# Product Datasheet - Technical Specifications

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Tel.:     **+49 - 81 41 - 52 71-0**

FAX:     **+49 - 81 41 - 52 71-129**

E-Mail:  **sales@meilhaus.com**

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# YOKOGAWA ◆

# Digital Multimeter Series

## TY700/TY500/732/731 Series

- **TY700** Series of 4.5-digit Handheld Multimeters
- **TY500** Series of 3.5-digit Handheld Multimeters
- **732** Series of 3.5-digit Handheld Multimeters
- **73101** of 3.5-digit Pocket Digital Multimeter

**73101**

Pocket DMM
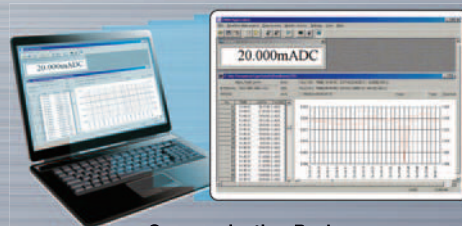**73101**

**TY720**

0.020% Maximum Measurement Accuracy
**TY720**

**TY530**

0.09% Accuracy RMS Measurement
**TY530**

**73203**

Low-end Model
**73203**

Communication Package
**92015**

## Yokogawa Meters & Instruments Corporation

Bulletin DMM-E

## Integral Action Time

Digital multimeters (DMMs) employ an A/D converter with a dual-integration system, which determines the measurement value by converting the input voltage into time using an integration AD converter. The interval to perform an integral action periodically is referred to as the integralaction time.

## Measurement Accuracy

With DMMs, the measurement accuracy is generally expressed as: ±__% of reading + __digits. ("Reading" refers to the reading value, and is abbreviated as "rdg"; "digits" refers to the number displayed in the smallest decimal place, and is abbreviated as "dgt.") This expresses the range of values that a DMM may measure or represent for a given actual value.

## Root Mean Square Value

The value most directly related to the energy of a given waveform. Refers to the square root of a value found by averaging the squares of instantaneous values of a waveform over a single cycle. (See Table 1,Figures 1 and 2.)

## Mean Value

Refers to the average of the sum of instantaneous values, determined for a current half-wave. It is equivalent to calculating the surface area of a waveform.

## Form Factor

Ratio of RMS value with respect to average value.
Form factor = RMS value/mean value (See Figures 1 and 2.)

## Crest Factor

Ratio of maximum value to RMS value.
Crest factor = maximum value/RMS value(See Figures 1 and 2.)

## Peak-to-Peak (P-P) value

Refers to the distance between the smallest and largest amplitudes in a waveform (see Figure 1).

## Frequency Characteristic

Refers to a characteristic that shows variations in input, measurement, or response with frequency. When measuring alternating current signals, a measured signal does not have a simple frequency, but often includes various frequencies ranging from lower frequencies to higher harmonics. To measure such signals more accurately, it is preferable to use a measurement device that has a broader frequency characteristic range.

## Input Impedance

To prevent the measured object from being influenced during voltage measurement, you should use a measurement device with an extremely high input impedance.

## Decibel

A unit used for describing the change in electrical signal amplitude or noise level, or transmission systems in wired devices, etc. This parameter is also used to represent the level differences in voltage, current or related values, but is generally restricted to cases characterized by the relationship: $(I_1/I_2)^2 = (V_1/V_2)^2 = P_1/P_2$. In the abbreviation "dB," "d" (deci) denotes 1/10, and "B" (Bell) denotes logarithm.

**Table 1. RMS Value, Average Value, Waveform Factor and Crest Factor for a Typical Periodic Waveform**
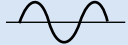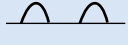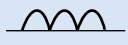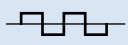
| Item | Waveform | RMS | Mean value | Waveform factor | Crest factor |
|---|---|---|---|---|---|
| Sine wave | | $\frac{1}{\sqrt{2}}=0.707$ | $\frac{2}{\pi}=0.637$ | $\frac{\pi}{2\sqrt{2}}=1.11$ | $\sqrt{2}=1.414$ |
| Half rectification wave | | $\frac{1}{2}=0.5$ | $\frac{1}{\pi}=0.318$ | $\frac{\pi}{2}=1.571$ | 2 |
| Full rectification wave | | $\frac{1}{\sqrt{2}}=0.707$ | $\frac{2}{\pi}=0.637$ | $\frac{\pi}{2\sqrt{2}}=1.11$ | $\sqrt{2}=1.414$ |
| Triangular wave | | $\frac{1}{\sqrt{3}}=0.577$ | $\frac{1}{2}=0.5$ | $\frac{2}{\sqrt{3}}=1.155$ | $\sqrt{3}=1.732$ |
| Square wave | | 1 | 1 | 1 | 1 |

**Figure 1. RMS and Mean Values of Sine Wave**



**RMS value**

$$E=\sqrt{\frac{1}{T}\int_0^T e^2(t)\,dt}\quad\text{(energy)}$$

**Mean value**

$$Emean=\frac{1}{T}\int_0^T |e(t)|dt\quad\text{(surface area)}$$

**Calibration of RMS value by mean value rectification**

$$E=\frac{1}{\sqrt{2}}\,Ep=0.7071\cdot Ep$$

$$Emean=\frac{2}{\pi}\,Ep=0.6366\cdot Ep$$

$$E=\frac{\pi}{2\sqrt{2}}\,Emean=1.11\cdot Emean$$

**P-P value**

$$Ep\text{-}p=2\sqrt{2}\,E=2.828\cdot E$$

**Figure 2. RMS of Distorted Waves**



**Instantaneous value and spectrum**

$$e(t)=a_0+a_1\cos wt+\cdots+a_n\cos nwt$$
$$+b_1\sin wt+\cdots+b_n\sin nwt$$

DC component | Fundamental wave component | Harmonic component

**RMS of each spectrum**

$$|En|=\frac{\sqrt{a_n^2+b_n^2}}{\sqrt{2}}$$

**RMS value**

$$E=\sqrt{E_0^2+|E_1|^2+|E_2|^2+\cdots+|E_n|^2}$$

**Crest factor (CF)**

$$CF=\frac{\text{Crest value}}{\text{RMS value}}$$

$$\text{Waveform factor}=\frac{\text{RMS value}}{\text{mean value}}$$

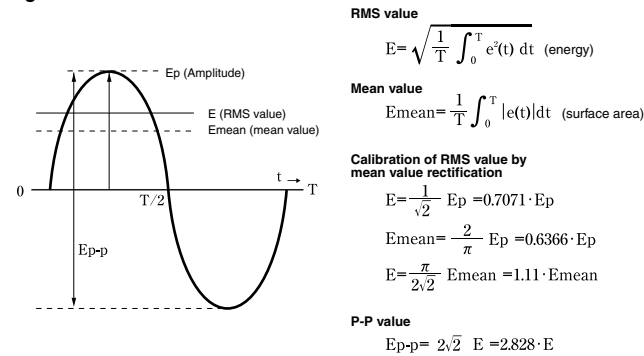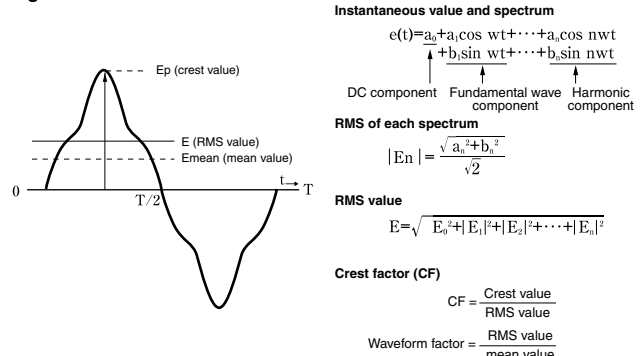## CE Mark

The products of Yokogawa Meters & Instruments Corporation are subjected to design and evaluation testing to ensure compliance with the safety and EMC standards in accordance with the directives issued by the EC.

## Electromagnetic Compatibility (EMC)

The parameters EMI and EMS are referred to as electromagnetic compatibility as they relate to compatibility within an electromagnetic environment.

## Safety Standards

These standards lay out safety requirements that are to be met by a product with the objective of the preservation of human life and property. The applicable international standard is IEC 61010, and while a product must conform to this standard, there are also domestic standards laid out by individual countries. With these safety regulations, the range of use of a measurement device is specified by categorization in measurement categories I through IV to ensure the safety of the user. The designations "CAT II, 1000 V" or "CAT III, 600 V" at the input terminals of a measurement device, for example, indicates the applicable category and the maximum voltage for the device in terms of safety.

## Measurement categories (CAT)

In order to ensure the safety of the user, IEC 60664 defines the ranges of use of measuring instruments by classifying power levels into measurement categories II through IV and O (None, other). This is because the excessive impulse or surge levels induced in a power line vary depending on the location of measurement (category). Categories with higher numerals designate locations that include larger surge voltages. Instruments that are designed for category III can thus withstand higher surge voltages than instruments designed for category II.
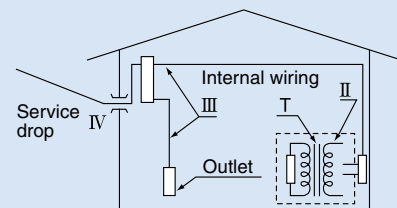


| Measurement category | Description | Remarks |
|---|---|---|
| O (None, other) | Other circuits that are not directly connect to MEAINS. | |
| CAT.II | For measurement performed on circuits directly connected to the low-voltage installation. | Appliances, portable equipments, etc. |
| CAT.III | For measurement performed in the building installation. | Switchboard, circuit breaker, etc. |
| CAT.IV | For measurement performed at the source of the low-voltage installation. | Overhead wire, cable systems, etc. |

# Digital Multimeter Selection Guide

| Model | Type | Max. Value | Dual | Bar Graph | Back-lit | AC RMS | Voltage | AC + DC | Current | AC + DC A | Resistance | Continuity Check | Diode Test | Frequency | Temperature | Capacitance | Filter | Communication | Data Memory | Max./Min. Value Memory | Relative Value Computation | Logarithm Computation | Data Hold | Auto Hold | Peak Hold | Overvoltage Input Warning | PC Connection | Auto Power Off | External View |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TY710 | Handheld | 50000 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |  | ● | ● | ● | ● | ● | ● | ● |  | ● | ● | ● |  | |
| TY720 | | 50000 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| TY520 | | 6000 |  | ● | ● | ● |  | ● | ● |  | ● | ● | ● | ● | ● | ● | ● |  | ● |  |  |  | ● | ● | ● |  |  | ● | |
| TY530 | | 6000 |  | ● | ● | ● |  | ● | ● |  | ● | ● | ● | ● | ● | ● | ● | ● | ● |  |  |  | ● | ● | ● | ● |  | ● | |
| 73201 | | 4300 |  |  |  | ● |  | ● |  | ● | ● | ● |  |  |  |  |  |  |  |  |  |  | ● |  |  | ◎ |  | ● | |
| 73202 | | 4300 |  |  |  | ● |  | ● |  | ● | ● | ● |  |  | ● |  |  |  |  |  |  |  | ● |  |  | ◎ |  | ● | |
| 73203 | | 4300 |  |  |  | ● |  | ● |  | ● | ● | ● |  | ● |  |  |  |  |  |  |  |  | ● |  |  | ◎ |  | ● | |
| 73204 | | 4300 |  |  |  | ● |  |  |  | ● | ● | ● |  |  |  |  |  |  |  |  |  |  | ● |  |  | ◎ |  | ● | |
| 73101 | Pocket-sized | 4300 |  |  |  | ● |  |  |  | ● | ● | ● |  |  |  |  |  |  |  |  |  |  | ● |  |  |  |  | ● | |

◎ : Also functions as excessive current input warning.

# TY700 Series

## Most Reliable Handheld Digital Multimeters

### Model
# TY720
# TY710

- 4.5 digits
- 50,000 count
- RMS
- USB
- Terminal shutters
- 0.020% (DCV)
- LPF (TY720)
- AC50mV (TY720)

**3-year Warranty**

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CE
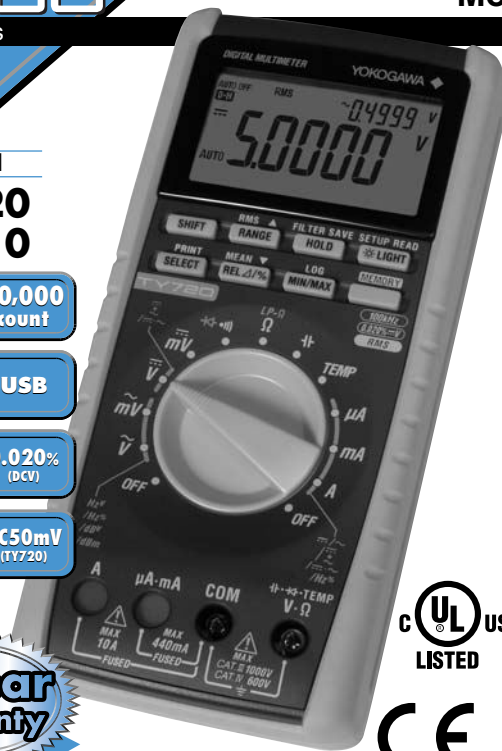
## Maximum Measurement Accuracy

0.020% rdg + 2 dgt (DC voltage)
True RMS measurement

## Safe Design

**Conforms to EN61010-1 safety standard**
Conforms to measurement category 1000 V AC/DC, CAT Ⅲ and 600 V AC/DC, CAT Ⅳ

**Shutters prevent erroneous insertion of test leads into current measurementterminals (terminal shutters)**

The current terminals have terminal shutters that prevent erroneous setting of the measurement function and leadwire connections resulting from operational errors. The terminal shutters open and close according to the function switch position.

## Closed Case Calibration

### User calibration function

The TY series, simply performing special operations via front panel allows for quick and reliable adjustment. In addition, the series allows for one-touch adjustment of AC voltage- and AC current-to-frequency characteristics. The user calibration function leads to improved operation efficiency and cost reduction.

- External standard instrument required for calibration.

## Full Support for Data Management

### Two memory modes

- SAVE-mode memory
  A mode for manually saving any data
- Logging-mode memory
  A mode for automatically saving data at a specified interval
  Logging interval: 1 second to 30 minutes

| Model | Memory capacity | |
|---|---|---|
| | SAVE-mode memory* | Logging-mode memory* |
| TY710 | 100 | 1000 |
| TY720 | | 10000 |

* Saved data can be checked on the display.

### Real-time measurement

The optional communication package*1 sold separately (Model 92015) allows you to connect to a PC for transmitting large amounts of data that cannot be saved in the DMM internal memory.
You can transmit the saved data from the internal memory to a PC and process it using application software or spreadsheet software (Excel*2) for data management.

*1 Communication cable and application software are included.
*2 Excel is a registered trademark of Microsoft Corporation in the United States.
*3 The communication cable employs an infrared system, so the device is electrically insolated.

## Loaded with Measurement Functions

### Peak hold function (TY720, for DC V/A measurement)

Supports waveforms of 1 ms or greater. You can capture instantaneous crest values not possible with ordinary maximum measurement functions.

### Relative and percentage value computation

Can display the measured values as the values relative to a reference value (defined by the REL key; even after data hold) or as the percentages of the reference value.
Percentage calculation: (Measured value – reference value) / (reference value), expressed as percentage.

### Duty ratio (%) measurement

Displays the duty ratio of a pulse waveform:
(High level period/1 cycle of waveform) x 100 = (t2/t1) x 100 [%]
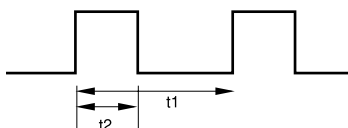
### AC+DC measurement

Measures RMS of a waveform in which ripple waveforms are superimposed on a direct current.

### Auto hold

Automatically hold the data measured when the test leads are disconnected from the measured object, thus freeing both hands for performing reliable measurement.

### Minimum/maximum/average display

Allows recording of minimum, maximum and average values along with their respective times (time passed since the start of measurement)

### Decibel calculation

Computes the logarithm of an alternating current, and uses it together with the relative value computation to display the relative value. You can select the standard resistance according to the application, such as audio or communication circuit signal measurement.

* Selectable standard resistance values:
4/8/16/32/50/75/93/110/125/135/150/200/250/300/500/600/800/900/1000/1200Ω

## Full Display Functions

**50,000-count, 51-segment bar graph display**
**Backlight provided as standard for when working in dark places.**
**Simultaneous display of frequency and voltage, frequency and duty ratio or decibels and voltage on the dual display.**

Display: V AC and V DC measurements

Sub-display

In addition to the above, the sub-display can display the reference value for differential calculation, memory storage numbers for measured data, minimum/maximum/average value recording times, and standard resistance during decibel calculation.

## TY700 General Specifications

**Measurement Functions** :DC voltage, AC voltage, DCV+ACV, DC current, AC current, DCA+ACA, resistance, frequency, temperature, capacitance, duty cycle, decibel calculation, continuity check, diode test, low-power resistance (TY720 only)
For AC voltage/current, RMS/MEAN detection can be switched (TY720 only).
For AC voltage/current, the low-pass filter can be turned on/off (TY720 only).

**Additional Functions** :Data hold/auto hold/peak hold (TY720 only), range hold, maximum/minimum/average values resistance, capacitance zero, relative and percentage value calculation, manual-mode memory, logging-mode memory, auto power off, backlight (white LED)

**Display** :5-digit LCD: ························· 7-segment
Digital display: ···················· Main display; [50,000] counts
Sub-display ; [50,000] counts
Bar graph display: ················ 51-segment
Polarity indicator: ············· "-" appears automatically when the polarity is negative
Overrange indicator:··········· "OL"
Low-battery indicator: ········ " ⊞ " appears at or below the minimum operating voltage.

**Measuring Rate** :6 times/sec (Frequency: 1 time/sec, Capacitance: max. 0.03 times/sec (50mF), Resistance: 4 times/sec)
Bar graph display: 15 times/sec

**Operating Temp. and Humidity** :-20 to 55°C; 80% RH or less (no condensation) 40 to 55°C: 70% RH or less

**Storage Temp. and Humidity** :-40 to 70°C; 70% RH or less (no condensation)

**Temperature Coefficient** :Add the accuracy 0.05/°C to the basic accuracy at a temperature within -20 to 18°C and 28 to 55°C. For continuous measurements, add 1 digit/°C for DC voltage (DCV) and DC current (DCA). (Add 3 digits/°C for 50mV, 5A, and 10A ranges)

**Power Supply** :Four AA (R6) dry cells
**Battery Life** :Approx. 120 hours (for continuous DC voltage measurement with alkaline cells)
**Withstanding Voltage** :6.88kV for 5 seconds (between input terminals and casing)
**Dimensions** :Approx. 90(W) x 192(H) x 49(D) mm
**Weight** :Approx. 560g (including batteries)
**Compliance with Standards** :Safety  EN61010-1, EN61010-2-030, EN61010-031, 1000V CATⅢ, 600V CATⅣ, pollution level 2, indoor, 2000m max. above sea level
UL 61010-1, CAN/CSA-C22.2 No. 61010-1,
UL 61010-031, CAN/CSA-C22.2 No. 61010-031
EMC:   EN61326-1 Class B, EN55011 Class B Group 1, EN61326-2-2
**Standard Accessories** :AA (R6) dry cells: 4, Test lead set (98015): 1, Fuse (installed) 440mA/1000V and 10A/1000V, Instruction manual: 1

## Model and Specification Code

| Name | Model |
|------|-------|
| Digital Multimeter | TY710 |
| | TY720 |

## Optional Accessories

| Name | Model | Specification |
|------|-------|---------------|
| DMM communication package | 92015 | USB communication adapter + USB communication cable + Application software |
| Test leads | 98073 | 1000V CAT Ⅲ, 600V CATⅣ Red/black (1 set) |
| Test leads with Alligator Clip | 99014 | 1000V CAT Ⅲ, 600V CATⅣ Red/black (1 set) |
| Fuse | 99015 | 440 mA/1000V (1 piece/1 unit) |
| | 99016 | 10 A/1000 V (1 piece/1 unit) |
| TC-K temperature probe | 90050B | -50 to 600°C (For liquids) |
| | 90051B | -50 to 600°C (For liquids) |
| | 90055B | -20 to 250°C (For surfaces) |
| | 90056B | -20 to 500°C (For surfaces) |
| Current clamp probe | 96001 | For 400A, AC Output: 10mV/A, AC |
| Carrying case | 93029 | Hard type (Houses the DMM, the test leads and communication cable) |

## Performance

**Test conditions: Temperature and humidity = 23 ± 5°C, 80% RH or less;    Accuracy = ± (% rdg + dgt).**
**Note: A response time is the time required for achieving the accuracy specified for the corresponding range.**

### DC Voltage Measurement (⎓V)

| Range | Resolution | Accuracy TY710,TY720 | Input Resistance | Maximum Input Voltage |
|-------|-----------|----------------------|------------------|----------------------|
| 50mV | 0.001mV | 0.05+10 | Approx. 100MΩ | 1000V DC |
| 500mV | 0.01mV | 0.02+2 | | |
| 2400mV | 0.1mV | | | |
| 5V | 0.0001V | 0.025+5 | 10MΩ | 1000V rms AC |
| 50V | 0.001V | 0.03+2 | | |
| 500V | 0.01V | | | |
| 1000V | 0.1V | | | |

NMRR: 80dB or greater for 50/60Hz ± 0.1%At 50mV of range, 70dB or greater for 50/60Hz ± 0.1%
CMRR: 100dB or greater for 50/60Hz(Rs=1kΩ) Response time: 0.3 seconds or less

### AC Voltage Measurement [RMS] (~V)
AC coupling, RMS detection, crest factor for 1000V of range: 1.5 ; crest factor for ranges other than 1000V: 3

| Range | Resolution | Accuracy (Upper: TY710; Lower: TY720; the display of "—" is not specified) | | | | | | Input Impedance | Maximum Input Voltage |
|-------|-----------|-------|-------|-------|-------|-------|-------|-----------------|----------------------|
| | | 10 - 20Hz | 20Hz - 1kHz | 1k - 10kHz | 10k - 20kHz | 20k - 50kHz | 50k - 100kHz | | |
| 50mV | 0.001mV | 2+80*2 | 0.4+40*2 | 5+40*2 | 5.5+40*2 | 15+40*2 | | 11MΩ<50pF | 1000V rms AC 1000V DC |
| 500mV | 0.01mV | 1.5+30*1 | 0.7+30*1 | 2+50*2 | — | | | | |
| 5V | 0.0001V | 1+30*1 | 0.4+30*1 | 1+40*1 | 2+70*2 | 5+200*2 | | | |
| 50V | 0.001V | | | | | | | | |
| 500V | 0.01V | | | 3+30*2 | — | | | 10MΩ<50pF | |
| 1000V | 0.1V | *2 | *2 | 3+30*2 | | | | | |
| | | *2 | *2 | 3+30*2 | | | | | |

*1: At 5 to 100% of range   *2: At 10 to100% of range CMRR: 80dB or greater for DC to 60Hz(Rs= 1kΩ) Response time: 1 second or less

### AC Voltage Measurement [MEAN] (~V)
AC coupling, Mean-value detection and RMS-value calibration (sinusoidal wave)

| Range | Resolution | Accuracy TY720 | | | Input Impedance | Maximum Input Voltage |
|-------|-----------|------|------|------|-----------------|----------------------|
| | | 10 - 20Hz | 20 - 500Hz | 500 - 1kHz | | |
| 50mV | 0.001mV | 4+80*2 | 1.5+30*2 | 5+30*2 | 11MΩ<50pF | 1000V rms AC 1000V DC |
| 500mV | 0.01mV | 2+30*1 | 1+30*1 | 3+30*1 | | |
| 5V | 0.0001V | | | | | |
| 50V | 0.001V | | | | | |
| 500V | 0.01V | | | | 10MΩ<50pF | |
| 1000V | 0.1V | *2 | *2 | *2 | | |

*1: At 5 to 100% of range  *2: At 10 to 100% of range  CMRR: 80dB or greater for DC to 60Hz (Rs= 1kΩ)  Response time: 1 second or less

### DCV + ACV (⎓+~)
AC coupling, RMS detection  crest factor for 1000V of range: 1.5 ; crest factor for ranges other than 1000 V: 3

| Range | Resolution | Accuracy (Upper: TY710; Lower: TY720; the display of "—" is not specified) | | | | | | Input Impedance | Maximum Input Voltage |
|-------|-----------|-------|-------|-------|-------|-------|-------|-----------------|----------------------|
| | | DC,10 - 20Hz | DC,20Hz - 1kHz | DC,1k - 10kHz | DC,10k - 20kHz | DC,20k - 50kHz | DC,50k - 100kHz | | |
| 5V | 0.0001V | 1.5+10*1 | 1+10*1 | 2+10*2 | | | | 11MΩ<50pF | |
| 50V | 0.001V | 1.5+10*1 | 0.5+10*1 | 1+10*1 | 2+10*2 | 5+20*2 | | | 1000V rms AC 1000V DC |
| 500V | 0.01V | | | | | | | 10MΩ<50pF | |
| 1000V | 0.1V | *2 | *2 | — | | | | | |
| | | *2 | *2 | | | | | | |

*1: At 5 to 100% of range   *2: At 10 to 100% of range  CMRR: 80dB or greater for DC to 60Hz (Rs = 1kΩ)   Response time: Approx. 2 seconds

### Resistance Measurement (Ω)

| Range | Resolution | Accuracy TY710 | Accuracy TY720 | Maximum Testing Current | Open-circuit Voltage | Input Protection Voltage |
|-------|-----------|-------|-------|----------------------|--------------------|-----------------------|
| 500Ω | 0.01Ω | 0.1+2*1 | 0.05+2*1 | <1mA | <2.5V | 1000V rms |
| 5kΩ | 0.0001kΩ | | | <0.25mA | | |
| 50kΩ | 0.001kΩ | | | <25μA | | |
| 500kΩ | 0.01kΩ | | | <2.5μA | | |
| 5MΩ | 0.0001MΩ | 0.5+2 | | <1.5μA | | |
| 50MΩ | 0.001MΩ | 1+2 | | <0.13μA | | |

*1: Accuracy after zero calibration  Response time: 1 second or less for 500Ω to 500kΩ, 5 seconds or less for 5MΩ to 50MΩ

### Low-power Resistance Measurement (LP-Ω)
Maximum effective display: 5000

| Range | Resolution | Accuracy TY720 | Maximum Testing Current | Open-circuit Voltage | Input Protection Voltage |
|-------|-----------|------|----------------------|--------------------|-----------------------|
| 5kΩ | 0.001kΩ | 0.2+3 | <10μA | <0.7V | 1000V rms |
| 50kΩ | 0.01kΩ | | <1.0μA | | |
| 500kΩ | 0.1kΩ | | <0.6μA | | |
| 5MΩ | 0.001MΩ | 1+3 | <0.05μA | | |

### Continuity Check (🔊)
Maximum effective display: 5000

| Range | Resolution | Continuity Beeper TY710, TY720 | Testing Current | Open-circuit Voltage | Input Protection Voltage |
|-------|-----------|-------------------------------|----------------|--------------------|-----------------------|
| 500Ω | 0.1Ω | Buzzer sounds at 100 ± 50Ω or less. | Approx. 0.5mA | <5V | 1000V rms |

### DC Current Measurement (⎓A)

| Range | Resolution | Accuracy TY710,TY720 | Voltage Drop | Maximum Input Current |
|-------|-----------|----------------------|-------------|----------------------|
| 500μA | 0.01μA | 0.2+5 | <0.11mV/μA | 440mA fuse-protected |
| 5000μA | 0.1μA | | | |
| 50mA | 0.001mA | | <4mV/mA | |
| 500mA *3 | 0.01mA | | | |
| 5A | 0.0001A | 0.6+10 | <0.1V/A | 10A fuse-protected |
| 10A | 0.001A | 0.6+5 | | |

Response time: 0.3 seconds or less *3: Maximum testing current at 500mA of range is 440mA

### AC Current Measurement [RMS] (~A)
RMS detection crest factor: 3

| Range | Resolution | Accuracy (Upper: TY710; Lower: TY720; the display of "—" is not specified) | | | Voltage Drop | Maximum Input Current |
|-------|-----------|-------|-------|-------|-------------|----------------------|
| | | 10 - 20Hz | 20Hz - 1kHz | 1k - 5kHz | | |
| 500μA | 0.01μA | 1.5+20 | 1+20 | — | <0.11mV/μA | 440mA fuse-protected |
| 5000μA | 0.1μA | | | | | |
| 50mA | 0.001mA | 1+20 | 0.75+20 | 1+30 | <4mV/mA | |
| 500mA *3 | 0.01mA | | | | | |
| 5A | 0.0001A | 1.5+20 | 1+20 | — | <0.1V/A | 10A fuse-protected |
| 10A | 0.001A | 1.5+20 | 1+20 | 2+30 | | |

Shown above is the accuracy at 5 to 100% of range (10 to 100% for 10A range).  Response time: 1 second or less
*3: Maximum testing current at 500mA of range is 440mA.

### AC Voltage Measurement [MEAN] (~A)
Mean-value detection and RMS-value calibration (sinusoidal wave)

| Range | Resolution | Accuracy TY720 | | | Voltage Drop | Maximum Input Current |
|-------|-----------|------|------|------|-------------|----------------------|
| | | 10 - 20Hz | 20 - 500Hz | 500Hz - 1kHz | | |
| 500μA | 0.01μA | 2+20 | 1.5+20 | 2+30 | <0.11mV/μA | 440mA fuse-protected |
| 5000μA | 0.1μA | | | | | |
| 50mA | 0.001mA | | | | <4mV/mA | |
| 500mA *3 | 0.01mA | | | | | |
| 5A | 0.0001A | 3+20 | 2+20 | 4+30 | <0.1V/A | 10A fuse-protected |
| 10A | 0.001A | | | | | |

Shown above is the accuracy at 5 to 100% of range (10 to 100% for 10A range).  Response time: Approx. second or less
*3: Maximum testing current at 500mA of range is 440mA.

### DCA + ACA (⎓+~)
Maximum effective display: 50,000, crest factor: 3

| Range | Resolution | Accuracy (Upper: TY710; Lower: TY720; the display of "—" is not specified) | | | Voltage Drop | Maximum Input Current |
|-------|-----------|-------|-------|-------|-------------|----------------------|
| | | DC,10 - 20Hz | DC,20Hz - 1kHz | DC,1k - 5kHz | | |
| 500μA | 0.01μA | 2+10 | 1.5+10 | — | <0.11mV/μA | 440mA fuse-protected |
| 5000μA | 0.1μA | | | | | |
| 50mA | 0.001mA | 1.5+10 | 1+10 | 1.5+10 | <4mV/mA | |
| 500mA *3 | 0.01mA | | | | | |
| 5A | 0.0001A | 2+10 | 1.5+10 | — | <0.1V/A | 10A fuse-protected |
| 10A | 0.001A | 2+10 | 1.5+10 | 3+10 | | |

Shown above is the accuracy at 5 to 100% of range (10 to 100% for 10A range).  Response time: Approx. 2 seconds  *3: Maximum testing current for 500mA of range is 440mA.

### Diode Test (▸⊢)

| Range | Resolution | Accuracy TY710,TY720 | Testing Current (Vf = 0.6 V) | Open-circuit Voltage | Input Protection Voltage |
|-------|-----------|----------------------|------------------------------|--------------------|-----------------------|
| 2.4V | 0.0001V | 1 + 2 | Approx. 0.5mA | <5V | 1000V rms |

### Temperature Measurement (TEMP)

| Range | Resolution | Accuracy TY710,TY720 | Input Protection Voltage |
|-------|-----------|----------------------|-----------------------|
| -200 - 1372°C | 0.1°C | 1+1.5°C | 1000V rms |

Temperature probe: Type K thermocouple sensor (optional)

### Capacitance (⊣⊢)
Maximum effective display:5000

| Range | Resolution | Accuracy TY710,TY720 | Input Protection Voltage |
|-------|-----------|----------------------|-----------------------|
| 5nF | 0.001nF | 1+5*1 | 1000V rms |
| 50nF | 0.01nF | | |
| 500nF | 0.1nF | | |
| 5μF | 0.001μF | | |
| 50μF | 0.01μF | | |
| 500μF | 0.1μF | 2+5 | |
| 5mF | 0.001mF | | |
| 50mF | 0.01mF | 3+5 | |

*1: Accuracy after zero calibration

### Frequency Measurement (Hz)
AC coupling, Maximum effective display: 9999

| Range (auto-ranging) | Resolution | Accuracy TY710,TY720 |
|---------------------|-----------|----------------------|
| 2.000 - 9.999Hz | 0.001Hz | 0.02+1*1 |
| 9.00 - 99.99Hz | 0.01Hz | |
| 90.0 - 999.9Hz | 0.1Hz | |
| 0.900 - 9.999kHz | 0.001kHz | |
| 9.00 - 99.99kHz | 0.01kHz | *2 |

*1: At 10 to 100% of input voltage or current range
*2: At 40 to 100% of input voltage or current range

### Duty Cycle (%)

| Range | Resolution | Accuracy TY710,TY720 |
|-------|-----------|----------------------|
| 10 - 90% | 1% | ± 1%*1 |

*1: For input of a square wave with a frequency within 10.00 to 500.0Hz  At 40 to 100% of input voltage or current range

### Peak Hold Function (PH) TY720 only
Maximum effective display: 5000

| Range | Accuracy TY720 | Response Time |
|-------|---------------|---------------|
| DCV, DCA | ± 100 digit | >250μs |

# TY500 Series

## Safe design and supports various maintenance applications.

**Model**

# TY530
# TY520

- 3.5 digits
- 6000 count
- RMS
- USB (TY530)
- Terminal shutters
- 0.09% (DCV)
- Sensor
- LPF

DIGITAL MULTIMETER    YOKOGAWA

**3-year Warranty**

C (UL) US
LISTED

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## Maximum Reliability and Safety

### ■ Reliability
### High accuracy and safety

Accuracy:   0.09% rdg + 2 dgt (DC voltage)
True RMS measurement
Only TY530 can switch RMS and mean detection.

## Safe Design

### Conforms to EN61010-1 safety standard.

Conforms to overvoltage category 1000 V AC/DC, CAT Ⅲ and 600 V AC/DC, CAT IV.

### Shutters prevent erroneous insertion of test leads into current measurement terminals (terminal shutters).

If the function is switched to other than current measurement while a test lead remains inserted in a current measurement terminal, the fuse built into the DMM can not protect the circuits. The terminal shutters prevent such accidental errors.

## Closed Case Calibration

### User calibration function

The TY series, simply performing special operations via front panel allows for quick and reliable adjustment.  In addition, the series allows for one-touch adjustment of AC voltage- and AC current-to-frequency characteristics. The user calibration function leads to improved operation efficiency and cost reduction.
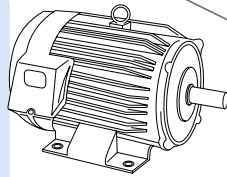
• External standard instrument required for calibration.

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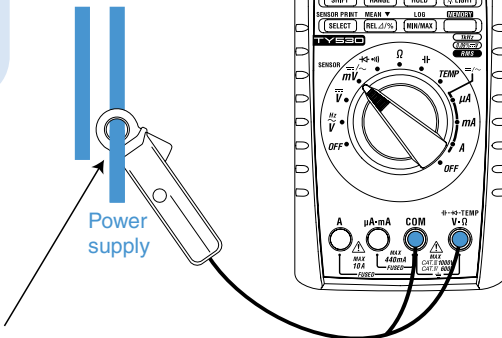## Direct reading of various sensor output signals

The DMM can directly read the various sensor output signals (mV DC/AC) at any scaling. The units can be changed (16 units are available). Output signal and scaled value are simultaneously displayed.

AUTO OFF
SENSOR
RMS
~ 55.0 mV
550 m A
0  1  2  3  4  5  600

Sub-display
Sensor output signal

Main display
Scaled value
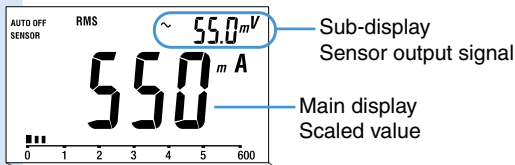
Small motor

Power supply

AC/DC clamp-on probe (Model 96095)
Reads maximum 60 A when used with the TY500 series.

## Data Storage Method

### Two memory modes (TY530 only)
### Selectable from 2 types of memory mode to suit field needs.

• SAVE-mode memory
  A mode for manually saving any data
• Logging-mode memory
  A mode for automatically saving data at a specified interval

| Model | Memory capacity | |
| --- | --- | --- |
| | SAVE-mode memory | Logging-mode memory |
| TY530 | 100 | 1600 |

### Real-time measurement

The optional communication package*1 sold separately (Model 92015) allows you to connect to a PC for transmitting large amounts of data that cannot be saved in the DMM internal memory.
You can transmit the saved data from the internal memory to a PC and process it using application software or spreadsheet software (Excel*2) for data management.

*1 Communication cable and application software are included.
*2 Excel is a registered trademark of Microsoft Corporation in the United States.
*3 The communication cable employs an infrared system, so the device is electrically insolated.

For details of the application software, refer to page 7.

## TY500 General Specifications

**Measurement Functions** : DC Voltage, AC voltage, DC current, AC current, resistance, frequency, temperature, capacitance, continuity check, diode test For AC voltage/current, RMS/MEAN detection can be switched (TY530 only). Low-pass filter can be switched on/off

**Additional Functions** : Data hold/auto hold/range hold, maximum/minimum/average values (TY530 only), resistance, relative and percentage value calculation, memory function (TY530 only), communication function (TY530 only), logging-mode memory (TY530 only), auto power off, backlight

**Display** : 3.5-digit LCD: ······················ 7-segment
Digital display: ····················· [6000] counts
Bar graph display: ················ 31-segment
Polarity indicator: ··············· "-" appears when the polarity is negative
Overrange indicator: ··········· "OL"
Low-battery indicator: ········· " ⊞ " appears at or below the minimum operating voltage.

**Measuring Rate** : 5 times/sec (Frequency: 1 time/sec, Capacitance: max. 0.14 times/sec (1000μF), Resistance: 2.5 times/sec, Temperature: 0.7 times/sec), Bar graph display: 25 times/sec (DC voltage, diode test: 5 times/sec)

**Operating Temp. and Humidity** : -10 to 55°C; 80% RH or less (no condensation) 40 to 55°C; 70% RH or less

**Storage Temp. and Humidity** : -30 to 70°C; 70% RH or less (no condensation)

**Temperature Coefficient** : Add the accuracy 0.1°/C to the basic accuracy at a temperature within -10 to 18°C and 28 to 55°C.

**Power Supply** : Four AA (R6) dry cells

**Battery Life** : Approx. 300 hours (for continuous DC voltage measurement with alkaline cells)

**Withstanding Voltage** : 6.88kV for 5 seconds (between input terminals and casing)

**Dimensions** : Approx. 90(W) x 192(H) x 49(D) mm

**Weight** : Approx. 570g (including batteries)

**Compliance with Standards** : Safety EN61010-1, EN61010-2-030, EN61010-031, 1000V CAT Ⅲ, 600V CATⅣ, pollution level 2, 2000m max. above sea level
UL 61010-1, CAN/CSA-C22.2 No. 61010-1,
UL 61010-031, CAN/CSA-C22.2 No. 61010-031
EMC: EN61326-1 Class B, EN55011 Class B Group 1, EN61326-2-1

**Standard Accessories** : AA (R6) dry cells: 4, Test lead set (98015): 1, Fuse (installed) 440mA/1000V and 10A/1000V, Instruction manual: 1

## Model and Specification Code

| Name | Model |
|---|---|
| Digital Multimeter | TY520 |
| | TY530 |

## Optional Accessories

| Name | Model | Specification |
|---|---|---|
| DMM communication package | 92015 | USB communication adapter + USB communication cable + Application software |
| Communication package for printer | 97016 | Printer adapter + Printer cable |
| Test leads | 98073 | 1000V CAT Ⅲ, 600V CAT Ⅳ Red/black (1 set) |
| Test leads with Alligator Clip | 99014 | 1000V CAT Ⅲ, 600V CAT Ⅳ Red/black (1 set) |
| Fuse | 99015 | 440mA/1000V (1 piece/1 unit) |
| | 99016 | 10A/1000V (1 piece/1 unit) |
| TC-K temperature probe | 90050B | -50 to 600°C (For liquids) |
| | 90051B | -50 to 600°C (For liquids) |
| | 90055B | -20 to 250°C (For surfaces) |
| | 90056B | -20 to 500°C (For surfaces) |
| Current clamp probe | 96001 | For 400A,AC Output: 10mV/A, AC |
| | 96030 | 200A,AC |
| | 96031 | 500A,AC |
| | 96033 | 50A,AC |
| | 96036 | 2A,AC |
| Carrying case | 93029 | Hard type (Houses the DMM, the test leads and communication cable) |

## Performance

**Test conditions: Temperature and humidity = 23 ± 5°C, 80% RH or less; Accuracy = ± (% rdg + dgt).**
**Note: A response time is the time required for achieving the accuracy specified for the corresponding range.**

### DC Voltage Measurement (⎓V)

| Range | Resolution | Accuracy TY520, TY530 | Input Resistance | Maximum Input Voltage |
|---|---|---|---|---|
| 600mV | 0.1mV | | 10MΩ | |
| 6V | 0.001V | 0.09+2 | 11MΩ | 1000V DC |
| 60V | 0.01V | | | 1000V rms AC |
| 600V | 0.1V | | 10MΩ | |
| 1000V | 1V | 0.15+2 | | |

NMRR: 60dB or greater for 50/60Hz ± 0.1%
CMRR: 120dB or greater for 50/60Hz (Rs = 1kΩ) Response time: 1 second or less

### AC Voltage Measurement (~V)

AC coupling, RMS detection (TY530, TY520) crest factor: 3/mean-value detection (TY530 only) sinusoidal wave

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

Shown above is the accuracy at 5 to 100% of range (200 to 1000V for 1000V range, peak 1500V or less). Response time: 2 seconds or less
Add accuracy = ±(2% of reading + 2% of F.S.), except for sinusoidal wave. CMRR: 60dB or greater for DC to 60Hz (Rs = 1kΩ). 4 counts or less is corrected to 0.

### Resistance Measurement (Ω)

| Range | Resolution | Accuracy | Maximum Testing Current | Open-circuit Voltage | Input Protection Voltage |
|---|---|---|---|---|---|
| 600Ω | 0.1Ω | | <1.2mA | <3.5V | |
| 6kΩ | 0.001kΩ | 0.4+1*1 | <110μA | | |
| 60kΩ | 0.01kΩ | | <13μA | | |
| 600kΩ | 0.1kΩ | | <1.3μA | <1.3V | 1000V rms |
| 6MΩ | 0.001MΩ | 0.5+1 | | | |
| 60MΩ | 0.01MΩ | 1+2(0-40MΩ) 2+2(40-60MΩ) | <130nA | | |

*1: Accuracy after zero calibration for 600Ω to 6kΩ range. Response time: 2 seconds or less for 600Ω to 600kΩ, 10 seconds or less for 6MΩ to 60MΩ.

### Frequency Measurement (Hz)

AC coupling, Maximum effective display: 9999

| Range (auto-ranging) | Resolution | Accuracy | Input Voltage Range |
|---|---|---|---|
| 10.00 - 99.99Hz | 0.01Hz | | 0.2 - 600V rms |
| 90.0 - 999.9Hz | 0.1Hz | 0.02+1 | |
| 0.900 - 9.999Hz | 0.001kHz | | 0.4 - 600V rms |
| 9.00 - 99.99kHz | 0.01kHz | | 0.8 - 100V rms |

### DC Current Measurement (⎓A)

| Range | Resolution | Accuracy | Voltage Drop | Maximum Input Current |
|---|---|---|---|---|
| 600μA | 0.1μA | | <0.12mV/μA | |
| 6000μA | 1μA | 0.2+2 | | 440mA fuse-protected |
| 60mA | 0.01mA | | <3.3mV/mA | |
| 600mA | 0.1mA | | | |
| 6A | 0.001A | 0.5+5 | <0.1V/A | 10A fuse-protected |
| 10A | 0.01A | | | |

Maximum testing current at 600mA of range is 440mA. Response time: 1 second or less.

### AC Current Measurement (~A)

RMS detection crest factor: 3

| Range | Resolution | Accuracy 50/60Hz | Accuracy 40Hz - 1kHz | Voltage Drop | Maximum Input Current |
|---|---|---|---|---|---|
| 600μA | 0.1μA | | | <0.12mV/μA | |
| 6000μA | 1μA | | | | 440mA fuse-protected |
| 60mA | 0.01mA | 0.75+5 | 1.5+5 | <3.3mV/mA | |
| 600mA | 0.1mA | | | | |
| 6A | 0.001A | | | <0.1V/A | 10A fuse-protected |
| 10A | 0.01A | | | | |

Shown above is the accuracy at 5 to 100% of range (2 to 10A for 10A range). Response time: 3 seconds or less
Add accuracy = ± (2% of reading + 2% of F.S.), except for sinusoidal wave. 4 counts or less is corrected to 0.

### Diode Test (⊳⊢)

| Range | Resolution | Accuracy | Testing Current (Vf=0.6V) | Open-circuit Voltage | Input Protection Voltage |
|---|---|---|---|---|---|
| 2V | 0.001V | 1+2 | Approx. 0.5mA | <3.5V | 1000V rms |

### Continuity Check (·))))

| Range | Resolution | Accuracy | Testing Current (Vf=0.6V) | Open-circuit Voltage | Input Protection Voltage |
|---|---|---|---|---|---|
| 600Ω | 0.1Ω | Buzzer sounds at 50+30Ω or less | Approx. 1.2mA | <3.5V | 1000V rms |

### Capacitance (⊣⊢)

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

*1: Accuracy after zero calibration for 10nF to 1μF range.

### Temperature Measurement (TEMP)

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

Temperature probe: Type K thermocouple sensor (optional)

## NEW Accessory AC/DC clamp-on probe (Model 96095)



### ■ Features

A compact, light, and portable device with 12-mm caliber useful for tangled wiring.
When used with this probe*1, the DMM can measure and display current (which it otherwise cannot do by itself). The TY500 series can directly read up to 60 A when used with the probe (in sensor mode).

### ■ Specifications

| Model | | 96095 | |
|---|---|---|---|
| Diameter of measurable conductor | | 12 mm max. | |
| Basic performance | Current to measure | Output voltage | Accuracy (at 23°C ± 5°C) |
| | | | 50/60 Hz | 40 Hz to 1 kHz |
| | AC 0.1 to 130 A | Output: 10 mV/A AC (AC 1 to 1300 mVrms) | 1.2%+0.4 mV | 2.5%+0.4 mV |
| | DC 0 to 180 A | Output: DC10 mV/A (DC 0 to ± 1800 mV) | 1.2% + 0.4 mV | |
| General specifications | | | |
| Operating temperature and humidity | | −10 to 55°C, 80%RH or less (no condensation) | |
| Storage temperature and humidity | | −30 to 70°C, 85%RH or less (no condensation) | |
| Power supply | | AAA alkaline cell × 2 Power alert: LED light on at 2.2 V ± 0.2 V Auto power off at 1.9 V ± 0.2 V | |
| Battery life | | Approx. 35 hours (continuous) (until LED light on)*2 | |
| Dimensions and weight | | 127(L) × 42(W) × 22(D) mm Cable length: 1200 mm Weight: Approx. 140 g (including cells) | |
| Safety standard | | EN61010-1: CAT III 300V, pollution degree 2, operation at maximum altitude of 2,000 m, EN61010-2-032 EN61326-1: Class B, EN61326-2-2, EN55011 Class B Group 1 | |
| Accessories | | Soft carrying case (93040), Battery, User's manual | |

*1 Readings must be converted when used with the DMM.
*2 After the battery alert, approx. 5 hours remain to automatic power-off.

# Communication Functions and Application Software Allow Analyses and Management of Measurement Data

## Data management by dedicated application software

Example of document windows in DMM application software

**Data saved in the DMM can be managed by the dedicated application software (Model 92015).**

■ Saved data can be transmitted from the internal memory to a PC. Data collected in SAVE-memory mode or logging-memory mode
■ Measurements by the DMM can be monitored on a PC in real time.
■ Large amounts of data that cannot be saved in the DMM internal memory can be transmitted to a PC in real time.
Data can be written to an Excel* spreadsheet.
Maximum number of real-time data transmission: 32767
■ Measurement data can be laid out in an Excel spreadsheet. Graphs can be automatically created on a spreadsheet.
 * Excel is a registered trademark of Microsoft Corporation in the United States.

### 92015 Communications Package Specifications

■ **Specifications**
**Communication cable**
Communication cable: IR communication adapter, USB communication cable: 1
Cable length:  2 m
Interface:  USB 1.1
Supported models:  TY710, TY720, TY530

■ **Application software**
**System requirements of PC**
Operating system:  WindowsXP/Vista(*)/7
CPU:  Pentium 133 MHz or higher
Memory:  64 MB or larger
Storage device:  Hard disk with 10 MB or more free space
 CD-ROM drive: 1
Excel:  Excel2003 or later (*)
Contents:  CD-ROM software: 1
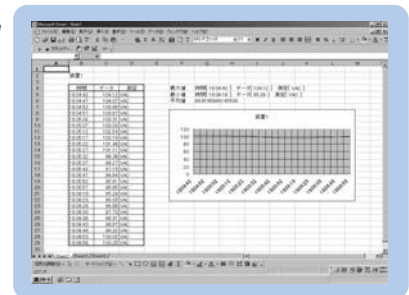 Communication cable (communication adapter included): 1
 User's manual
 * Windows and Excel is a registered trademark of Microsoft Corporation in the United States.

**Enlarged view**

**Data layout on Excel spreadsheet**

USB communication

TY720

PC

Data layout example on Excel spreadsheet

## Optional Accessories*

* For TY710, TY720, and TY530 only

| Item | Model | Specification |
|---|---|---|
| DMM communication package | 92015 | USB communication cable (adaptor included), application software |

| Name | Model | Specification | Applicable DMM Models | Appearance |
|---|---|---|---|---|
| DMM communication package | 92015 | USB communication adapter + USB communication cable + Application software | TY700 series TY530 | |
| Test leads | 98073 | 1000V CAT.III 600V CAT.IV Red/black (1set) | All models except 73101 | |
| | RD031 | L-plug, Red/black (1set) | 732 series | |
| Test leads with Alligator Clip | 99014 | 1000V CAT.III 600V CAT.IV Red/black (1set) | All models except 73101 | |
| Alligator clips | B9646HF | Red/black(1set) | All models | 98073   99014 |
| Fuse | F02 | 15A/250V (3pcs/1set) | 73201/73202/73203 | |
| | F05 | 500mA/250V(3pcs/1set) | | |
| | 99015 | 440mA/1000V(1pc/1set) | TY700/TY500 series | |
| | 99016 | 10A/1000V(1pc/1set) | | |
| Rubber case | 93007 | | 732 series | |
| Carrying case | B9646GB | Hard case | | |
| | 93029 | Hard case (Houses the DMM, the test leads and communication cable) | TY700/TY500 series | |
| Temperature (thermocouple type K) probe | 90050B | -50°C to 600°C(for liquid) | TY700/TY500 series | |
| | 90051B | -50°C to 600°C(for liquid) | | |
| | 90055B | -20°C to 250°C(for surface) | | |
| | 90056B | -20°C to 500°C(for surface) | | |
| Current clamp probe | 96001 | For 400A AC; 10mV/A AC output | All models except 73101 (with TY500 series upto 60A can be read directly) | |
| | 96095 | For 130A AC/180A DC; 10mV/A AC/DC output | | |

## Current Clamp Probe:TY700/TY500 series (Direct reading is possible for TY500 series)

| Name | 96036 | 96033 | 96030 | 96031 |
|---|---|---|---|---|
| Current Clamp Probe | | CE | CE | CE |
| Measurable Conductor Diameter | dia. 40mm | dia. 18mm | dia. 30mm | dia. 30mm |
| Measurement Range | 2A,AC | 50A,AC | 200A,AC | 500A,AC |
| Output Voltage | 50mV,AC | 500mV,AC | 500mV,AC | 500mV,AC |
| Accuracy *varies according to input/Amplitude | ±0.5% of rdg | ±0.5% of rdg | ±0.5% of rdg | ±0.5% of rdg |
| Frequency Range | 20Hz - 5kHz | 20Hz - 20kHz | 20Hz - 20kHz | 20Hz - 5kHz |
| Maximum Circuit Voltage | 50V,AC | 300V,AC | 600V,AC | 600V,AC |

Note:Use AC voltage range of the DMM.
Note:Need to covert the meter reading except TY500series.

## Basic Usage Digital Multimeters

### Voltage/Resistance Measurement

The COM terminal and V/Ω terminal are used. To measure a voltage, set the dial to voltage measurement. To measure a resistance, set the dial to resistance measurement. Some DMM models can also display the frequency and calculated decibel value at the same time when measuring an AC voltage. During resistance measurement, it is possible to switch the function to checking of the continuity of the measured circuit.

**Measuring a Voltage and Resistance**
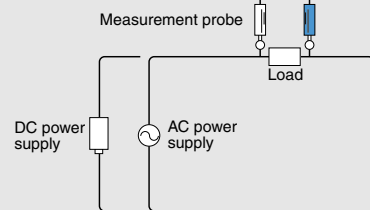


### Current Measurement

The COM terminal, and A, μA or mA terminal are used. Some models have shutters for preventing erroneous insertion into the current terminals and allow a contact of a lead to a current terminal only when the dial is set to current measurement. For these models, you cannot set the dial to voltage measurement while a lead is left inserted into a current terminal. This feature provides greater safety.
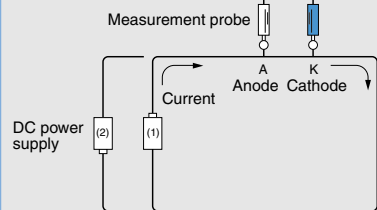
**Measuring a Current**
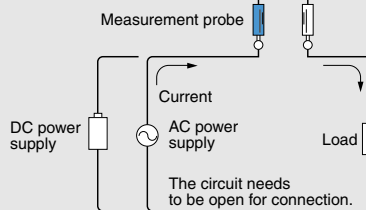


### Diode Test

A current flows through a diode when the power supply is connected as (1) below, while, almost no current flows when the power supply is connected as (2). The diode test function applies an adequate forward voltage across a diode to make a constant current flow and measures the voltage drop in the forward direction to determine the forward and reverse directions of the diode.

**Checking the Polarity of a Diode**

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