YOKOGAWA

Insulation Testers
Earth Testers

Insulation and Earth Testers

● **Insulation Tester**

2406E 2 and 3 ranges
MY10 Single range
MY40 4 ranges

● **Earth Tester**

EY200 Digital

EY200

MY40

Yokogawa Meters & Instruments Corporation

Bulletin MY-E

What Is Insulation Resistance?

Insulation resistance represents the state of insulation of electric equipment or circuits. It is one of the important measurement parameters in terms of safety and security. Methods of examining the state of insulation include using a clamp-on leakage tester for live circuits. Under normal circumstances, however, such electric equipment or circuits are shut down temporarily and their insulation is tested with an insulation tester.

Classification of Applications

Applications are roughly classified into low-voltage, high-voltage and ultra-high-voltage circuits. The table below summarizes examples of using rated test voltages. A tester with the rated test voltage of 500 V or 100 V/250 V is used for low-voltage circuits.

Rated test voltage	Example of use
25 V/50 V	Insulation testing of telephone line equipments and telephone line circuits
100 V/125 V	Maintenance of low voltage circuits or equipment handling 100 V line
	Insulation testing of control equipment
250 V	Maintenance of low voltage circuits or equipment handling 200 V line
500 V	Maintenance of low voltage circuits or equipment handling 600 V line or lower
	Inspection of low voltage circuits or equipment when installing handling 600 V line or lower
1000 V	Insulation testing of circuits or equipment handling 600 V line or over
	Insulation testing of circuits or equipment handling constantly high operating voltage (e.g. high voltage cables, high voltage equipment and communication equipment or cables handling high voltages)

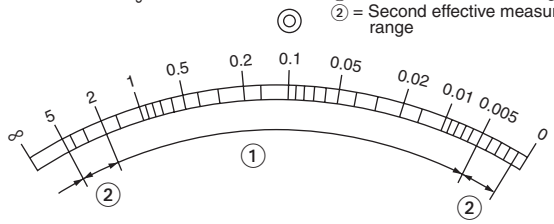
Test Methods for Low-voltage Circuits

Insulation resistance between cables of a low-voltage circuit and between the circuit and ground is tested for each circuit that can be separated by a switch or overcurrent breaker installed as specified by the electrotechnical equipment standards.
The low-voltage circuit is shut down by opening the switch and insulation between cables of the circuit and between the circuit and ground is tested. If the measured value is below the rated resistance, all shunt switches of a trunk line are opened and insulation is tested separately for each shunt circuit.
The comparator function of the MY40 insulation tester allows for smooth judgment when checking the insulation of electric circuits.

Methods of Scaling the 1st and 2nd Effective Measuring Ranges of Moving-pointer Insulation Testers

Rated test voltage: 25 V
Maximum effective reading: 5 MΩ

◎ = Central scale value
① = First effective measuring range
② = Second effective measuring range



Maximum effective reading:
The maximum reading that is indicated on the insulation tester and falls within the range with which the intrinsic error of the insulation tester is guaranteed.

Effective test range:
A test range or ranges, among those of the insulation tester, over which intrinsic error specified in the standards is guaranteed. In moving-pointer insulation testers, the range from a resistance value one-thousandth (1/1000) the maximum effective reading to the resistance value that is nearest to half (1/2) the maximum effective reading and equal to the maximum effective reading multiplied by 1, 2 or 5 or by any of these values multiplied by ten (10) raised to a whole-number power, shall be referred to as a first effective measuring range. In addition, the range from the upper limit of the first effective measuring range to the maximum effective reading and the range from the lower limit of the first effective measuring range to the zero (0) reading shall be referred to as second effective measuring ranges (see the figure above). (Excerpt from JIS C1302-2014).

Insulation Testers

General Specifications

Display readings	Digital	Analog
Model	MY40	MY10, 2406E
Effect of AC components	A change in the reading must not exceed ±10% when a resistance calculated from the rated measuring voltage and current is connected to the tester and a capacitance of 5 mF ±10% is connected in parallel across the resistance.	Same as to the left, except that the connected resistance has the central scale value.
Effect of temperature	A change in the reading at an ambient temperature of 23°C must not exceed ±2% at each of the maximum, minimum, and central scale values of the first effective measuring range when the temperature is changed from 23°C to 0°C or to 40°C.	A change in the reading must not exceed ±5% at the central scale value and be no more than ±0.7% of the scale length at either the infinite scale value or the zero scale value when the temperature is changed from 20°C to 0°C or to 40°C.
Effect of humidity	A change in the reading must be within the specified tolerance range when the tester is left to stand for one hour under a relative humidity of 90%.	
Effect of external magnetic field	A change in the reading must not exceed ±3% (analog) and be no more than ±1.2% (digital) at each of the maximum, minimum, and central scale values of the first effective measuring range when an external magnetic field of 400 A/m DC is applied to the direction where the effect thereof is the most significant.	Same as to the left, except that a change at the central scale value must be read.
Effect of inclination	———	A change in the infinite scale value (∞) must not exceed ±2% of the scale length when the tester is inclined 30° forward or backward and leftward or rightward from the horizontal position.
Effect of external voltage application	No damage should be present when a 50 Hz or 60 Hz AC voltage with an amplitude 1.2 times the rated test range is applied across the test terminals for 10 seconds each time the tester switch is turned ON and OFF. Nor should the user be subjected to any danger.	Same as to the left, except that the voltage is applied for 10 seconds with the tester switch turned OFF.
Effect of vibration	No structural damage should be present and a change in the reading must be within the specified tolerance after applying a vibration frequency of 25 Hz and a displacement amplitude width of 1 mm for 20 minutes to each of three axis directions.	No mechanical or electrical damage should be present and the rating within the specified tolerance must be satisfied after applying a vibration frequency of 16.7 Hz and a double amplitude of 4 mm for one hour to each of three axis directions.
Effect of shock	No structural damage should be present and a change in the reading must be within the specified tolerance after directly and reversely applying 1000 m/s^2, 6 ms half sine-wave shocks to the three axis directions three times each (i.e., 18 times in total).	The rating within the specified tolerance must be satisfied after applying a shock of 1000 m/s^2 to each of three directions twice each.
Operating temperature/ humidity range	0°C to 40°C/90% RH maximum (no condensation)	
Storage temperature/ humidity range	-10°C to 60°C/70% RH maximum (no condensation – batteries should be removed)	

Points on How to Choose an Insulation Tester

1 Type

Two choices:
Choose an analog model if visual recognition is of utmost importance, or a digital model if precise numeric recognition is of utmost importance.

2 Ratings

A wide choice of voltage/resistance ratings, from 25 V/5 MΩ to 1000 V/2000 MΩ
Some models have two or three ranges; thus, you need not take more than one instrument to the site.

3 Functionality

Each series includes a model or models with a backlight for working in dark places. Multi-functional models capable of, for example, AC voltage measurement, are also available.

4 Accessories

Optional test probes and probe tips are available for a variety of test environments.

Selection Guide (Insulation Tester & Earth Tester)

Type		Series/ Model	Suffix Code & Backlight	Rating	AC Voltage Measuring range	Display	Additional Function	External View	Page
Digital insulation testers	4 ranges	MY40 CE	01 (EL-illuminated)	125V/200MΩ 250V/200MΩ 500V/2000MΩ 1000V/2000MΩ	0–600V	3 1/2-digit LCD	Automatic discharge Conductor resistance measurement Comparator function Memory function		P.3
Analog insulation testers	2 & 3 ranges	2406E	31 (N/A)	25V/5MΩ 50V/10MΩ 125V/20MΩ	0–300V	Analog	Automatic discharge Battery check		P.4
			41 (EL-illuminated)						
			32 (N/A)	125V/20MΩ 250V/50MΩ	0–300V				
			42 (EL-illuminated)						
			33 (N/A)	125V/20MΩ 250V/50MΩ 500V/100MΩ	0–600V				
			43 (EL-illuminated)						
			34 (N/A)	250V/50MΩ 500V/100MΩ 1000V/2000MΩ	0–600V				
			44 (EL-illuminated)						
			35 (N/A)	250V/500MΩ 500V/1000MΩ 1000V/2000MΩ	0–600V				
			45 (EL-illuminated)						
	Single range	MY10 CE	01 (afterglow-illuminated)	125V/20MΩ	0–250V	Analog	Automatic discharge Battery check		P.5
			02 (afterglow-illuminated)	250V/50MΩ	0–300V				
			03 (afterglow-illuminated)	500V/100MΩ	0–500V				
			04 (afterglow-illuminated)	500V/1000MΩ	0–500V				
			05 (afterglow-illuminated)	1000V/2000MΩ	0–500V				

Type		Series/ Model	Suffix Code & Backlight	Rating	AC Voltage Measuring range	Display	Additional Function	External View	Page
Earth Testers		EY200 CE		0–2000Ω	Earth Voltage 0–200V	3 1/2-digit LCD			P.6

MY40 Digital Insulation Tester

MY40 SERIES

- **Digital model with 4 voltage/resistance ratings**
- **Multifunction**
  Insulation resistance, AC voltage and conductor resistance measurement
  Insulation test mode: Comparator, memory, auto-hold and discharge functions
  All test modes: Live-line alarm (excluding AC voltage measurement), battery check and automatic power-off
- **Easy-to-view, fluctuation-free display**
- **Double-action safety mechanism**

Protection against inadvertent setting of rotary switch to 1000 V rating

Testing Performance Specifications

Model	Rating	Range Option	Resolution	Measuring Range	Tolerance	Lower Limit of measured Ω	Rated Current	Central Scale Value
MY40 -01	125V/200MΩ	.4000	.1kΩ	0–.0199MΩ	± (5%of rdg+6dgt)	0.125MΩ	1mA	5MΩ
		4.000	1kΩ	.0200–10.00MΩ*	± (2%of rdg+6dgt)			
		40.00	10kΩ	10.01–200.0MΩ	± 5%of rdg			
		200.0	100kΩ					
	250V/200MΩ	.4000	.1kΩ	0–.0499MΩ	± (5%of rdg+6dgt)	0.25MΩ	1mA	5MΩ
		4.000	1kΩ	.0500–20.00MΩ*	± (2%of rdg+6dgt)			
		40.00	10kΩ	20.01–200.0MΩ	± 5%of rdg			
		200.0	100kΩ					
	500V/2000MΩ	4.000	1kΩ	0–0.999MΩ	± (5%of rdg+6dgt)	0.5MΩ	1mA	50MΩ
		40.00	10kΩ	1.000–500MΩ*	± (2%of rdg+6dgt)			
		400.0	100kΩ	501–2000MΩ	± 5%of rdg			
		2000	1MΩ					
	1000V/2000MΩ	4.000	1kΩ	0–1.999MΩ	± (5%of rdg+6dgt)	2MΩ	0.5mA	50MΩ
		40.00	10kΩ	2.000–1000MΩ*	± (2%of rdg+6dgt)			
		400.0	100kΩ	1001–2000MΩ	± 5%of rdg			
		2000	1MΩ					

* First effective measuring range; ** The minimum value at which the rated voltage can be maintained

Standard test conditions
Ambient temperature/humidity ranges: 23 ±5℃/45-75% RH

Tolerances under the above-mentioned conditions:

Deviation from zero scale value: 6 digits maximum

Indication of ∞ mark on bar graph: Approx. 4000 MΩ min. (500 V/1000 V)
Approx. 400 MΩ min. (125 V/250 V)

Open circuit voltage: 130% max. of rated voltage

Rated measuring current: 1 mA (0 to 20%) when in first effective measuring range
Short-circuit Current: 2 mA max.

AC voltage measurement (45-400 Hz)

Model	Range	Resolution	Accuracy	Input Impedance
MY40-01	600V	1V	±(2% of rdg + 6dgt)	Approx. 2 MΩ

Conductor resistance measurement

Model	Range	Resolution	Accuracy	Open-circuit Voltage
MY40-01	400Ω	0.1Ω	±(2% of rdg + 8dgt)	Buzzer sound resistance: <40Ω.

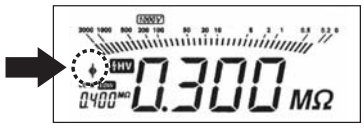
General Specifications

Display: 3 1/2-digit LCD; 4000 count; backlight-illuminated; logarithmic bar graph; extension bar graph–no fluctuations, as the display shows the digits of a reading in the order in which each digit settles.

Example of Extension Bar Indicator View

The data value is changing.

The data value is fixed.



Comparator function: The MY40 alerts you by turning on the LOW symbol and sounding the buzzer if the measured value is smaller than the reference value. You can allocate as many as three user-defined reference values to each rating. The factory-set defaults are 0.1 MΩ, 0.2 MΩ and 0.4 MΩ.

Memory function: For each rating, you can save as many as 20 measurements at desired memory address numbers.

Automatic discharge function: The MY40 automatically begins discharge when you turn off the MEAS switch. You can monitor the state of discharge by checking the bar graph and make sure discharge is complete by checking that the segment bar disappear.

High-voltage indicators: The high-voltage symbol and LED lamp come on to alert you when the MY40 is in insulation testing mode or if any voltage remains to be discharged.

Live-line alarm: If you apply an AC voltage of approximately 40 V or higher across the input terminals, the MY40 alerts you by blinking the LED lamp and sounding the buzzer.

Overrange input alarm: If the voltage being measured exceeds 600 V during AC voltage measurement, the MY40 alerts you by flashing the Maximum Value indicator and sounding the buzzer.

Auto-hold function: The tester retains the measured resistance for approximately 5 seconds after the MEAS switch is turned off.

Dimensions: 125 (W) × 103 (H) × 53 (D) (mm), excluding protrusions

Weight: 420 g (main unit and batteries only, excluding accessories)

Batteries: Four AA (LR6 or R6) batteries

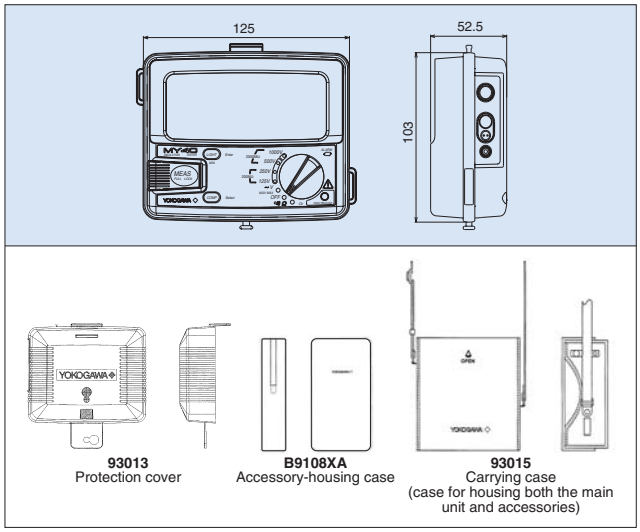
Note: See the list of accessories on the backside of this bulletin for more information on accessories.

Standard Accessories

Product	Part Number	Qty
Protection cover	93013	1
Shoulder strap	99005	1
Line probe	98001	1
Earth probe	98002	1
User's manual	–	1
Batteries	–	4

External Dimensions

Unit: mm



2406E Series of Analog Insulation Testers

2406E SERIES

240631 240632 240633 240634 240635 240641 240642 240643 240644 240645

- **Analog models with two and three ratings**
- **AC voltage measurement**
- **Automatic discharge**
- **Sky blue EL backlight**

Testing Performance Specifications

Model	Suffix Code	Rating	Effective Measuring range	Central Scale Value	AC Voltage Measuring range	Lower limit of measured Ω	Rated Current
240631	-E	25V/5MΩ	0.001–5MΩ	0.1MΩ	0–300V	0.025MΩ	1mA
240641	-E	50V/10MΩ	0.005–10MΩ	0.2MΩ		0.05MΩ	1mA
		125V/20MΩ	0.01–20MΩ	0.5MΩ		0.125MΩ	1mA
240632	-E	125V/20MΩ	0.01–20MΩ	0.5MΩ	0–300V	0.125MΩ	1mA
240642	-E	250V/50MΩ	0.01–50MΩ	1MΩ		0.25MΩ	1mA
240633	-E	125V/20MΩ	0.01–20MΩ	0.5MΩ	0–600V	0.125MΩ	1mA
240643	-E	250V/50MΩ	0.01–50MΩ	1MΩ		0.25MΩ	1mA
		500V/100MΩ	0.05–100MΩ	2MΩ		0.5MΩ	1mA
240634	-E	250V/50MΩ	0.01–50MΩ	1MΩ	0–600V	0.25MΩ	1mA
240644	-E	500V/100MΩ	0.05–100MΩ	2MΩ		0.5MΩ	1mA
		1000V/2000MΩ	1–2000MΩ	50MΩ		1MΩ	1mA**
240635	-E	250V/500MΩ	0.1–500MΩ	10MΩ	0–600V	0.25MΩ	1mA**
240645	-E	500V/1000MΩ	0.5–1000MΩ	20MΩ		0.5MΩ	1mA**
		1000V/2000MΩ	1–2000MΩ	50MΩ		1MΩ	1mA**

EL-backlit Non-backlit

* The minimum value at which the rated voltage can be maintained;
** 0.55 mA in the case of the first effective measuring range

Standard test conditions:
Ambient temperature/humidity ranges: 23 ±5℃/45-75% RH
Position of use: Horizontal (5° max. of angle of inclination)
External magnetic fields: None
Battery voltage: Within effective voltage range
(The pointer must stay within the range indicated by the BAT symbol when the battery check is performed.)

Tolerances under the above-mentioned conditions:
Resistance measurement: First effective measuring range = ±5% of reading
Second effective measuring range = ±10% of reading
Infinite and zero scale values: 0.7% max. of scale length
AC voltage: ±10% of maximum scale value
No-load voltage: 130% max. of rated voltage
Rated measuring current: 1 mA (0 to 20%) when in first effective measuring range
Short-circuit current: 12 mA max.

General Specifications

Scale length: Approx. 86 mm (outer scale)

Discharge function: The tester automatically begins discharge when you turn off the MEAS switch. The pointer swings if there is any residual voltage in the circuit under test. You can make sure discharge is complete by checking that the pointer swings back to the infinite (∞) scale value. Under this condition, the tester is ready to enter voltage measurement mode.

AC voltage measurement: AC voltage measurement is possible wherever the rotary switch is positioned.

Dimensions (main unit): Approx. 120 (W) × 110 (H) × 60 (D) (mm)

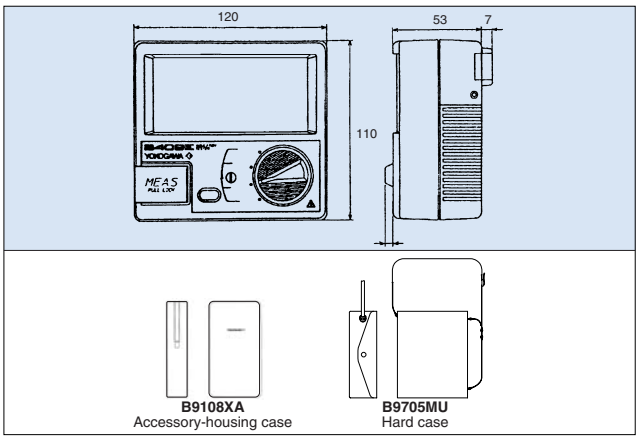
Weight: Approx. 500 g (including batteries)

Batteries: Six AA (LR6 or R6) batteries

Accessories: See the list of accessories on the backside of this bulletin for information on accessories.

External Dimensions

Unit: mm



Standard Accessories

Product	Part Number	Qty	Remarks
Earth and Line probes	98007	1	Earth probe(blake);approx. 1m long Line probe(vermilion);approx. 1m long
Carrying case	B9075MU	1	w/probe-housing pocket and neck strap
User's manual	–	1	–
Batteries	–	6	–

MY10 Series of Analog Insulation Testers

MY10 SERIES

- **Analog models with single rating**
  - MY10-01:125V/20MΩ
  - MY10-02:250V/50MΩ
  - MY10-03:500V/100MΩ
  - MY10-04:500V/1000MΩ
  - MY10-05:1000V/2000MΩ
- **AC voltage measurement**
- **Automatic discharge**
- **A wide choice of accessories –Designed for shared use with the MY40**

Testing Performance Specifications

Model	Rating	Effective Measuring Range	Central Scale Value	AC Voltage Measuring Range	Lower Limit of Measured Ω*	Rated Current
MY10-01	125V/20MΩ	0.01–20MΩ	0.5MΩ	0–250V	0.125MΩ	1–1.2mA
MY10-02	250V/50MΩ	0.01–50MΩ	1MΩ	0–300V	0.25MΩ	1–1.2mA
MY10-03	500V/100MΩ	0.05–100MΩ	2MΩ	0–500V	0.5MΩ	1–1.2mA
MY10-04	500V/1000MΩ	0.5–1000MΩ	20MΩ	0–500V	1MΩ	0.5–0.6mA
MY10-05	1000V/2000MΩ	1–2000MΩ	50MΩ	0–500V	2MΩ	0.5–0.6mA

* The minimum value at which the rated voltage can be maintained

Standard test conditions:
Ambient temperature/humidity ranges:
23 ±5℃/45-75% RH
Position of use:
Horizontal (5° max. of angle of inclination)
Effect of geomagnetism: None
Battery voltage: Within effective voltage range
(The pointer must stay within the range indicated by the BAT symbol when the battery check is performed.)

Tolerances under the above-mentioned conditions:
Resistance measurement:
First effective measuring range = ±5% of reading
Second effective measuring range = ±10% of reading
Infinite and zero scale values: 0.7% max. of scale length
AC voltage: ±10% of maximum scale value
No-load voltage: 130% max. of rated voltage
Rated measuring current:
1 mA (0 to 20%) when in first effective measuring range
Short-circuit current: 12 mA max.

General Specifications

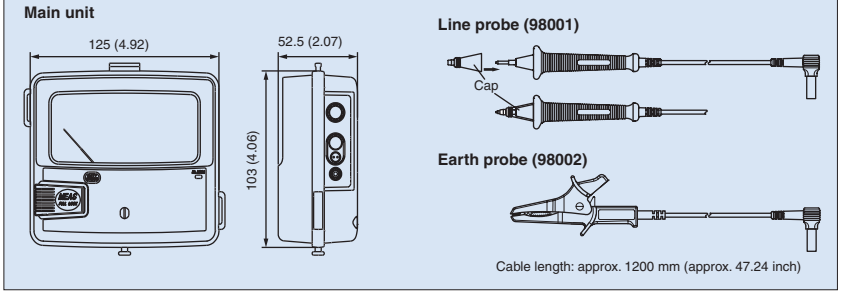
Scale length: Approx. 78 mm
Battery life: Approx. 10 hours when continuously operated on manganese-oxide batteries with the pointer pointing to the central scalevalue.
Batteries: Four AA(LR6 or R6) batteries
Dimensions: Approx. 125(w) × 103(H) × 53(D) mm, excluding protrusions
Weight: Approx. 400 g (main unit and batteries only, excluding accessories)
Compliance: EN61010-1, EN61010-31 (over voltage category III, pollution Degree2 installations for indoor use).

Standard Accessories

Product	Part Number	Qty
Protection cover	93013	1
Shoulder strap	99005	1
Line probe	98001	1
Earth probe	98002	1
User's manual	–	1
Batteries	–	4

External Dimensions

Unit: mm (approx. inch)



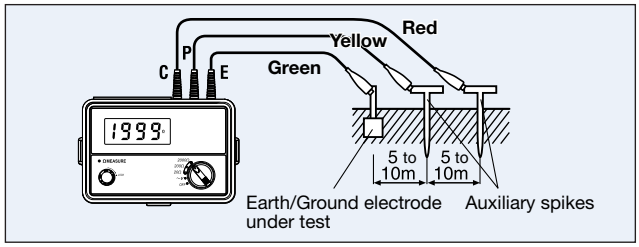
Digital Earth Tester EY200

Specifications

- **Designed to safety standard IEC 61557**
- **Reference to IEC 60529: Degrees of protection provided by enclosures (IP54). Measurement can be made even under adverse weather conditions**
- **Large, easy-to-read LCD digital display**
- **Convenient carrying soft bag for accessories etc.**

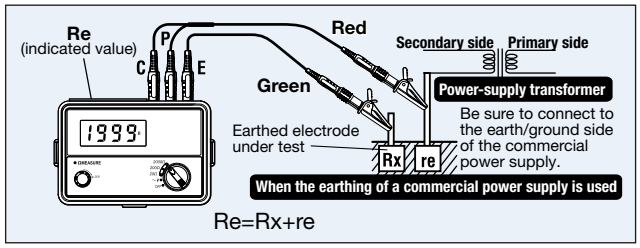
3-pole earth resistance measurement (precise measurement)

Connect the earth/ground electrode (E) and auxiliary spikes (P, C) to the main body using the accessory test lead. Put apart 5 to 10 m between E and P, and P and C, respectively. E, P, and C should be approximately in a line.



2-pole earth resistance measurement (simplified measurement)

A simplified 2-pole measuring method can be used if there is an almost perfectly earth/ground object such as a lead or iron water-pipe (plastic pipes cannot be used) or if there is an object with a known value of earth resistance, near the measurement site.



• Model Code

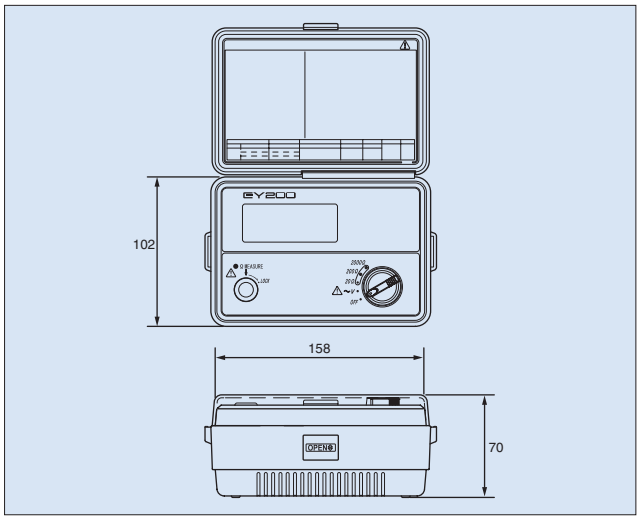
Name	Model
Digital Earth Tester	EY200

• EY200 General Specifications

Name	Model
Display	LCD Digital Display:1999-count digital reading
Measuring Range	Earth Resistance: 2000Ω LSD:0.01 to 1Ω Earth Voltage: 200V
Accuracy	Earth Resistance: 20Ω range: ±2%rdg±0.1Ω 200Ω range: ±2%rdg±3dgt 2000Ω range: ±2%rdg±3dgt Earth Voltage: ±1%rdg±4dgt
Measuring Frequency	Approx. 820Hz
Measuring Current	Approx. 3mA (at 20Ω range)
Battery Life	Approx. 4.5hours (at 5 second measuring 3300 times)
Operating Temp. and Humidity	0~40°C, 85%Rh or less
Dimensions	Approx. 102×158×70mm
Weight	Approx. 550g
Standard Accessories	3-pole Test Lead (Model 98074), Earth Spikes (for EY200) (Model 98070), 2-pole Test Lead Set (Model 98075), Soft Case (Model 93041), Shoulder Belt (for EY200) (Model 99018), Six AA (R6) dry cells, User's manual

External Dimensions

Unit: mm



Insulation Tester

Quick-reference Table of Accessories

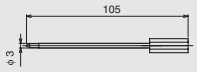
Series/Model		2406E	MY10	MY40
Spare probe tip	For breaker pins	–	99011	
	General-purpose	B9600GN	B9600GN *2	
	Extended	B9600NX	B9600NX *2	
	Sharp-pointed	B9600NZ	B9600NZ *2	
Probe	Line probe	98007 Earth and Line probes	98001	
	Earth probe		98002	
Case *1	Accessory-housing case	B9108XA	B9108XA	
	Carrying case	B9075MU(hard case) B9075MV(soft case) Note: Includes an accessory-housing case.	93015 Store main unit/accessories	93015 Store main unit/accessories
Others	Protection cover	–	93013	
	Shoulder strap	–	99005	
	Lead for guard terminals	321803	–	–

Note that the color of the plastic part of a probe tip may not always match that of the probe, depending on the combination.
*1 Regarding external dimensions of cases, Pls refer to each product specification.
*2 For using with MY Series, 98052 is necessary.

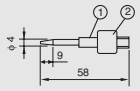
■ Spare Probe Tips

Unit: mm

99011



B9600GN



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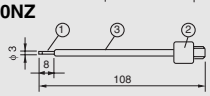

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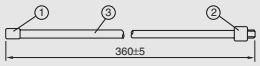
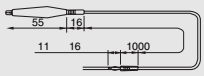


No.	Description	Remarks
①	Testing shank	Metal shank with 6 mm dia. screw
②	Fastening nut	ABS resin
③	PVC-clad	

■ Others

Unit: mm

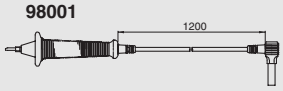
3218 03



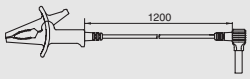
■ Probes

Unit: mm

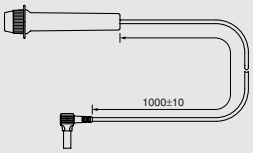
98001



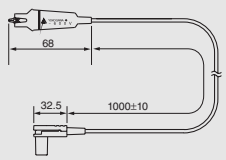
98002



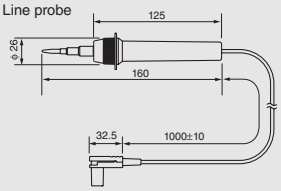
98052



98007 Earth probe



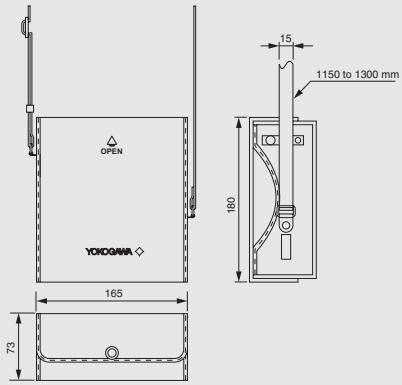
Line probe



■ Case

Unit: mm

93015



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