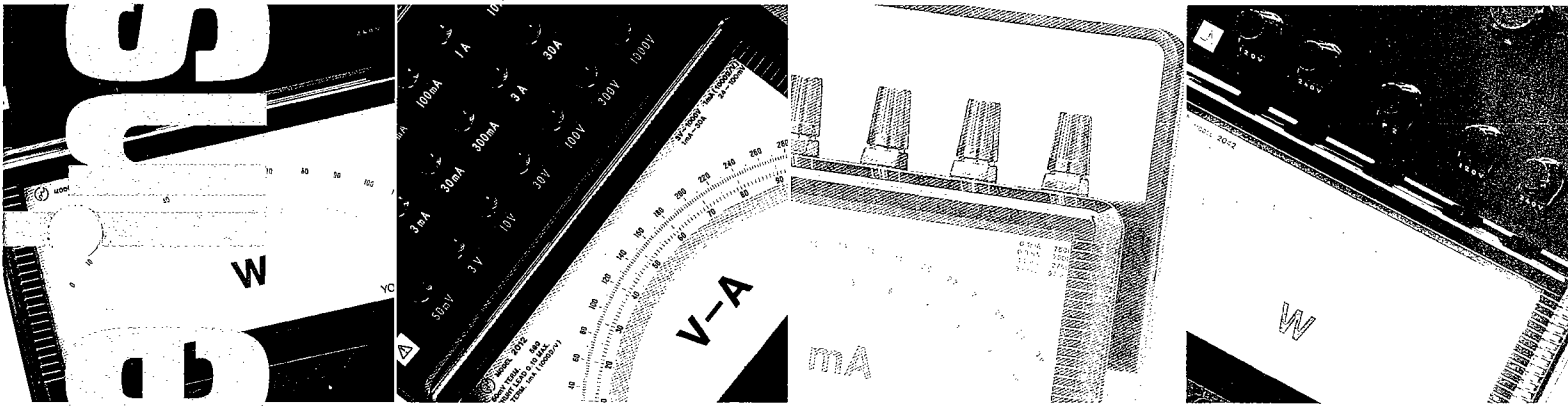



New JIS (JIS C1102-1997) compliant

Portable Instruments



Usage Precautions

 **Warning** : Indicates usage precautions that must be read to ensure the safety of users and the equipment.

Safety Instructions for Portable Instruments

1. Usage environment and conditions

Do not use YOKOGAWA M&C Corporation portable instruments in locations such as the following:

- Locations where the ambient temperature is outside the range of 0-40°C
- Locations where relative humidity is outside the range of 30-75%
- Locations subject to vibrations or shock impact
- Locations subject to rain, dripping water, or direct sunlight
- Locations exposed to large amounts of dust, salt, soot, or corrosive gases (sulfurous acid gas, ammonia gas, hydrogen sulfide gas, or other gases that corrode metals or plastics)
- Locations subject to strong external noise or electromagnetic waves
- Locations subject to large amounts of static electricity
- Locations subject to large amounts of high frequencies and waveform distortion (e.g., from inverters or thyristor circuits)

2. Wiring

Adhere to the following rules when connecting the wires:

- When connecting an instrument with accessories, first make sure none of the wires are live.
- The connector terminals on the wires should be appropriate for the electricity load and terminal size.
- Connect the wires properly as illustrated in the wiring diagrams of catalogs or on product labels.
- Fasten connector terminals to the proper torque for the size of screw being used.
- Instruments that are combined with current transformers (CT) should be properly connected to the secondary side of the CT. Improper connection may result in a CT failure, burned components, or a fire. When the secondary side of a CT is disconnected, especially while the primary side is powered, the secondary-side terminal will carry a high voltage which could result in electrical shock. Therefore, the secondary side should be short-circuited before the instrument is disconnected.

3. Usage precautions

- Use the instrument within the rated specifications. Failure to do so can cause the equipment to malfunction or result in a failure.
- While the power is on, do not touch any terminals or open the cover or case.
- The current transformer emits heat while powered, so do not touch it.

4. What to do if the equipment functions abnormally or fails

- If you notice abnormal heating, or a strange odor, noises, or smoking, or if the equipment seems to have failed, immediately take steps such as cutting off the input. Next, contact your YOKOGAWA M&C Corporation sales office.

5. Maintaining and checking the equipment

To ensure that your instrument operates properly, perform the following checks on a regular basis:

- Check for damage to the instrument or accessories due to heating or other factors.
- Check for loose attachments or screws (always turn off the power before doing this to ensure safety).
- The instrument covers have been coated with an antistatic agent to block static electricity. Gently wipe dirt off the cover surfaces with a soft, dry cloth. Do not use a wet cloth as this will reduce the effects of the antistatic coating. Do not allow cloths made from synthetic materials to contact the cover for an extended period of time, and do not use benzene, paint thinner, or similar substances. Doing so may cause the cover to become deformed, discolor it, or cause cracking.
- If the indicator reading becomes unstable due to static electricity, coat the front and back of the cover with a commercially available antistatic agent.
- Instrument service life will vary according to usage conditions. In general, however, we recommend replacing the instrument after about 15 years of use.

Table of Contents

C O N T E N T S

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10	<u>Shunts, External Multipliers, and Carrying Cases</u>
11	<u>JIS Mark List</u>
12	<u>Q & A</u>

Portable DC Ammeters and Voltmeters

2011, 2012



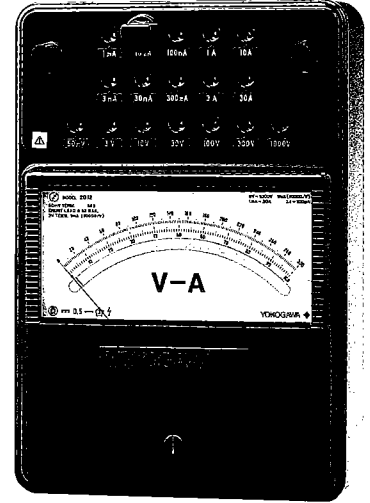
Models 2011 and 2012 are moving coil type instruments using a taut-band suspension system. The suspension system provides excellent reproducibility without friction, and strong resistance to shock impact. These precision instruments combine a magnetic circuit (sandwich mechanism) that blocks the effects of external magnetic fields, and a superior temperature compensation circuit.

Features

- Taut-band suspension system eliminates friction and provides strong resistance to shock impact.
- Stable performance ensures that changes over time are negligible.
- Quick response and easy-to-read scale
- Superior temperature compensation circuit reduces external temperature effects.
- Magnetic circuit (sandwich mechanism) reduces the effects of external magnetic fields.



2011 33



2012 00

Specifications

Operating principle : Permanent moving coil
 Class : JIS C 1102 : 1997 Class 0.5 (*equivalent to Class 1.0)
 Operating position : Horizontal
 Scale length : Approximately 135 mm (deflection angle : 85°)
 Scale divisions : 100/150
 Linemax : 250V(Ammertersonly)
 Operating temperature and humidity ranges : 0~40°C, 30~75%RH
 Storage temperature and humidity ranges : -10~50°C, 25~80%RH

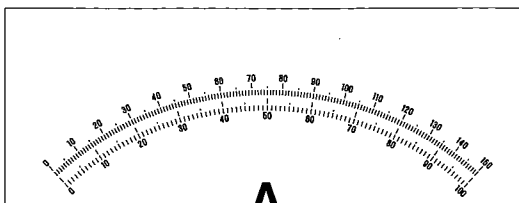
External dimensions and weight : 2011 Approximately 195×170×87 mm, approximately 1.7kg
 2012 Approximately 260×180×115 mm, approximately 2.8kg
 Standard accessories : Instruction Manual (1)
 Shunt cable (2011 41, 2012 00 only)
 Optional accessories (sold separately) : 2291 01 Carrying case for 2011 (page 10)
 2292 01 Carrying case for 2012 (page 10)

Model	Maximum scale value	Approximate internal resistance and consumed power																										
2011	31 *3/10/30/100 μ A	5.1/18.3/7.7/2.5 k Ω																										
	32 *10/30/100/300 μ A	6.8/6.8/2.5/0.88 k Ω																										
	33 0.1/0.3/1/3 mA	750/750/278/97.5 Ω																										
	34 1/3/10/30 mA	23/14/4.7/1.6 Ω																										
	35 10/30/100/300 mA	Voltage drop 50mV																										
	36 0.1/0.3/1/3 A																											
	37 1/3/10/30 A	1mA (1000 Ω /V)																										
	38 0.3/1/3/10 V																											
	39 3/10/30/100 V	93 Ω																										
	40 30/100/300/1000 V																											
	41 (50mV)																											
42 (3V)																												
2012	00 3/10/30/100/300/1000V 1/3/10/30/100/300mA 1/3/10/30A/50mV (17 different measurement ranges)	Voltage measurement range Approximately 1mA (1000 W/V)																										
		Current measurement range <table border="1"> <tr> <td><Range></td> <td><Voltage drop></td> <td><Range></td> <td><Voltage drop></td> </tr> <tr> <td>1mA</td> <td>24mV</td> <td>1 A</td> <td>53mV</td> </tr> <tr> <td>3mA</td> <td>41mV</td> <td>3 A</td> <td>56mV</td> </tr> <tr> <td>10mA</td> <td>47mV</td> <td>10 A</td> <td>75mV</td> </tr> <tr> <td>30mA</td> <td>49mV</td> <td>30 A</td> <td>100mV</td> </tr> <tr> <td>100mA</td> <td>50mV</td> <td>50mV</td> <td>59Ω</td> </tr> <tr> <td>300mA</td> <td>51mV</td> <td></td> <td></td> </tr> </table>	<Range>	<Voltage drop>	<Range>	<Voltage drop>	1mA	24mV	1 A	53mV	3mA	41mV	3 A	56mV	10mA	47mV	10 A	75mV	30mA	49mV	30 A	100mV	100mA	50mV	50mV	59 Ω	300mA	51mV
<Range>	<Voltage drop>	<Range>	<Voltage drop>																									
1mA	24mV	1 A	53mV																									
3mA	41mV	3 A	56mV																									
10mA	47mV	10 A	75mV																									
30mA	49mV	30 A	100mV																									
100mA	50mV	50mV	59 Ω																									
300mA	51mV																											

Notes

1. The asterisks indicate models that are not JIS-approved.
2. For ranges higher than 30 A, externally connect a shunt 2215-2217 (page 2217) to the 50 mV terminal on 2011 41 (50 mV instrument) or 2012. 2011 41 (50 mV instrument) and 2012 both come with a set of shunt cables (two 1.5-meter cables with 0.025W resistance). Different cables may be used if the cable resistance is 0.1W or less.
3. For ranges higher than 1000 V, use 2011 42 (3 V instrument) or externally connect external multiplier 2222 or 2223 (page 10) to the 3 V terminal on 2011 or 2012.

Scale



● 2011 41 50 mV instrument and 2011 42 3 V instrument

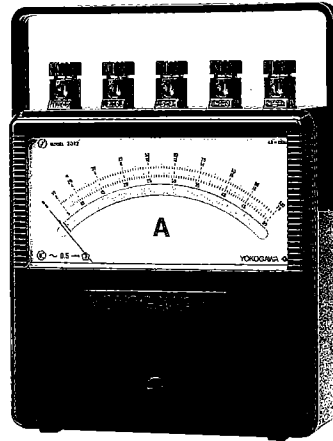
The scale for the 50mV instrument has 100 and 150 divisions. A 50 mV current transformer may be combined with any rated current instrument to read measurements through a simple conversion process. DC scales (single scale or dual scale) are also available by special order.

Portable AC Ammeters and Voltmeters

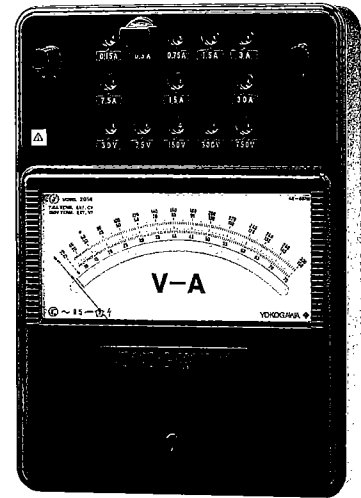
2013, 2014



Models 2013 and 2014 are moving iron type instruments using a taut-band suspension system. The suspension system provides excellent reproducibility without friction, and good resistance to shock impact. A cap shield mechanism serving to reduce external magnetic fields, a superior temperature compensation circuit, and other components ensure stable performance.



2013 14



2014 00

Features

- Taut-band suspension system eliminates friction and provides good resistance to shock impact.
- Stable performance ensures that changes over time are negligible.
- Magnetic circuit reduces the effects of external magnetic fields.
- Superior temperature compensation circuit reduces external temperature effects.

Specifications

Operating principle : Moving iron type
 Class : JIS C 1102 : 1997 Class 0.5
 Operating position : Horizontal
 Scale length : Approximately 135 mm (deflection angle : 85°)
 Operating frequency range : 45~65 Hz
 Linemax : 250V
 Scale divisions : Check the symbols below against the instrument list.
 A : 100 divisions B : 150 divisions C : 100/150 divisions
 D : 100/125 divisions E : 120/150 divisions

Operating temperature and humidity ranges : 0~40°C 30~75%RH
 Storage temperature and humidity ranges : -10~50°C, 25~80%RH
 External dimensions and weight : 2013 Approximately 195×170×87 mm, approximately 1.7kg
 2014 Approximately 260×180×115 mm, approximately 4.2kg
 Standard accessories : Instruction Manual (1)
 Current transformer 2244 (2013 22)
 Optional accessories (sold separately) : 2291 01 Carrying case for 2013 (page 10)
 2292 01 Carrying case for 2014 (page 10)

Model	Maximum scale value		Approximate internal resistance and consumed power		
	(scale divisions)				
2013	01	20/100 mA A	0.3/0.2	VA	
	02	50/250 mA D	0.5/0.5	VA	
	03	100/500 mA A	0.5/0.5	VA	
	04	0.2/1 A A	0.4/0.4	VA	
	05	0.5/2.5 A D	0.5/0.5	VA	
	06	1/5 A A	0.6/0.6	VA	
	07	2/10 A A	0.7/0.7	VA	
	08	5/25 A D	1/1	VA	
	09	10/50 A A	1.2/1.8	VA	
	10	20/50/100/200 mA A	0.4/0.3/0.2/0.3	VA	
	11	0.1/0.2/0.5/1 A A	0.2/0.3/0.4/0.5	VA	
	12	0.5/1/2/5 A A	0.7/0.6/0.5/0.3	VA	
	13	2/5/10/20 A A	0.5/0.3/0.6/0.9	VA	
	14	10/20/50/100 A A	0.6/0.9/1.7/2.4	VA	
	15	15/30 V B	3.8VA		
	16	30/75 V B			
	17	75/150 V B			
	18	150/300 V B			
	19	300/750 V B			
	20	(5A) C	0.2VA		
	21	(150V) C	3.8VA		
	22	500A (500AT) D	Used in combination with current transformer 2244 (accessory)		
2013 (for 400 Hz)	23	0.5/1/2/5 A A	1.2VA		
	24	2/5/10/20 A A	3.5VA		
	25	10/20/50/100 A A	3.8VA		
	26	75/150 V B	3.8VA		
	27	150/300 V B	3.8VA		
2014	00	30/75/150/300/750V 0.15/0.3/0.75/1.5/3/ 7.5/15/30A B	Each voltage measurement range 4.5VA Current measurement range 7.5A or less 0.7VA		

Notes

- For ranges higher than 100 A, externally connect current transformer 2241 or 2242 (page 9) to the 5 A terminal on 2013 20 (5 A instrument) or 2013, or the 7.5 A terminal on 2014.
- For ranges higher than 750 V, use to 2013 21 (150 V instrument), or externally connect voltage transformer 2261 or 2262 (page 9) to the 150 V terminal on 2013 or 2014.
- The scales on 2013 20 (5 A instrument) and 2013 21 (150 V instrument) are dual scale (100 and 150) with both scales printed. These standard scales are easy to use through a simple conversion process with CTs and VTs of any rating. DC scales (single scale or dual scale) are also available by special order.

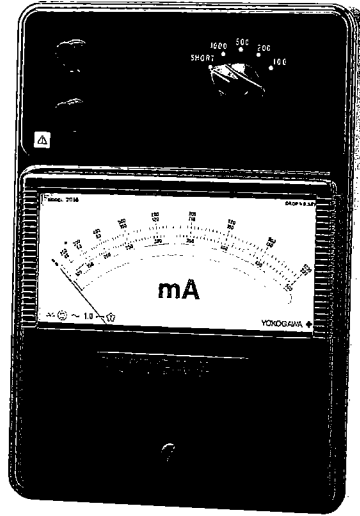
Portable High-frequency AC Ammeters and Voltmeters, Portable Audio-Frequency Voltmeters

Portable High-frequency AC Ammeters and Voltmeters **2016**

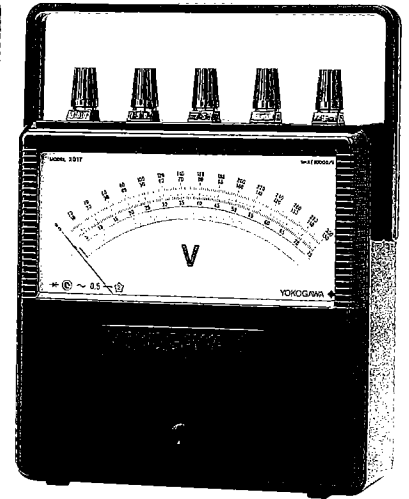
Portable Audio-Frequency Voltmeters **2017**

Model 2016 consists of thermocouple type ammeters and voltmeters with four different measurement ranges. They are designed to provide true RMS values of inputs, so they can be used to measure high-frequency currents and voltages (DC) up to several MHz (the maximum frequency for the voltmeter is 100 kHz). The indicator is based on a taut-band suspension system, which eliminates friction, provides good resistance to vibrations and shock impact, and ensures excellent characteristics.

Model 2017 is a rectifier type, Class 0.5 voltmeter designed for the audio-frequency range.



2016 03 (ammeter)



2017 30

Features

- Taut-band suspension system eliminates friction and provides good resistance to shock impact.
- 2016 : For measurements (DC) up to high frequencies
- 2017 : For measurements from 45 Hz to 10 kHz with 1000Ω/V internal resistance

Specifications

2016

- Operating principle : Thermocouple type
 Class : JIS C 1102 : 1997
 2016 01~03 : Equivalent to Class 1.0
 2016 04 : Equivalent to Class 0.5
 Operating position : Horizontal
 Scale length : Approximately 135 mm (deflection angle: 85°)
 Scale divisions : 100 for ammeters 150 for voltmeter
 Overload : Approximately 1.5 times rated current (or approximate consumed current)
 Frequency ranges : 2016 01; DC, 10 Hz to 5 MHz
 2016 02; DC, 10 Hz to 2 MHz
 2016 03; DC, 10 Hz to 1 MHz
 2016 04; DC, 10 Hz to 100 kHz
 Operating temperature and humidity ranges : 0~40°C, 30~75%RH
 Storage temperature and humidity ranges : -10~50°C, 25~80%RH
 Linemax : 250V(Ammeters Only)
 External dimensions and weight : 2016 01~03 Approximately 260×180×115 mm, approximately 2.5 kg
 2016 04 Approximately 195×170×87 mm, approximately 1.8 kg
 Standard accessory : Instruction Manual (1)
 Optional accessories (sold separately): 2291 01 Carrying case for ammeters (page 10)
 2292 01 Carrying case for voltmeter (page 10)
 B9646BB Spare thermocouple

2017 30

- Operating principle : Rectifier type
 Class : JIS C 1102 : 1997, equivalent to Class 0.5
 Operating position : Horizontal
 Scale length : Approximately 135 mm (deflection angle: 85°)
 Scale divisions : 150
 Maximum scale value : 30/75/150/300 V
 Rated accuracy : ±0.5% between 45 Hz and 10 kHz
 Approximate consumed current : 1 mA (1000Ω/V)
 Operating temperature and humidity ranges : 0~40°C, 30~75%RH
 Storage temperature and humidity ranges : -10~50°C, 25~80%RH
 External dimensions and weight : 197×181×92mm, approximately 1.8kg
 Optional accessories (sold separately) : 2291 01 Carrying case (page 10)

Notes

1. May also be used as an Epstein testing magnetic flux voltmeter.
2. Not JIS-approved.

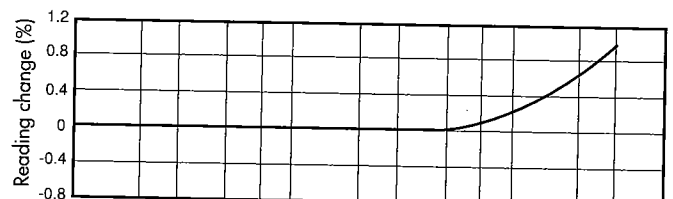
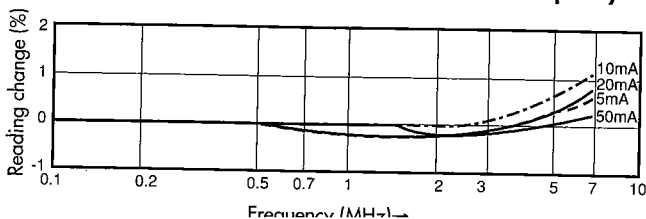
Model	Maximum scale value	Approximate consumed current
2016	01 5/10/20/50 mA	Voltage drop: 375 mV
	02 20/50/100/200 mA	
	03 100/200/500/1000 mA	
	04 15/30/75/150 V	

Notes

1. During measurements, do not allow the current to reach or exceed 1.5 times the rated current or consumed current.
2. If the thermocouple is accidentally burned, it can be easily replaced if you purchase a spare thermocouple. Note, however, that replacing the thermocouple changes the tolerances as follows:
 2016 01~03: Class 1.5 2016 04: Class 1.0
3. Ammeters are enclosed in a full shield case, and are connected to the ± terminal. A milliampere terminal must be connected to the load in order to measure high-frequency currents.
4. Not JIS-approved.

Characteristics

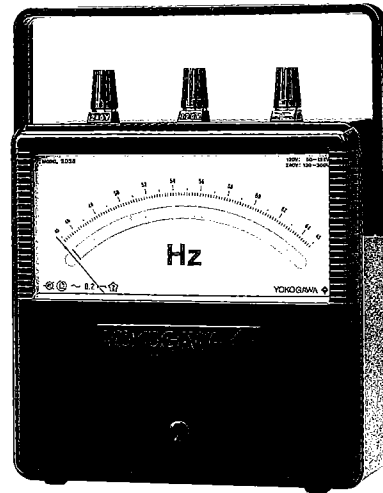
2016 frequency characteristics (examples)



Portable Needle-indicator Frequency Meters

2038

Model 2038 uses a transducer to convert a measured frequency to a proportionate DC current, then shows the current as a DC current reading. The transducer, combined with a high sensitivity moving coil type indicator based on YOKOGAWA's proprietary taut-band suspension system, provides a level of performance not possible with conventional frequency meters. In addition to frequency measurements for research labs and schools, the 2038 can be used as a standard for measurement control labs and field tests.



2038 31

Features

- A wide range of frequencies (45~500 Hz) can be measured with the broad selection of models.
- True equivalent scale enables measurement of continuous frequency changes.
- A wide range of voltages (50~300 V) can be used.
- RMS response (differential system) minimizes waveform effects.
- Anti-shock structure provided by taut-band design.

Specifications

Operating principle : Needle-indicator frequency meter (differential system)
 Class : JIS C 1102 : 1997 (see table below)
 Operating position : Horizontal
 Rated voltages : 120/240V, 120V...Can be used between 50 and 135V.
 240V...Can be used between 130 and 300V.
 Scale length : Approximately 135 mm (deflection angle : 85°)
 Consumed power : 120V...Approximately 1.3VA 240V...Approximately 2VA

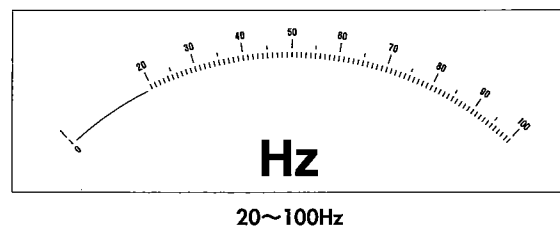
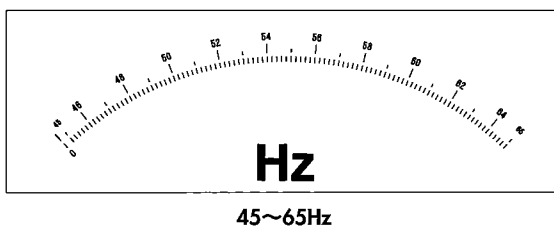
Operating temperature and humidity ranges : 0~40°C, 30~75%RH
 Storage temperature and humidity ranges : -10~50°C, 25~80%RH
 Insulating resistance : Minimum 500V DC 100MΩ (across electrical circuitry and casing)
 Withstand voltage : 2000V AC for 1 minute (across electrical circuitry and casing)
 External dimensions and weight : 195×170×87mm, approximately 1.8kg
 Standard accessory : Instruction Manual (1)
 Optional accessories (sold separately) : 2291 01 Carrying case (page 10)

Model	Measurement range	Class	Scale divisions	
2038	31	45~65Hz	Equivalent to Class 0.2	100 divisions (0.2Hz/div)
	32	20~100Hz	Equivalent to Class 1.0	80 divisions (1Hz/div)
	03	100~300Hz	Equivalent to Class 0.5	100 divisions (2Hz/div)
	04	300~500Hz	Equivalent to Class 0.5	100 divisions (2Hz/div)
	11	45~55Hz	Equivalent to Class 0.2	100 divisions (0.1Hz/div)
	12	55~65Hz	Equivalent to Class 0.2	100 divisions (0.1Hz/div)

Notes

1. If the voltage exceeds 300 V, externally connect an instrument voltage transformer 2261 or 2262 (page 9).
2. 2038 is not JIS-approved.

Scales



(Note: Frequencies from 0 to 20 Hz are outside the measurement range.)

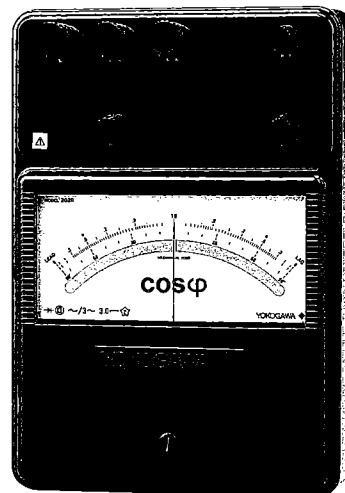
Portable Power Factor Meters

2039

Model 2039 is a revolutionary series of portable wattmeters in which a power factor is used to operate the DC indicator. This is done using a transducer which provides a DC current proportionate to the voltage-current phase by means of a circuit. Model 2039 can be used in single-phase and balanced three-phase circuits. The electronic transducer, combined with a high sensitivity moving coil type indicator based on YOKOGAWA's proprietary taut-band suspension system, provides a level of performance not possible with conventional power factor meters.

Features

- For both single-phase and three-phase (balanced circuit).
- Excellent current characteristic: 20~200% of rated current (short time period)
- Wide range of applicable voltages: 60~300 V AC
- Phase angle scale included
- Taut-band suspension system eliminates friction and provides strong resistance to shock impact.



2039 02

Specifications

Operating principle : Rectifier type
 Class : JIS C 1102 : 1997, equivalent to Class 3.0
 Operating position : Horizontal
 Rated frequency : 45~65 Hz
 Scale length : Approximately 135 mm (deflection angle: 85°)
 Scale : Lead 0-0.3 to 1.0 to 0.3-0 lag (with phase angle scale)
 Effective measurement range : Lead 0.5 to 1.0 to 0.5 lag

Consumed power Voltage circuit (120 V) : Approximately 0.14 VA
 Current circuit (5 A) : Approximately 2.4 VA
 Operating temperature and humidity ranges : 0~40°C, 30~75%RH
 Storage temperature and humidity ranges : -10~50°C, 25~80%RH
 External dimensions and weight : Approximately 260×180×115 mm, approximately 2.9 kg
 Standard accessory : Instruction Manual (1)
 Optional accessories (sold separately) : 2292 01 Carrying case (page 10)

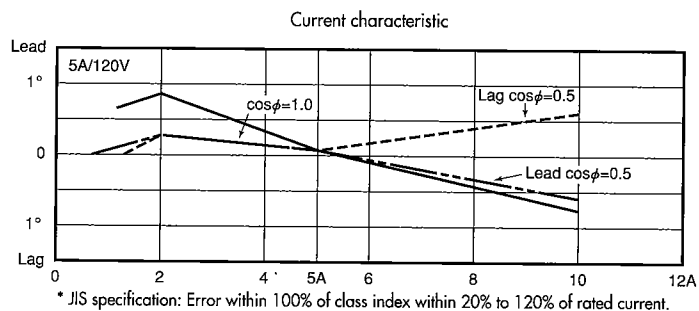
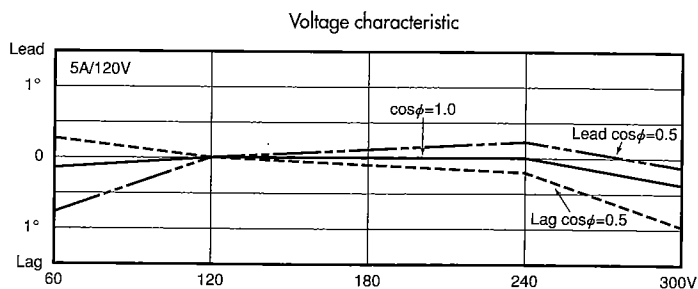
Model	Rated current	Rated voltage
2039	01	0.2/1A
	02	1/5A
	03	5/25A

120V
(Can be used between 60 and 300 V.)

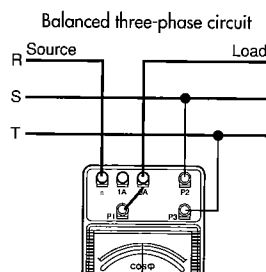
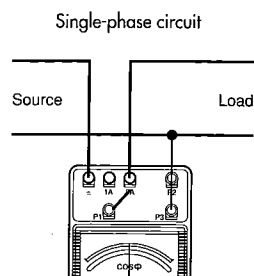
Notes

1. For measurements exceeding the rated current (25 A), externally connect a current transformer 2241~2243 (page 9) to the 5 A terminal.
2. For measurements with a voltage exceeding 300 V, externally connect a voltage transformer 2261 or 2262 to the 120V terminal. (page 9).
3. 2039 is not JIS-approved.

Characteristics



Connection diagrams

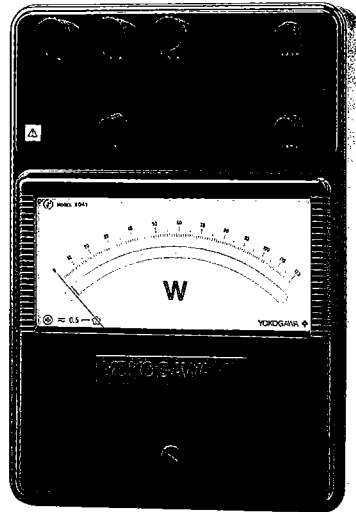


Portable Wattmeters

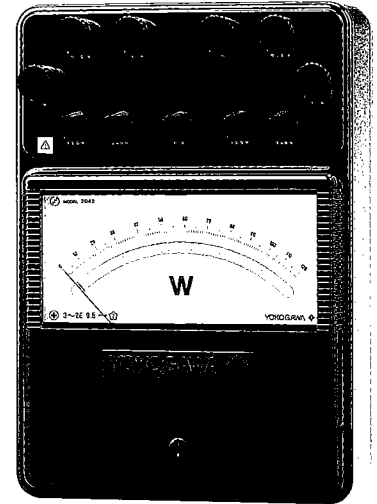
2041 and 2042



Model 2041 single-phase wattmeters and single-phase low-power-factor wattmeters and Model 2042 three-phase wattmeters are electro-dynamometer type wattmeters with indicators based on taut-band suspension. They can handle DC and frequencies from 25 Hz to 1000 Hz, and provide excellent power factor characteristics. These instruments are shielded with dual permalloy sheets as protection against external magnetic fields.



2041 02



2042 02

Features

- Frequency range: DC, 25 Hz to 1000 Hz (2041 01-03, 2042 01-03)
- Effective for measurement of low-power-factor load power and small power (2041 11-13, 21, 22)
- Low self-consuming power
- Taut-band suspension system eliminates friction and provides strong resistance to shock impact.

Specifications

Specifications Operating principle : Electro-dynamometer type
 Operating position : Horizontal
 Scale length : Approximately 135mm(deflection angle 85°)
 Scale divisions : 120
 Operating temperature and humidity ranges : 0~40°C 30~75%RH
 Storage temperature and humidity ranges : -10~50°C 25~80%RH

External dimensions and weight : 2041 Approximately 260×180×136mm Approximately 2.8kg
 2042 Approximately 260×180×136mm Approximately 3.2kg
 Standard accessories : Instruction Manual (1)
 Optional accessories (sold separately) : 2292 01 Carrying case (page 10)

Product/ model	Single-phase wattmeter		
	2041		
	01	02	03
Parameter	Three-phase wattmeter		
	2042		
	01	02	03
Class	JIS C 1102 : 1997 Class 0.5		
Rated voltage (approximate consumed power)	120/240V (1.2/2.4VA)		
Rated current (approximate consumed power)	0.2/1A (0.66/0.56VA)	1/5A (0.93/0.84VA)	5/25A (1.72/1.69VA)
Rated power factor	1.0		
Operating frequency	DC, 25~1000Hz		

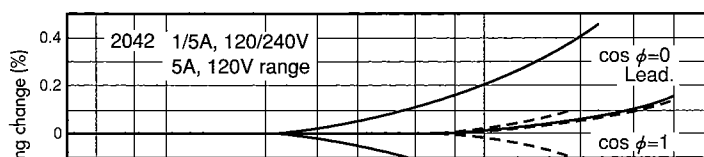
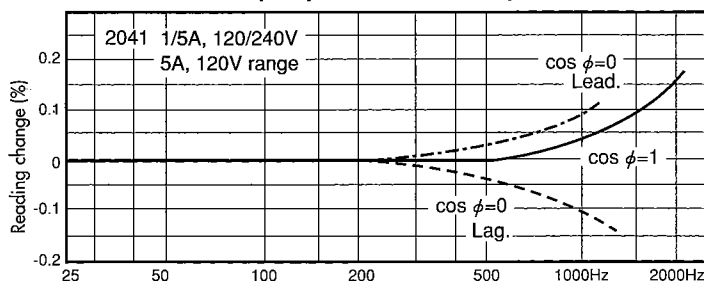
Single-phase low-power-factor wattmeter (Note 5)				
2041				
11	12	13	21	22
JIS C 1102 : 1997 equivalent to Class 0.5				
120/240V (2.4/4.8VA)			30/60V (0.6/1.2VA)	
0.2/1A (1.25/1.09VA)	1/5A (1.71/1.5VA)	5/25A (2.62/2.5VA)	0.2/1A (1.25/1.09VA)	1/5A (1.71/1.5VA)
0.2				
25~500Hz				

Notes

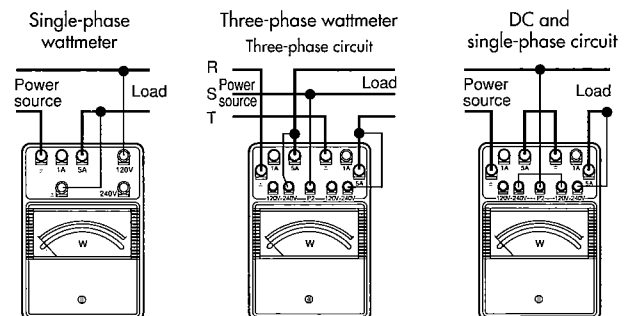
1. For measurements exceeding the rated current (25 A), externally connect a current transformer 2241-2243 (page 9) to the 5 A terminal (two required for three-phase).
2. If the rated voltage (240 V) is exceeded, externally connect an instrument voltage transformer 2261 or 2262 (page 9) to the 240 V terminal (two required for three-phase).
3. The low-power-factor wattmeter is used with Epstein test sets, as well as for measurement of low-power-factor power and small power.
4. Three-phase wattmeter total consumed power = (voltage range + current range) X 2
5. Single-phase low-power factor wattmeters are not JIS-approved

Characteristics

Frequency characteristic (examples)



Connection diagrams

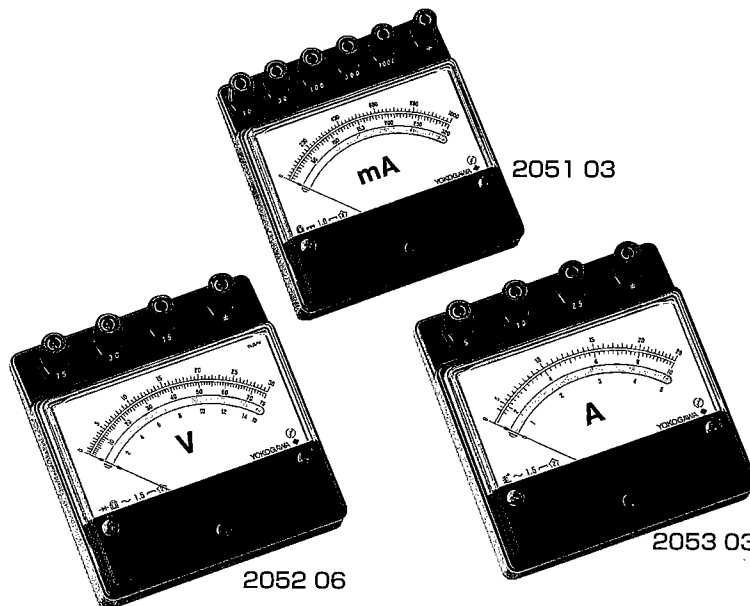


Miniature Portable Ammeters and Voltmeters

2051, 2052, 2053



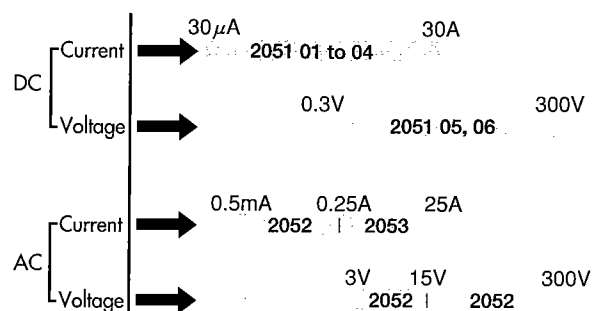
The E series of miniature portable instruments consists of JIS C 1102-2 Class 1.0 and Class 1.5 instruments. The taut-band suspension system is used in the moving parts of Models 2051 and 2052 to eliminate friction and provide strong resistance to shock impact. These instruments are functional and compact, making them suitable for labs at research centers and schools. They are also very useful for factory setups in which numerous instruments are arranged on a small tabletop area, and they are small enough to be carried for maintenance service use.



Features

- Useful for both high-sensitivity and large-volume measurements
DC : 30 μ A~30 A, 0.3 V~300 V
AC : 500 μ A~25 A, 3 V~300 V
- Taut-band suspension system eliminates friction and provides strong resistance to shock impact.
- Small and lightweight, with easy-to-read mirrored scale

Measurement ranges



Specifications

- | | |
|---|---|
| Operating principle | : 2051 Permanent magnet moving coil type
2052 Rectifier type (approximating RMS rectifier type for 15~300V)
2053 Moving iron type |
| Class | : JIS C 1102 : 1997
2051... Class 1.0, 2052, 2053... Class 1.5 |
| Scale length | : Approximately 88mm (deflection angle: 90°) |
| Needle | : Bladed needle (red) |
| Operating position | : Horizontal |
| Linemax | : 250V(Ammeters Only) |
| Operating temperature and humidity ranges | : 0~40°C 30~75%RH |
| Storage temperature and humidity ranges | : -10~50°C 25~80%RH |
| External dimensions and weight | : Approximately 113×106×46mm Approximately 0.35kg |
| Optional accessories (sold separately) | : 2291 02 Carrying case for E series of miniature portable instruments
A case (B9604WM) that can hold the instrument as well as leads and other accessories is also available. (page 10) |

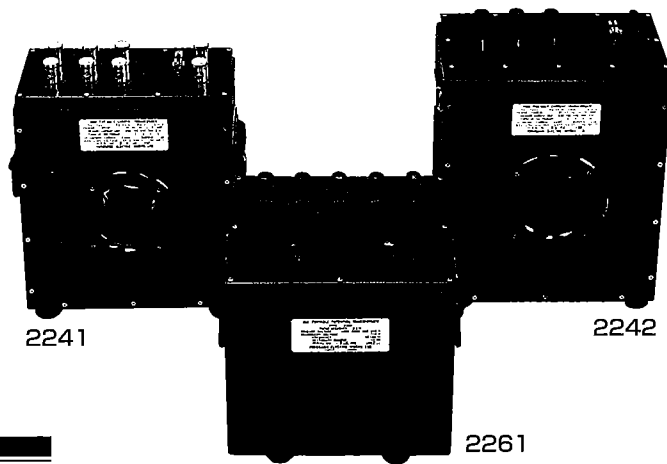
Model	Maximum scale value	Approximate internal resistance, consumed power	
2051	01 30/100/300/1000/3000 μ A DC	5/6.8/2.8/0.9/0.3 k Ω	
	02 0.3/1/3/10/30 mA DC	970/390/140/43/14 Ω	
	03 10/30/100/300/1000 mA DC	4/1.4/0.4/0.14/0.04 Ω	
	04 0.3/1/3/10/30 A DC	0.14/0.04/0.014/0.004/0.001 Ω	
	05 0.3/1/3/10/30 V DC	100 μ A (10k Ω /V)	
	06 3/10/30/100/300 V DC		
	11 \pm 0.15/0.5/1.5/5/15 mA DC	970/390/140/43/14 Ω	
	12 \pm 0.3/1/3/10/30 mA DC	1170/400/135/40/14 Ω	
	13 \pm 5/15/50/150/500 mA DC	4/1.4/0.4/0.14/0.04 Ω	
	14 \pm 10/30/100/300/1000 mA DC	4/1.5/0.4/0.15/0.04 Ω	
	15 \pm 0.15/0.5/1.5/5/15 A DC	0.14/0.04/0.014/0.004/0.001 Ω	
	16 \pm 0.3/1/3/10/30 A DC	0.15/0.14/0.11/0.004/0.001 Ω	
	17 \pm 0.15/0.5/1.5/5/15 V DC	100 μ A (20k Ω /V)	
	18 \pm 0.3/1/3/10/30 V DC	100 μ A (10k Ω /V)	
	19 \pm 1.5/5/15/50/150 V DC	100 μ A (20k Ω /V)	
	20 \pm 3/10/30/100/300 V DC	100 μ A (10k Ω /V)	
	2052	01 0.5/1/2.5 mA AC	3V
		02 2.5/5/10 mA AC	
		03 10/25/50 mA AC	
		04 50/100/250 mA AC	1mA
05 3/7.5/15 V AC			
06 15/30/75 V AC			
07 75/150/300 V AC			
2053	01 0.25/0.5/1 A AC	1/1/1 VA	
	02 1/2 5/5 A AC	0.0/0.0/0.0 VA	

Instrument Transformers

2241, 2242, 2243, 2261, 2262



Instrument transformer is a general term for voltage transformers and current transformers that are used with electrical instruments. The main purpose of instrument transformers is to extend the measurement range for electrical quantities (voltage, current, power, power factor) on large-current and high-voltage circuits. They serve to convert currents and voltages to levels that are suitable for measurement, and to insulate the instrument, etc. from high-voltage circuitry. YOKOGAWA makes a variety of standard instrument transformers. These include the top class (Class 0.1) current transformer 2243, the Class 0.2 6600V circuit instrument voltage transformer 2262, the 6600V current transformer 2242, instrument voltage transformer 2261, and current transformer 2241.



Features

- ⊗ Precision conversion of electrical quantities on AC large-current or high-voltage circuits
- ⊗ Secondary circuit is isolated from primary circuit.
- ⊗ Capable of wide-range measurement using numerous ranges
 - Current : 0.5 A~1500 A
 - Voltage : 15V~6600 V
 - Relative error : ± 0.1 to $\pm 0.2\%$

Specifications

JIS C 1731 Instrument transformers

Model	Instrument current transformer			Instrument voltage transformer			
	2241 00	2242 00	2243 00	2261			2262 00
Parameter				01	02	03	
Primary	10/15/30/50/100/ 250/300/500/750 1500A	10/15/30/50/100/ 250/300/500/750 1500A	0.5/0.75/1/1.5/2/ 3/5/7.5/10/15/20/ 30/50/75/100A	220/440/ 2200/3300V	15/30/50/75V	100/200/ 300/500V	3300/6600V
Secondary	5A	5A	5A	110V	150V	150V	110V
Rated load	15VA	15VA	15VA	15VA	15VA	15VA	15VA
Relative error	$\pm 0.2\%$	$\pm 0.2\%$	$\pm 0.1\%$	$\pm 0.2\%$	$\pm 0.2\%$	$\pm 0.2\%$	$\pm 0.2\%$
Phase angle	± 10 minutes	± 10 minutes	± 5 minutes	± 10 分	± 10 minutes	± 10 minutes	± 10 minutes
Class	0.2	0.2	0.1	0.2	0.2	0.2	0.2
Maximum circuit voltage	3450V	6900V	250V	—	—	—	—
Withstand voltage (for one minute)	10000V	16000V	2000V	10000V	2000V	4000V	16000V
Rated frequency	50~60Hz			50~60Hz			
External dimensions	Approximately 318X246X128mm	Approximately 349X267X152mm	Approximately 343X256X136mm	Approximately 255X240X200mm			Approximately 294X240X200mm
Weight	Approximately 9kg	Approximately 11kg	Approximately 12.5kg	Approximately 18kg			Approximately 18kg

Notes

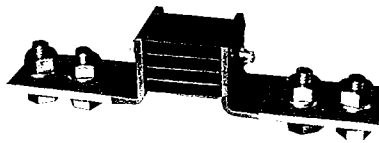
1. Current transformers 2241 and 2242 are terminal type for measurements at 100 A and below, and through type at 250 A and above.
2. 2243 is a terminal type transformer.
3. In addition to 2241 through 2243, 2244 is also available. The specifications for this transformer (for current measurements only; cannot be used for power measurements) are 500 A primary, 5 A secondary (one range, through type), 1.5 VA rated load, Class 0.2, and 250 V maximum circuit voltage.

Shunts and External Multipliers

Shunts **2215~2217** External Multipliers **2222 and 2223**

Shunts

Tolerance : $\pm 0.2\%$
 Rated voltage drop : 50 mV

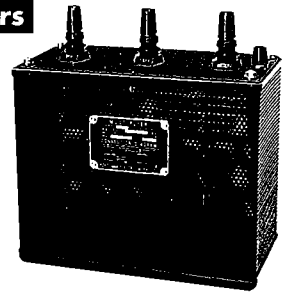


2216 (500A)

Model	Rating		Model	Rating	
2215	08	15A	2216	01	500A
	09	20A		02	750A
	10	30A		03	1000A
	11	50A	2217	01	1500A
	12	75A		02	2000A
	13	100A		03	3000A
	14	150A		04	5000A
	15	200A			
16	300A				
		50mV			

External Multipliers

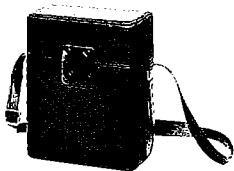
Class : Class 0.2
 Consumed power : 1mA



2222 (1.5/3kV)

Model	Rating	
2222	01	0.75/1.5 kV
	02	1/2 kV
	03	1.5/3 kV
2223	00	3/5 kV

2291 and 2292 Carrying Cases



2291 01



2292 01



2291 02

Model	Compatible instruments	
2291 01		2011,2013,2016 (voltmeters) ,2017,2038
2292 01		2012,2014,2016 (ammeters) ,2039,2041,2042,3254
2291 02		2051,2052,2053

● Carrying cases are useful for carrying and storing instruments.

List of JIS Mark Indications

Product	Model	Specifications	JIS mark	Product	Model	Specifications	JIS mark			
DC ammeter (4 ranges)	2011	31 3/10/30/100 μ A	None	Needle-indicator frequency meter	2038	31 45~65Hz 120/240V	None			
		32 10/30/100/300 μ A				32 20~100Hz 120/240V				
		33 0.1/0.3/1/3 mA				33 100~300Hz 120/240V	None			
		34 1/3/10/30 mA	34 300~500Hz 120/240V							
		35 10/30/100/300 mA	35 45~55Hz 120/240V							
		36 0.1/0.3/1/3 A	36 55~65Hz 120/240V							
		37 1/3/10/30 A								
DC voltmeter (4 ranges)		38 0.3/1/3/10 V	None	Power factor meter	2039	01 0.2/1A 120V	None			
		39 3/10/30/100 V		02 1/5A 120V						
		40 30/100/300/1000 V	None	03 5/25A 120V						
DC ammeter		41 (50mV)		Single-phase wattmeter		01 0.2/1A 120/240V	None			
DC voltmeter		42 (3 V)	02 1/5A 120/240V							
DC ammeter and voltmeter	2012	00 17 ranges	03 5/25A 120/240V							
AC ammeter (2 ranges)	2013	01 20/100 mA	None	Single-phase low power factor wattmeter	2041	11 0.2/1A 120/240V Power factor: 0.2	None			
		02 50/250 mA				12 1/5A 120/240V Power factor: 0.2				
		03 100/500 mA				13 5/25A 120/240V Power factor: 0.2				
		04 0.2/1 A				21 0.2/1A 30/60V Power factor: 0.2				
		05 0.5/2.5 A				22 1/5A 30/60V Power factor: 0.2				
		06 1/5 A		Three-phase wattmeter	2042	01 0.2/1A 120/240V	None			
		07 2/10 A				02 1/5A 120/240V				
		08 5/25 A				03 5/25A 120/240V				
		09 10/50 A								
AC ammeter (4 ranges)		10 20/50/100/200 mA	None	Miniature DC ammeter	2051	01 30/100/300/1000/3000 μ A	None			
		11 0.1/0.2/0.5/1 A				02 0.3/1/3/10/30 mA				
		12 0.5/1/2/5 A				03 10/30/100/300/1000 mA				
		13 2/5/10/20 A				04 0.3/1/3/10/30 A				
AC voltmeter (2 ranges)		14 10/20/50/100 A	None			Miniature DC voltmeter		2051	11 \pm 0.15/0.5/1.5/5/15 mA	None
		15 15/30 V							12 \pm 0.3/1/3/10/30 mA	
		16 30/75 V							13 \pm 5/15/50/150/500 mA	
		17 75/150 V							14 \pm 10/30/100/300/1000 mA	
		18 150/300 V							15 \pm 0.15/0.5/1.5/5/15 A	
AC ammeter		19 300/750 V	None			Miniature AC ammeter		2052	16 \pm 0.3/1/3/10/30 A	None
AC voltmeter		20 (5 A)		05 0.3/1/3/10/30 V						
AC ammeter		21 (150V)	06 3/10/30/100/300 V							
AC voltmeter (4 ranges) (for 400 Hz)		22 500 (500AT) A	None	17 \pm 0.15/0.5/1.5/5/15 V						
		23 0.5/1/2/5 A		18 \pm 0.3/1/3/10/30 V						
		24 2/5/10/20 A		19 \pm 1.5/5/15/50/150 V						
AC voltmeter (2 ranges) (for 400 Hz)		25 10/20/50/100 A	None	20 \pm 3/10/30/100/300 V						
AC ammeter and voltmeter	2014	00 13 ranges		01 0.5/1/2.5 mA						
High-frequency AC ammeter	2016	01 5/10/20/50 mA	None	02 2.5/5/10 mA						
		02 20/50/100/200 mA		03 10/25/50 mA						
		03 100/200/500/1000 mA		04 50/100/250 mA						
High-frequency AC voltmeter		04 15/30/75/150 V	None	Miniature AC voltmeter	2053	01 0.25/0.5/1 A	None			
Audio-frequency voltmeter	2017	30 30/75/150/300 V				02 1/2.5/5 A				
						03 5/10/25 A				

Is there a way to use the portable instruments in an upright (vertical) position? —●

Portable instruments must be used in a horizontal position (standard position). There is no assurance of precision within the specified ranges if a portable instrument is set in a vertical or tilted position during use. This is due to the weight balance of the moving parts, including the indicator needle. If the instrument is horizontal, there is basically no balance problem, but if it is vertical, the indicator error will be doubled. There are no strict guidelines on leveling the instrument (e.g., using a spirit level). It should be OK if it is set on a desk (or bench) that is basically level. If you really need to use your portable instrument in a vertical position, you should calibrate it in that position before use.

Can I order measurement leads from YOKOGAWA M&C Corporation? —●

YOKOGAWA M&C does not carry measurement leads; you will need to purchase them separately. We do not carry leads because it is very difficult to establish a standard type of lead. This is because, with the exception of chips connected on the instrument end, line diameters, lengths, and the specifications of the remote chip being connected can vary greatly, depending on operating conditions. However, shunt cables (two 1.5-meter cables with 0.05Ω resistance) are provided with external shunt ammeters 2011 41 (50 mV) and 2012 00.

What are Class 0.5 and Class 1.0? —●

They are precision classes specified in JIS C 1102:1997 ("Direct Acting Indicator Electrical Instruments"). The classes refer specifically to limitations on error and influential fluctuations (characteristics), but are normally used to indicate the maximum tolerance.

Class 0.5 = $\pm 0.5\%$ of fiducial value; percentage of range's maximum scale value

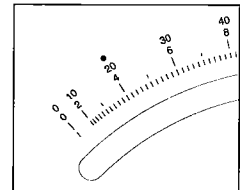
Class 1.0 = $\pm 1.0\%$ of fiducial value; percentage of range's maximum scale value

What is the solid circle (•) above the scale number on the labels of Models 2013 and 2014? —●

This indicates the minimum value in the measurement range.

- The range from the scale value marked by the solid circle to the maximum scale value is the guaranteed precision range.
- Values below the scale value marked by the solid circle are outside the guaranteed precision range.

This mark is specified in JIS C 1102:1997 ("Direct Acting Indicator Electrical Instruments").



What is the maximum circuit voltage of the ammeters? —●

250 V (called the nominal circuit voltage in JIS C 1102:1997).

The applicable ammeter models are 2011, 2012, 2013, 2014, 2016, 2051, 2052, and 2053.

What are the test voltages for the voltage tests on the various meters? —●

The test voltages are listed below. Tests are done across the input terminal (electric circuit) and the outer casing.

3000 V AC for one minute; 2011, 2012, 2013, 2014

2000 V AC for one minute; 2016, 2017, 2051, 2052, 2053, 2038, 2039, 2041, 2042

How do you calculate the internal (terminal-to-terminal) resistance or impedance? —●

When voltage drop is given on an ammeter

; Voltage drop (V) / Range's rated current (A) = Internal resistance

When consumed power is given on an ammeter (circuit)

; Consumed power (VA) / Square of rated current (A) = Internal impedance

When consumed current is given on a voltmeter

; Range's rated voltage (V) / Consumed current (A) = Internal resistance

When consumed power is given on a voltmeter (circuit)

; Consumed power (VA) / Rated voltage (V) = Rated current

→ Consumed power (VA) / Square of rated current (A) = Internal impedance