TOYO KEIKI

Pivot-type Fixed Meter 110mm Angle

[JIS C 1102-2007, RoHS Compatible Products]

Wide Angle Meter

■VF-11M Series

東洋計器株式会社

CAT. NO. VF-11M-03

New Series 110mm Angle Wide Angle Meter □VF-11M Series

Contents

About Model Names

L ..... With Lamp Lighting
E ..... With EL Plate Lighting
V..... When equipped with resistor for instruction adjustment

11 ..... Front Dimensions 110 × 110

VF ..... Design Shape Wide Angle Shape

Indicates the type of input electric quantity

D ..... Direct current or voltage
Se..... Alternating current or voltage (R.M.S.-Response type)
S ..... Alternating current or voltage (Mean value rectifier type)
A..... Alternating current or voltage (Moving-iron type)
E ..... 1P or 3P power
R ..... 1P or 3P varmeter power
U ..... 1P or 3P balanced power rate
Uu..... 3P unbalanced power rate
F..... Frequency
C.....Tachometer

VF-11M SERIES

Details of Changes from Previous Product (□VF-11 Series)

1. Mounting screws at the four corners of the meter changed from M6 to M5 size.
2. Meter terminal screws changed as follows.
   Ammeter, voltmeter, frequency meter
   M6 screws → M4 screws
   Wattmeter, Varmeter, Power Factor Meter
   1P, 3P3W: M4 screws → M4 screws
   3P4W : M3 screws → M4 screws
3. Scale characteristics of the electronic device type (M.R.S.-Response type) AC ammeter have been improved from non-linear wiring to linear wiring.

Features

1. A long scale meter for indicating wide angles.
2. A stepped scale plate is used to remove any level difference between the scale and tip of the needle, resulting in accurate readings.
3. Meter that has a bright scale due to the wide cover lighting surface.
4. It is not affected by steel panels.
5. Can be manufactured with EL board (Electro-Luminescence Board) lighting.
6. Terminal cover is now equipped as standard.
7. It is now compatible with multi-setting set pointer models.

VF-1 1M Series List

Applicable Standards: JIS C 1102-1, 2, 3, 4, 5, 9

Part Name		□VF–11M			Notes Page
		Model Name	Operating Principles	Accuracy Class	
Direct Current	Ammeter	DVF–11M	Permanent magnet Moving-coil type	1.5	5
	Voltmeter				6
	Reception Meter				5/6
Alternating Current	Ammeter	SVF–11M	Rectifier type	2.5	7
	Voltmeter				8
	Ammeter	SeVF–11M	Electronic device type	1.5	9
	Voltmeter				10
	Ammeter	AVF–11M	Moving-iron type	1.5	11
	Voltmeter				12
	Reception Meter	SVF–11M	Rectifier type	2.5	7/8
	1P Wattmeter	EVF–11M	Electronic device type	1.5	13
	3P Wattmeter				
	3P4W Wattmeter				
	1P Varmeter	RVF–11M	Electronic device type	1.5	13
	3P Varmeter				
	3P4W Varmeter				
	1P Power Factor Meter	UVF–11M	Electronic device type	5.0	14
	3P Balanced Power Rate Meter				
	3P Unbalanced Power Factor Meter	UuVF–11M			
	3P4W Power Factor Meter				
	Frequency Meters	FVF–11M	Electronic device type	0.5	18

Production Standards

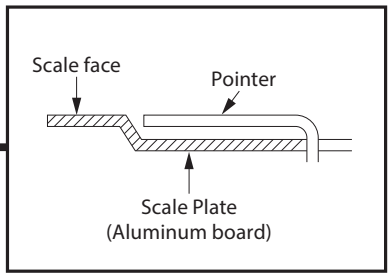
☆Can be manufactured to 80×80 (mm) or 120×120 (mm) sizes. Please contact us for more details.

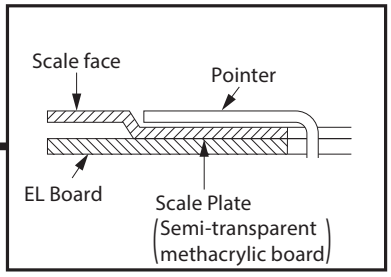
Model Name	□VF–11M
Front Dimensions (Horizontal × Vertical) (mm)	110×110
JIS Symbol (JISC1103)	KW3a
Scale Length (mm)	170
Blur Angle	237°
Accuracy/Class	Refer to □VF-11 M Series List Table (Upper Table)
Mounting Posture	Vertical (Other than vertical: Specification required, e.g. ⁄30°)
Recommended No. of Scale Divisions	Division 35 to division 75
Pointer Shape	VF Standard Pointer (See Next page)
Cover Material	Methacrylic Resin
Cover Frame Color	●Black (Munsell symbol: N-1.5) ●Blue/green color according to specifications (Munsell symbol: 7.5BG 4/1.5)
Base Material	Body: ABS resin Terminals: PBT resin
Scale Plate	Aluminum plate with white coating (Scale lines and numbers are black)

Note) See p.26 for details on the recommended scale divisions.

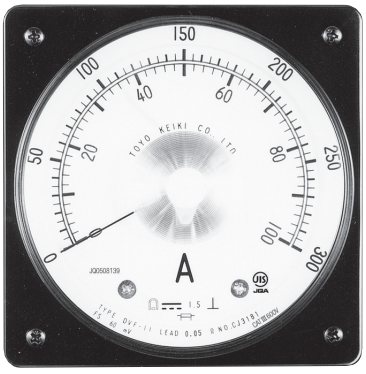
Insulation Test Between all circuits in a batch and outer casing …More than 10 MΩ (500V mega tester)
Between current circuit and voltage circuit …More than 5M (at 500V mega)

Voltage Test Between all measurement circuits in a batch and outer casing, and between current circuit and voltage circuit ...
maximum usable circuit voltage up to 600V. AC3320V for 5 seconds: CAT III 600V displayed at the bottom right of the scale plate.
If the maximum usable circuit voltage of 600V is exceeded, (2E+1000) V (E: Maximum usable circuit voltage [V])





Pointer Shape



VF Standard Pointer
(Single scale and
Single scale double printing)

Rod Pointer
(for Multiple Scale)

Operating Environment

Operating Temperature Limits	–10°C to+50°C, Accuracy Assurance Range: +5°C to +40°C
Storage Temperature	–20°C to +60°C
Relative Humidity	Less than 80%
Operating Environment	Indoor
Installation Height	2000m or less (See p.23 for details)

Special Specifications

(Can be manufactured to the following special specification by request.)

★Mounting posture other than vertical (Specification of installation angle required)

★With Red Set Pointer Single Setting Type, Multiple Setting Type (See P.21 for details)

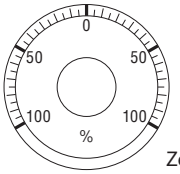
★Special Scale: Conversion scale, zero center scale, colored scale, multiple scale, magnifed scale, specific symbol display, scale division increase in lines

★Rod pointer (Rod pointer is used for multiple scales.)

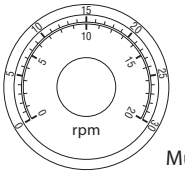
★EL plate lighting (Color: green or orange) (See below)

★Special processing (heat processing, etc.)

★Other special specifications



Zero Center Scale



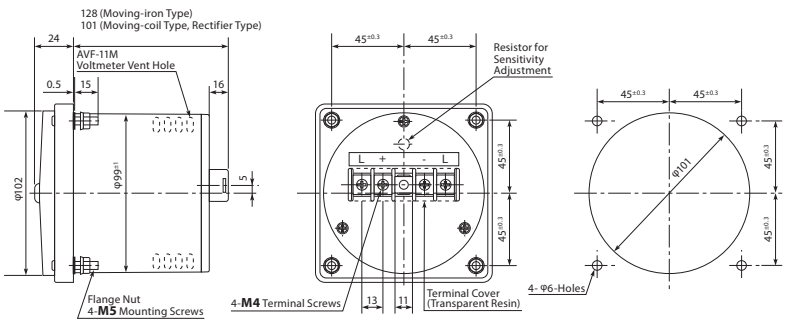
Multiple Scale

Common Specifications for Meter with EL Plate Lighting

EL plate impressed voltage: 100/110V AC (Please contact us for uses with 200/220V AC and 100/110V DC.)

Outside Dimensions

☐VF-11ME



Note) Accessories are attached externally as shown below for meters with EL plate lighting.
(Unmarked items have accessories built-in, and the wiring method is as standard.
See the following pages for details on the outside dimensions of accessories and the wiring methods.

Specifications	Accessories
AC Voltmeter (Moving-iron Type)	M-4 A Series Resistor
Wattmeter	ERG-3 Converter
Varmeter	RRG-3 Converter
Power Factor Meter	URG-3 Converter Or UuRG-3 Converter

VF SERIES

DC Ammeter (Moving-coil Type)

Model Name DVF-11M

Specifications

Measurement Range Value	DVF-11M	
	Internal Resistance	Distributor
200 μA	1.9 kΩ	Not Required
500 μA	1.1 kΩ	
1 mA	380 Ω	
2 mA	125 Ω	
5 mA	21 Ω	
10 mA	8 Ω	
20 mA	3 Ω	
50 mA 100 mA 500 mA 1 A 5 A 10 A 15 A 20 A 30 A	Voltage drop: 100mV Sensitivity: Approx. 10mA	Built-in
40 A ≀ 5 kA	Voltage drop: 60mV Sensitivity: Approx. 10mA	External
Weight	Approx. 0.45kg	

Reception Meter Meter Input	DVF-11M	
	Internal Resistance	Distributor
4~20 mA	7Ω	Not Required
10~50 mA	3Ω	
Weight	Approx. 0.45kg	

Note 1) Internal resistance value tolerance: ±30% (at 23°C)

Remarks

Connection to Shunt

1. Connect the shunt to the wires on the earth side.
2. See P.19 for details on the outside dimensions of the shunt.

Instrument Lead

Instrument lead is **not included**.

Instrument Lead Resistance

1. Meters externally attached to shunts are normally adjusted to an **instrument lead resistance of 0.05Ω**.
   (Indicate LEAD 0.05Ω on the scale plate)
   Therefore, use wiring that is equivalent to 0.05Ω for the instrument lead.
2. Please provide separate instructions if the instrument lead resistance is to be a value other than 0.05Ω.
   When combining with a 60mV rated shunt, the instrument lead resistance can be manufactured up to 1.0Ω specifications.
   If the wiring exceeds 1.0Ω, combine with a high mV shunt.
3. If the instrument lead resistance is not clearly specified, the meter can be manufactured with a sensitivity adjustment variable resistor (VR).
   The adjustable range is up to 1.0Ω for a 60mV meter.

   Note) The model name of an meter equipped with VR is the same as the normal model name with V appended.
   E.g. DVF-11MV

Note Zero center meters and multiple-scale meters can also be manufactured. 50mV and 100mV meters with externally attached shunts can also be manufactured.

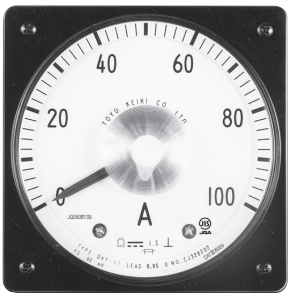
Reference Table of Instrument Lead Resistance

[Unit Ω (at 20℃)]

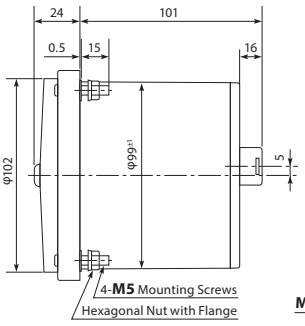
Wire Diameter \ Length	1 m	2 m	3 m	4 m	5 m	10 m	20 m	Conductor Resistance Ω/km
0.75 mm²	0.05	0.1	0.15	0.2	0.25	0.5	1.0	24.4
1.25 mm²	0.03	0.06	0.09	0.12	0.15	0.3	0.6	14.7
2.0 mm²	0.02	0.04	0.06	0.08	0.1	0.2	0.4	9.50
3.5 mm²	0.01	0.02	0.03	0.04	0.05	0.1	0.2	5.09
5.5 mm²	0.0066	0.0132	0.0198	0.0264	0.033	0.066	0.132	3.27

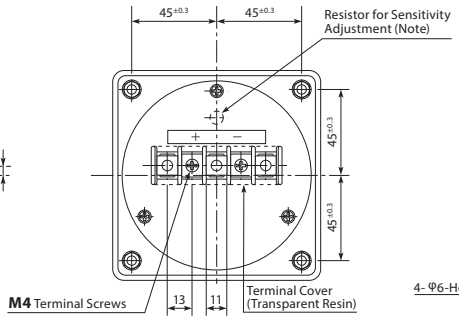
Note) 1. The resistance values in the table above are applicable when the prescribed length of vinyl wire for wiring electric devices is installed as return wiring.
2. If the wiring exceeds 20m, calculate from the conductor resistance value column. E.g. For 2.0mm² 36m, $2\times9.50\times\frac{36}{1000}\fallingdotseq0.68\Omega$

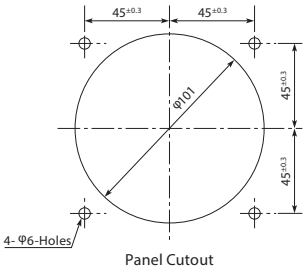
Outside Dimensions



DVF-11M





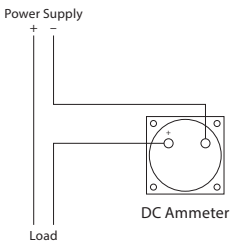


Panel Cutout

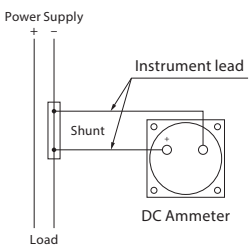
Note) The DVF-11MV model resistor for sensitivity adjustment must be used.

Connection Diagram

When the shunt is built-in and not required



When the shunt is externally attached



VF SERIES

DC Voltmeter (Moving-coil type)

Model Name DVF-11M

Specification

Measurement Range Value	DVF-11M		Note
	Consumption Current	Series Resistor	
1 V	1mA	Built-in	
1.5 V			
3 V			
5 V			
7.5 V			
10 V			
15 V			
30 V			
50 V			
75 V			
100 V			
150 V			
300 V			
500 V (600V) *			
750 V		M-2B	Voltage Division Type Series Resistor
1 kV		M-3	
1.5 kV			
2 kV		M-4A	
3 kV			
4 kV		M-6	
5 kV			
7.5 kV			
Weight	Approx. 0.45kg		

* Series resistors than 600V are built in.
* M-2A type series resistors that exceed 600V but are less than 750V are externally connected. (Series connection, 1mA consumption current)
* The JIS mark cannot be displayed for specifications that exceed 600V.

Meter Input for Reception Meter	DVF-11M		Note
	Consumption Current	Series Resistor	
1~5V	1mA	Built-in	Internal Resistance: 5kΩ
Weight	Approx. 0.45kg		

Remarks

Connection to Series Resistor

1. Meters over 750V must be connected with the voltage division type series resistor specified in the table to the left as shown in the figure below.

   Note) M-6 series resistors must be **connected to the earth using the G terminal**.
   (The G terminal is only available on the M-6 series resistor.
   There is no G terminal on other series resistors because the boxes are made of resin.)

2. See P.25 for details on the outside dimensions of the series resistors.

Meter Sensitivity

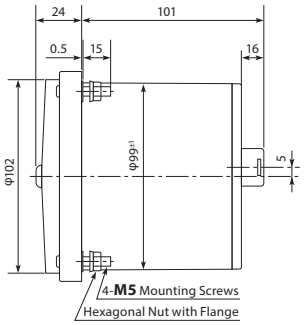
The meter sensitivity of DV voltmeters is 1mA (1kΩ/V) as standard.

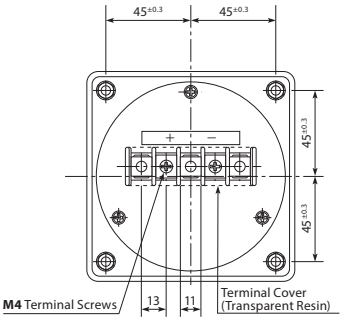
Note

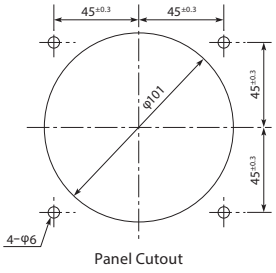
Zero center meters and multiple-scale meters can also be manufactured.

Outside Dimensions

DVF-11M



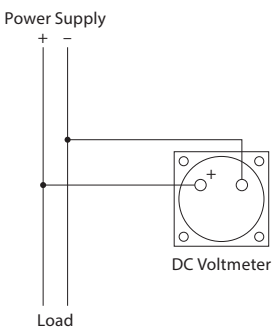




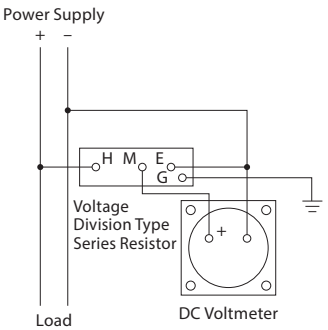
Panel Cutout

Connection Diagram

For a built-in series resistor (If 600V or below)



For an externally connected voltage division type series resistor (Over 750V)



VF SERIES

AC Ammeter (Rectifier Type <Mean Value Response of Effective Value Conversion Scale>)

Model Name SVF-11M

Specifications

Measurement Range Value	SVF-11M VA Consumption	SVF-11M Accessories	Note
300 μA 500 μA 1 mA 3 mA 5 mA 10 mA 20 mA 50 mA 75 mA		None	Direct Measurement
100 mA 300 mA 500 mA 1 A 3 A 5 A	0.2VA	None	Direct Measurement
7.5 A ~ 10 kA			Use combination of CT and 5A (1A) meter
Weight	Approx. 0.55kg		

Remarks

Using CT

1. Use **combined CT and 5A (1A) meter** if 5A is exceeded.
2. When circuit voltage of 500V is exceeded at 5A or below, use **combined CT and 5A (1A) meter** for insulation.

Frequency

Indicate the frequency when measuring AC frequencies outside of commercial frequencies. (JIS mark not indicated)
(Can be manufactured from approximately 30Hz to 10kHz)

Extended Scale Meter

Meters attached with double, triple or 5-times extended scale to use for measuring the current flow of electric motor-class of starting current can be manufactured.

Waveform Distortion

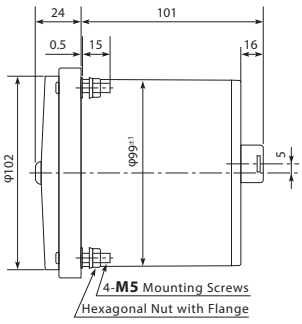
If there is waveform distortion, use an **electronic device type** (SeVF type: M.R.S.-Response P9) that is less susceptible to waveform distortion.

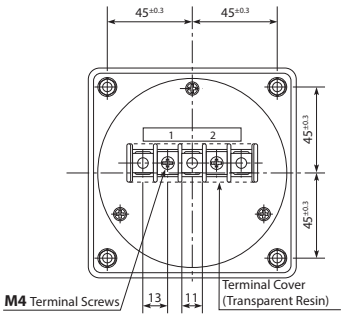
Note) Scale calibration for rectifier-type meters is conducted via sine waves.

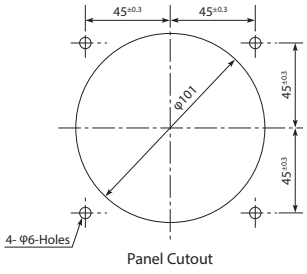
Note

Multi-scale meters can also be manufactured.

SVF-11M



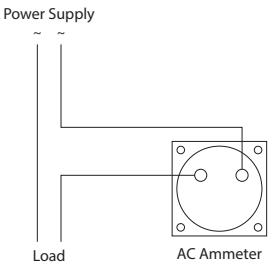




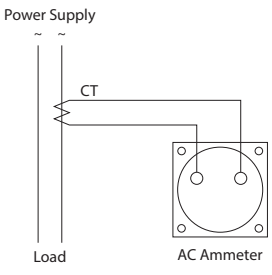
Panel Cutout

Connection Diagram

For Direct Measurement



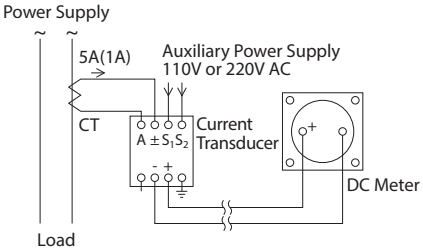
When Combined With a CT



Note

Telemetering

For direct feed type telemetering, you can reduce line loss if the second rated value uses a 1A CT combined with a 1A meter. (The rated value of 5A is 1/25.)
To further reduce loss, use an AC current transducer combined with a DC meter.
(For details on AC current transducers, see the AC current transducer catalog.)



VF SERIES

AC Voltmeter (Rectifier Type <Mean Value Response of Effective Value Conversion Scale>)

Model Name SVF-11M

Specifications

Measurement Range Value	SVF-11M		Note
	Current Consumption	Series Resistor	
3 V 5 V 7.5 V 10 V 15 V 30 V 50 V 75 V 100 V 150 V 300 V 600 V	AC1mA	Built-in	Direct Measurement
601 V ~ 20 kV		VT combined	Use a combination of 150V meter and VT
Weight	Approx. 0.45kg		

Remarks

Using VT

Use **combined VT and 150V meter** if 600V is exceeded.

Usage example Meter: Scale 0~9000V, input 0~150V

VT:6600V/110V

Frequency

Indicate the frequency when measuring AC voltage outside of commercial frequencies. (JIS mark not indicated)

(Can be manufactured from approximately 30Hz to 10kHz, but limited to sine waves.)

Meter Sensitivity

Standard AC voltmeter sensitivity is 1mA (1kΩ/V), but high-sensitivity meters can also be manufactured.

Waveform Distortion

If there is waveform distortion, use an **electronic device type** (SeVF type: M.R.S.-Response P10) that is less influenced by waveform distortion.

Scale Calibration

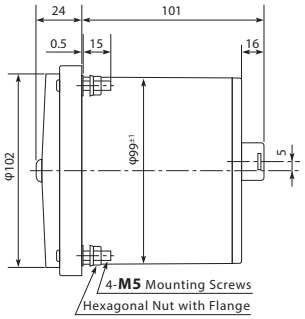
Conducted via sine waves.

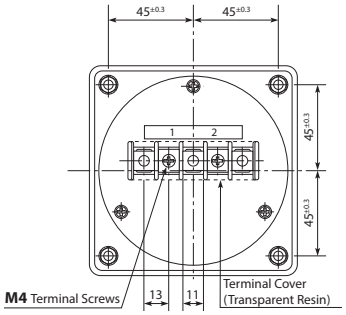
Note

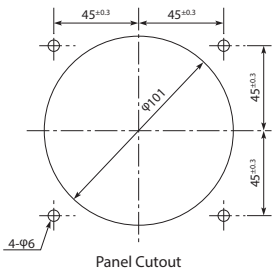
Multi-scale meters can also be manufactured.

Outside Dimensions

SVF-11M



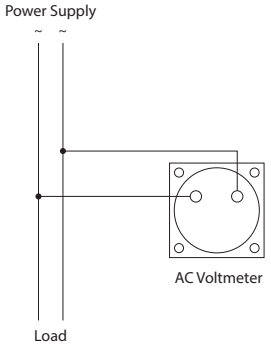




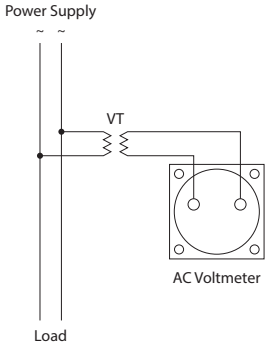
Panel Cutout

Connection Diagram

For Direct Measurement
(If 600V or below)



When Combined With a VT
(If 600V is exceeded)



VF SERIES

AC Ammeter (Electronic Device Type, R.M.S.-Response)

Model Name SeVF-11M

Specifications

Measurement Range Value	SeVF-11M		Note
	VA Consumption	Accessories	
100 mA 300 mA 500 mA 1 A 3 A 5 A	0.5VA	None	Direct Measurement
7.5 A ~ 10 kA			Use combined CT and 5A (1A) meter
Weight	Approx. 0.55kg		

Remarks

Waveform Distortion

Electronic device type meters **indicate the root-mean-square value** without being influenced by waveform distortion. (However, the waveform distortion must be less than the "**third harmonic wave 20% of the fundamental wave**" prescribed in JIS C1102-1 to 2, 9.)

Using CT

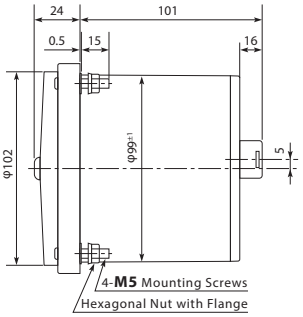
1. Use **combined CT and 5A (1A) meter** if 5A is exceeded.
2. When circuit voltage of 600V is exceeded at 5A or below, use **combined CT and 5A (1A) meter** for insulation.

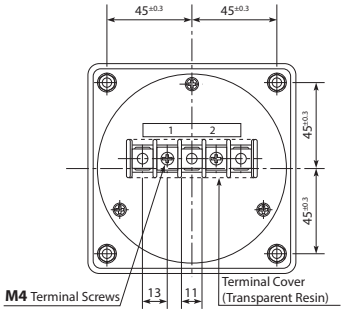
Extended Scale Meter

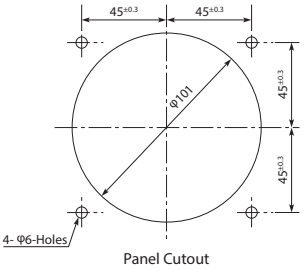
Meters attached with double, triple or 5-times extended scale to use for measuring the current flow of electric motor-class of starting current

Outside Dimensions

SeVF-11M



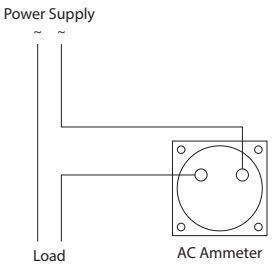




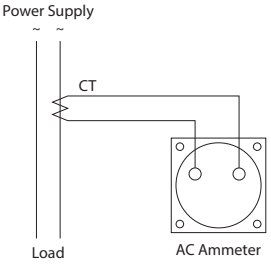
Panel Cutout

Connection Diagram

For Direct Measurement



When Combined With a CT



VF SERIES

AC Voltmeter (Electronic Device Type, R.M.S.-Response)

Model Name SeVF-11M

Specifications

Measurement Range Value	SeVF-11M		Note
	Current Consumption	Series Resistor	
50 V 75 V 100 V 150 V 300 V 600 V	AC 4mA	Built-in	Direct Measurement
601 V ~ 20 kV		VT combined	Use a combination of VT and 150V meter
Weight	Approx. 0.47kg		

Remarks

Waveform Distortion

Electronic device type meters **indicate the root-mean-square value** without being influenced by waveform distortion. (However, the waveform distortion must be less than the "**third harmonic wave which is 20% of the fundamental wave**" prescribed in JIS C1102-1 to 2, 9.)

Using VT

Use a **combination of VT and 150V meter** if 600V is exceeded. (Cannot be manufactured with a series resistor.)

Usage example Meter: Scale 0~9000V, input 0~150V

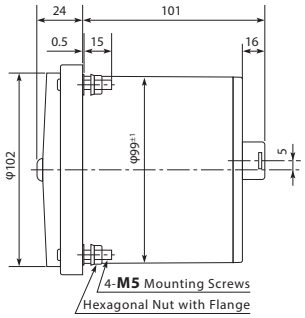
VT:6600/110V

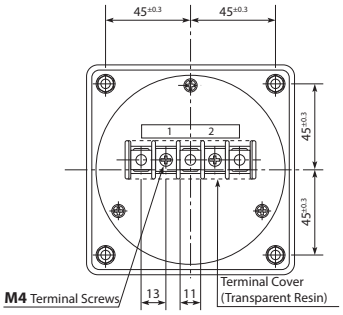
Meter Sensitivity

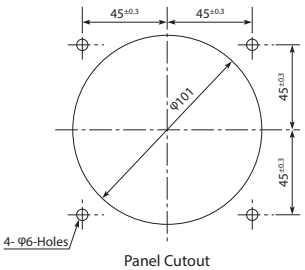
Standard AC voltmeter sensitivity is AC 4mA.

Outside Dimensions

SeVF-11M



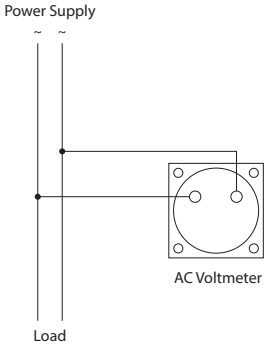




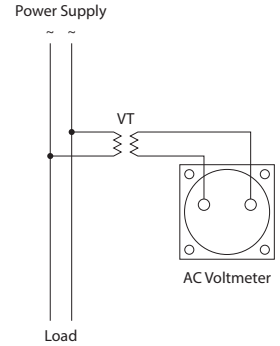
Panel Cutout

Connection Diagram

For Direct Measurement
(If 600V or below)



When Combined With a VT
(If 600V is exceeded)



VF SERIES

AC Ammeter (Moving-iron Type, R.M.S.-Response)

Model Name AVF-11M

Specifications

Measurement Range Value	Extended Scale Meter			AVF-11M		Note
	Double	Triple	Five Times	VA Consumption	Weight	
100 mA	200 mA	300 mA	500 mA	3.2VA	Approx. 0.62kg	Direct Measurement
200 mA	400 mA	600 mA	1000 mA			
500 mA	1000 mA	1500 mA	2500 mA			
1 A	2 A	3 A	5 A			
5 A	10 A	15 A	25 A			
7.5 A	15 A	22.5 A	37.5 A			
10 A	20 A	30 A	50 A			
15 A ≀ 10 kA	30 A ≀ 20 kA	45 A ≀ 30 kA	75 A ≀ 50 kA			Use combination of CT and 5A (1A) meter.

Note 1) The standard scale meters and extended scale meters shown below are standard specification displays.
(For standard scale meters, the above measurement range is full-scale.)

Remarks

Using CT

1. Use **combined CT and 5A (1A) meter** if 10A is exceeded.
2. When circuit voltage of 600V is exceeded at 10A or below, use **combined CT and 5A (1A) meter** for insulation.

Extended Scale Meter

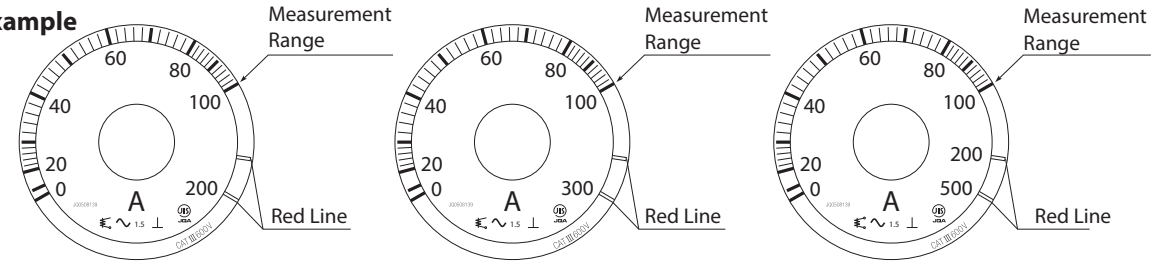
Use a double, triple or five-times extended scale meter-standard meter to measure the current flow of electric motor-class of starting current.

Usage example For a triple extended scale AVF-11M
0~100~(300)A(CT ratio 100A/5A)

Note 1) In the case of extended scale meters, the 70% point on the scale length represents the measurement range (upper limit value of the effective measurement range), and the section that exceeds 70% up to 100% is the extended scale section. **(Extended scale part intrinsic error: ±10% of indicated values)**

Note 2) The **red color extended** scale lines are the points below for extended scale meters.

Scale Example



Double-Extended Scale: Measurement range value is 1.5 times, double

Triple-Extended Scale: Measurement range value is double, triple

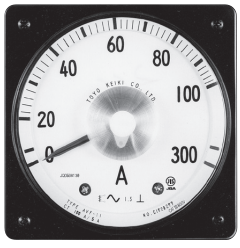
Five-times Extended Scale: Measurement range value is double, five times

Specifications

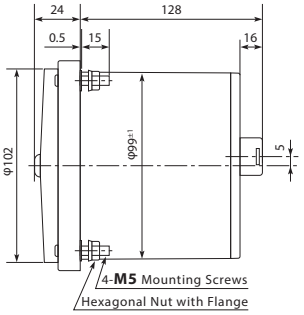
Scale Calibration Conducted via sine waves.

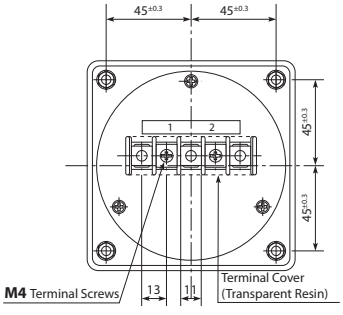
Telemetering For direct feed type telemetering, you can reduce line loss if the second rated value uses a 1A CT combined with a 1A meter. (The rated value of 5A is 1/25.)
To further reduce loss, use an AC current transducer combined with a DC meter.
(For details on AC current transducers, see the AC current transducer catalog.)

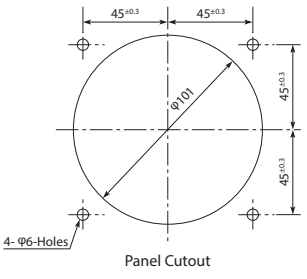
Outside Dimensions



AVF-11M

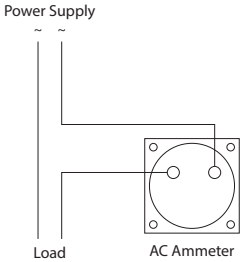




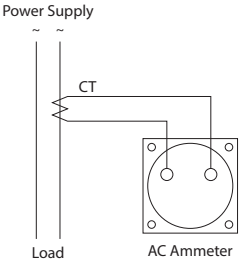


Connection Diagram

For Direct Measurement



When Combined With a CT



VF SERIES

AC Voltmeter (Moving-iron Type, R.M.S.-Response)

Model Name AVF-11M

Specification

Measurement Range Value	AVF-11M		Note
	VA Consumption	Series Resistor	
75 V 100 V 150 V 300 V	9VA	Built-in	Direct Measurement
400 V ~ 20 kV		VT combined	Use a combination of 150V meter and VT
Weight	Approx. 0.72kg		

Note

When Series Resistor is used (when inputting directly into the meter without using VT)

Measurement Range Value	AVF-11M		Note
	VA Consumption	Series Resistor	
400V	12VA	M-2A	Connect meter and series transistor in a series for use
500V	15VA	M-2B	
600V	18VA	M-3	

Note) For series transistor outside dimensions, see P25.

Remarks

Using VT

Use **combined VT and 150V meter** if 300V is exceeded.

Usage example Meter: Scale 0~9000V, input 0~150V
VT:6600/110V

Note) Models up to 600V can be manufactured with a series resistor as shown in the table below.

Series Resistor

The M-4 type series resistor is attached externally for products equipped with EL plate lighting. (See below)

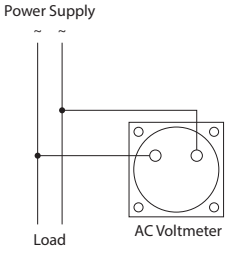
Scale Calibration

Conducted via sine waves.

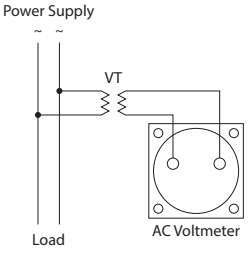
Connection Diagram

AVF-11M

Less than 300V

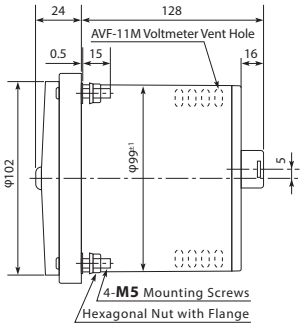


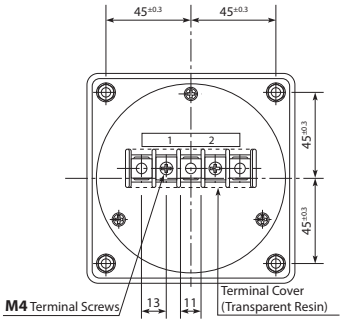
More than 300V

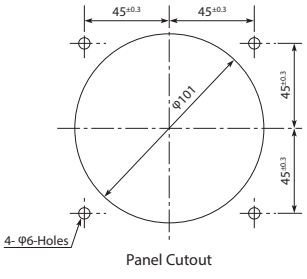


Outside Dimensions

AVF-11M





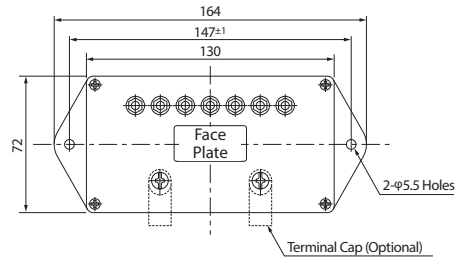


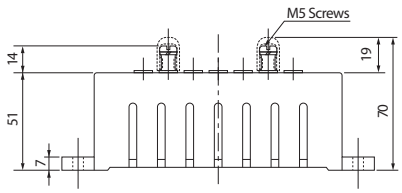
Outside Dimensions of Accessory

AVF-11ME (EL plate lighting with meter)

M-4A Type Series Resistor
(Accessories for Meter with EL Plate Lighting Use)

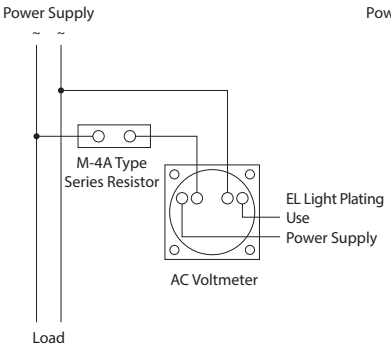
Weight: Approx. 0.3kg



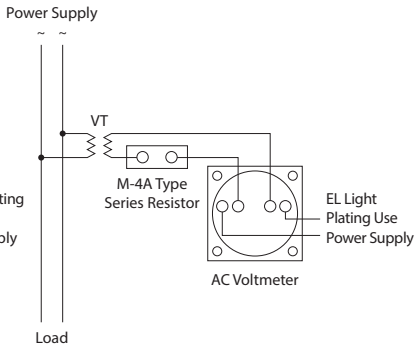


Connection Diagram

Less than 300V



More than 300V



VF SERIES

Wattmeter and Varmeter (Electronic Device Type, Time Sharing Multiplication Method)

Model Name EVF-11M (Wattmeter) RVF-11M (Varmeter)

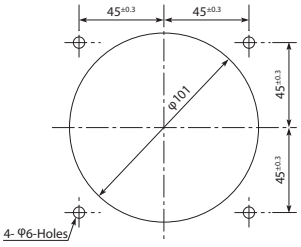
Specifications

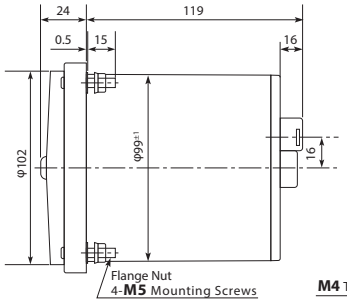
Product Name	Model Name	Rating	VA Consumption		Weight	Note
			Voltage Circuit	Current Circuit		
1P Wattmeter	EVF-11M	110 V5A	1.1VA	0.5VA	Approx. 0.95kg	50/60Hz Common Use
		220 V5A	1.1VA	0.5VA		
3P Wattmeter		110 V5A	1.1VA per phase	0.5VA per phase		50/60Hz Common Use
		220 V5A	1.1VA per phase	0.5VA per phase		
3P4W Wattmeter		110/√3 V5A	1.1VA per phase	0.5VA per phase		50/60Hz Common Use
		220/√3 V5A	1.1VA per phase	0.5VA per phase		
1P Varmeter	RVF-11M	110 V5A	1.1VA	0.5VA per phase		50 or 60Hz Required Designation
		220 V5A	1.1VA	0.5VA per phase		
3P Varmeter		110 V5A	1.1VA per phase	0.5VA		50 or 60Hz Required Designation
		220 V5A	1.1VA per phase	0.5VA		
3P4W Varmeter		110/√3 V5A	1.1VA per phase	0.5VA per phase		50 or 60Hz Required Designation
		220/√3 V5A	1.1VA per phase	0.5VA per phase		

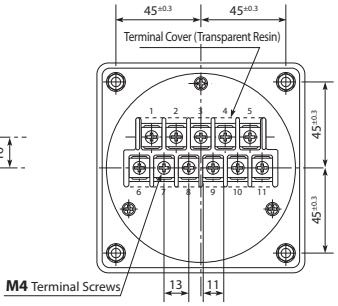
Outside Dimensions

EVF-11M
RVF-11M
(Built-in Transducer Type)

Panel Cutout







Remarks

Using VT, CT

Use a **combination of the 110V5A rating meter with VT and CT** if the rating on the left is exceeded.

Measurement Range Value

Select the measurement range from the wattmeter measurement range selection standards chart on P15.

Production Limits of Meter

For the production limits of meters, see P16.

Usable Voltage Range

Rated voltage within ±15%

Varmeter Scale

The standard scale of a varmeter is **LEAD ☐ ~0~LAG ☐ kvar**.

Note) Pulse meters(0~☐kvar) are also producible.
(For pulse meters, designate LEAD or LAG.)

Meter Wiring

1. You cannot obtain a normal indicator if phase is reversed. Therefore, be sure to check the **phase sequence of the bus** and the **polarity of VT and CT**.
2. For phenomena related to mis-wiring, see P17.

1P3W Wattmeter

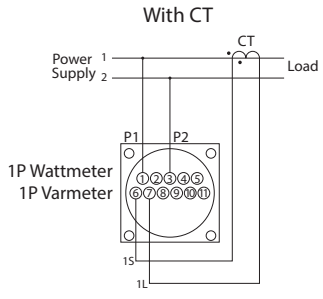
1P3W Wattmeters as listed on the left can be manufactured.

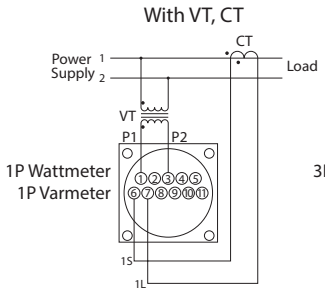
Note

Voltage rated value 1A meters can also be manufactured.

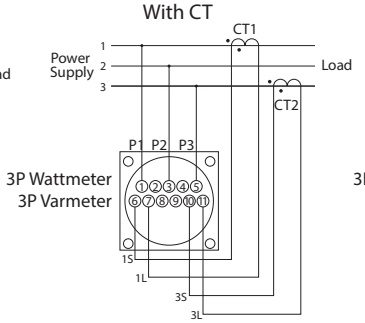
Connection Diagram

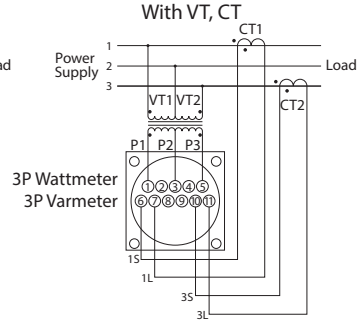
1P Circuit



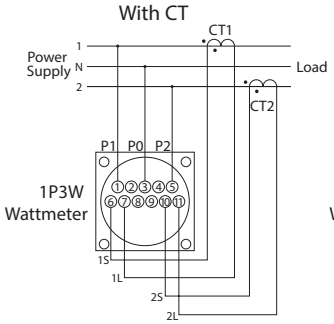


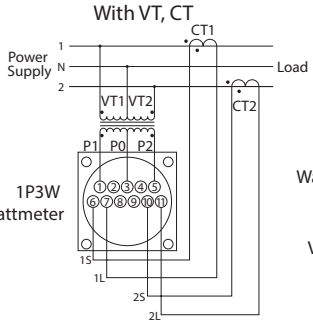
3P Circuit



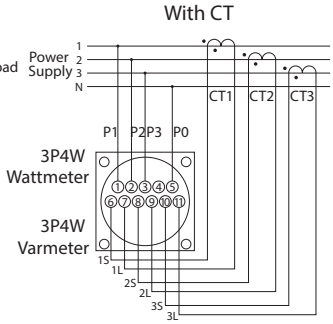


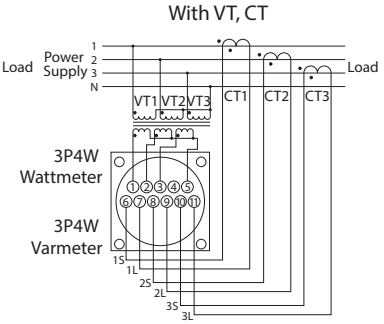
1P3W Circuit





3P4W Circuit





VF SERIES

Power Factor Meter (Electronic Device Type, Phase Discrimination Method)

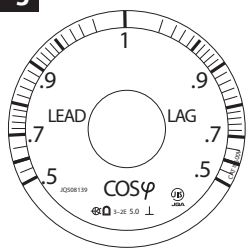
Model Name UVF-11M (1P Power Factor Meter / 3P Balanced Power Rate Meter)

UuVF-11M (3P Unbalanced Power Factor Meter / 3P4W Power Factor Meter)

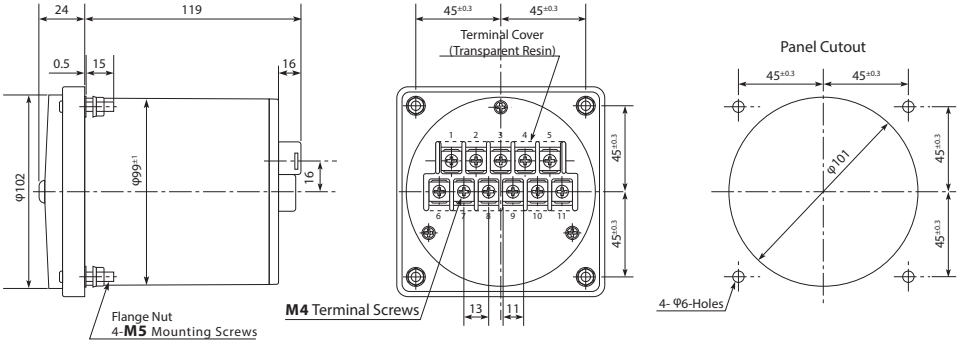
Specification

Product Name	Model Name	Scale	Rating	VA Consumption		Weight	Note
				Voltage Circuit	Current Circuit		
1P Power Factor Meter	UVF-11M	LEAD LAG 0.5~1~0.5 COSφ	110 V 5A 220 V 5A	0.8 V A	0.8 V A	Approx. 0.8kg	50/60Hz Common Use
3P Balanced Power Rate Meter				1.3 V A	0.8 V A		
3P Unbalanced Power Factor Meter	UuVF-11M			0.5 V A per phase	0.8 V A per phase		50 or 60Hz Required Designation
3P4W Power Factor Meter				1 V A per phase	0.8 V A per phase		

Scale Drawing



Outside Dimensions



Remarks

Using VT, CT

Use a combination of the **110V5A rating meter with VT and CT** if the rating on the left is exceeded.

Usable Voltage Range

Rated voltage within ±15%

For Small Current

When circuit voltage is rated under 20% (5A rating: less than 1A), it may not be possible to obtain a normal indicator. (Indicates a single scale if the power is off)

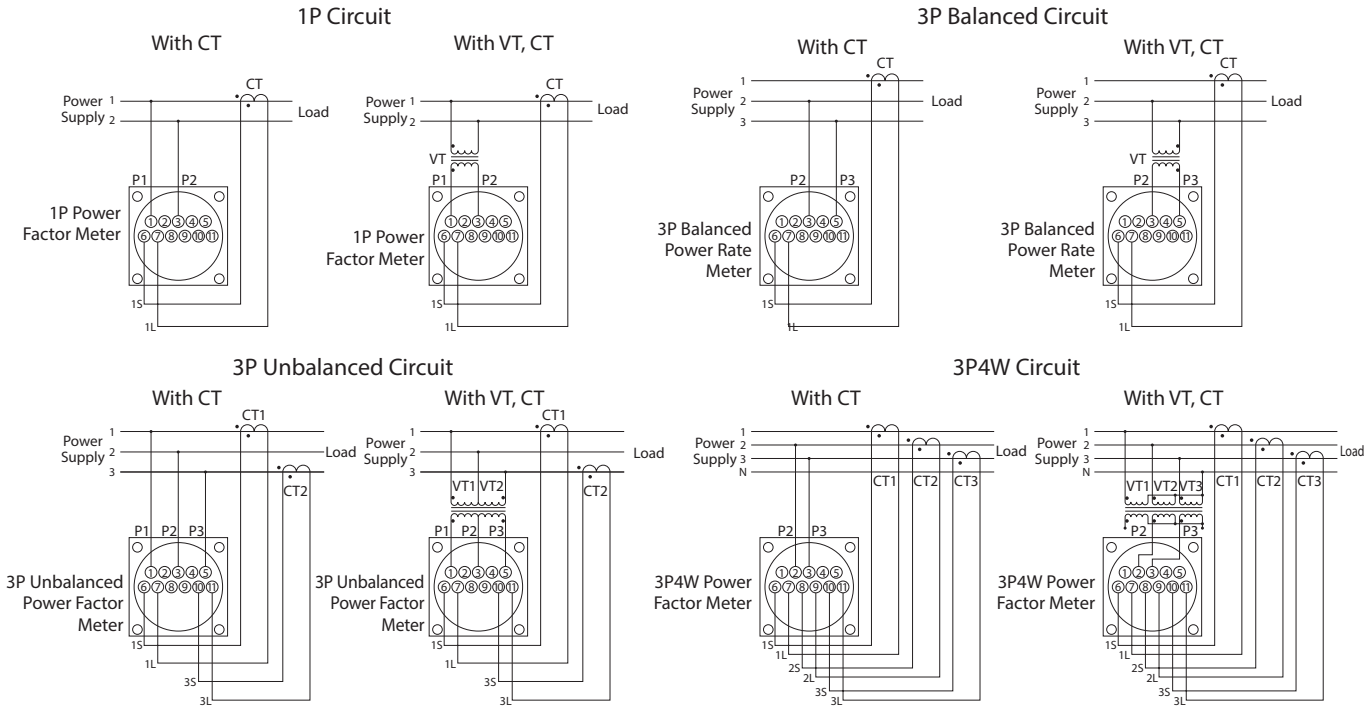
Meter Wiring

1. A normal indicator cannot be obtained if the polarity is reversed. Therefore, be sure to check the **phase sequence of the bus** and **the polarity of VT and CT**.
2. For phenomena related to mis-wiring, see P17.

Note

Voltage rated value 1A meters can also be manufactured.

Connection Diagram



Standard Table of Wattmeter Measurement Range

This standards chart is a resource for determining the measurement range values of wattmeters and varmeters, so 3P wattmeter standards are indicated.

Line Voltage	110 V			220 V			440 V			3300 V			6600 V		
VT Ratio							440V/110V			3300 V/110 V			6600 V/110 V		
Meter Intrinsic Watts Value / CT Ratio	625 Or 667 W	750 Or 833 W	1 kW	1.25 Or 1.33 kW	1.5 Or 1.67 kW	2 kW	625 Or 667 W	750 Or 833 W	1 kW	667 W	833 W	1 kW Or 1.11 kW	625 Or 667 W	833 W	1 kW Or 1.11 kW
5 A/5 A	——	750 W	1 kW	1.2 kW	1.5 MW	2 kW	2.5 kW	3 kW	4 kW	20 kW	25 kW	30 kW	40 kW	50 kW	60 kW
7.5 A/5 A	1 kW	1.2 kW	1.5 kW	2 kW	2.5 MW	3 kW	4 kW	5 kW	6 kW	30 kW	40 kW	50 kW	60 kW	75 kW	100 kW
10 A/5 A	1.2 kW	1.5 kW	2 kW	2.5 kW	3 kW	4 kW	5 kW	6 kW	8 kW	40 kW	50 kW	60 KW	80 kW	100 kW	120 kW
15 A/5 A	2 kW	2.5 kW	3 kW	4 kW	5 kW	6 kW	8 kW	10 kW	12 kW	60 kW	75 kW	100 kW	120 kW	150 kW	200 kW
20 A/5 A	2.5 kW	3 kW	4 kW	5 kW	6 kW	8 kW	10 kW	12 kW	(16 kW)	80 kW	100 kW	120 kW	150 kW	200 kW	(240 kW)
30 A/5 A	4 kW	5 kW	6 kW	8 kW	10 kW	12 kW	15 kW	20 kW	(24 kW)	120 kW	150 kW	200 kW	(240 kW)	300 kW	400 kW
40 A/5 A	5 kW	6 kW	8 KW	10 kW	12 kW	(16 kW)	20 kW	(24 kW)	(32 kW)	(160 kW)	200 kW	(240 kW)	300 kW	400 kW	(480 kW)
50 A/5 A	——	7.5 kW	10 kW	12 kW	15 kW	20 kW	25 kW	30 kW	40 kW	200 kW	250 kW	300 kW	400 kW	500 kW	600 kW
75 A/5 A	10 kW	12 kW	15 kW	20 kW	25 kW	30 kW	40 kW	50 kW	60 kW	300 kW	400 kW	500 kW	600 kW	750 kW	1 MW
100 A/5 A	12 kW	15 kW	20 kW	25 kW	30 kW	40 kW	50 kW	60 kW	80 kW	400 kW	500 kW	600 kW	800 kW	1 MW	1.2 MW
150 A/5 A	20 kW	25 kW	30 kW	40 kW	50 kW	60 kW	80 kW	100 kW	120 kW	600 kW	750 kW	1 MW	1.2 MW	1.5 MW	2 MW
200 A/5 A	25 kW	30 kW	40 kW	50 kW	60 kW	80 kW	100 kW	120 kW	(160 kW)	800 kW	1 MW	1.2 MW	1.5 MW	2 MW	(2.4 MW)
300 A/5 A	40 kW	50 kW	60 kW	80 kW	100 kW	120 kW	150 kW	200 kW	(240 kW)	1.2 MW	1.5 MW	2 MW	(2.4 MW)	3 MW	4 MW
400 A/5 A	50 kW	60 kW	80 kW	100 kW	120 kW	(160 kW)	200 kW	(240 kW)	(320 kW)	(1.6MW)	2 MW	(2.4 MW)	3 MW	4 MW	(4.8 MW)
500 A/5 A	——	75 kW	100 kW	120 kW	150 kW	200 kW	250 kW	300 kW	400 kW	2 MW	2.5 MW	3 MW	4 MW	5 MW	6 MW
750 A/5 A	100 kW	120 kW	150 kW	200 kW	250 kW	300 kW	400 kW	500 kW	600 kW	3 MW	4 MW	5 MW	6 MW	7.5 MW	10 MW
1000 A/5 A	120 kW	150 kW	200 kW	250 kW	300 kW	400 kW	500 kW	600 kW	800 kW	4 MW	5 MW	6 MW	8 MW	10 MW	12 MW
1500 A/5 A	200 kW	250 kW	300 kW	400 kW	500 kW	600 kW	800 kW	1 MW	1.2 MW	6 MW	7.5 MW	10 MW	12 MW	15 MW	20 MW
2000 A/5 A	250 kW	300 kW	400 kW	500 kW	600kW	800 kW	1 MW	1.2 MW	(1.6 MW)	8 MW	10 MW	12 MW	15 MW	20 MW	(24 MW)
3000 A/5 A	400 kW	500 kW	600 kW	800 kW	1 MW	1.2 MW	1.5 MW	2 MW	(2.4 MW)	12 MW	15 MW	20 MW	(24 MW)	30 MW	40 MW

Note) Numerical values inside parentheses indicate values that deviate from JIS standards, but can be manufactured.

Using the Above Chart

[1] **For 3P wattmeters, 3P4W wattmeters,** and **1P3W wattmeters**, the measurement range upper limit values are displayed in the voltage ratios (VT ratio differences) and CT ratio differences in the table above. (There are three types defined for the same VT and CT ratios. Choose the appropriate type.)

(E.g.) For a VT: 3300V/110V, CT: 100A/5A 3P wattmeter... select the appropriate one from 400kW, 500kW or 600kW from the table above.

[2] **For 1P wattmeters, 3P varmeters, and 3P4W varmeters, the values displayed above are multiplied by 1/2**, and are multiplied by 1/4 for **1P varmeters**

Note 1) For varmeters, read kW units as kvar.

Scale is LEAD ☐ ~0~LAG ☐ kvar.

Example: For a VT: 3300V/110V, CT: 100A/5A 3P varmeter

... LEAD250~0~LAG250kvar or LEAD300~0~LAG300kvar
(500 × 1/2) (500 × 1/2) (600 × 1/2) (600 × 1/2)

2) **For 3P varmeters or 3P4W varmeters with zero left meters**, follow the values as **displayed above, and for 1P varmeters with zero left meters**, the values **in the table above are multiplied by 1/2.**

[3] If the CT ratio exceeds the range listed above, (for example, VT: 3300V/110V, CT: 5000A/5A 3P wattmeter) select a value from the CT: 500A/5A row (2 MW, 2.5 MW, 3 MW) and multiply it by 10.

Note) In the situation above, scale indicators are 20MW, 25MW and 30MW. (It is preferable that the highest 3 digits of scales are displayed)

[4] If CT ratios do not correspond with those indicated above (for example, CT: 60A/5A), use the calculation chart below to acquire the measurement range, then choose from among them the value with the best ending number.

Measurement Range Value = Intrinsic Power × VT Ratio × CT Ratio

Note) Select a value indicated below from the intrinsic power value in the above calculation chart. However, intrinsic power values vary depending on meter type. Use the multiplier indicated below to calculate the value.

Meter Types	Multiplier
3P Wattmeters, 3P4W Wattmeters, 1P3W Wattmeters	1
1P Wattmeters, 3P Varmeters, 3P4W Varmeters	1/2 (1 for varmeters with zero left meters)
1P Varmeters	1/4 (1/2 for zero left meters)

E.g. For a VT3300V/110V, CT: 60A/5A 3P wattmeter

Measurement Range Value = (667W, 833W, 1kW or 1.11kW) × 3300/110 × 60 / 5

= 240kW, 300kW, 360kW or 400kW.

[5] Values of 1, 1.2, 1.5, 2, 2.5, 3, 4, 5, 6, 7.5 or 8, or integers that are multiples of those 10 values are preferable selections for the upper range scale value. (JIS standards)

[6] Even when using a CT of 1A for the secondary current, the measurement range value is as indicated on the left (selection standards chart).

Note) If CT ratios do not correspond (for example, CT: 60A/1A) with those indicated to the left (selection standards chart), follow calculation chart [4] below to calculate the measurement range value. However, intrinsic power values vary depending on meter type. Use the multiplier indicated below to calculate the value.

Meter Types	Multiplier
3P Wattmeters, 3P4W Wattmeters, 1P3W Wattmeters	1/5
1P Wattmeters, 3P Varmeters, 3P4W Varmeters	1/10 (1/5 for varmeters with zero left meters)
1P Varmeter	1/20 (1/10 for zero left meters)

Example: For a VT: 440V/110V, CT: 60A/1A single-phase wattmeter

Measurement Range Value = [(625W, 667W, 750W, 833W or 1kW) × 1/10] × 440/110 × 60/1

= 15kW, 16kW, 18kW, 20kW or 24kW, but select either 15kW or 20kW.

Production Limits of Meters (Wattmeter, Varmeter)

The production range of wattmeters and varmeters can be manufactured according to the indicated range of intrinsic power values in the calculation chart below.

$$\text{Intrinsic Power Value [W]} \quad \frac{\text{Measurement Range Value [W]}}{\text{VT Ratio} \times \text{CT Ratio}}$$

E.g. VT: 6600V/110V, CT: 50A/5A

When measurement range value = 400kW

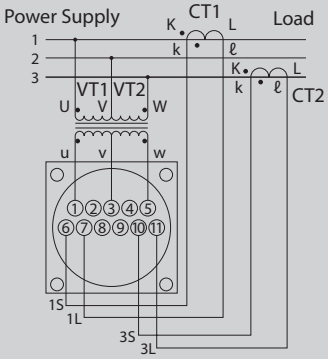
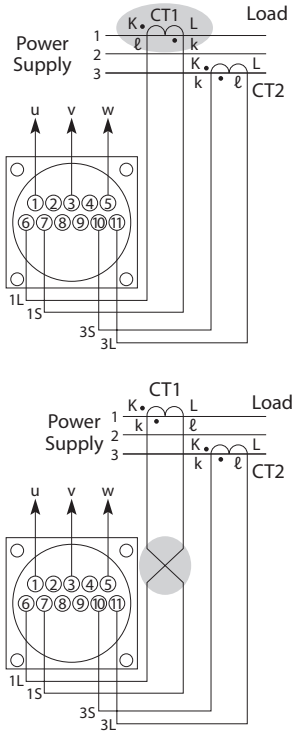
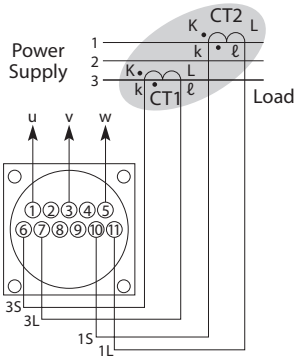
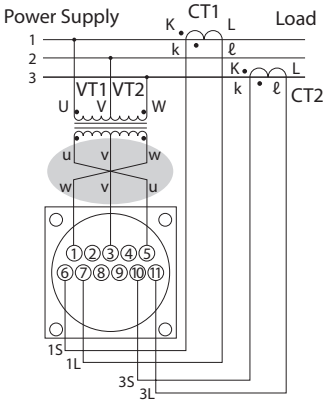
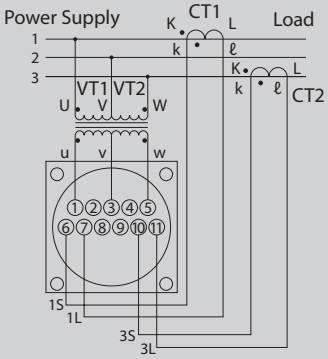
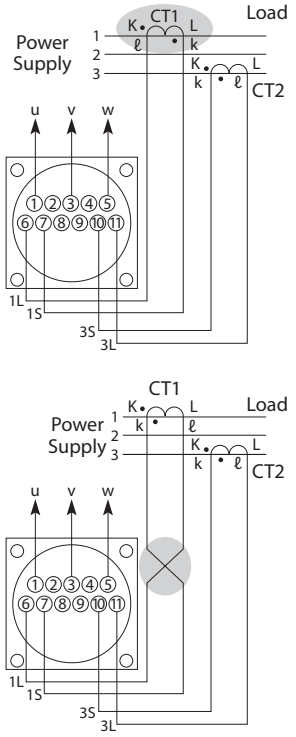
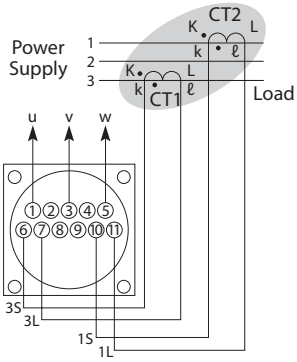
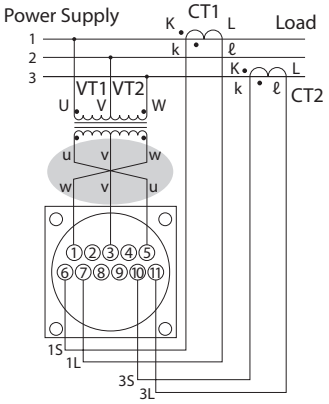
$$\text{Intrinsic Power Value} \quad W = \frac{400\text{kW}}{60 \times 10} = 667\text{W}$$

Product Name	Rating	Production Range
1P Wattmeters, 1P Varmeters	110V 5A 220V 5A	300 ~ 625 W (var) 600 ~ 1250 W (var)
3P Wattmeters, 3P Varmeters, 1P3W Wattmeters	110V 5A 220V 5A	500 ~ 1250 W (var) 1000 ~ 2500 W (var)
3P4W Wattmeters, 3P4W Varmeters	$110/\sqrt{3}$V5A $220/\sqrt{3}$V5A	500 ~ 1250 W (var) 1000 ~ 2500 W (var)

Note) The meter production range for using a CT of 1A for the secondary current is the value indicated on the left multiplied by 1/5.

Wattmeter, Power Factor Meter Misconnection Phenomena

When using a measuring circuit with VT, CT for wattmeters, power factor meters, etc., a complete review will often show that misconnection due to the location where installation is applied is often the cause of indicating meter failure. There is only one kind of correct connection, but there are many cases which result in misconnection. Reference the figures below for examples of particularly common examples of misconnection phenomena.
(Correctly connect phase sequence and polarity. Set phase rotation to an order of 1.2.3. Three-phase unbalanced power factor meters will be particularly inoperable.)

Wattmeter (Electronic Device Type) 	(1) CT polarity is incorrect 	(2) CT is misplaced 	(3) VT polarity is altered 
Wattmeter, normal time - largest scale point indicated	Zero point indicated (no shift)	Zero point indicated (if there is a shift to the extent of -2, 3%)	Zero point indicated (if there is a shift to the extent of -0.5%)
Power Factor Meter (Electronic Device Type) 	(1) CT polarity is incorrect 	(2) CT is misplaced 	(3) VT polarity is altered 
Power Factor Meter, normal time - when power factor "1" is indicated (or normal power factor)	(K ℓ) of CT_1 shifts completely to the LEAD side (K ℓ) of CT_2 shifts completely the LAG side	Indicates power factor "1" (even if the power factor of the electrical circuit changes)	(u w) LEAD-side VT indicates 0.65 points

VF SERIES

Frequency Meter (Electronic Device Type)

Model Name FVF-11M

Specification

Scale	Rated Voltage	FVF-11M	
		VA Consumption	Converter
45~55Hz	110V	1VA	Built-in
	220V	2VA	
55~65Hz	110V	1VA	
	220V	2VA	
45~65Hz	110V	1VA	
	220V	2VA	
Weight		Approx. 0.48kg	

Remarks

Usable Voltage Range

Rated voltage within ±15%

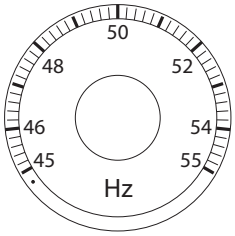
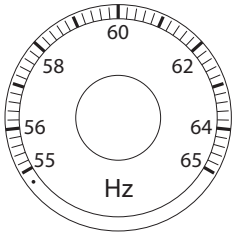
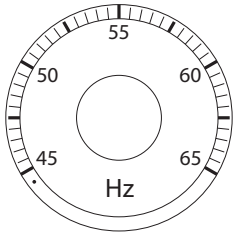
Using VT

Use a combination of the **110V rating meter and VT if the circuit voltage rating** on the left is exceeded.

Note

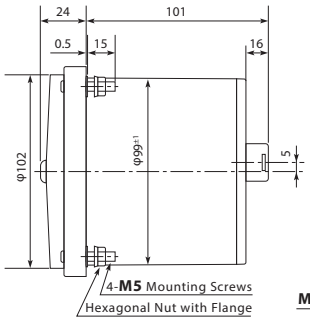
(Note) Preliminary status of intrinsic error testing time: five minutes
Scales outside those displayed on the left can also be manufactured.
(However this is limited to between approximately 40Hz and 10kHz.)

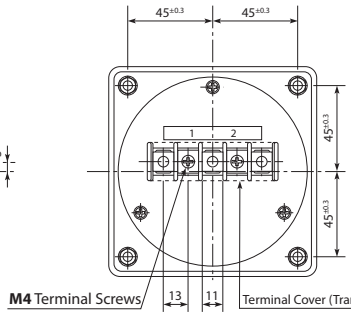
Scale Drawing

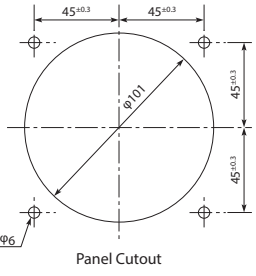
Model Name \ Scale Rating	45~55Hz	55~65Hz	45~65Hz
FVF-11M			

Outside Dimensions

FVF-11M

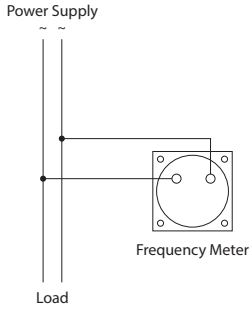




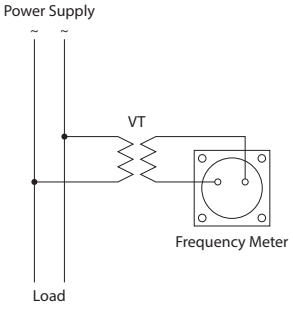


Connection Diagram

Rated Voltage

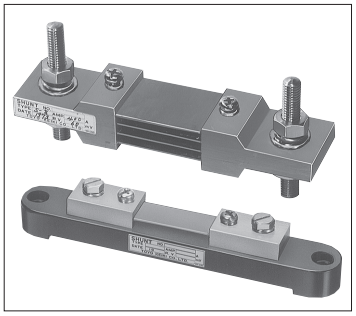


Rated Voltage is Exceeded



Shunt Outside Dimensions

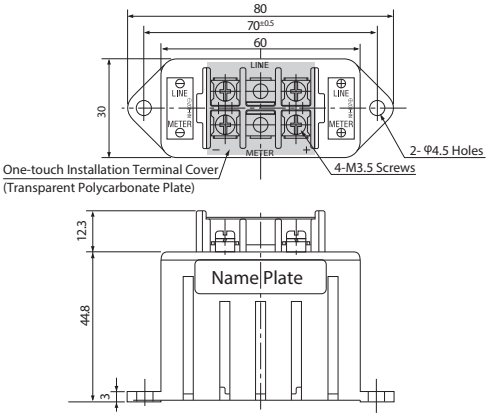
Rated voltage drop 60mV
However, 100mV may occur for the M-2A model.



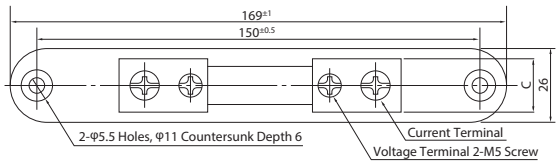
Rating	Shunt Model Name	Note
Less than 1A	M-2A	Continuous Rating 100%
1A to less than 5A	M-2A	
5A to less than 50A	S-10A	
50A~250A	S-8A	Continuous Rating 80%
300A~5000A	S-8	

Less than 1 to 5A M-2A Model

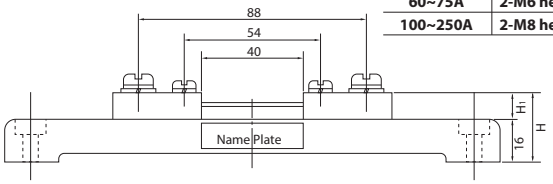
Weight: Approx. 100g



5 to less than 50A S-10A Model
50 to 250A S-8A Model

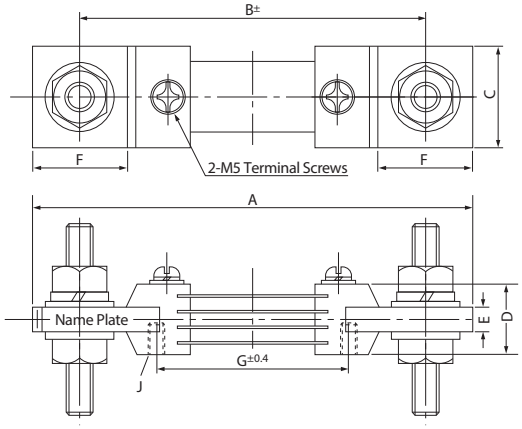


Current Rating	Current Terminal
5~50A	2-M6 pan head screws
60~75A	2-M6 hexagonal bolts
100~250A	2-M8 hexagonal bolts



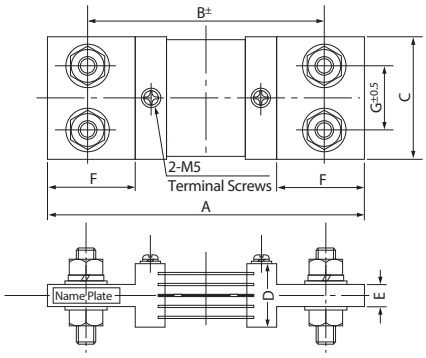
	H	H1	C	Weight
5~100A	26	10	20	Approx. 0.19kg
150A	31	15	22	Approx. 0.27kg
200~250A	33.5	17.5	22	Approx. 0.32kg

300A to 750A S-8 Model



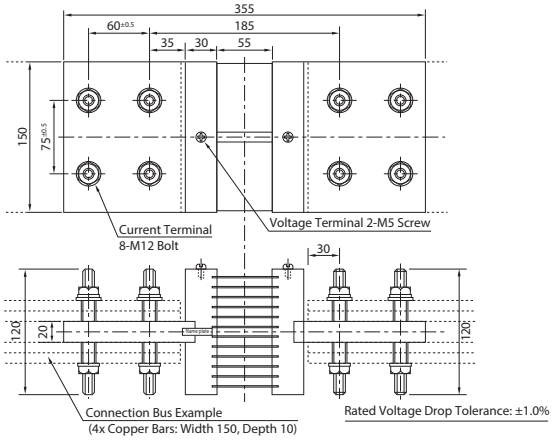
	A	B	C	D	E	F	G	J	Terminal Screws	Weight
300A	140	110	32	22	10	30	60	M5 Tapping	M 8 × 60	Approx. 0.5kg
400A	140	110	32	22	10	30	60	"	M 8 × 60	"
500A	165	125	46	30	12	40	67	M5 Tapping	M 12 × 60	Approx. 1kg
600A	165	125	46	30	12	40	67	"	M 12 × 60	"
750A	190	140	65	40	15	50			M 12 × 60	Approx. 2kg

1000A to 3000A S-8 Model

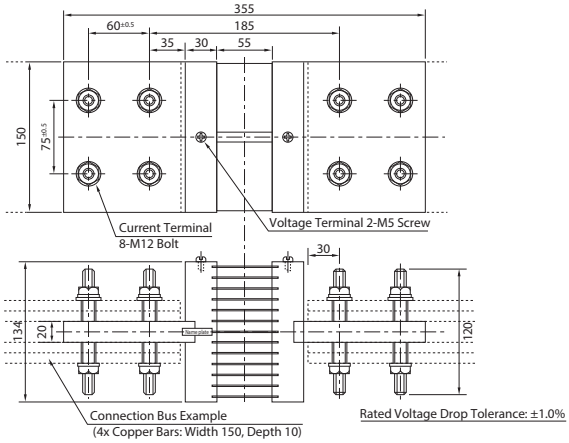


	A	B	C	D	E	F	G	Terminal Screws	Weight
1000A	200	150	75	40	15	55	40	M 12 × 60	Approx. 2.2kg
1500A	230	170	85	55	16	65	45	M 12 × 60	Approx. 4kg
2000A	230	170	110	55	16	65	60	M 12 × 60	Approx. 5kg
2500A	254	198	110	70	23	64	60	M12 × 90	Approx. 6.5kg
3000A	254	198	110	70	23	64	60	M 12 × 90	Approx. 8kg

4000A S-8 Model Weight: Approx. 21kg



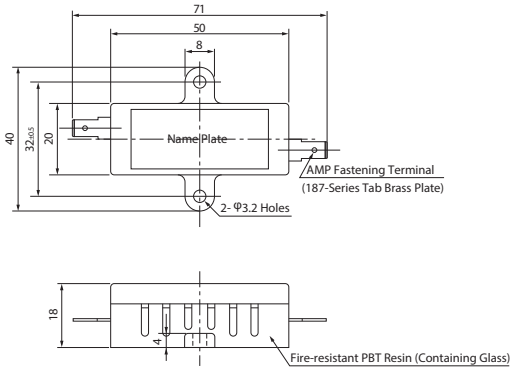
5000A S-8 Model Weight: Approx. 22kg



Series Resistor Outside Dimensions

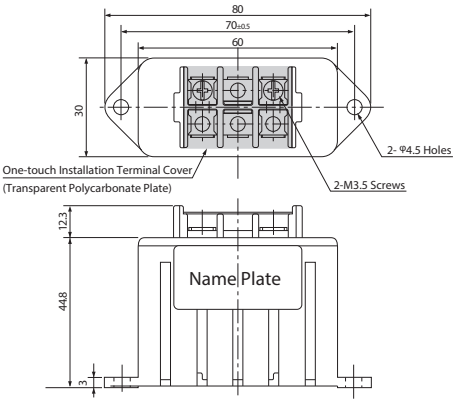
M-1 Model

Weight: Approx. 20g



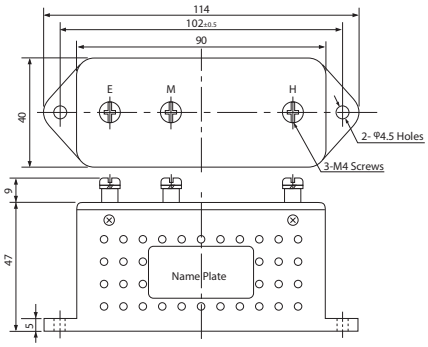
M-2A Model

Weight: Approx. 100g



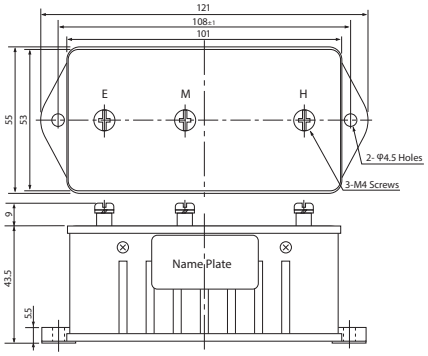
M-2B Model

Weight: Approx. 0.15kg



M-3 Model

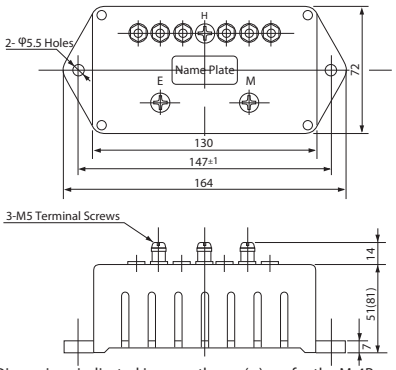
Weight: Approx. 0.15kg



Note) There are 2 terminals on the M-2B, M-3 and M-4A series resistors for the moving-iron type AC voltmeters.

M-4A Model (M-4B Model)

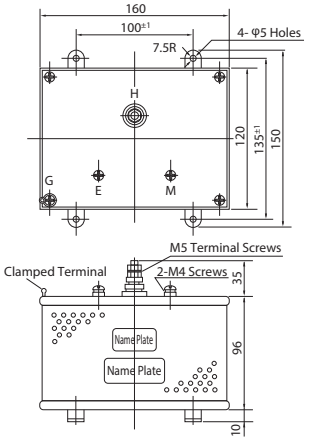
Weight: Approx. 0.3kg



Dimensions indicated in parentheses ( ) are for the M-4B model.

M-6 Model

Weight: Approx. 0.8kg



■Specified Items when Ordering Direct Acting Electrical Indicating Instrument

1. Pointer shape···
   a. Standard pointer: Cannot be specified
   b. Rod pointer or knife shape pointer:
      Specfication required
2. Mounting posture
   a. Vertical (⊥): Cannot be specified
   b. Horizontal (⌐) Diagonal (∠): Specification required
3. Cover color
   a. Black: Cannot be specified
   b. 7. 5BG/1. 5: Specification required
4. Measurement Range Value···
   a. Measurement range values for standard table
   b. Measurement range values for non-standard
5. Scale···
   a. Same scale as measurement range values inherent to meter
   b. Scale that differs from measurement range values
   c. Recommended External Scale Division
   d. Single scale double printing
      Double scale double printing
   e. Unit Symbol
      [μA mA A V kV W
      kW MW cosφ kvar Hz
      rpm m/min kPa etc.]
   f. Color display (No. of colors, color band)
      [Only available in red, green and yellow.]
6. List of Results:
   500 yen per set if required.
   Delivery specifications:
   1500 yen for up to 5 sets if required.
   150 yen for each additional set.
   Joint inspection:
   Separate quote.
7. Others···
   a. Change class
   b. Special conditions such as temperature, humidity, atmosphere, vibration, etc.

When Set Pointer is Installed

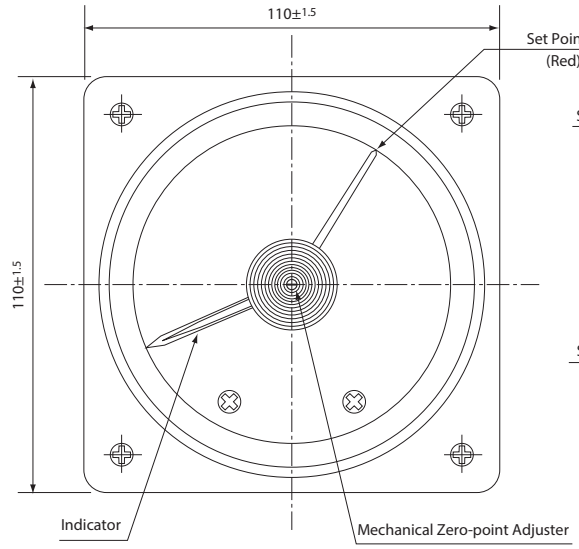
There are two types of set pointer methods, the conventional **single setting type** where the knob in the center of the meter is turned to perform settings, and the **holder type multiple setting type (holder set pointer) for which multiple settings** can be configured.

The holder meter is inserted into the holder from the front of the meter, and held in place with screws.
Specify the alphabetical letter (capital) to specify the color of the set pointer.
For the multiple setting type (holder meter), specify the alphabetical letter (capital) to specify the color of the meter from the zero side (left side) of the meter scale.

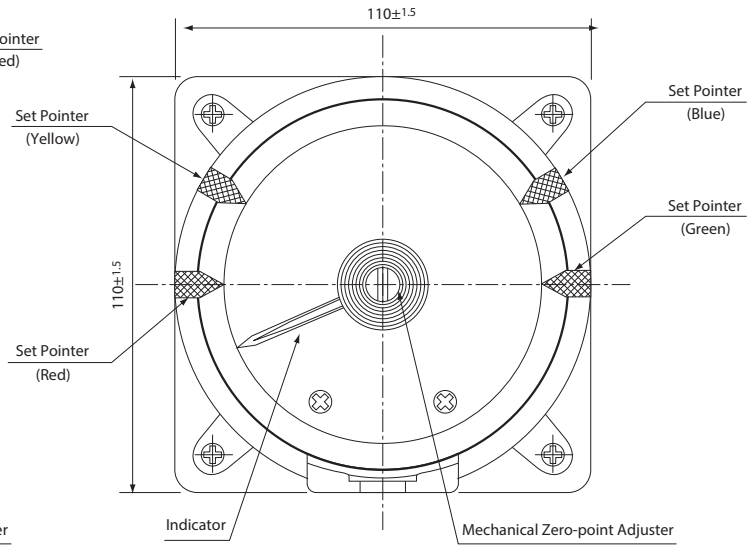
E.g.) Specify “Holder set pointers RYBG" in order to specify the color of the holder meter as shown in the figure below.

Set pointer color Red: R
Yellow: Y
Blue: B
Green: G

Single Setting Type (E.g.) □ VF-11M with Set Pointer



Multiple Setting Type (E.g.) □ VF-11M with Holder Set Pointers RYBG



Indicator Symbols

Display indicator differences between new and old, and their meaning

Old JIS Standard Symbols	New JIS Standard Symbols	Display Indicator Contents
		Reference the accompanying section
		Rectifier-type - indicates that an item is affected by waveform
		Electronic Device Type - not affected by waveform
		Moving-coil type
		Moving-iron type
		DC circuit and/or DC response measurement component
		AC circuit and/or AC response measurement component
		DC and AC response measurement component
3~	3~	Three-phase AC circuits
3~1E	3~1E	Single measurement component for use with three-wire system circuits
3~2E	3~2E	Two measurement component for use with unbalanced load three-wire system circuits
3N~1E	3N~1E	Single measurement component for use with four-wire system circuits
3N~2E	3N~2E	Two measurement component for unbalanced load four-wire system circuits
3N~3E	3N~3E	Three measurement component for unbalanced load four-wire system circuits
0.5	0.5	Class index 0.5 class
1.0	1.0	Class index 1.0 class
1.5	1.5	Class index 1.5 class
2.5	2.5	Class index 2.5 class
5.0	5.0	Class index 5.0 class Applied to the synchroscope Applied to the power factor meter
|1.0|	|1.0|	Class index 1.0 class depending on span (Used with reception meter)
|1.5|	|1.5|	Class index 1.5 class depending on span (Used with reception meter)
|2.5|	|2.5|	Class index 2.5 class depending on span (Used with reception meter)
		Scale plate used for vertically mounted meters
		Scale plate used for horizontally mounted meters
		Scale plate used for meters from the horizontal plane to 60°
		Indicates normal use range from 80°~100° in the initial position
	CAT III 600V	Voltage test 3320V 5 seconds long
	———	Voltage test 1500V
	———	Voltage test is not conducted
		Indicates an externally attached shunt
		Indicates an externally attached series resistor
		Indicates externally attached serial impedance
		Indicates an externally accessory
	———	Indicates that a nominal circuit voltage of AC650 is exceeded (Indicated on labels of relevant items)
	———	Indicates an accessory and/or meter is high voltage. DC650V AC650V More than
		JIS Mark (JIS C1102 is not indicated) JQA is an abbreviation for Japan Quality Assurance Organization, the certifying authority in Japan
CT ○○○A/○A	CT ○○○A/○A	CT expressions are indicated in ratios (both sides are expressed in A)
VT ○○○V/○○○V	VT ○○○V/○○○V	VT expressions are indicated in ratios (both sides are expressed in V)

Types		Symbols
Current	Ampere	A
	Milliampere	mA
	Microampere	μA
	Kiloampere	kA
Voltage	Volt	V
	Millivolt	mV
	Kilovolt	kV
Electrical Power	Watt	W
	Kilowatt	kW
	Megawatt	MW
Reactive Power	Var	var
	Kilovar	kvar
	Megavar	Mvar
Frequency	Hertz	Hz
	Kilohertz	kHz
Phase Angle		φ
Power Factor		cosφ
Reactive Factor		sinφ

Other Symbols

Types	Symbols
Steel Plate Use	Fe
Non-Steel Plate Use	NFe

Notice for New JIS Mark Products

Meters bearing the new JIS mark are guaranteed for use in the conditions described below.
Adhere to the following precautionary conditions when installing meters.

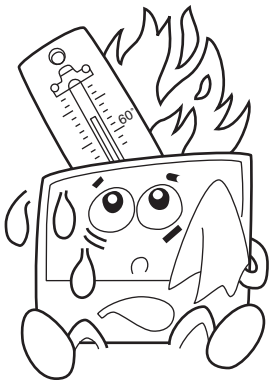
- The following are general conditions for the installation environment of meters.
  (1) Use in an indoor environment
  (2) Measurement category of the measurement circuit: III
  (3) Pollution level: 2
  (4) Installation height: 2000m or lower
  (5) Temperature range: from 5 to 40°C
  (6) Highest relative humidity until 31°C: 80%. At 40°C it should be directly reduced to a general humidity of 50%

  The following installation conditions are in accordance with provisions JIS C 1102-1:2007 (direct acting electrical indicating instrument) and JIS C 1010-1:2005 (Safety requirements for electrical equipment for measurement, control, and laboratory use). (Although products that operate in environments comprising of a wide variety of humidity and temperature can be found in our company's catalog, the acceptable range of temperature and humidity for safe usage is as prescribed above.)

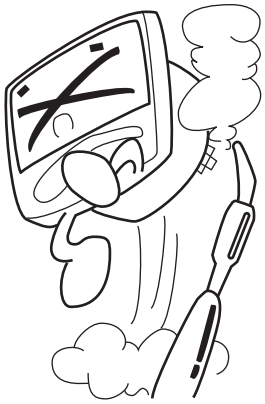
- In order to assess compatibility requirements for the security of panel attachments for meters, assessments are made assuming the user is standing in front of the attached panel. For this reason, the inside of installed panels (parts of distribution boards, etc.) are excluded from general maintenance because it is assumed they are only handled by persons who have specialized knowledge.
  When installing panels for meters, make sure internal parts cannot be touched by general users.
  Furthermore, product fuses should be installed by a person who has undergone sufficient training, and the necessary consideration should be given to safety such as inserting fuses into voltage circuits.

Precautions for Handling Meters

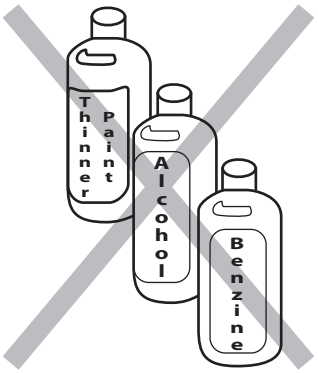
Be sure to note the following when handling the meter.



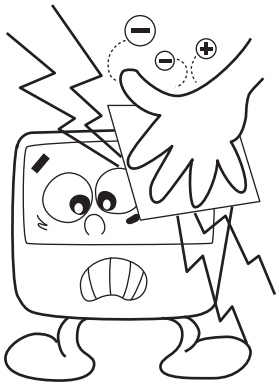
● Avoid high temperature locations (60℃ or over) because the plastic cover and base of the meter are easily affected by heat.



● Do not apply solder directly to meter terminals.
Also, be sure not to solder the case when soldering connections.

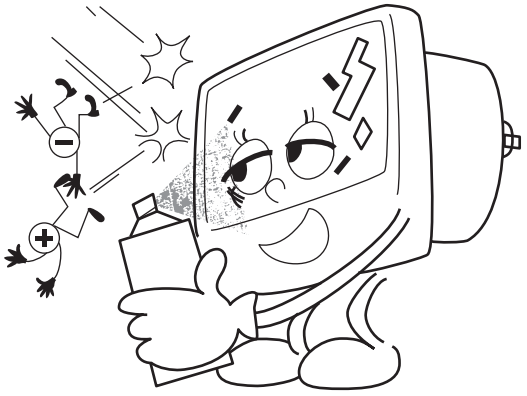


● The case may be damaged through contact with chemicals (paint thinner, benzine, alcohol, etc.).



● The following points apply to the anti-static finish that has been applied to the transparent part of the cover.

1) Remove dirt from the surface of the cover by gently wiping it with a damp towel or leather.
2) Do not use alcohol, paint thinner, benzine or other such liquids that contain these chemicals to wipe the surface of the cover.
(Doing so damages the coating, reducing its effectiveness.)
3) Do not use polishing silicone, silicone cloth, or any other silicone-based cleaning agent to clean the surface of the cover.
(Doing so reduces the effectiveness of the water-resistant finish.)
4) Do not store the meter by wrapping it in newspaper or other paper products.
(Wrapping products in a hygroscopic material causes faster degradation.)



● Apply a commercially available antistatic agent if the antistatic agent has peeled or is no longer effective.
If the anti-static agent has peeled or is no longer effective, even the slightest touch can cause the indicator to move, resulting in incorrect readings. The effectiveness of the anti-static finish may be negatively affected when the humidity is particularly low, such as during the dry periods in winter.

● The following anti-static agents can be applied easily.
- ○ Riverson No. 30 with applicator (made by Tokyo Yakuhin Kakosei)
- ○ Anti-Sta #80S spray-type (made by Tanaka Chemical Laboratory)

~Promotion of Environmental Issues~

Our company is fully committed to not using hazardous materials in our products.
All of our main products are manufactured without the use of the six hazardous materials prescribed in the RoHS directives.
However, while our □VF-11M Series is a fully RoHS compliant product, it has not yet received the "Ro" mark.

Safety Precautions

- Only allow this product to be handled by people with sufficient knowledge and skill to ensure proper use.
- Carefully review any connection diagrams before soldering to ensure correctly soldered connections.
- Fully tighten screws. Loose screws may cause overheating or burnout.
  Mount the terminal cover after completing connections.
- Do not use if the specified rating is exceeded. Doing so may lead to malfunction or injury.
- Do not touch live parts of the product. Disconnect circuits during maintenance or inspections.

ISO 9001 Registration No. JSAQ 1492

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