

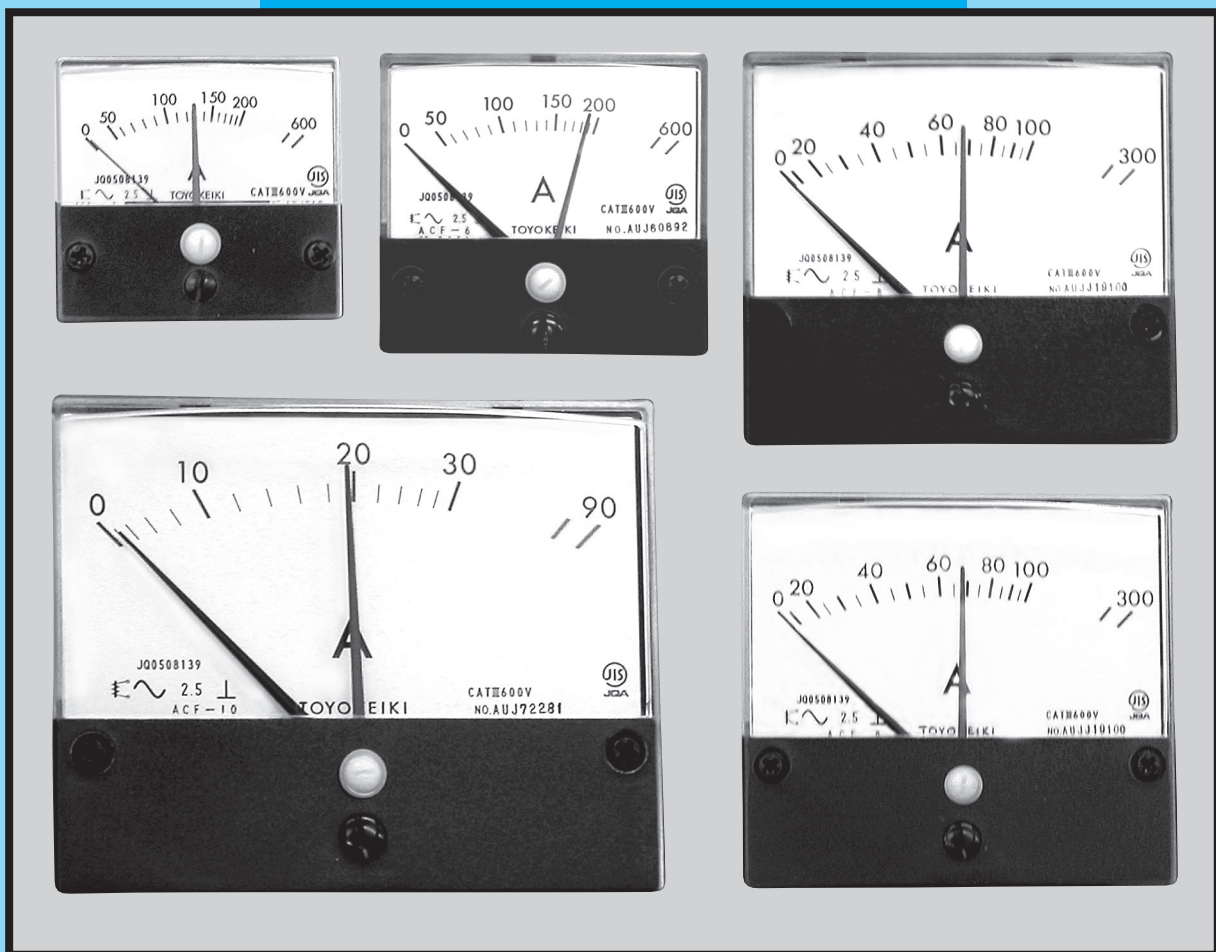


Equipped with a Special Anti-electric Resin Cover

**CF**  
Type

# Fixed Meters

[JIS C 1102-2007, RoHS Compatible Products]



**東洋計器株式会社**

CAT. NO. CF-19

## Specified Items when Ordering Electrical Indicating Meters

1. Pointer shape
    - a. Standard pointer: Cannot be specified
    - b. Rod pointer or knife shape pointer: Specification required
  2. Meter mounting posture
    - a. Vertical ( $\perp$ ): Cannot be specified
    - b. Horizontal ( $\rightarrow$ ) Diagonal ( $\angle$ ): Specification required
  3. Meter Mounting Panel
 

Iron and non-ferrous metal:  
Cannot be specified

Inclusion Insulating rubber:  
Specification required
  4. Cover color
    - a. Black: Cannot be specified
    - b. 7.5 BG4/1.5: Specification required
  5. Measurement Range Value
    - a. Recommended value
    - b. Upper limit other than the recommended value
  6. Scale
    - a. Same scale as upper limit value inherent to meter
    - b. Scale that differs from upper limit value
    - c. Scale division outside the recommended value
    - d. Single scale double printing  
Double scale double printing
    - e. Unit Symbol  

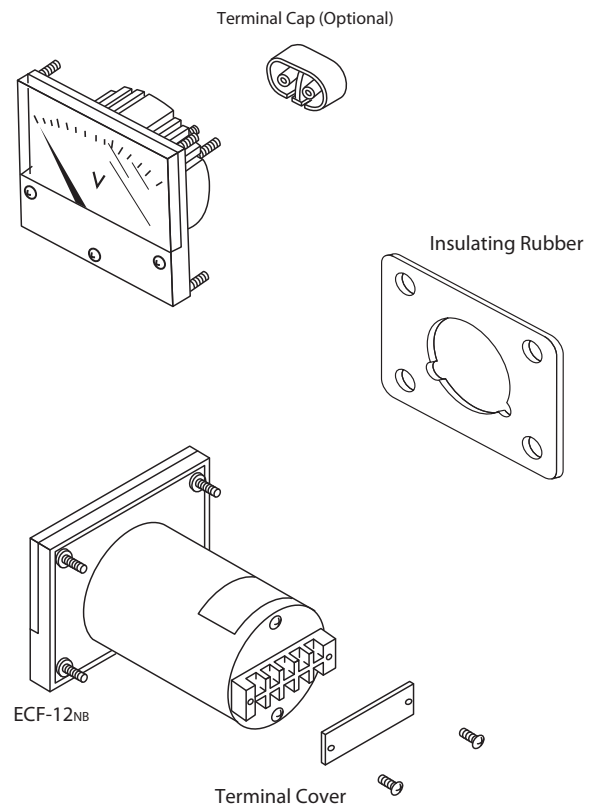
$$\left( \begin{array}{l} \mu\text{A} \text{ mA} \text{ A} \text{ V} \text{ kV} \text{ W} \\ \text{kW} \text{ MW} \text{ cos}\varphi \text{ kvar} \text{ Hz} \\ \text{rpm} \text{ m/min} \text{ etc.} \end{array} \right)$$
    - f. Color display (colored line and band)  
(Only available in red, green and yellow)
  7. Record of results  
500 yen per set if requested
  8. Delivery specifications  
1500 yen for up to 5 sets if requested  
300 yen for each additional set
- On-site inspection**  
Quoted separately.
9. Others
    - a. Change in accuracy class
    - b. Special conditions such as temperature, humidity, atmosphere, vibration, etc.

Please be aware that contents described in the catalog may be changed for the purpose of upgrades without prior notice.

[New JIS <sup>2007</sup> compliant] IEC standard conformance

## Improvements

1. All models are equipped with a terminal cap if requested. (list price ¥50)
2. Both 500 and 600V DC and rectifier series resistors are now built in.
3. ECF-12NB, RCF-12NB and UuCF-12NB types:
  - 1) Ammeter type was changed to the electronic device type and a transducer is now built in.
  - 2) Terminal cap was attached.
  - 3) Consumption VA was reduced.
4. RoHS compliant product (however, the taut band of the DCF-6, 8, 10 and 12N type 50 $\mu$ A and 100 $\mu$ A meters are non-RoHS products.)



Electric transducer system provided with □CF-6, 8, 10 models (□: E, R, U, Uu) The converter was reduced in size to unify with the □RG-3 type (with terminal cover).

The insulation category is CAT III 600V For the AC voltmeter and AC ammeter ACF-□ type (operating principle: moving-iron type), even without installing the insulating rubber. (600V is the maximum circuit voltage value that can be used)

The insulation category is CAT III 300V for meters other than those indicated above when using only the meter body (without the insulating rubber). (300V is the maximum circuit voltage value that can be used)

The insulation category is raised to CAT III 600V if the insulating rubber is installed on the panel board.

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# CF SERIES

**CF-5**  
**CF-10**

**CF-6**  
**CF-12N**

**CF-8**  
**CF-12NB**

Voltage Test: AC 2210V for 5 seconds

(Note) AC 3320v for 5 seconds when using the insulating rubber

Insulation Test: More than 10MΩ (at 500V mega)

## Features

1. Meter has a bright scale face due to the wide cover lighting surface.
2. Accuracy of readability has increased due to the long scale length compared to the meter's size.
3. A variety of sizes are available so you can choose a meter that best suits the size of your switchboard.

### Cover eliminates static electricity.


- Equipped with special anti-static resin.
- Maintaining an **anti-static finish is not necessary.**
- Static phenomena will not occur even in low humidity.

## About Model Names

### First Character

- Indicates the meter type as follows
- D ..... DC ammeter or voltmeter
- S ..... Rectifier type AC ammeter or voltmeter
- A ..... Moving-iron type AC ammeter or voltmeter
- E ..... Wattmeter (1P, 3W or 4W)
- R ..... Varmeter ( " )
- U ..... Power Factor Meter (1P or 3P Balanced)
- Uu ..... Unbalanced Power Factor Meter (3P or 3P4W)
- F ..... Frequency meter
- C ..... Tachometer

### Second and Third Character

- Indicates design shape.
- CF .....  90° deflection angle type rounded body recessed type (special anti-electric resin cover)

# DCF-12 N □

### Numbers

5	.....	Meter front dimensions	56 × 52
6	.....	"	65 × 60
8	.....	"	87 × 80
10	.....	"	100 × 83
12	.....	"	120 × 100

### Final Characters

- As follows:
- N .....Indicates an improved model.
- V .....Resistor for Sensitivity adjustment
- NB .....Improved model

## CF Series List

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

Product Name	□CF-5			□CF-6			□CF-8			□CF-10			□CF-12N			Notes Page	
	Model Name	Operating Principles	Accuracy Class	Model Name	Operating Principles	Accuracy Class	Model Name	Operating Principles	Accuracy Class	Model Name	Operating Principles	Accuracy Class	Model Name	Operating Principles	Accuracy Class		
Direct Current	Ammeter	Permanent Magnet Moving-Coil Type	2.5	DCF-6	Permanent Magnet Moving-Coil Type	2.5	DCF-8	Permanent Magnet Moving-Coil Type	2.5	DCF-10	Permanent Magnet Moving-Coil Type	2.5	DCF-12N	Permanent Magnet Moving-Coil Type	1.5	5	
	Voltmeter															7	
	Reception Meter															5, 7	
Alternating Current	Ammeter	Rectifier Type	2.5	SCF-6	Rectifier Type	2.5	SCF-8	Rectifier Type	2.5	SCF-10	Rectifier Type	2.5	SCF-12N	Rectifier Type	2.5	9	
	Voltmeter															11	
	Ammeter															ACF-5	Moving-iron type
	Voltmeter	15															
	Reception Meter	SCF-5	Rectifier Type	2.5	SCF-6	Rectifier Type	2.5	SCF-8	Rectifier Type	2.5	SCF-10	Rectifier Type	2.5	SCF-12N	Rectifier Type	2.5	9, 11
	1P Wattmeter	Electronic Device Type	2.5	ECF-6	Electronic Device Type	2.5	ECF-8	Electronic Device Type	2.5	ECF-10	Electronic Device Type	2.5	ECF-12NB	Electronic Device Type	1.5	1.5	17
	3P Wattmeter																
	3P4W Wattmeter																
	1P Varmeter	Electronic Device Type	2.5	RCF-6	Electronic Device Type	2.5	RCF-8	Electronic Device Type	2.5	RCF-10	Electronic Device Type	2.5	RCF-12NB	Electronic Device Type	1.5	1.5	17
	3P Varmeter																
	3P4W Varmeter																
	1P Power Factor Meter	Electronic Device Type	5.0	UCF-6	Electronic Device Type	5.0	UCF-8	Electronic Device Type	5.0	UCF-10	Electronic Device Type	5.0	UCF-12NB	Electronic Device Type	5.0	5.0	20
	3P Balanced Power Rate Meter																
	3P Unbalanced Power Factor Meter																
	3P4W Power Factor Meter																
Frequency Meters	Electronic Device Type	1.0	FCF-6	Electronic Device Type	1.0	FCF-8	Electronic Device Type	1.0	FCF-10	Electronic Device Type	1.0	FCF-12NB	Electronic Device Type	0.5	0.5	22	
Tachometer																CCF-5	Rectifier Type

## Production Standards

Model Name	□CF-5	□CF-6	□CF-8	□CF-10	□CF-12N・12NB
Front Dimensions (Horizontal x Vertical) [mm]	56×52	65×60	87×80	100×83	120×100
JIS Symbol	-	KS7 Equivalent	KS6a Equivalent	KS5b Equivalent	KS3d Equivalent
Scale Length [mm]	45	53	68	80	100
Accuracy Class	See the CF Series List				
Panel Attached to Meter	<b>Cannot be Specified (Specification required for high-sensitivity meters of DC 100 μA or less)</b>				
Mounting Posture	Vertical (Other than vertical: Specification required, e.g. <math>\angle 30^\circ</math>)				
Recommended No. of Scale Divisions	Division 12 to division 25	Division 12 to division 25	Division 12 to division 25	Division 20 to division 45	Division 24 to division 50
Pointer Shape	Rod Pointer	CF Type Standard Pointer (See the figure below)			
Cover Material	Special Anti-electric Resin (Two-color molding)				
Cover Frame Color	● Black (Munsell Notation: N-1.5) ● Blue-green (Munsell Notation: 7.5B G4 / 1.5)				
Base Material	ABS Resin				
Scale Plate	Aluminum plate with white coating (Scale lines and numbers are black)				

Note) See P33 for details on the recommended scale divisions.

**Insulation Test** Between all circuits in a batch and outer casing..... More than 10MΩ (at 500V mega)

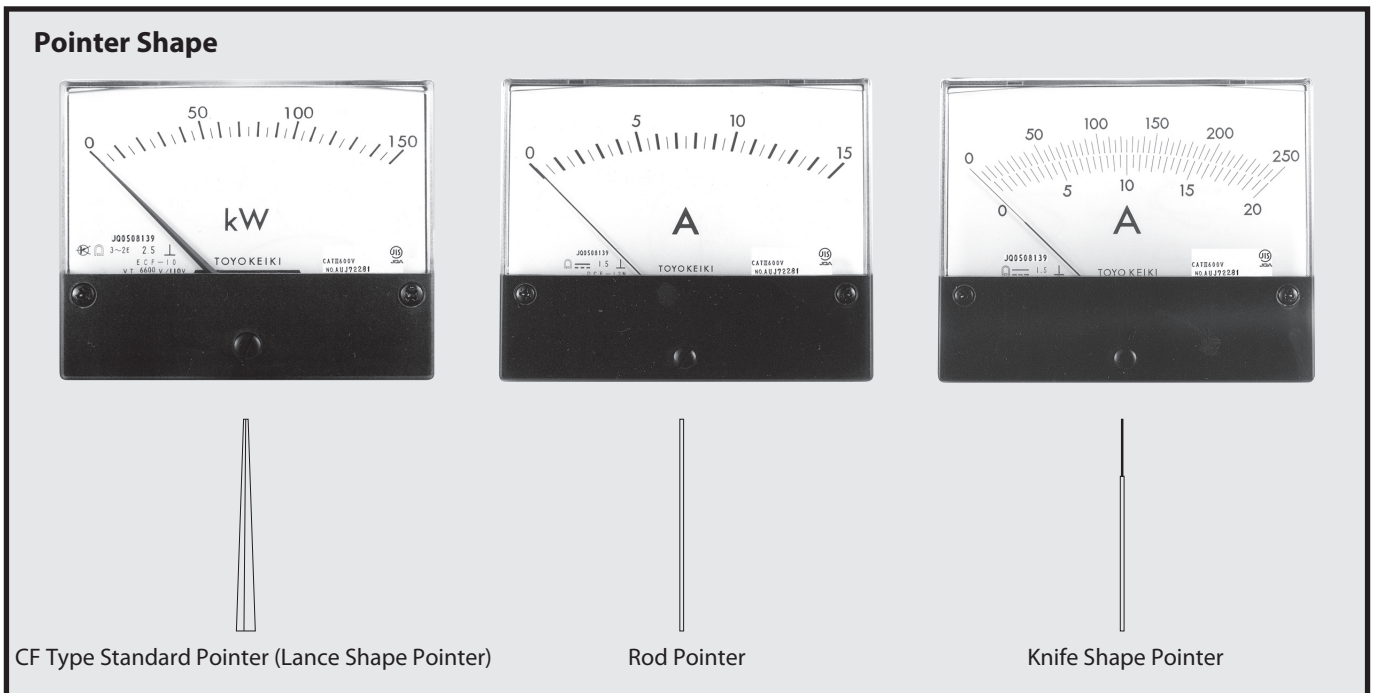
Between current circuit and voltage circuit..... More than 5MΩ (at 500V mega)

**Voltage Test** Between all measurement circuits in a batch and outer casing, and between current circuit and voltage circuit

..... CAT III 300V: AC 2210V (50/60Hz) for 5 seconds (300V is the maximum circuit voltage value that can be used)

Between all measurement circuits in a batch and outer casing, and between current circuit and voltage circuit

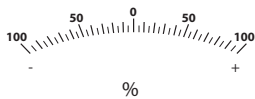
.....CAT III 600V: AC 3320V (50/60Hz) for 5 seconds (600v is the maximum circuit voltage value that can be used)



## Special Specifications

(Can be manufactured to the following special specifications by request)

- ◆ Mounting posture other than vertical (Specification of installation angle required)
- ◆ With red set pointer
- ◆ Special Scale: Conversion scale, zero center scale, colored scale, multiple scale, magnified scale, specific symbol display, scale division increase in lines

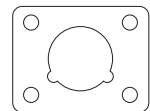


- ◆ Rod pointer (Rod pointer is used for multiple scales)
- ◆ Knife shape pointer with mirror (for CF-8, 10, 12N types)
- ◆ Special processing (heat processing, etc.)
- ◆ Other special specifications

## 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 P37 for details)

Made of silicon rubber (2mm thick)



- ◆ Insulating Rubber

When the meter is installed on a panel board, use of this insulating rubber can increase dielectric strength.

(Measurement category) CAT III 300V → CAT III 600V

# CF SERIES DC Ammeter (Moving-coil Type)

Model Name DCF-5 DCF-6 DCF-8 DCF-10 DCF-12N

## Specifications

Measurement Range Value	DCF-5		DCF-6		DCF-8		DCF-10		DCF-12N	
	Internal Resistance	Shunt	Internal Resistance	Shunt	Internal Resistance	Shunt	Internal Resistance	Shunt	Internal Resistance	Shunt
50 $\mu$ A	-	-	1250 $\Omega$ (taut band)		1250 $\Omega$ (taut band)		2350 $\Omega$ (taut band)		2350 $\Omega$ (taut band)	
100 $\mu$ A	-	-	830 $\Omega$ (taut band)		830 $\Omega$ (taut band)		1010 $\Omega$ (taut band)		1010 $\Omega$ (taut band)	
200 $\mu$ A	1000 $\Omega$		835 $\Omega$		835 $\Omega$		900 $\Omega$		900 $\Omega$	
500 $\mu$ A	500 $\Omega$		600 $\Omega$		600 $\Omega$		900 $\Omega$		900 $\Omega$	
1 mA	100 $\Omega$		65 $\Omega$		65 $\Omega$		200 $\Omega$		200 $\Omega$	
2 mA	32 $\Omega$	Not Required	25 $\Omega$	Not Required	25 $\Omega$	Not Required	50 $\Omega$	Not Required	50 $\Omega$	Not Required
5 mA	5 $\Omega$		5 $\Omega$		5 $\Omega$		6 $\Omega$		6 $\Omega$	
10 mA	5 $\Omega$		5 $\Omega$		5 $\Omega$		5 $\Omega$		5 $\Omega$	
20 mA	3 $\Omega$		3 $\Omega$		3 $\Omega$		4 $\Omega$		4 $\Omega$	
50 mA		Built-in		Built-in		Built-in		Built-in		Built-in
100 mA										
500 mA										
1 A										
5 A										
10 A	Voltage Drop :60mV		Voltage Drop :60mV		Voltage Drop :60mV		Voltage Drop :60mV		Voltage Drop :60mV	
15 A	Sensitivity : Approx. 6mA		Sensitivity : Approx. 6mA		Sensitivity : Approx. 6mA		Sensitivity : Approx. 5mA		Sensitivity : Approx. 5mA	
20 A		External		Back-mounted Note 2		Back-mounted Note 2		Back-mounted Note 2		Back-mounted Note 2
30 A										
50 A										
?										
5 kA										
Weight	Approx. 0.06kg		Approx. 0.09kg		Approx. 0.1kg		Approx. 0.12kg		Approx. 0.15kg	

Reception Meter Meter Input	DCF-5		DCF-6		DCF-8		DCF-10		DCF-12N	
	Internal Resistance	Shunt	Internal Resistance	Shunt	Internal Resistance	Shunt	Internal Resistance	Shunt	Internal Resistance	Shunt
4~20mA	3 $\Omega$	Not Required	3 $\Omega$	Not Required	3 $\Omega$	Not Required	3 $\Omega$	Not Required	3 $\Omega$	Not Required
Weight	Approx. 0.06kg		Approx. 0.09kg		Approx. 0.1kg		Approx. 0.12kg		Approx. 0.15kg	

Note 1. Intrinsic error of the internal resistance value is  $\pm 30\%$  (at 23°C). Note 2. Terminal cap is not included. (Optional) Specify if required.

## Remarks

### Instrument Lead Instrument Lead Resistance

Instrument lead is **not included**.

- Meters externally attached to shunts are normally adjusted to an instrument lead resistance of **0.05 $\Omega$  for the specified meter**. (Indicate LEAD 0.05 $\Omega$  on the scale plate)  
Note) Use wiring that is equivalent to 0.05 $\Omega$  for the wiring of the instrument lead.
- Please specify** separate instructions if the instrument lead resistance of the specified meter is to be a value other than 0.05 $\Omega$ . (Instrument Lead Resistance: Can be manufactured up to **1.5 $\Omega$** ... However, use a meter with both a voltage drop and shunt of 100mV for 1 $\Omega$  or more.)
- If the instrument lead resistance is not clearly specified, the meter can be manufactured with a sensitivity adjustment variable resistor (VR).

Note1) The model name of a meter equipped with VR is the same as the normal model name with V appended. E.g. DCF-12nV

2) DCF-5 meters equipped with VR cannot be manufactured.

### Connection to Shunt

- Connect the shunt to the wires on the earth side.
- See P24 for details on the outside dimensions of the shunt.

### Note

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

### Note

#### Table of Instrument Lead Resistance

[Unit  $\Omega$  (at 20°C)]

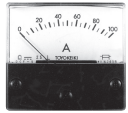
Wire Diameter	Length	1m	2m	3m	4m	5m	10m	20m	Conductor Resistance $\Omega$ /km
0.75 mm <sup>2</sup>		0.05	0.1	0.15	0.2	0.25	0.5	1.0	24.4
1.25 mm <sup>2</sup>		0.03	0.06	0.09	0.12	0.15	0.3	0.6	14.7
2.0 mm <sup>2</sup>		0.02	0.04	0.06	0.08	0.1	0.2	0.4	9.50
3.5 mm <sup>2</sup>		0.01	0.02	0.03	0.04	0.05	0.1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

Note) 1. The resistance values indicated in the table above are applicable when the prescribed length of vinyl wire for wiring electric devices is installed as return wiring.

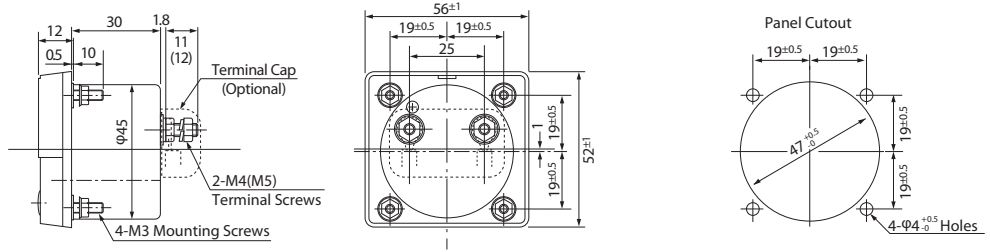
2. If the wiring exceeds 20m, calculate from the conductor resistance value column.

E.g. If 2.0mm<sup>2</sup> 36m  $2 \times 9.50 \times \frac{36}{1000} = 0.68\Omega$

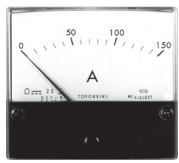
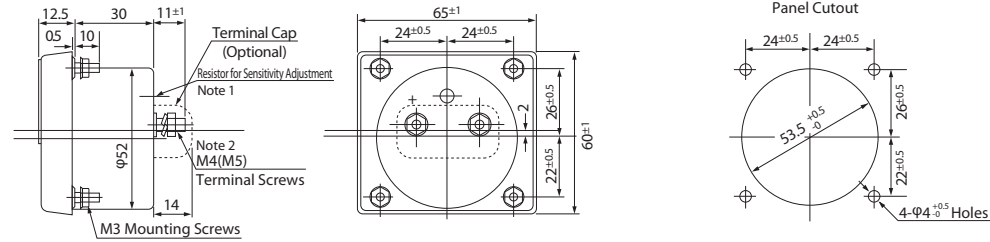
## Outside Dimensions



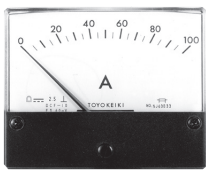
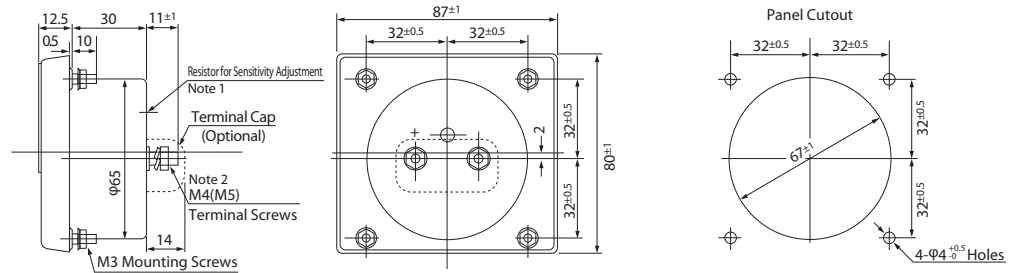
DCF-5



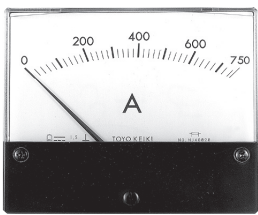
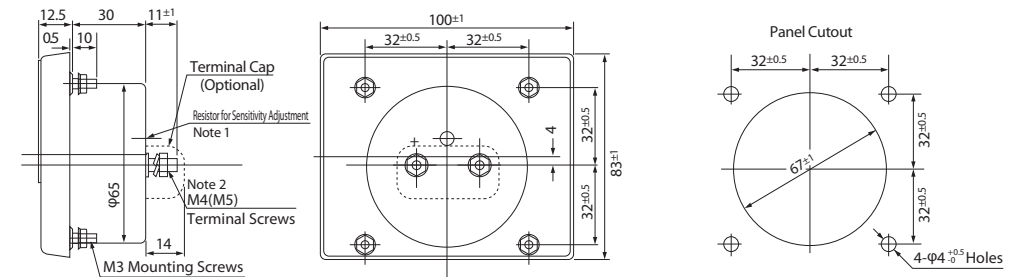
DCF-6



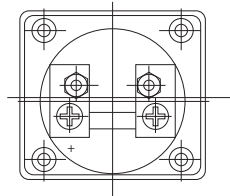
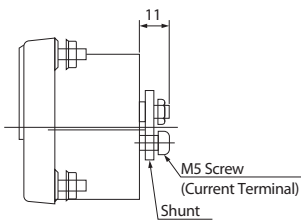
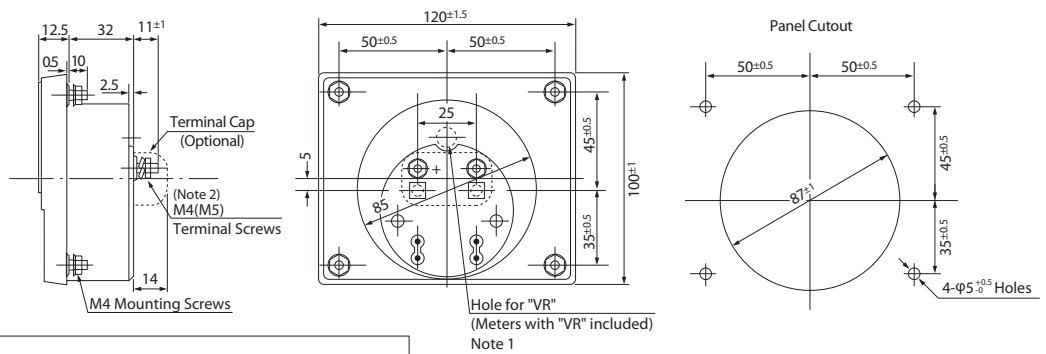
DCF-8



DCF-10



DCF-12N

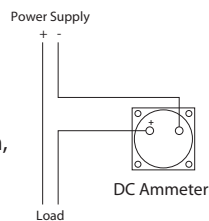


Note 1) Resistor for sensitivity adjustment is included with DCF-6V, DCF-8V, DCF-10V and DCF-12N models only.

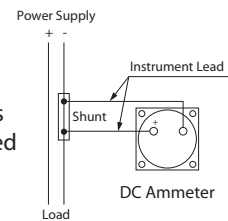
Note 2) DCF-6, DCF-8, DCF-10, DCF-12N models 15 - 30A meters have a back-mounted shunt as shown in the figure on the left. (however, a terminal cap is not included.)

## Connection Diagram

When the Shunt is Not Required, Built-in, or Back-mounted



When the Shunt is Externally Attached



# CF SERIES DC Voltmeter (Moving-coil Type)

**Model Name** DCF-5 DCF-6 DCF-8 DCF-10 DCF-12N

## Specifications

Measurement Range Value	DCF-5		DCF-6		DCF-8		DCF-10		DCF-12N		Note
	Current Consumption	Series Resistor	Current Consumption	Series Resistor	Current Consumption	Series Resistor	Current Consumption	Series Resistor	Current Consumption	Series Resistor	
1 V	1mA	Built-in	1mA	Built-in	1mA	Built-in	1mA	Built-in	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											
1 kV											
1.5 kV	M-3	M-3	M-3	M-3	M-3	M-3	M-3	M-3	M-3		
2 kV	M-4A	M-4A	M-4A	M-4A	M-4A	M-4A	M-4A	M-4A	M-4A		
3 kV	M-4A	M-4A	M-4A	M-4A	M-4A	M-4A	M-4A	M-4A	M-4A		
4 kV	M-6	M-6	M-6	M-6	M-6	M-6	M-6	M-6	M-6		
5 kV	M-6	M-6	M-6	M-6	M-6	M-6	M-6	M-6	M-6		
7.5 kV	M-6	M-6	M-6	M-6	M-6	M-6	M-6	M-6	M-6		
Weight	Approx. 0.06kg		Approx. 0.09kg		Approx. 0.1kg		Approx. 0.12kg		Approx. 0.15kg		

\* M-2A type series resistors that exceed 600V but are less than 750V are externally connected. (Series connection, 1mA current consumption)

Note. Terminal cap is not included. (Optional) Specify if required.

## Remarks

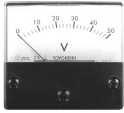
**Connection to Series Resistor** 1. Meters over 750V must be connected with the voltage division type series resistor specified in the table above as shown in the figure on the right.  
 Note) M-6 series resistors must be connected to the earth using the G terminal.  
 The G terminal is only available on the M-6 series resistor.  
 There is no G terminal on other series resistors because the boxes are made of resin.

**Meter Sensitivity** Standard DC voltmeter sensitivity is 1mA (1kΩ/V), but high-sensitivity meters can also be manufactured.  
 However, the 500V and 600V meters have a sensitivity of 500μA.

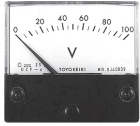
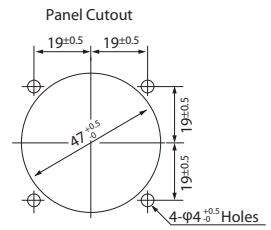
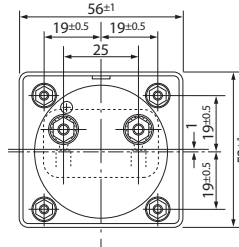
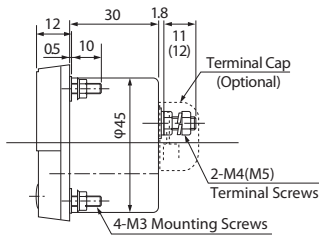
**Note** Zero center meters and multiple-scale meters can also be manufactured.



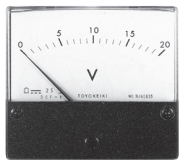
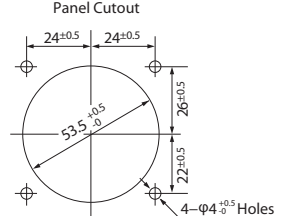
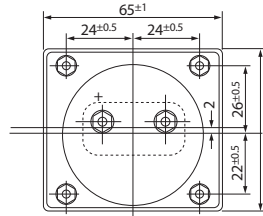
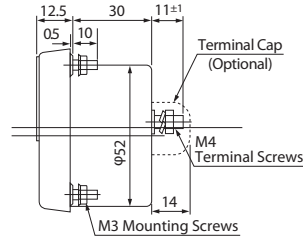
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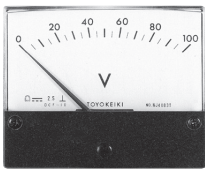
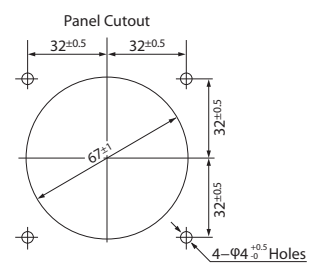
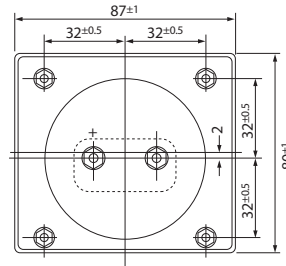
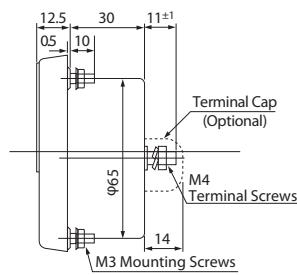
DCF-5



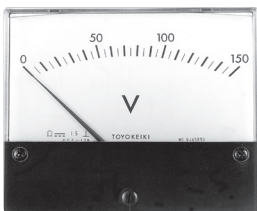
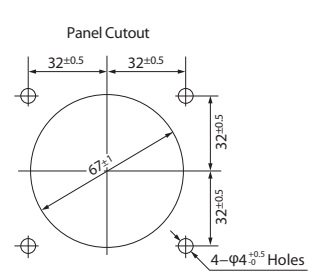
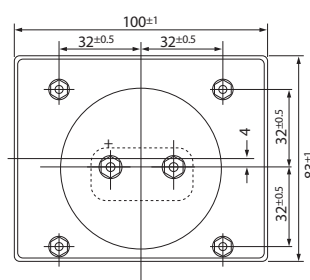
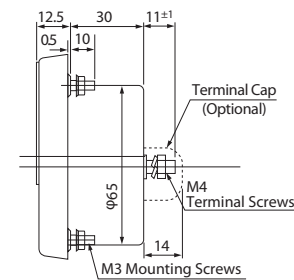
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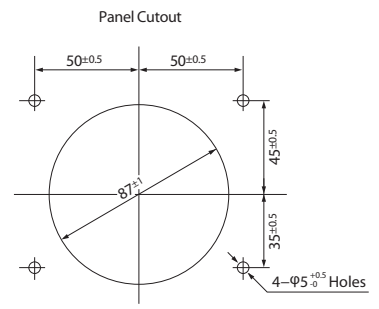
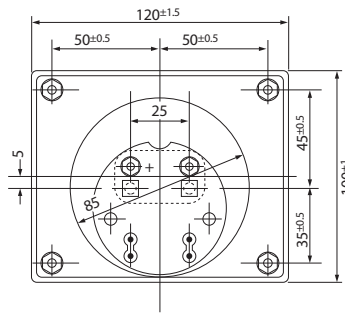
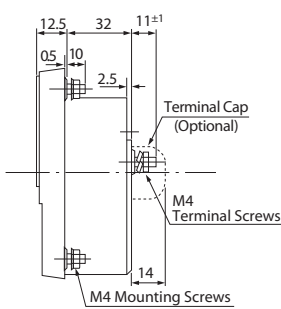
DCF-8



DCF-10

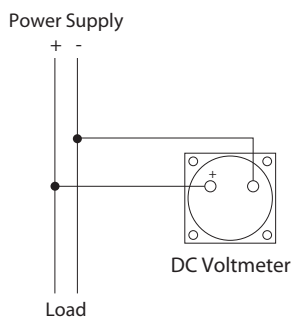


DCF-12N

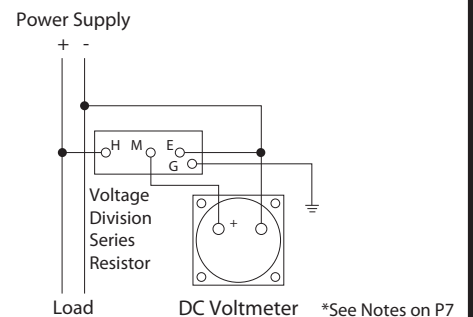


## Connection Diagram

For a Built-in Series Resistor



For an Externally Connected Voltage Division Type Series Resistor (Over 750V)



# CF SERIES AC Ammeter Rectifier Type (Mean Value Response of Effective Value Conversion Scale)

**Model Name** SCF-5 SCF-6 SCF-8 SCF-10 SCF-12N

## Specifications

Measurement Range Value	SCF-5		SCF-6		SCF-8		SCF-10		SCF-12N		Note
	VA Consumption	Accessories	VA Consumption	Accessories	VA Consumption	Accessories	VA Consumption	Accessories	VA Consumption	Accessories	
200 $\mu$ A 300 $\mu$ A 500 $\mu$ A 1 mA 3 mA 5 mA 10 mA 20 mA 50 mA 75 mA		None		None		None		None		None	Direct Measurement However, the SCF-5 model 20-75A should be connected to the M-2A rectifier box for use
		M-2A Model Rectifier Box									
100 mA ? 100 A	0.16VA ? 2VA	C-3 Model "Measurement range / 10mA" Current Transducer	0.16VA ? 2VA	C-3 Model "Measurement range / 10mA" Current Transducer	0.16VA ? 2VA	C-3 Model "Measurement range / 10mA" Current Transducer	0.16VA ? 2VA	C-3 Model "Measurement range / 10mA" Current Transducer	0.18VA ? 2VA	C-3 Model "Measurement range / 10mA" Current Transducer	Combine meter with the current transducer on the left for use (If circuit voltage is 460 or below)
More than 100 A	0.26VA (0.17VA)	C-3 Model "5A(1A) /10mA" Current Transducer	0.26VA (0.17VA)	C-3 Model "5A(1A) /10mA" Current Transducer	0.26VA (0.17VA)	C-3 Model "5A(1A) /10mA" Current Transducer	0.26VA (0.17VA)	C-3 Model "5A(1A) /10mA" Current Transducer	0.28VA (0.2VA)	C-3 Model "5A(1A) /10mA" Current Transducer	Combine meter with the current transducer on the left and CT for use
Weight	Approx. 0.06kg		Approx. 0.09kg		Approx. 0.1kg		Approx. 0.12kg		Approx. 0.15kg		

Note. Terminal cap is not included. (Optional)  
Specify if required.

## Remarks

- When Using CT**
1. **Combine the meter with CT and the C-3 model 5A (1A)/10mA current transducer** if 100A is exceeded.
  2. When circuit voltage of 460V is exceeded at 100A or below, **combine the meter with CT and the C-3 model 5A (1A)/10mA current transducer** for insulation.

Note: The C-3 model current transducer is a dedicated accessory for the meter. The combined intrinsic error for the meter and the C-3 model current transducer is  $\pm 2.5\%$ .

**Frequency** **Indicate the frequency** when measuring AC outside of commercial frequencies.  
(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.  
(In this case, the M-2A model rectifier box is externally connected.)

**Scale Calibration** Conducted via sine waves.

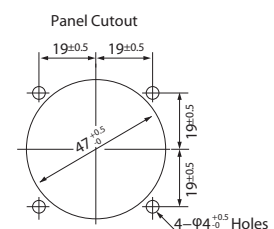
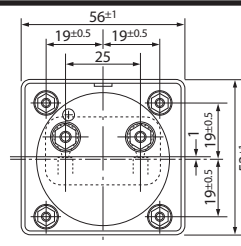
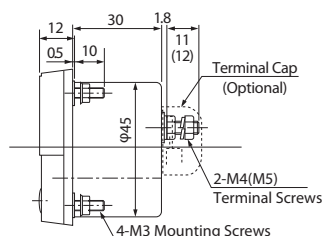
- Note**
1. Multi-scale meters can also be manufactured.
  2. We also manufacture R.M.S.-Response models that minimize the impact of waveforms. The model names are SeCF-6, 8, 10 and 12N. (The C-3 model current transducer and M-2A model rectifier box are externally connected.) (Additional price)  
The scale is nonlinear, condensed near zero.

**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 dedicated catalog.)

## Outside Dimensions



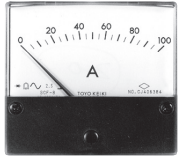
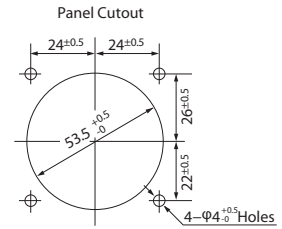
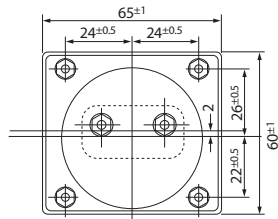
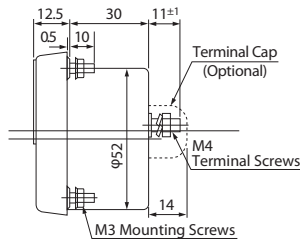
SCF-5



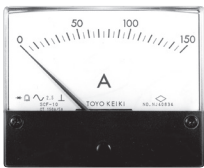
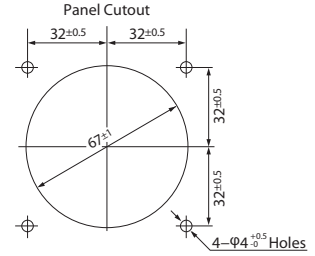
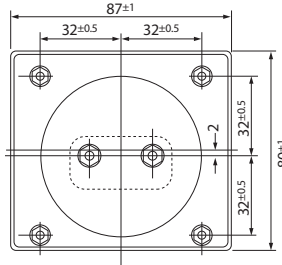
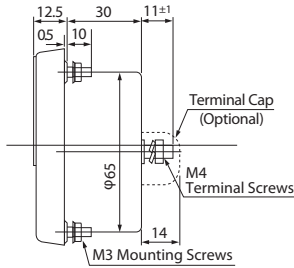
## Outside Dimensions



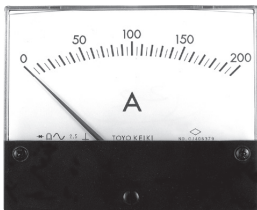
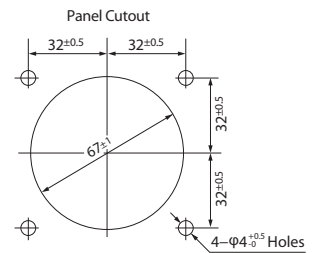
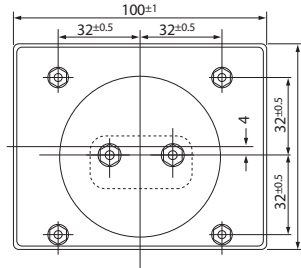
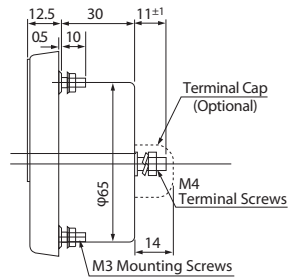
SCF-6



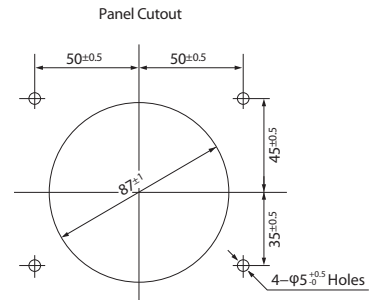
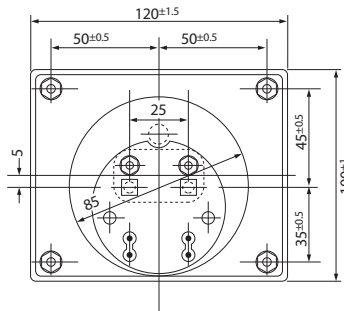
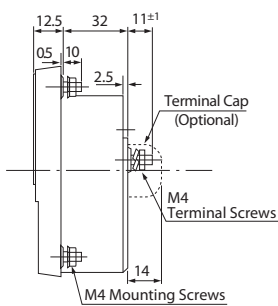
SCF-8



SCF-10

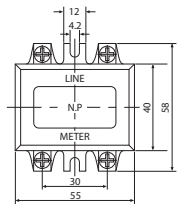


SCF-12N

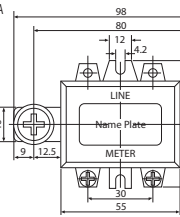


## Accessories C-3 Model Current Transducer

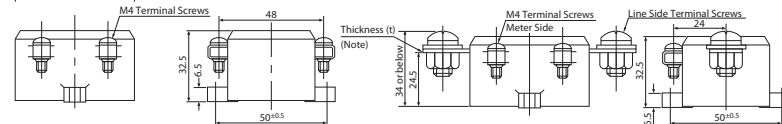
1) Less than 15A Specifications Rated Load 0.1VA  
 Primary Current Various types less than 15A  
 Secondary Current 10mA  
 Circuit Voltage 460V  
 Voltage Test Value AC2000V  
 Weight Approx. 0.2kg



2) 15A - 100A Specifications Rated Load 0.1VA  
 Primary Current Various types from 15A to 100A  
 Secondary Current 10mA  
 Circuit Voltage 460V  
 Voltage Test Value AC2000V  
 Weight Approx. 0.26kg

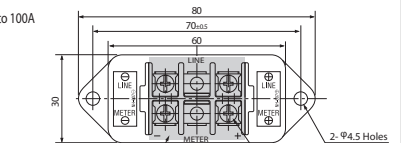


Primary Current Type	Conductor Thickness t(mm)	Line Side Terminal Screws
15A - 75A	1.5	M6x14
75A - 100A	2	M8x16

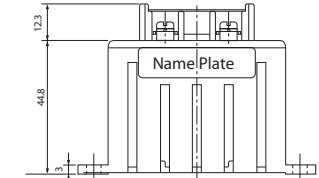


## M-2A Model Rectifier Box (Extended Scale Meter and SCF-5 Model For 20-75mA Meter)

Weight: Approx. 70g

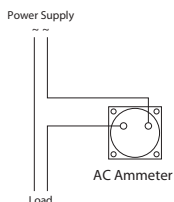


One-touch Installation Terminal Cover (Transparent Polycarbonate Plate)  
 4-M3.5 screws  
 2-φ4.5 Holes

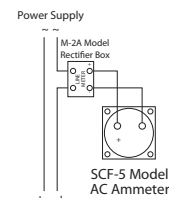


## Connection Diagram 1. Standard Scale Meter

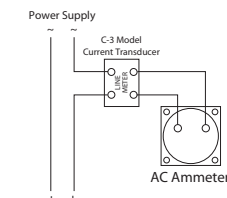
For Direct Measurement



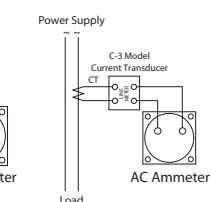
With SCF-5 Model 20-75mA Meter



When Combined With a Current Transducer

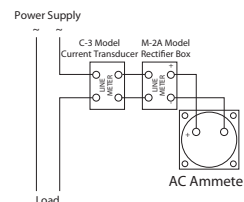


When Combined With a Current Transducer and CT

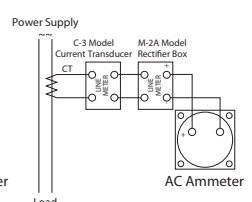


## 2. Extended Scale Meter

When Combined With a Current Transducer



When Combined With a Current Transducer and CT



# CF SERIES AC Voltmeter (Rectifier Type Mean Value Response of Effective Value Conversion Scale)

**Model Name** SCF-5, SCF-6, SCF-8, SCF-10, SCF-12<sub>N</sub> (Linear Scale)  
 SeCF-6, SeCF-8, SeCF-10, SeCF-12<sub>N</sub> (Nonlinear Scale)

## Specifications

Measurement Range Value	SCF-5		SCF-6 SeCF-6		SCF-8 SeCF-8		SCF-10 SeCF-10		SCF-12 <sub>N</sub> SeCF-12 <sub>N</sub>		Note
	Current Consumption	Series Resistor	Current Consumption	Series Resistor	Current Consumption	Series Resistor	Current Consumption	Series Resistor	Current Consumption	Series Resistor	
3 V	AC1mA	M-2A	AC1mA (SeCF AC4mA)	Built-in	AC1mA (SeCF AC4mA)	Built-in	AC1mA (SeCF AC4mA)	Built-in	AC1mA (SeCF AC4mA)	Built-in	Direct Measurement (However, the SCF-5 3V meter should be connected to a series resistor)
5 V											
7.5 V											
10 V											
15 V											
30 V											
50 V											
75 V											
100 V											
150 V											
300 V	VT combined	VT combined	VT combined	VT combined	VT combined	VT combined	VT combined	VT combined	VT combined	VT combined	Combine the 150V meter with VT for use
500 V											
600 V											
750 V											
20 kV											
Weight	Approx. 0.06kg		Approx. 0.09kg		Approx. 0.1kg		Approx. 0.12kg		Approx. 0.15kg		

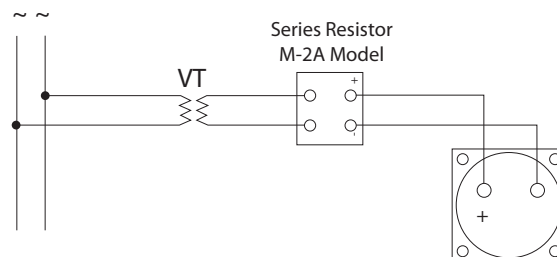
Note. Terminal cap is not included. (Optional)  
Specify if required.

## Remarks

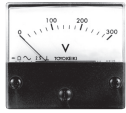
- When Using VT** Use a combination of VT and 150V meter if using VT at over 300V.  
Usage example Meter: Scale 0-9000V, input 0-150V VT: 6600V/110V
- Frequency** Indicate the frequency when measuring AC outside of commercial frequencies.  
(Can be manufactured from approximately 30Hz to 10kHz)
- Meter Sensitivity** Standard AC voltmeter sensitivity is 1mA (1kΩ/V), but high-sensitivity meters can also be manufactured.  
However, the 500V and 600V meters have a sensitivity of 500μA.
- Scale Calibration** Conducted via sine waves.

## Note

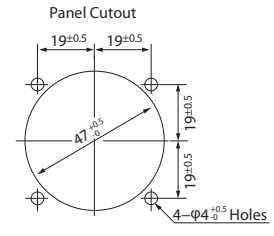
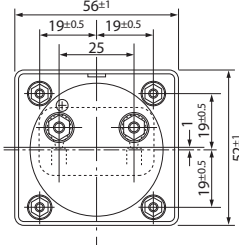
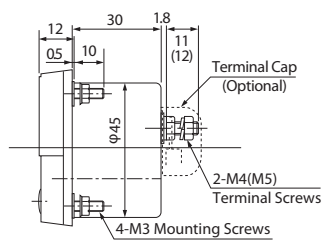
- Multi-scale meters can also be manufactured.
- We also manufacture R.M.S.-Response models that minimize the impact of waveforms. The model names are SeCF-6, 8, 10 and 12<sub>N</sub>.  
(The M-2A type series resistor is externally connected. 50V and over can be manufactured.) (Additional price)  
The scale of the SeCF models is nonlinear, condensed near zero.
- Request that it is for secondary inverter measurement when performing secondary voltage measurement with an inverter. (Additional price)



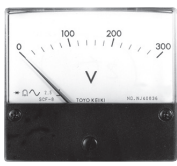
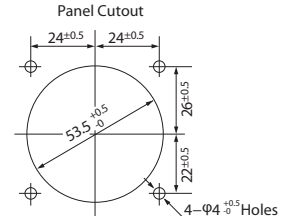
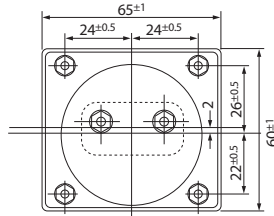
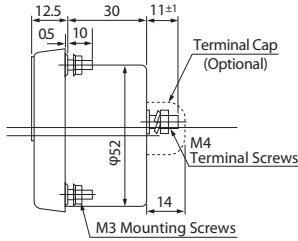
## Outside Dimensions



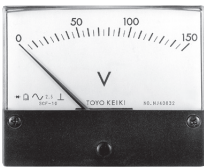
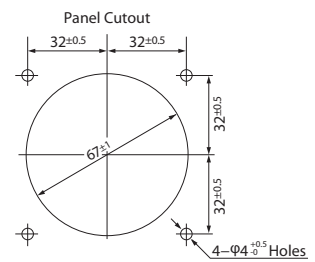
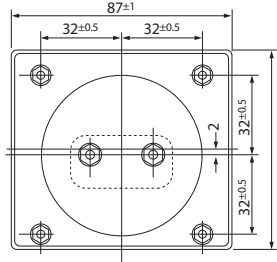
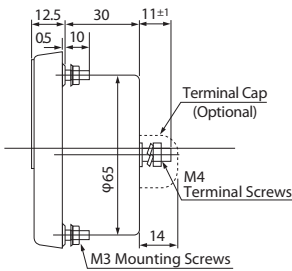
SCF-5



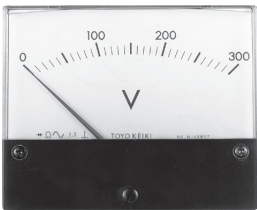
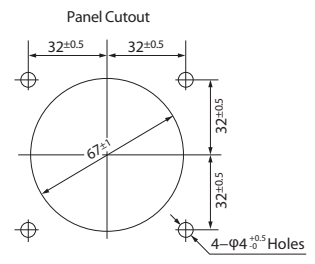
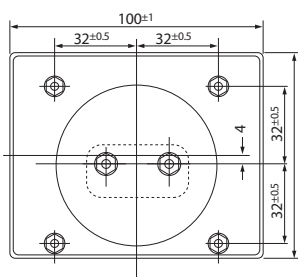
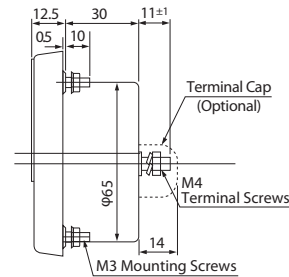
SCF-6  
SeCF-6



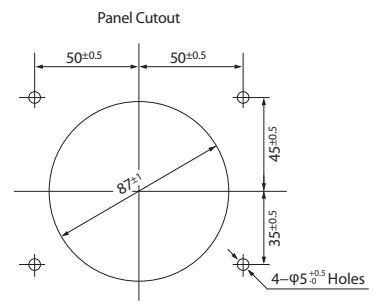
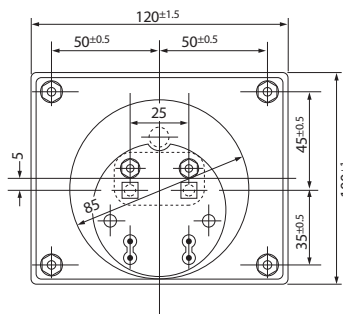
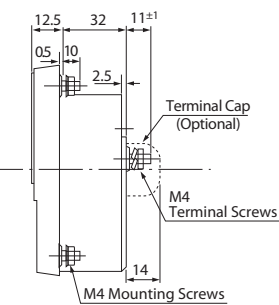
SCF-8  
SeCF-8



SCF-10  
SeCF-10



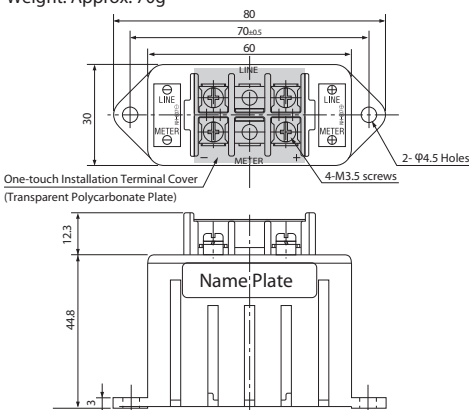
SCF-12N  
SeCF-12N



## Accessories

M-2A Series Resistor  
(For SCF-5 Model 3V Meter)

Weight: Approx. 70g



## Connection Diagram

For an Externally  
Connected Series Resistor  
(SCF-5 Model 3V Meter)

For Direct Measurement  
(5-600V Meter)

When Combined With a VT  
(Over 600V)

Power Supply

Power Supply

Power Supply



AC Voltmeter



AC Voltmeter



AC Voltmeter

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

**Model Name**    ACF-5            ACF-6            ACF-8            ACF-10            ACF-12<sub>NB</sub>

## Specifications

Measurement Range Value	Extended Scale Value			ACF-5		ACF-6		ACF-8		ACF-10		ACF-12 <sub>NB</sub>		Note
	Double	Triple (Standard)	Five Times	VA Consumption	Weight	VA Consumption	Weight	VA Consumption	Weight	VA Consumption	Weight	VA Consumption	Weight	
100 mA	200 mA	300 mA	500 mA	1VA	Approx. 0.06kg	1VA	Approx. 0.08kg	1VA	Approx. 0.12kg	1VA	Approx. 0.13kg	1VA	Approx. 0.25kg	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	30 A	45 A	75 A											
20 A	40 A	60 A	100 A											
30 A	60 A	90 A	150 A											
50 A	100 A	150 A	250 A	Combine 5A (1A) meter with CT										
?	?	?	?											
10 kA	20 kA	30 kA	50 kA											

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.)

Note 2. Terminal cap is not included. (Optional) Specify if required.

Note 3. ACF-5 is only compatible with current input.

## Remarks

### When Using CT

1. Use a **combination of CT and 5A (1A) meter** if 30A is exceeded.
2. When circuit voltage of 500V is exceeded at 30A or below, **combine CT with the meter** for insulation.

### Extended Scale Meter

Use a **triple** (or double 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: ACF-12<sub>NB</sub> 0-100-(300)A (CT ratio 100A/5A)

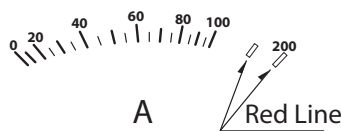
Note1) The standard scale of the extended scale meter is a triple extended scale.

- 2) In the case of extended scale meters, the 70% point on the scale length represents the upper limit (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**)

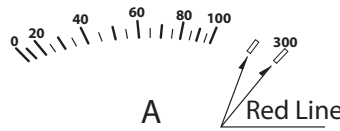
- 3) The **red color extended scale lines** are the points below for extended scale meters.

2 Times Extended	1.5 Times and 2 Times Measurement Range Value
3 Times Extended	2    "    3            "
5 Times Extended	2    "    5            "

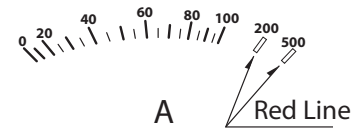
Scale Example



**2 Times Extended Scale**



**3 Times Extended Scale**



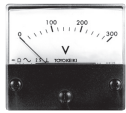
**5 Times Extended Scale**

**Scale Calibration**    Conducted via sine waves.

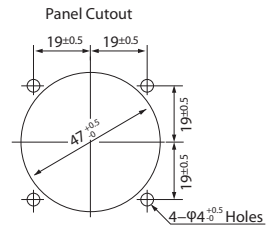
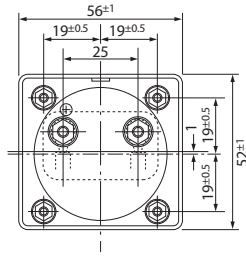
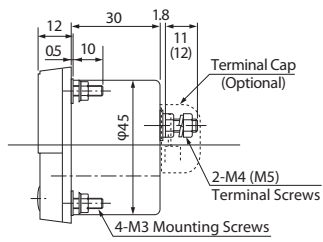
**Frequency**            Combine with a rectifier type meter or converter and DC meter for use when measuring AC outside of commercial frequencies.

**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 dedicated catalog.)

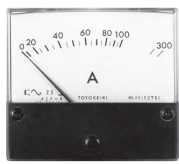
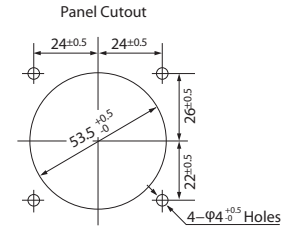
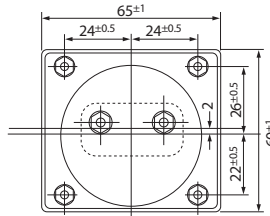
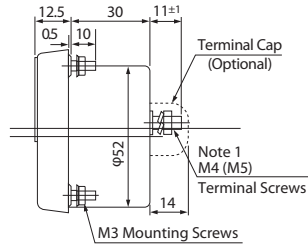
## Outside Dimensions



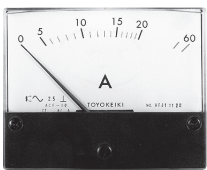
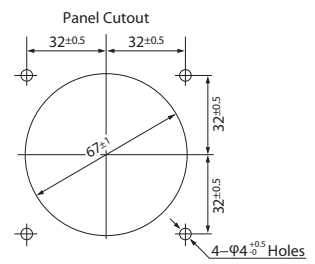
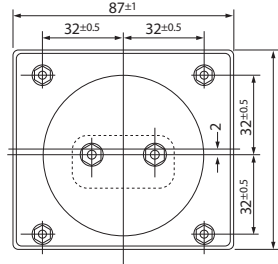
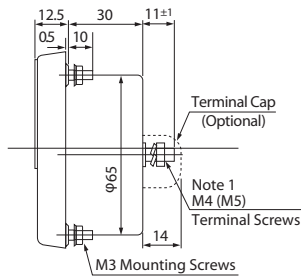
ACF-5



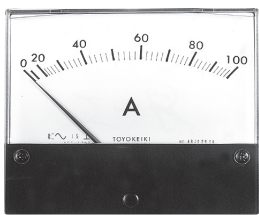
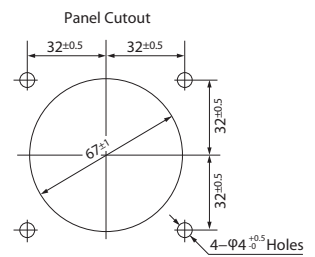
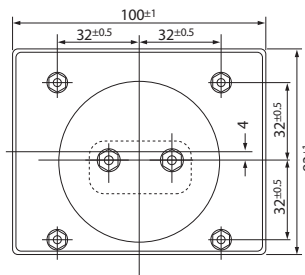
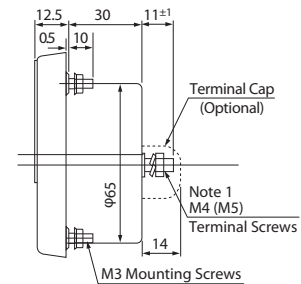
ACF-6



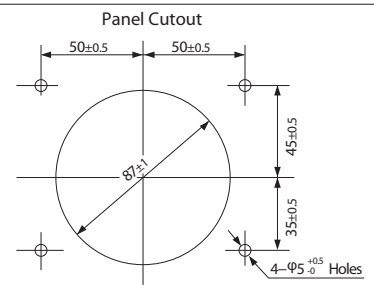
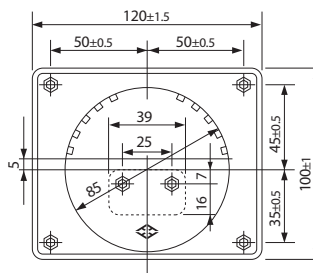
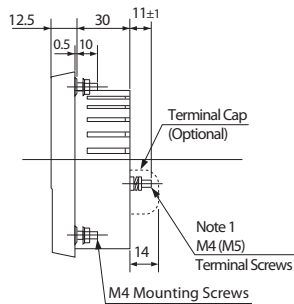
ACF-8



ACF-10



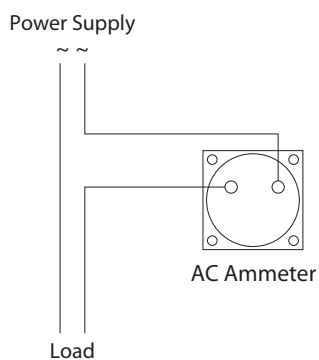
ACF-12NB



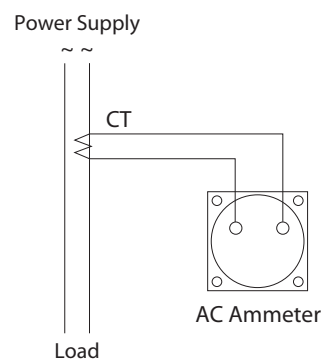
Note 1) The terminal screws for the meter are M5 for 10-30A.

## Connection Diagram

For Direct Measurement



When Combined With a CT



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

**Model Name**    ACF-6            ACF-8            ACF-10            ACF-12<sub>NB</sub>

## Specifications

Measurement Range Value	ACF-6		ACF-8		ACF-10		ACF-12 <sub>NB</sub>		Note
	VA Consumption	Series Resistor	VA Consumption	Series Resistor	VA Consumption	Series Resistor	VA Consumption	Series Resistor	
30 V	3VA	Back-mounted	3VA	Back-mounted	3VA	Back-mounted	3VA	Built-in	Direct Measurement
50 V									
75 V									
100 V									
150 V									
300 V	3.5VA		3.5VA		3.5VA		3.5VA		
400 V	3VA		3VA		3VA		3VA		Combine the 150V meter with VT
?									
20 kV									
Weight	Approx. 0.13kg		Approx. 0.16kg		Approx. 0.18kg		Approx. 0.29kg		

Note 1. An ACF-5 model is not manufactured.    Note 2. Terminal cap is not included. (Optional) Specify if required.

## Remarks

**When Using VT**    Use a **combination of VT and 150V meter** if 300V is exceeded.  
 Usage example    Meter: Scale 0-9000V, input 0-150V    VT: 6600V/110V  
 Note) Models up to 600V can be manufactured with a series resistor as shown in the table below.

**Scale Calibration**    Conducted via sine waves.

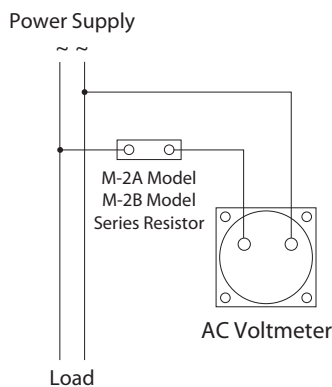
**Frequency**            Combine with a rectifier type meter or converter and DC meter for use when measuring AC outside of commercial frequencies.

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

Measurement Range Value	ACF-6		ACF-8		ACF-10		ACF-12 NB		Note
	VA Consumption	Series Resistor	VA Consumption	Series Resistor	VA Consumption	Series Resistor	VA Consumption	Series Resistor	
400V	5	M-2A	5	M-2A	5	M-2A	5	M-2A	Connect meter and series resistor in a series for use
500V	6	M-2A	6	M-2A	6	M-2A	6	M-2A	
600V	7	M-2B	7	M-2B	7	M-2B	7	M-2B	

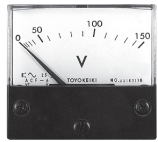
Note) For series transistor outside dimensions, see P25.

## Connection Diagram

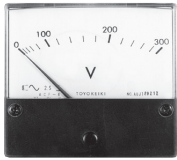
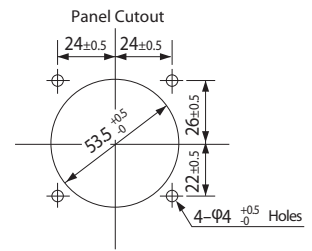
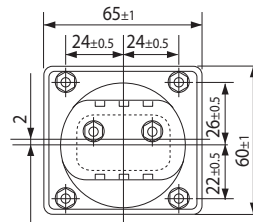
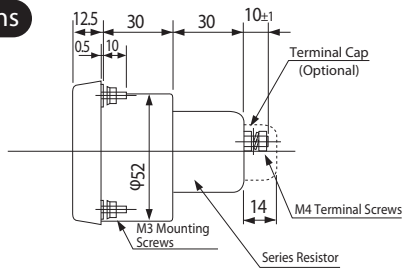




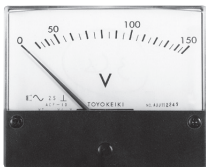
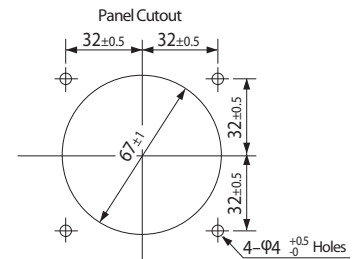
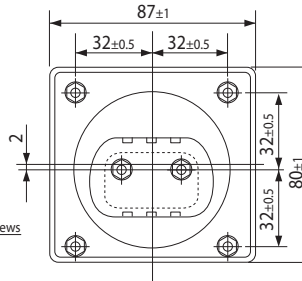
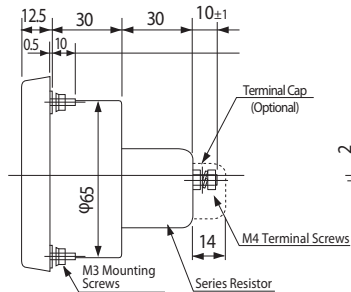
## Outside Dimensions



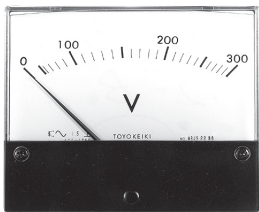
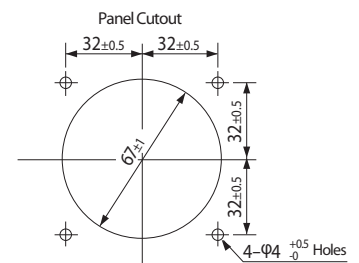
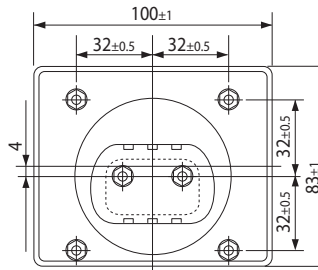
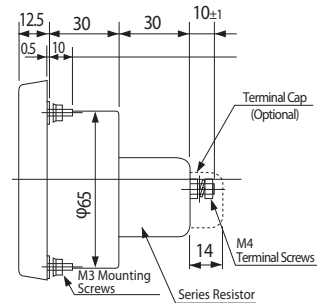
ACF-6



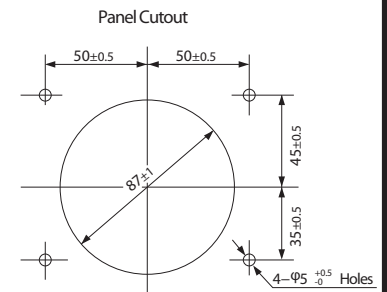
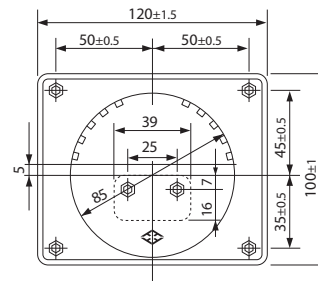
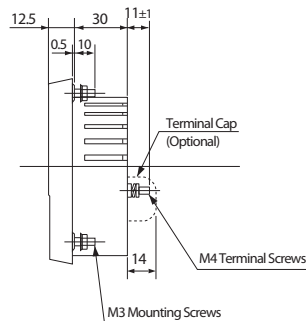
ACF-8



ACF-10

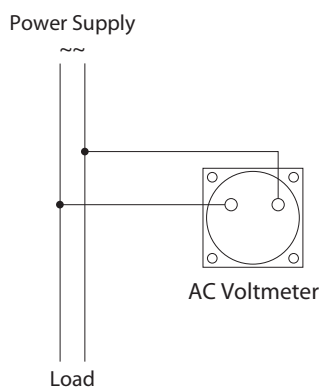


ACF-12NB

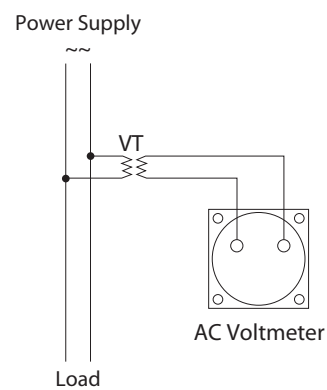


## Connection Diagram

For Direct Measurement



When Combined With a VT



<b>Model Name</b>	<b>Wattmeter</b>	<b>ECF-6</b>	<b>ECF-8</b>	<b>ECF-10</b>	<b>ECF-12NB</b>
	<b>Varmeter</b>	<b>RCF-6</b>	<b>RCF-8</b>	<b>RCF-10</b>	<b>RCF-12NB</b>

## Specifications

Product Name	Model Name	Operating Principles	Rating	VA Consumption		Attached Converter	Weight		Note
				Voltage Circuit	Current Circuit		Meters	Accessories	
1P Wattmeter	ECF-6 ECF-8 ECF-10	Electronic Device Type	110V 5A 220V 5A	1.1VA 1.1VA	0.5VA 0.5VA	ERG-3 type	Approx. 0.14kg Approx. 0.16kg Approx. 0.18kg	Approx. 0.60kg	50-60Hz Common Use
	ECF-12NB		110V 5A 220V 5A	1.1VA 1.1VA	0.5VA 0.5VA	None	Approx. 0.67kg		
3P Wattmeter	ECF-6 ECF-8 ECF-10	Electronic Device Type	110V 5A 220V 5A	1.1VA per phase 1.1VA per phase	0.5VA per phase 0.5VA per phase	ERG-3 type	Approx. 0.14kg Approx. 0.16kg Approx. 0.18kg	Approx. 0.62kg	50/60Hz Common Use
	ECF-12NB		110V 5A 220V 5A	1.1VA per phase 1.1VA per phase	0.5VA per phase 0.5VA per phase	None	Approx. 0.67kg		
3P4W Wattmeter	ECF-6 ECF-8 ECF-10	Electronic Device Type	110/ $\sqrt{3}$ V5A 220/ $\sqrt{3}$ V5A	1.1VA per phase 1.1VA per phase	0.5VA per phase 0.5VA per phase	ERG-3 type	Approx. 0.14kg Approx. 0.16kg Approx. 0.18kg	Approx. 0.65kg	50/60Hz Common Use
	ECF-12NB		110/ $\sqrt{3}$ V5A 220/ $\sqrt{3}$ V5A	1.1VA per phase 1.1VA per phase	0.5VA per phase 0.5VA per phase	None	Approx. 0.67kg		
1P varmeter	RCF-6 RCF-8 RCF-10	Electronic Device Type	110V 5A 220V 5A	1.1VA 1.1VA	0.5VA 0.5VA	RRG-3 type	Approx. 0.14kg Approx. 0.16kg Approx. 0.18kg	Approx. 0.60kg	50 or 60Hz Specification Required
	RCF-12NB		110V 5A 220V 5A	1.1VA 1.1VA	0.5VA 0.5VA	None	Approx. 0.67kg		
3P Varmeter	RCF-6 RCF-8 RCF-10	Electronic Device Type	110V 5A 220V 5A	1.1VA per phase 1.1VA per phase	0.5VA per phase 0.5VA per phase	RRG-3 type	Approx. 0.14kg Approx. 0.16kg Approx. 0.18kg	Approx. 0.62kg	50 or 60Hz Specification Required
	RCF-12NB		100V 5A 220V 5A	1.1VA per phase 1.1VA per phase	0.5VA per phase 0.5VA per phase	None	Approx. 0.67kg		
3P4W Varmeter	RCF-6 RCF-8 RCF-10	Electronic Device Type	110/ $\sqrt{3}$ V5A 220/ $\sqrt{3}$ V5A	1.1VA per phase 1.1VA per phase	0.5VA per phase 0.5VA per phase	RRG-3 type	Approx. 0.14kg Approx. 0.16kg Approx. 0.18kg	Approx. 0.65kg	50 or 60Hz Required Designation
	RCF-12NB		110/ $\sqrt{3}$ V5A 220/ $\sqrt{3}$ V5A	1.1VA per phase 1.1VA per phase	0.5VA per phase 0.5VA per phase	None	Approx. 0.67kg		

Note. □ The CF-6, 8 and 10 meters do not come with a terminal cap. (Optional) Specify if required.

## Remarks

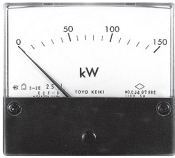
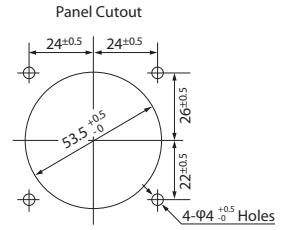
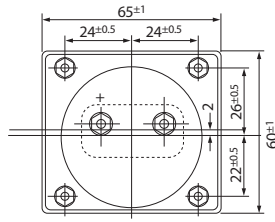
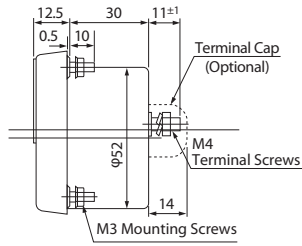
- VT and CT Usage** Use a **110V5A rating meter combined with VT and CT** if the rating above is exceeded.
- Measurement Range Value** Select the measurement range from the standard table of wattmeter measurement range chart on P30.
- Production Limits of Meter** For the production limits of meters, see P31.
- 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) can also be manufactured. (for zero-left meters, designate LEAD or LAG.)
- Meter Wiring**
  - 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**.
  - For phenomena related to miswiring, see P32.
- 1P3W Wattmeter** 1P3W wattmeters can be manufactured in compliance with the 3P3W wattmeters listed above.

**Note** Voltage rated value 1A meters can also be manufactured.

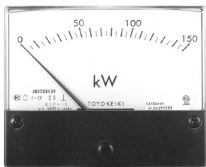
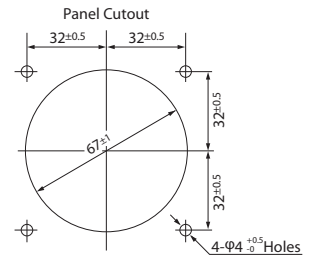
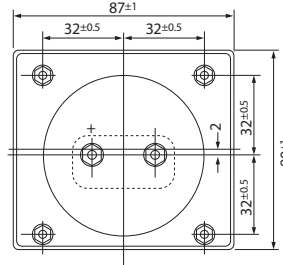
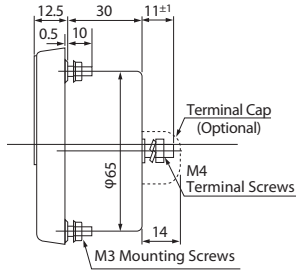
## Outside Dimensions



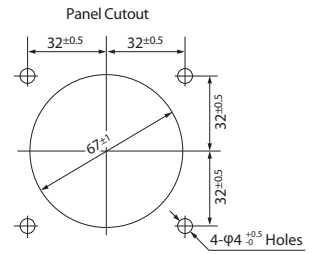
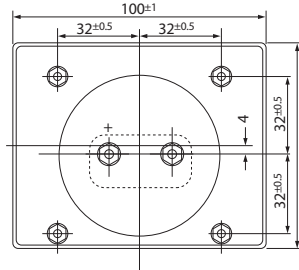
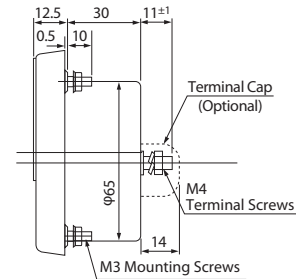
ECF-6 UCF-6  
RCF-6 UuCF-6



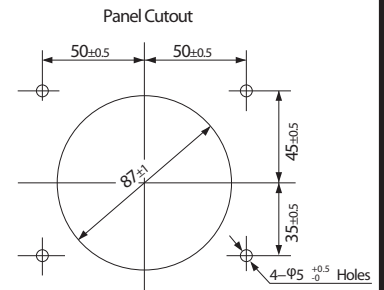
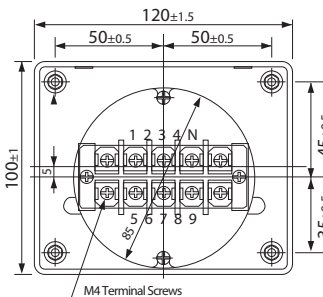
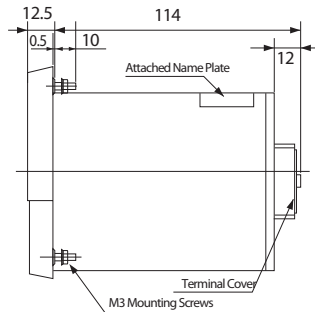
ECF-8 UCF-8  
RCF-8 UuCF-8



ECF-10 UCF-10  
RCF-10 UuCF-10



ECF-12NB UCF-12NB  
RCF-12NB UuCF-12NB

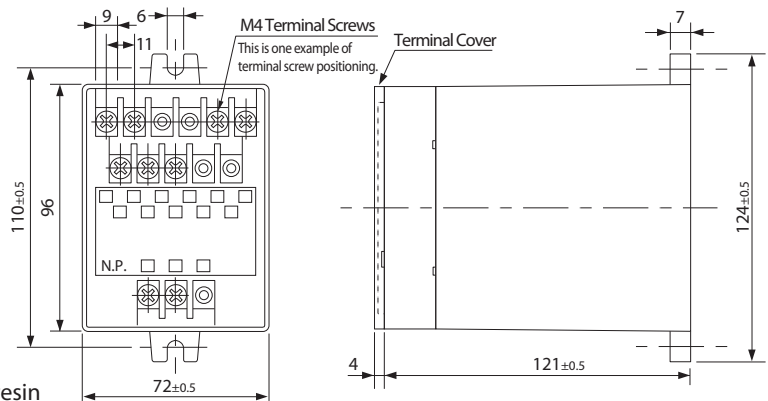


## Accessories

ECF-6	ECF-8	ECF-10
RCF-6	RCF-8	RCF-10
UCF-6	UCF-8	UCF-10
UuCF-6	UuCF-8	UuCF-10

ERG-3 models  
RRG-3 models  
URG-3 models  
UuRG-3 models

Converter



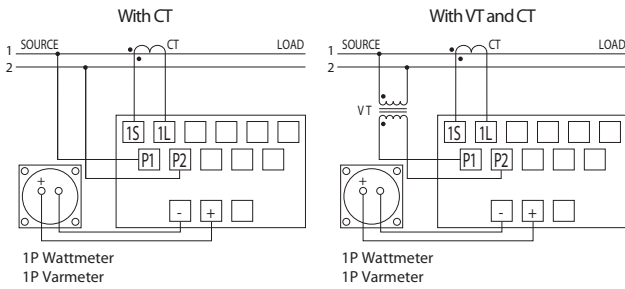
Case Material: Glass fiber-strengthened PC resin  
Terminal Part Material: Glass fiber-strengthened PBT resin  
Cover Material: Transparent polycarbonate resin

Din rail mounts can also be manufactured. In such cases, the model name is □ RG-3A.

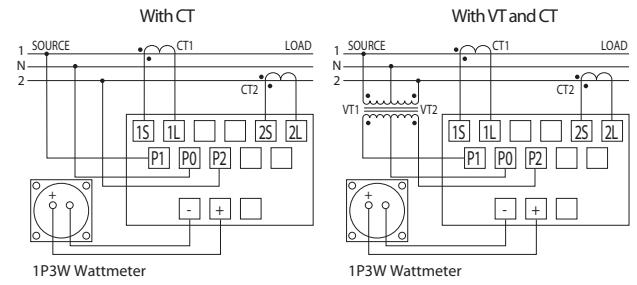
## Connection Diagram

ECF-6 ECF-8 ECF-10 (Electronic device type)  
RCF-6 RCF-8 RCF-10

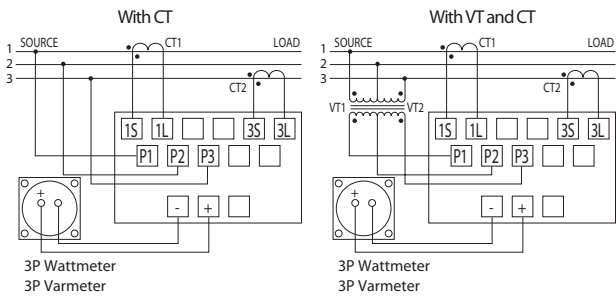
1P Circuit



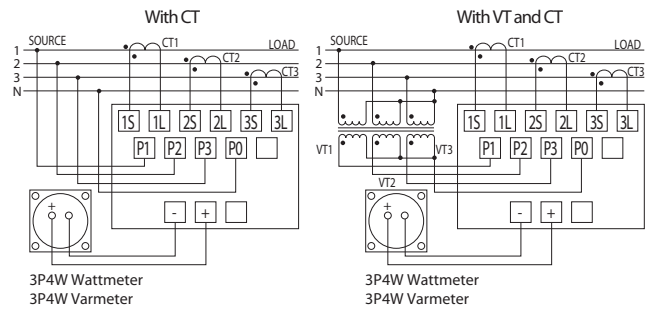
1P3W Circuit



3P Circuit

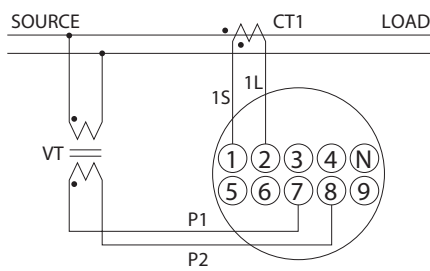


3P4W Circuit

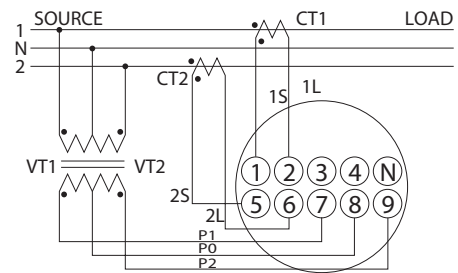


ECF-12NB  
RCF-12NB (Electronic device type)

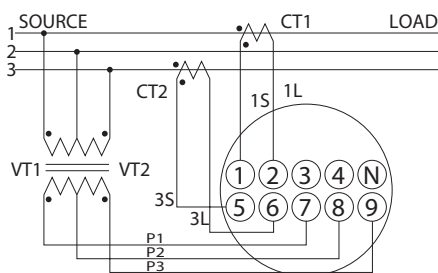
ECF-12NB1P RCF-12NB1P  
1P Wattmeter, 1P Varmeter



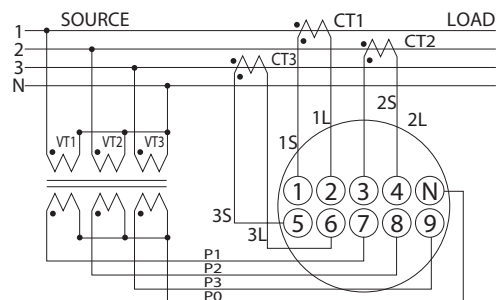
ECF-12NB1P3W RCF-12NB1P3W  
1P3W Wattmeter



ECF-12NB3P RCF-12NB3P  
3P Wattmeter, 3P Varmeter



ECF-12NB3P4W RCF-12NB3P4W  
3P4W Wattmeter, 3P4W Varmeter



# CF SERIES Power Factor Meter (Electronic Device Type, Phase Detection Method)

**Model Name** 1P Power Factor Meter and 3P Balanced Power Rate Meter  
 UCF-6 UCF-8 UCF-10 UCF-12NB  
 3P Unbalanced Power Factor Meter and 3P4W Power Factor Meter  
 UuCF-6 UuCF-8 UuCF-10 UuCF-12NB

## Specifications

Product Name	Model Name	Scale	Operating Principles	Rating	VA Consumption		Attached Converter	Weight		Note
					Voltage Circuit	Current Circuit		Meters	Accessories	
1P Power Factor Meter	UCF-6 UCF-8 UCF-10	LEAD LAG 0.5~1~0.5	Electronic Device Type	110V 5A 200V 5A	0.8 VA 1.3 VA	0.8VA 0.8VA	URG-3 type	Approx. 0.14kg Approx. 0.16kg Approx. 0.18kg	Approx. 0.60kg	50/60Hz Common Use
	110V 5A 220V 5A			1 VA 2 VA	0.5 VA 0.5 VA	None	Approx. 0.42kg			
3P Balanced Power Factor Meter	UCF-6 UCF-8 UCF-10		Electronic Device Type	110V 5A 220V 5A	0.8 VA 1.3 VA	0.8VA 0.8VA	URG-3 type	Approx. 0.14kg Approx. 0.16kg Approx. 0.18kg	Approx. 0.60kg	50/60Hz Common Use
	110 5A 220V 5A			1 VA 2 VA	0.5VA 0.5VA	None	Approx. 0.41kg			
3P Unbalanced Power Factor Meter	UuCF-6 UuCF-8 UuCF-10		Electronic Device Type	110V 5A 220V 5A	0.5VA per phase 1VA per phase	0.8VA per phase 0.8VA per phase	UuRG-3 models	Approx. 0.14kg Approx. 0.16kg Approx. 0.18kg	Approx. 0.62kg	50 or 60Hz Specification required
	110V 5A 220V 5A			1VA per phase 2VA per phase	0.5VA per phase 0.5VA per phase	None	Approx. 0.45kg			
3P4W Power Factor Meter	UuCF-6 UuCF-8 UuCF-10	Electronic Device Type	110V 5A 220V 5A	1.5VA per phase 3VA per phase	2VA per phase 2VA per phase	UuRG-3 models	Approx. 0.14kg Approx. 0.16kg Approx. 0.18kg	Approx. 0.62kg	50 or 60Hz Required Designation	
	110V 5A 220V 5A		1VA per phase 2VA per phase	0.5VA per phase 0.5VA per phase	None	Approx. 0.47kg				

Note.  The CF-6, 8 and 10 meters do not come with a terminal cap. (Optional) Specify if required.

## Remarks

- VT and CT Usage** Use a 110V5A rating meter combined with VT and CT if the rating above is exceeded.
- Usable Voltage Range** Rated voltage within  $\pm 15\%$
- 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 "1" scale if the power is off)
- Meter Wiring**
  - 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.**
  - For phenomena related to miswiring, see P32.

**Note** Voltage rated value 1A meters can also be manufactured.

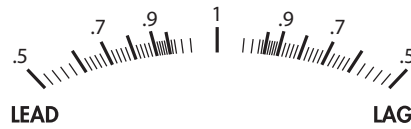
**Outside Dimensions** For the production limits of meters, see P18.

## Scale Drawing



$\text{COS } \varphi$

UuCF-6, 8, 10



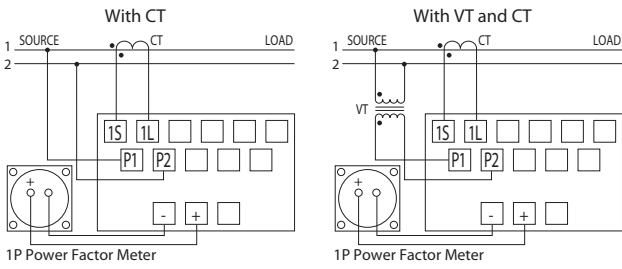
$\text{COS } \varphi$

UuCF-12NB

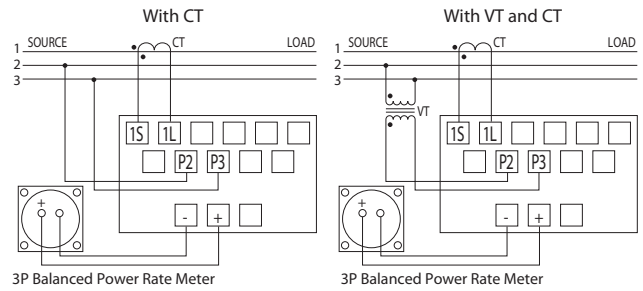
## Connection Diagram

UCF-6 UCF-8 UCF-10  
 UuCF-6 UuCF-8 UuCF-10 (Electronic device type)

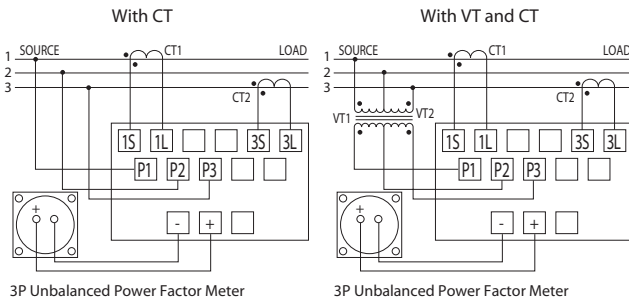
1P Circuit



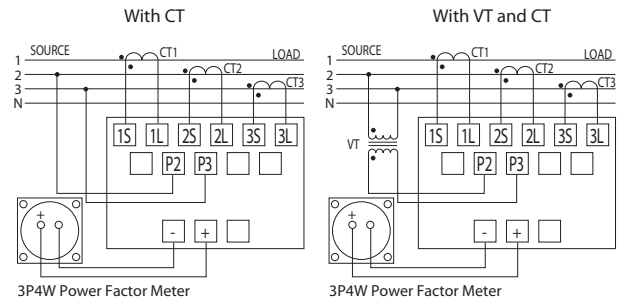
3P Balanced Circuit



3P Unbalanced Circuit

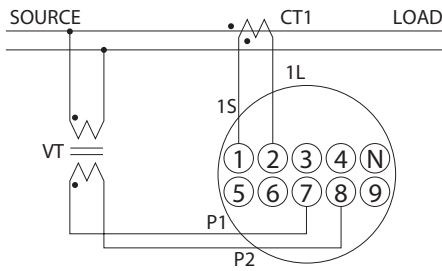


3P4W Circuit

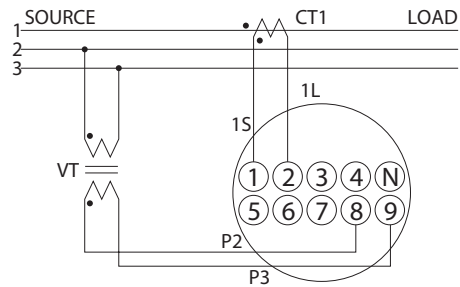


UCF-12<sub>NB</sub>  
 UuCF-12<sub>NB</sub> (Electronic device type)

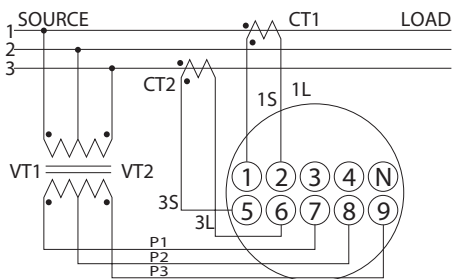
UCF-12NB1P  
 1P Power Factor Meter



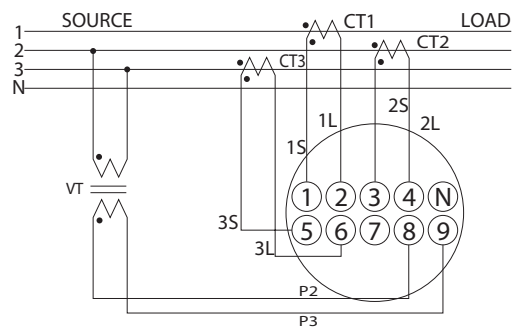
UCF-12NB3P  
 3P Balanced Power Rate Meter



UuCF-12NB3P  
 3P Unbalanced Power Factor Meter



UuCF-12NB<sup>3P4W</sup>  
 3P4W Power Factor Meter



# CF SERIES Frequency Meter (Electronic Device Type, Differential Method)

**Model Name** FCF-6 FCF-8 FCF-10 FCF-12NB

## Specifications

Scale	Rated Voltage	FCF - 6		FCF - 8		FCF - 10		FCF - 12NB	
		VA Consumption	Converter	VA Consumption	Converter	VA Consumption	Converter	VA Consumption	Converter
45~55Hz	110V 220V	1VA 2VA	Built-in	1VA 2VA	Built-in	1VA 2VA	Built-in	1VA 2VA	Built-in
55~65Hz	110V 220V	1VA 2VA		1VA 2VA		1VA 2VA		1VA 2VA	
45~65Hz	110V 220V	1VA 2VA		1VA 2VA		1VA 2VA		1VA 2VA	
Weight		Approx. 0.21kg		Approx. 0.23kg		Approx. 0.25kg		Approx. 0.4kg	

Note. Terminal cap is not included. (Optional)  
Specify if required.

## Remarks

**Usable Voltage Range** Rated voltage within  $\pm 15\%$

### Using VT

Use a **110V rating meter combined with VT** if the circuit voltage exceeds the rated voltage above.  
Note) Preliminary status of intrinsic error testing time: five minutes

## Note

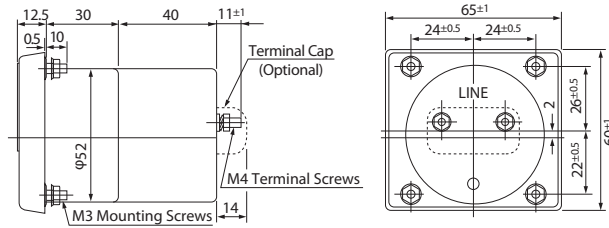
Scales outside those displayed above can also be manufactured.  
(However this is limited to between approximately 40Hz and 10kHz.)

Scale Rating Model Name	45~55Hz	55~65Hz	45~65Hz
FCF-6 FCF-8 FCF-10			
FCF-12NB			

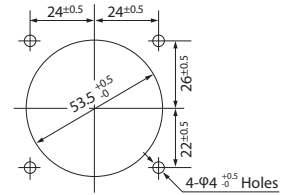
## Outside Dimensions



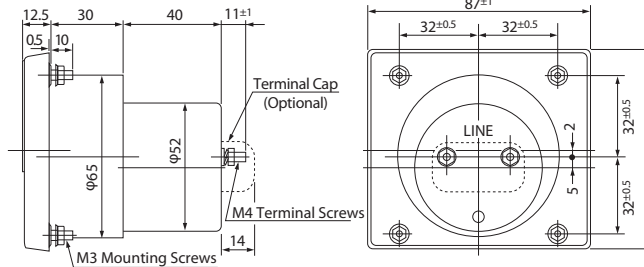
FCF-6



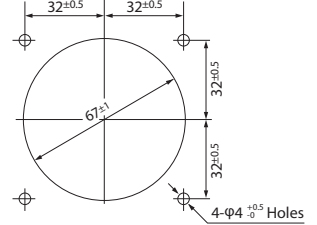
Panel Cutout



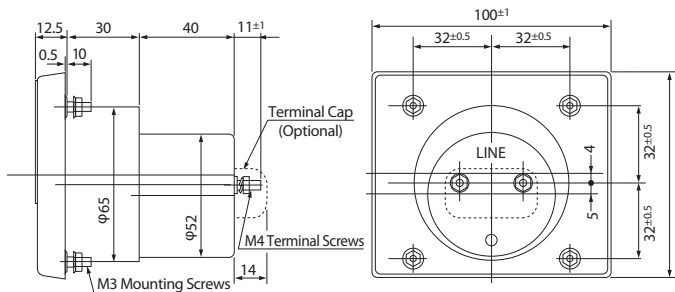
FCF-8



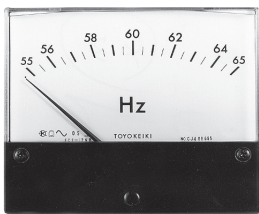
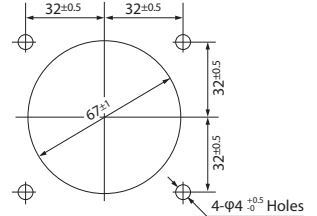
Panel Cutout



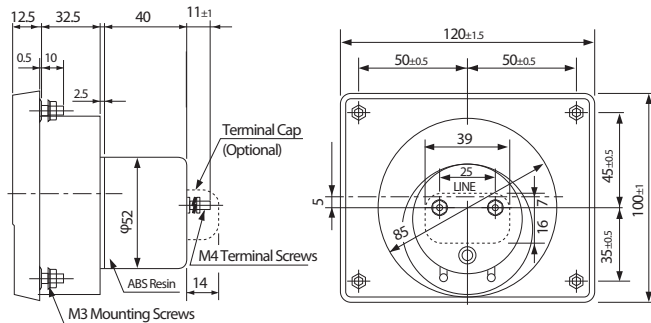
FCF-10



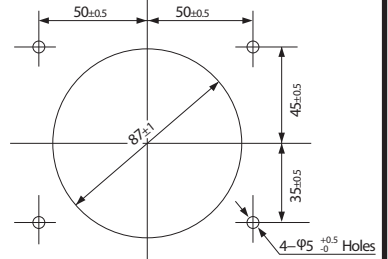
Panel Cutout



FCF-12NB

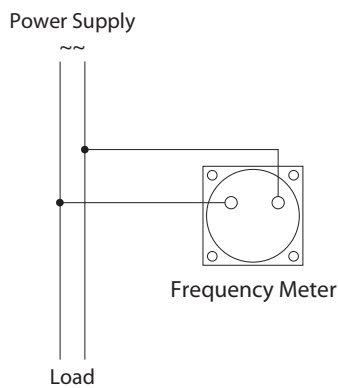


Panel Cutout

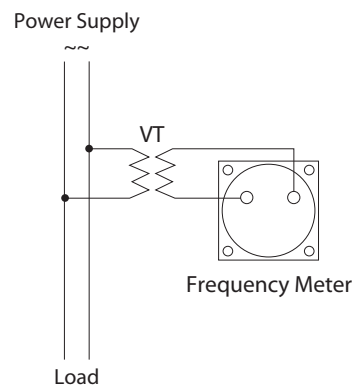


## Connection Diagram

Rated Voltage



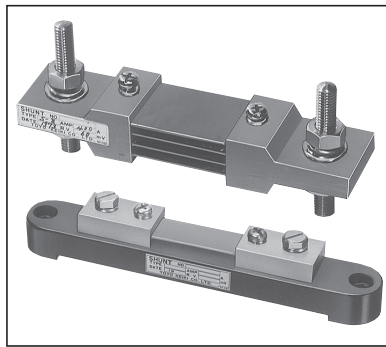
When Combined With a VT



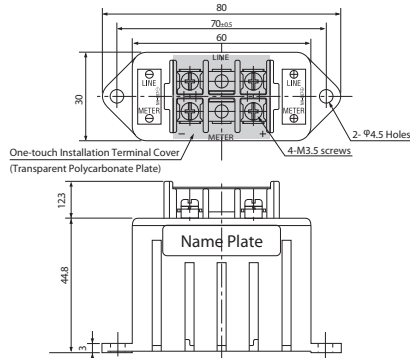


# Shunt Outside Dimensions

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

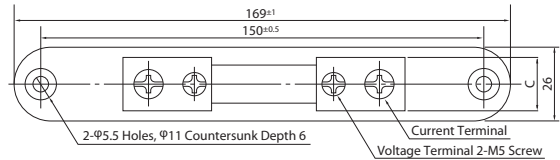


**Less than 5A to M-2A Model**  
Weight: Approx. 100g

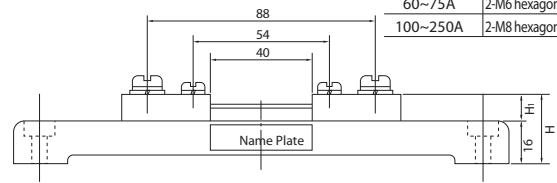


Rating	Shunt Model Name	Notes
Less than 5A	M-2A	Continuous rating 100%
5A to less than 50A	S-10A	
50A~250A	S-8A	Continuous rating 80%
300A~5000A	S-8	

**5 to Less than 50A S-10A Model**  
**50 to 250A S-8A Model**

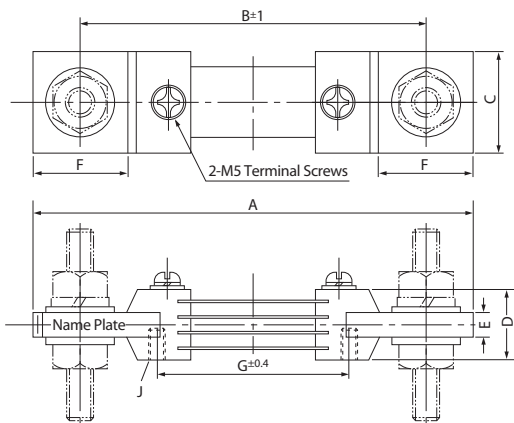


Current Rating	Current Terminal
5~50A	2-M6 pan head screws
60~75A	2-M6 hexagonal bolts
100~250A	2-M8 hexagonal bolts



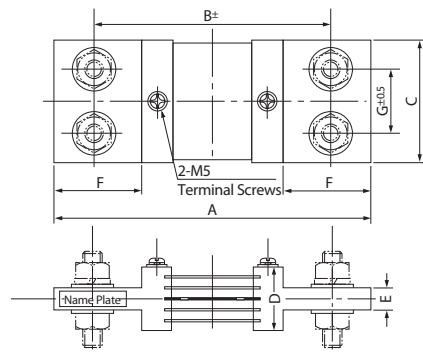
	H	H1	C	Weight
5~100A	26	10	20	Approx. 0.19kg
150A	31	15	22	Approx. 0.27kg
200~250A	33.5	17.5	22	Approx. 0.32kg

**300A to 750A S-8 Model**



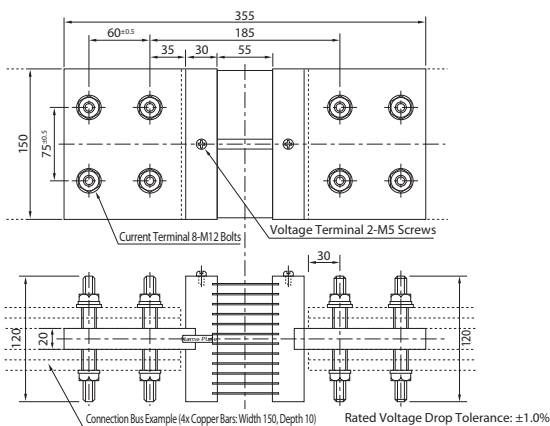
	A	B	C	D	E	F	G	J	Terminal Screws	Weight
300A	140	110	32	22	10	30	60	M5 Tapping	M 8 × 60	Approx. 0.5kg
400A	140	110	32	22	10	30	60	"	M 8 × 60	"
500A	165	125	46	30	12	40	67	M6 Tapping	M 12 × 60	Approx. 1kg
600A	165	125	46	30	12	40	67	"	M 12 × 60	"
750A	190	140	65	40	15	50			M 12 × 60	Approx. 2kg

**1000A to 3000A S-8 Model**

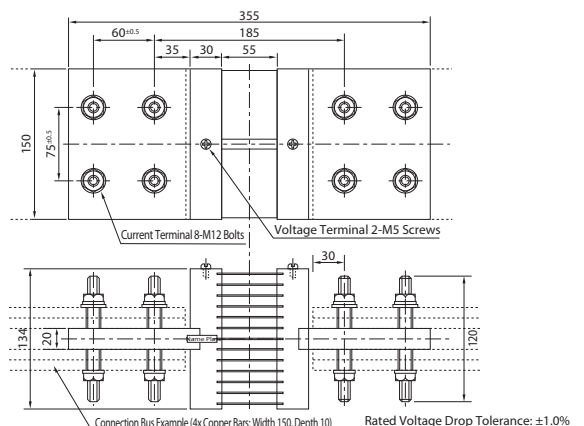


	A	B	C	D	E	F	G	Terminal Screws	Weight
1000A	200	150	75	40	15	55	40	M 12 × 60	Approx. 2.2kg
1500A	230	170	85	55	16	65	45	M 12 × 60	Approx. 4kg
2000A	230	170	110	55	16	65	60	M 12 × 60	Approx. 5kg
2500A	254	198	110	70	23	64	60	M12 × 90	Approx. 6.5kg
3000A	254	198	110	70	23	64	60	M 12 × 90	Approx. 8kg

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

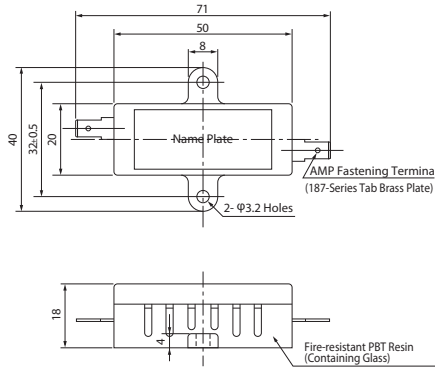


**5000A S-8 Model** Weight: Approx. 22kg

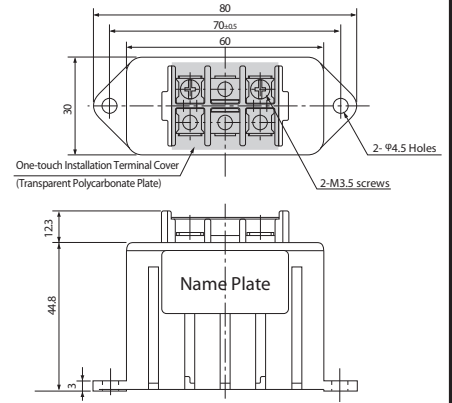


# Series Resistor Outside Dimensions

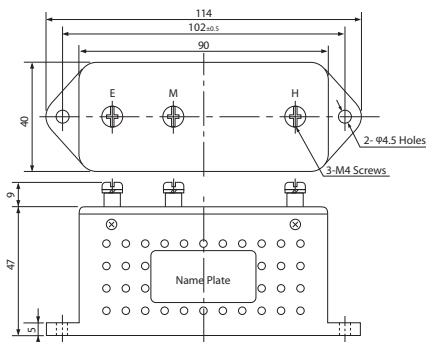
**M-1 Model**  
Weight: Approx. 20g



**M-2A Model**  
Weight: Approx. 100g

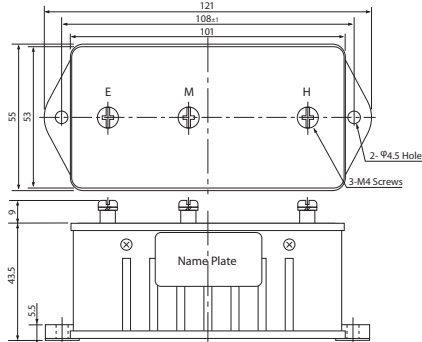


**M-2B Model**  
Weight: Approx. 0.15kg

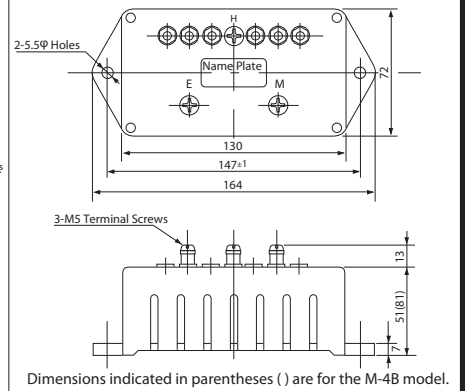


Note) There are 2 terminals on the M-2B, M-3 and M-4A series resistors for the moving-iron type AC voltmeters.

**M-3 Model**  
Weight: Approx. 0.15kg

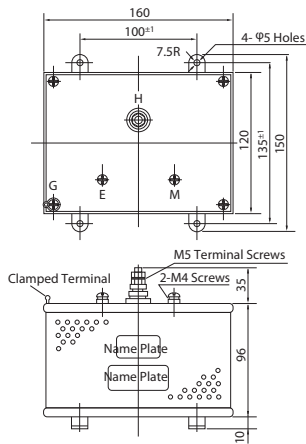


**M-4A Model (M-4B Model)**  
Weight: Approx. 0.3kg



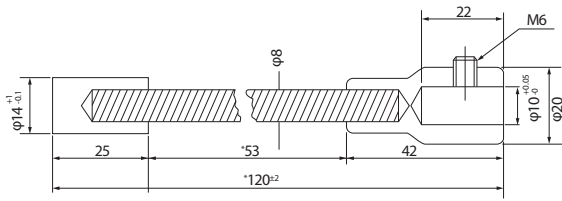
Dimensions indicated in parentheses ( ) are for the M-4B model.

**M-6 Model**  
Weight: Approx. 0.8kg



## Flexible Shaft Outside Dimensions (A)

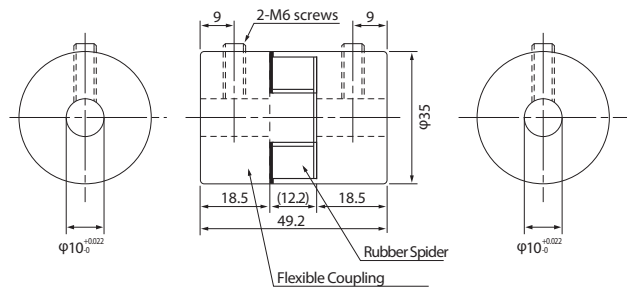
Compatible generators: TSH, TFH



Note) \*The marked dimensions are for the standard model.  
This product can also be manufactured in the specified dimensions.

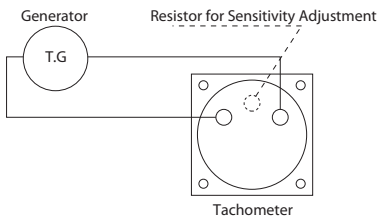
## Flexible Coupling Outside Dimensions (B)

Compatible generators: TSH, TFH

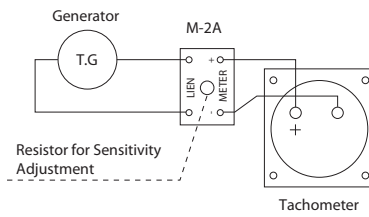


## Connection Diagram

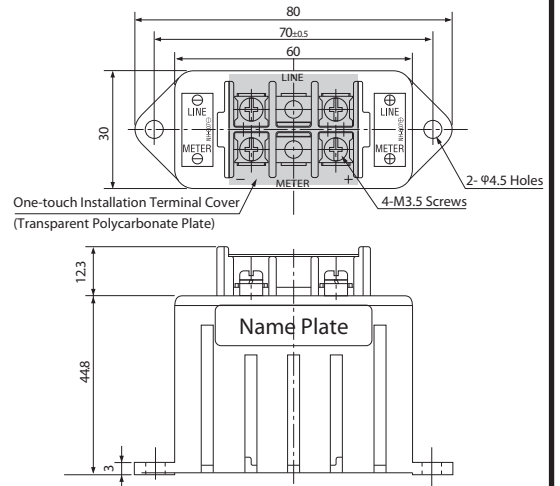
For a Built-in Series Resistor  
(CCF-6, 8, 10, 12N)



With M-2A Series Resistor  
(CCF-5)



Outside Dimensions of Accessory  
M-2A Series Resistor



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

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

### Using the Above Chart

- For 3P wattmeters, 3P4W wattmeters and 1P3W wattmeters, the measurement range values are displayed in the voltage ratios (VT ratio differences) and CT ratio differences indicated 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 above.
- 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.  
The scale is LEAD □ - 0 - LAG □ kvar.  
(E.g.) With VT: 3300/110V, CT: 100A/5A 3P Varmeter  
...LEAD 250 - 0 - LAG 250kvar or LEAD 300 - 0 - LAG 300kvar  
(500x1/2) (500x1/2) (600x1/2) (600x1/2)  
Note 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.
- 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)
- 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.

$$\text{Measurement Range} = \text{Intrinsic Power} \times \text{VT Ratio} \times \text{CT Ratio}$$

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 and 3P4W varmeters	1/2 (1 for varmeters with zero left meters)
1P Varmeter	1/4 (1/2 for zero left meters)

E.g. For a VT3300V/110V, CT: 60A/5A 3P wattmeter  
Measurement range = (667W, 833W, 1kW or 1.11kW) × 3300 / 110 × 60 / 5  
= 240kW, 300kW, 360kW or 400kW.

- 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)

[5] 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.

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

(E.g.) With VT: 440V/110V, CT: 60A/1A 1P Wattmeter

$$\text{Measurement Range Value} = \{(625\text{W}, 667\text{W}, 750\text{W}, 833\text{W or } 1\text{kW}) \times 1/10\} \times 440 / 110 \times 60 / 1$$

$$= 15\text{kW}, 16\text{kW}, 18\text{kW}, 20\text{kW or } 24\text{kW. Select } 15\text{kW or } 20\text{kW.}$$

## 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.

$$\text{Intrinsic Power Value (W)} = \frac{\text{Measurement Range Value (W)}}{\text{VT ratio} \times \text{CT ratio}}$$

Product Name	Rating	Production Range
1P Wattmeter, 1P Varmeter	110V 5A 220V 5A	300 ~ 625 W(var) 600 ~ 1250 (var)
3P Wattmeter, 3P varmeters 1P3W Wattmeter	110V 5A 220V 5A	500 ~ 1250 W(var) 1000 ~ 2500 W(var)
3P4W Wattmeter 3P4W Varmeter	110/√3A 5A 220/√3V 5A	500 ~ 1250 W(var) 1000 ~ 2500 W(var)

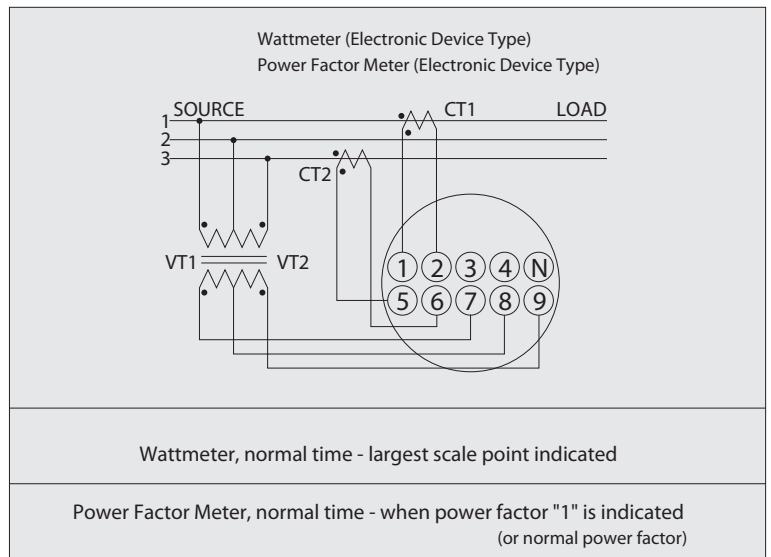
Note) The meter production range for using a CT of 1A for the secondary current is the value indicated on the left multiplied by 1/5.

## Wattmeter, Power Factor Meter Misconnection Types and Phenomena

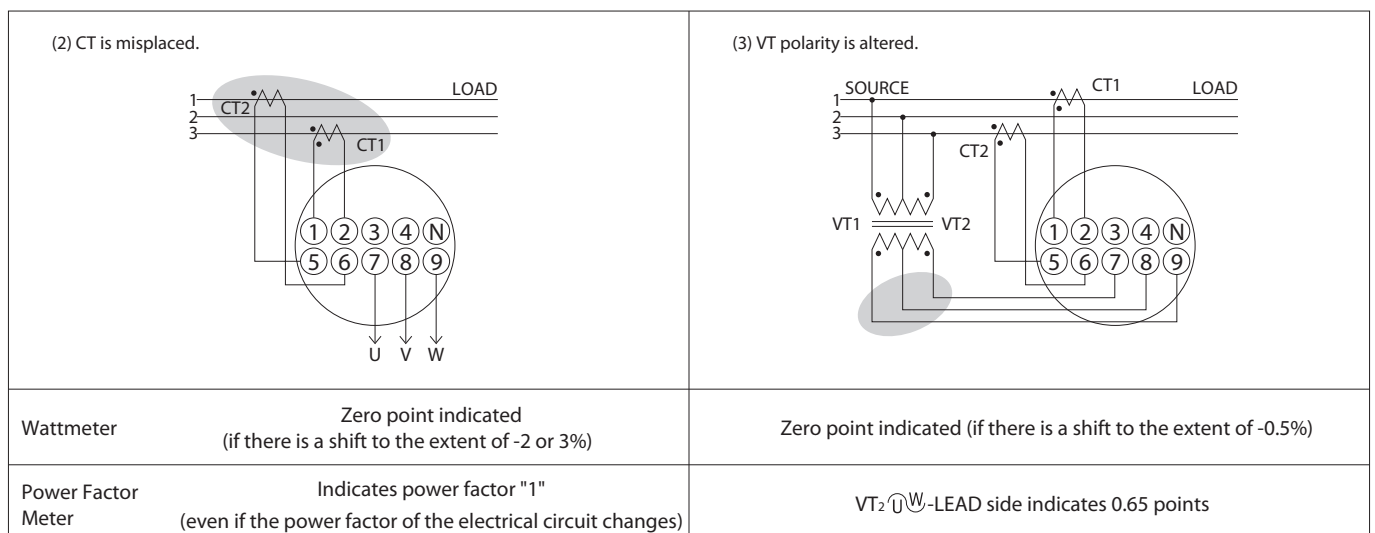
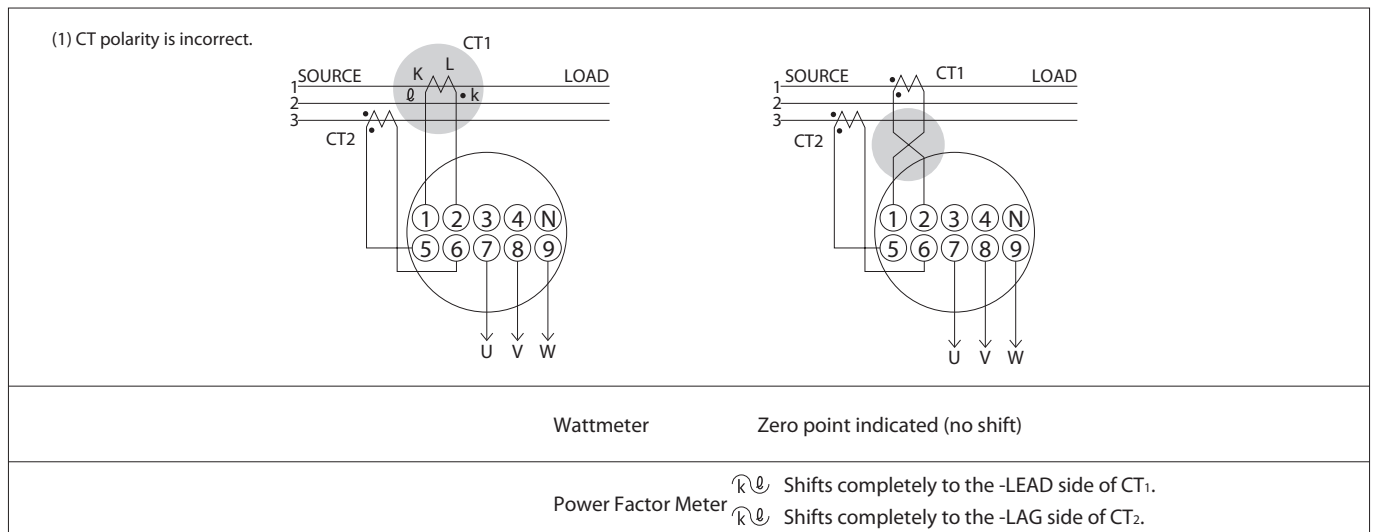
When using a measuring circuit with VT, CT for wattmeters, power factor meters, etc., a complete review will often show that a misconnection due to the location where installation is applied is often the cause of indicating meter failure. There is only one kind of correct connection, but there are many cases which result in misconnection. Reference the figures below for examples of particularly common examples of misconnection phenomena.

(Check the phase sequence first and set the correct phase sequence.)

### Correct connection



### Misconnection



## 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 instruments) 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.)

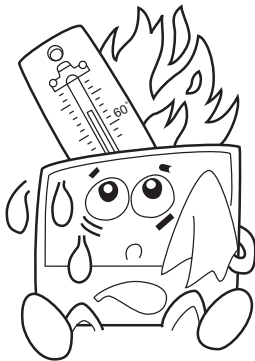
- In order to assess compatibility requirements for the security of panel attachments for meters, assessments are made assuming the user is standing in front of the attached panel. For this reason, the inside of installed panels (parts of distribution boards, etc.) are excluded from general maintenance 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.

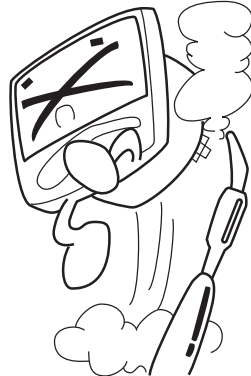
# Special Anti-electric Resin Applied to Cover

## ■ Precautions for Handling Meters

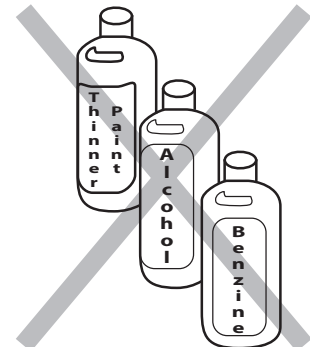
Be sure to note the following when handling, as the meters in the CF Series are made from new materials.



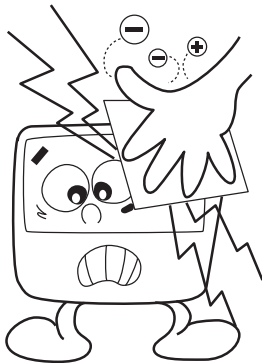
- Avoid high temperature locations (60°C or over) because the plastic cover and base of the meter are easily affected by heat.



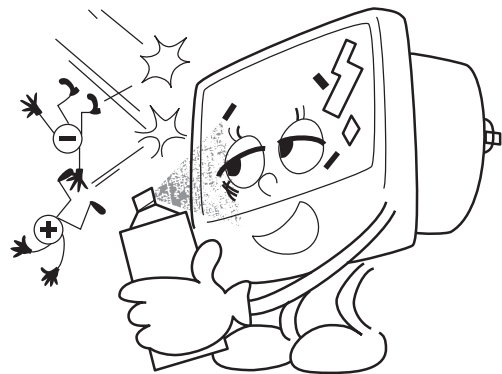
- Do not apply solder directly to meter terminals. Also, be sure not to solder the case when soldering connections.



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



- The following points apply to the special anti-electric resin that has been applied to 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, benzene or other such liquids that contain these chemicals to wipe the surface of the cover.
  - 3) Do not use polishing silicone, silicone cloth, or any other silicone-based cleaning agent to clean the surface of the cover.
  - 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 anti-static finish if the anti-static finish is no longer effective. If the anti-static finish 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)

## ■ 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: Specification required
2. Mounting posture
  - a. Vertical (⊥): Cannot be specified
  - b. Horizontal (→) Diagonal (∠): Specification required
3. Cover color
  1. Black: Cannot be specified
  - b. 7.5BG 4/1.5: 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
 

$\mu$ A	mA	A	V	kV	W
kW	MW	cos $\phi$	kvar	Hz	
rpm	m/min	kPa	etc.		
  - f. Color display (No. of colors, color band)
 

Only available in red, green and yellow.	]
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6. List of Results:
 

500 yen per set if required.  
Delivery specifications:  
1500 yen for up to 5 sets if required.  
300 yen for each additional set.

Joint inspection: Separate quote.
7. Others...
  - a. Change class
  - b. Special conditions such as temperature, humidity, atmosphere, vibration, etc.



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~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.

Please consult us about the compatibility of each product.

Products that comply with the RoHS directives are distinguished by a label containing the "Ro" mark.

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#### 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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