the MEMORY key.
(The display shows the “ MEM ”symbol.)
 - 2) Hold down the SAVE (HOLD) key for one second.
(The display shows the “ CLr ? ”symbol.)
 - 3) Press the SAVE (HOLD) key.
All data is deleted.

- To overwrite selected data
- 1) Press the MEMORY key.
(The display shows the “MEM” symbol.)
 - 2) Press the SAVE (HOLD) key.
(The sub-display shows the number of saved data.)
 - 3) Use the ▲ (RANGE) key or ▼ (RELΔ/%) key to select the number of saved data.
 - 4) Press the SAVE (HOLD) key to save (over write) the data.
 - 5) To cancel the function, hold down the MEMORY key for one second.
(“MEM” symbol disappears.)

Delete method (LOGGING-mode)

- To delete all data
- 1) Press the MEMORY key.
(The display shows the “MEM” symbol.)
 - 2) Hold down the LOG (MIN/MAX) key for one second.
(The display shows the “CLr ?” symbol.)
 - 3) Press the LOG (MIN/MAX) key.
All data is deleted.



4.5 AUTO POWER OFF Function

<To use the AUTO POWER OFF function>

The display shows the “AUTO OFF” indication.

- The instrument automatically turns off twenty minutes after the last key operation.
The instrument will beep for approximately 30 seconds to alert the operator before the AUTO POWER OFF function takes effect.
- Pressing any key or switch while the instrument is beeping postpones the power-off time.
- Pressing any key once after the power to the instrument is automatically turned off switches the instrument on again.

<To cancel the AUTO POWER OFF function>

- 1) Turn the function switch to the OFF.
- 2) With pressing the HOLD key, turn the function switch to the desired position of any measurement mode (function).
The “AUTO OFF” indication turns off when the function is canceled.

Note

Additional functions simply set when POWER ON can be used.

<To enable the AUTO POWER OFF function once again>

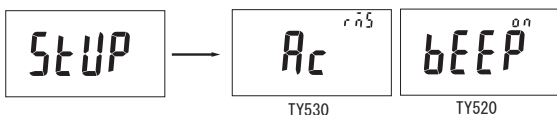
- 1) Turn the function switch to the OFF.
- 2) Turn the function switch to the desired position of any measurement mode (function).
The AUTO POWER OFF function is enabled again.
The display shows the “ AUTO OFF ” indication.

4.6 Set-up Function

The following settings can be made using the Set-up function:

- default setting of detection method during AC voltage measurement (TY530 only)
- default setting of LOGGING interval (TY530 only)
- sound on/off setting (beep of buzzer)
- input, display and unit settings of SENSOR mode
- reset to factory preset mode

- 1) Press the SHIFT key shows “Shift” on the display.
- 2) Press the LIGHT key changes the mode to Set-up mode,
from Set-up to AC detection method (TY530), beep on/off of buzzer (TY520).



- 3) Press the LIGHT key or SHIFT key changes the setting items accordingly.
- 4) Change values by using the ▲ (RANGE) key or ▼ (REL) key.
- 5) Press the HOLD key to save/finish each setting.
“SET” appears and the display returns to the setting items.
- 6) Hold down the LIGHT key for more than one second to return from Set-up mode to measurement mode.

Note

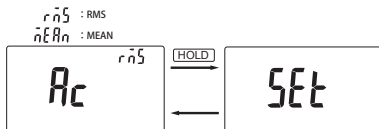
To cancel any setting, hold down the LIGHT key for more than one second, or turn off by using the function switch.

<Default setting of detection method during AC voltage measurement> (TY530 only)

Set a default setting of detection methods during AC voltage measurement.

RMS or MEAN: The default setting is RMS.

1) Display “Ac” by using the LIGHT key or SHIFT key.



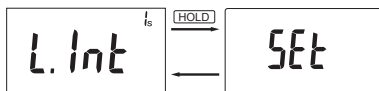
- 2) Select the detection method by using the ▲ (RANGE) key or ▼ (REL) key.
- 3) Press the HOLD key to save the setting.
- 4) “SET” appears and then “Ac.”

<Default value of LOGGING interval> (TY530 only)

Set a default value of the saving interval during LOGGING mode.

1) Display “L.Int” by using the LIGHT key or SHIFT key.

The default setting is 1 sec.



- 2) Select the saving interval by using the ▲ (RANGE) key or ▼ (REL) key.
- 3) Press the HOLD key to save the setting. “SET” appears and then “L.Int.”

Settings of saving interval

1, 2, 5, 10, 30, 60, 600, 1800 sec

<Sound on/off setting>

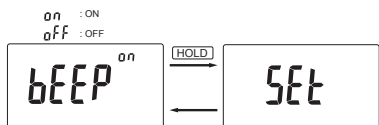
Set the sound on/off (beep of buzzer)

Even if the user sets the sound off, it goes off at the following points.

- checking continuity
- alarm for over-input
- alarm for auto power-off

1) Pressing the LIGHT key or SHIFT key shows “bEEP” on the display.

Set on/off on the sub-display. Default is ON.



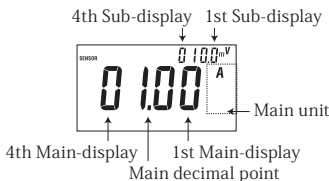
- 2) Select on/off by using the ▲ (RANGE) key or ▼ (REL) key.
- 3) Press the HOLD key to save the setting.

“SET” appears and then “bEEP.”

<input, display and unit settings of SENSOR mode>

Settings of input voltage in the SENSOR mode at the mV function, main display and the unit for input voltage can be made.

1) Display as follows by using the LIGHT key or SHIFT key. Then parameters can be changed will blink.



Press the LIGHT key to change displays in following sequence.

4th Sub-display → 3rd Sub-display → 2nd Sub-display → 1st Sub-display →
4th Main-display → 3rd Main-display → 2nd Main-display → 1st Main-display →
Main decimal point → Main unit

(Using the SHIFT key switches them in the reversed sequence.)

- 2) Select each number, place of decimal point and unit by using the ▲ (RANGE) key or ▼ (REL) key.
- 3) Press the HOLD key to save the setting. “SEt” appears and then returns to the set-up.



Example of setting

To display (convert) as 1.00A against an input of 10.0mV
(displayed as 60.00A against max 600.0mV)

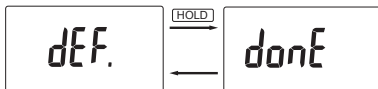
Setting value

numbers at sub-display: 000.0~999.9, numbers at main-display: 0000 ~ 9999,
place of decimal point at main-display: XXXX, X.XXX, XX.XX, XXX.X
unit at main-display: A, mA, μ A, °C, M Ω , k Ω , Ω , kHz, Hz, μ F, nF, %, lx, none, V, mV

<Reset to factory preset mode>

Reset all the settings to factory preset mode.

1) Pressing the LIGHT key or SHIFT key shows “dEF.” on the display.



- 2) Press the HOLD key to reset the settings.
“donE” appears and then “dEF.”

4.7 Additional functions simply set when POWER ON



CAUTION

To avoid damage to instrument

When the measurement function is completed, turn the function switch back to the OFF position to turn off.

With pressing the following keys, turn the function switch to the desired position of any measurement mode (POWER ON-state).

This enables the following functions corresponding to the press keys.

Keys	Functions to be set
SELECT	LCD check (Lit only while pressing the SELECT key)
HOLD	Cancels the Auto power off function
HOLD + REL Δ /%	Reset all calibration values to those before shipment.
SELECT + RANGE	Calibration function

4.8 LCD Check

The instrument can lit all segments and mark for LCD check.

(Lit only while pressing the SELECT key.)

5. User Calibration Function

It is recommended that the instrument be calibrated periodically.

The instrument can be calibrated.



To avoid electrical shock

- Only authorized engineers are allowed to calibrate the instrument using dedicated facilities.
 - Connect the calibrator to the instrument with the calibrator's testing leads.
 - Before carrying out calibration, read the instruction manual of the calibrator.
 - Temporarily remove the testing leads from the instrument before switching measurement mode (function).
-

<Conditions of calibration>

Calibrator: With accuracy higher than of this instrument

Ambient Environment:

Temperature: $23\pm 3^{\circ}\text{C}$

Humidity: 55%RH or less

Leave the instrument for 30 minutes under above conditions
before carrying out calibration.

After reference valve of Calibrator stabilizes, Press the key to confirm for calibration valve.

Carry out calibration of ranges in accordance with Table 1.

- 1) Turn the function switch from the OFF position to the mV position while pressing the SELECT and RANGE keys at the same time.

The display shows the “CAL” symbol then the “PASS” symbol.

- 2) Press the SELECT key. (The display shows the “-” symbol.)
- 3) Press the HOLD key twice. (The display shows the “- - -” symbol.)
- 4) Press the RANGE key. (The display shows the “mV” symbol.)
- 5) Connect the instrument to the calibrator with the testing leads.
- 6) Set the calibrator to Input value as an input to the instrument.
- 7) Press the HOLD key.
- 8) Be sure to confirm that the function switch and input terminal are set to the desired range.

Carry out calibration of other ranges by repeating steps 6) and 7) with reference to Table 1.

- 9) To quit calibration, turn the function switch back to the OFF position.

Note

Calibration should be started after fixing a range with the RANGE key.

Table 1. Calibration Table

Range	Input value	Range	Input value
DC600mV	600mV	AC6V (RMS) *1	6V 60Hz
DC6V	6V	AC6V (MEAN) *2	6V 60Hz
DC60V	60V		
DC600V	600V	10nF	10nF
DC1000V	1000V	100nF	100nF
DC600μA	600μA	1μF	1μF
DC6000μA	6000μA	10μF	10μF
DC60mA	60mA	100μF	100μF
DC600mA	400mA	1000μF *3	1000μF
DC6A	6A		
DC10A	10A		

*1 : Calibration for all ranges by RMS value detection

*2 : Calibration for all ranges by MEAN value detection. (TY530 only)

*3 : Press the HOLD key 20 sec later after applying an input. It takes about 8 sec(max) to get a readings stable. (A buzzer sounds.) Further operations should not be done until readings becomes stable.

6. Battery and Fuse Replacement

6.1 Battery Replacement

If the batteries fall below the normal operating voltage, the “” symbol turns on.

Follow the steps below to replace the batteries with new ones.

(AA-size (R6/LR6) 1.5V batteries)



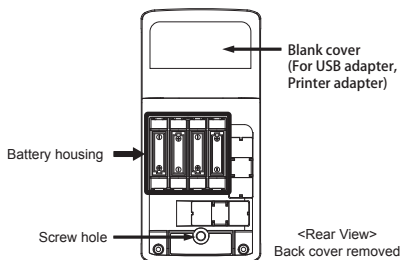
- Be sure to disconnect the instrument from the circuit under test and testing leads before replacing the batteries.
- Turn the function switch to OFF (turn off the power).
- Do not operate the instrument with the casing left open.



- Do not mix batteries of different types or new batteries with used ones.
- Make sure the polarities of the new batteries are exactly as shown on the battery holder.

To replace the batteries:

- 1) Remove the screw on the back of the casing.
- 2) Remove the back cover.
- 3) Take the batteries out of the housing.
- 4) Replace the batteries with new ones.
- 5) Close the back cover and fasten it with the screw.



6.2 Fuse Replacement

If a current greater than the rated value flows when the instrument is in the current-measurement range, a protection fuse may blow.

If this happens, replace that fuse. The instrument contains the following types of fuses.

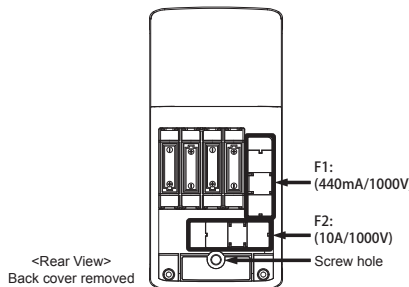


- Be sure to disconnect the instrument from the circuit under test and testing leads before replacing the fuses.
- Turn the function switch to OFF (turn off the power).
- Do not operate the instrument with the casing left open.
- In order to avoid damage to the instrument or any possible accident, use fuses of the specified rating.

Fuse rating:	F1	99015 (440mA/1000V)
	F2	99016 (10A/1000V)

To replace the fuse:

- 1) Remove the screw on the back of the casing.
- 2) Remove the back cover.
- 3) Remove the blown fuse from the fuse holder.
- 4) Install a new fuse in the holder.
(Make sure the fuse rating.)
- 5) Close the back cover and fasten it with the screw.



7. Calibration and Maintenance

Calibration Cycle

It is recommended that the instrument be calibrated once every year.
(SEE ALSO: User Calibration Function)

Contacts of Services

Please contact one of the Yokogawa sales offices listed on the back cover of this manual or the sales representative from which you purchased the instrument.

8 Disposing the Product

Waste Electrical and Electronic Equipment (WEEE), Directive 2002/96/EC

This Product complies with the WEEE Directive (2002/96/EC) marking requirement.
The affixed product label (see below) indicates that you must not discard this electrical/ electronic product in domestic household waste.

Product Category

With reference to the equipment types in the WEEE directive Annex 1, this product is classified as a “Monitoring and Control instrumentation” product.

To return unwanted products within the EU area, contact your local Yokogawa Europe B. V. office.

Do not dispose in domestic household waste.



“Measures for Administration of the Pollution Control of Electronic Information Product” of the People’s Republic of China

中華人民共和国の「電子情報製品の汚染予防管理方法」による説明です。

中華人民共和国でのみ有効です。

The following are the provisions of “Measures for Administration of the Pollution Control of Electronic Information Product” of the People’s Republic of China.

They are applicable only in the People’s Republic of China.

产品中有毒有害物质或元素的名称及含量

部件名称	有毒有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
框架(塑料)	x	x	x	x	○	○
线路板 ASSY	x	x	x	x	○	○
导线 98015	x	x	x	x	○	○
电池	x	x	x	x	○	○
○：表示该部件的所有均质材料中的有毒有害物质的含量均在 SJ/T11363-2006 标准中所规定的限量以下。 x：表示该部件中至少有一种均质材料中的有毒有害物质或元素的含量超过 SJ/T11363-2006 标准所规定的限量要求。						
< 选购 >						
90050 - 90056：TC-K（温度探头）						
	x	x	x	x	○	○

环保使用期限：



该标识适用于 2006 年 2 月 28 日颁布的《电子信息产品污染控制管理办法》以及 SJ/T11364 - 2006《电子信息产品污染控制标识要求》中所述，在中华人民共和国销售的电子信息产品的环保使用期限。

只要您遵守该产品相关的安全及使用注意事项，在自制造日起算的年限内，则不会因产品中有有害物质泄漏或突变变异，而造成对环境的污染或对人体及财产产生恶劣影响。注) 该年数为“环保使用期限”，并非产品的质量保证期。零件更换的推荐周期，请参照使用说明书。

YOKOGAWA

横河メータ&インスツルメンツ株式会社

Yokogawa Meters & Instruments Corporation

東日本営業

〒190-8586 東京都立川市栄町6-1-3 立飛ビル2号館

電話:042-534-1456 ファクシミリ:042-534-1438

関西営業

〒530-0001 大阪府大阪市北区梅田2-4-9 プリーゼタワー18F

電話:06-6341-1517 ファクシミリ:06-6341-1519

Yokogawa Meters & Instruments Corporation

International Sales Dept.

Tachihi Bld. No.2, 6-1-3, Sakaecho, Tachikawa-shi, Tokyo 190-8586 Japan

Phone: 81-42-534-1413, Facsimile: 81-42-534-1426

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205 Westwood Ave
Long Branch, NJ 07740
1-877-742-TEST (8378)
Fax: (732) 222-7088
salesteam@Tequipment.NET