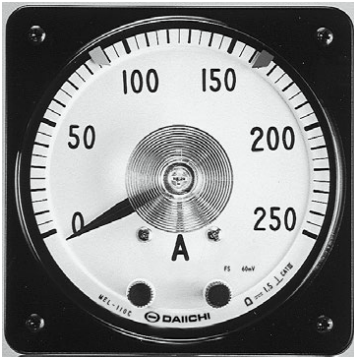


**PHOTOELECTRIC NON-CONTACT METER RELAY**

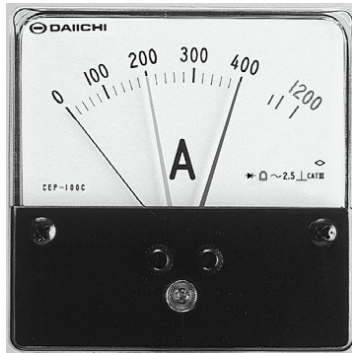
**EL / EP / EK / EF SERIES**

# PHOTOELECTRIC NON-CONTACT METER RELAY

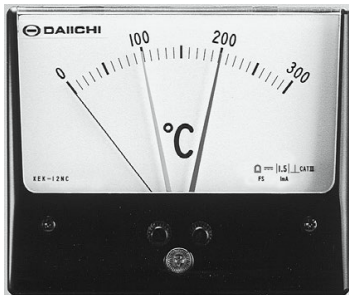
## EL / EP / EK / EF Series



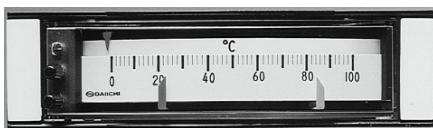
EL



EP



EK



EF

### EL / EP / EK / EF Series

- \* Meter relay is comprised of 2 parts: Indicator part for detection mechanism and relay part to control external circuit.
- \* Combination LED and phototransistor non-contact system is adopted in our meter relay for indicating mechanism, which is free from vibration and impulse from outside influence, because of no contact points and coherence in the passage of a pointer.
- \* Also selected high reliable parts for electronic circuit are adopted to ensure stable operation.
- \* This product can be used for wide application including abnormal alarm, abnormal detection and automatic control.

### FEATURES

- \* High quality and high performance meter.
- \* Varieties in outer dimension, designs and function for most suitable selection for your requirements.
- \* EF type, thin in thickness, detachable from panel and multiple units mountable in series.
- \* Meter relay with various protection circuit and compensation circuit can be manufactured for simplification of sequence circuit.
- \* Protective against surge caused from relay control power circuit and also preventive against damage by mis-wiring of polarity.
- \* All models provided with countermeasure against impulse noise.
- \* Product has been further improved and expanded by adopting transducer with electronics technology.
- \* Breaking capacity of output contact is AC200V/5A, DC30V/5A (resistance load). 2C contact for H and L side (EF type is 1C contact)

### PURPOSE

- \* Abnormal alarm, abnormal detection and automatic control of electrical control in various industries.
- \* Abnormal alarm, abnormal detection and automatic control of revolution, speed, temperature and pressure in rotating machines.

# PHOTOELECTRIC NON-CONTACT METER RELAY

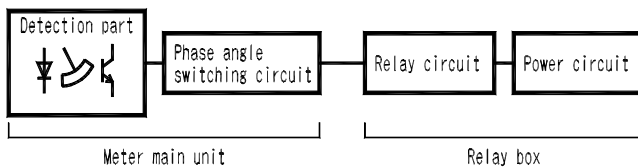
EL / EP / EK / EF Series

## OPERATING PRINCIPLE

Detection part is comprise of LED and phototransistor interlinking with setting pointer.

Phototransistor normally is ON because always received the light of LED. When screen come in between LED and phototransistor, LED light will be blocked and phototransistor become OFF.

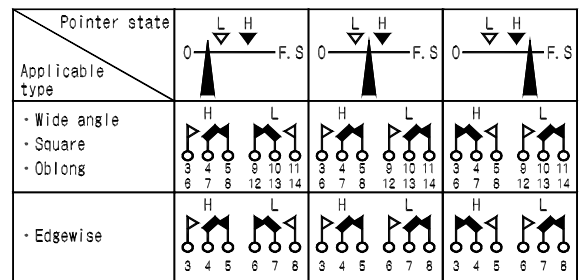
This change makes secondary relay ON & OFF through phase invert switching circuit.



## Contact Operation Principle

(Pointer Passing Type)

Sign	Method
H	Upper limit
L	Lower limit
HL	Upper / Lower limit



Note:

Wide angle, square, ablong meter relay is 2C contact. (only edge-wise meter relay is 1C contact.)

## EXAMPLE APPLICATION

### Example Application 1: Overload operation prevention circuit of motor.

Use meter relay: CEP-80C, H-Type AC current meter relay with starting current protection circuit and contact delay circuit (optional setting within 60 sec.)

Electromagnetic contactor is used for main circuit contactor MC and contact the start button switch to MC auxiliary contact 'a' (normal open) in paralell setting for selfsustaining.

If upper setting contact 'b' (normal close) of the meter relay as over current relay like Figure 1, series in front of the push button contact 'b' as over current relay, the contact 'b' will open when overloaded and enabling the motor stop running. In this case, use meter relay with contact delay circuit, it can prevent motor stop by instantaneous overload within setting time and can enhance operating rate. The starting current protecting circuit will protect the operation of the meter relay contact 'b', which may be affected by the starting current at the time of the moter start. Above-mentioned funtions can be embodied in 1 unit meter relay without adding timers, etc.

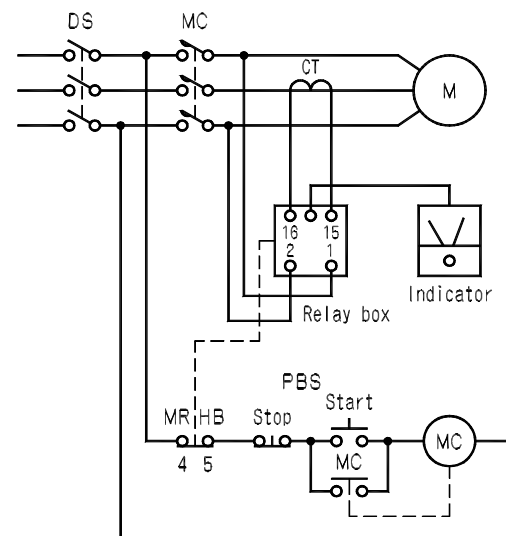


Figure 1

# PHOTOELECTRIC NON-CONTACT METER RELAY

## EL / EP / EK / EF Series

### Example Application 2: Control of emergency power accumulator charger.

Use meter relay: MEP-80C, HL-Type DC current meter relay with expanded scale.

Input, output of charge can be controlled by electromagnetic contactor MC. When battery voltage is low then lower limit setting value of meter relay, LM is closed and MC contacts and charging will be start. Self-perserving in parallel and MC auxiliary 'a' contact.

When battery voltage is above and beyond than upper limit setting value of meter relay, HB will open and self-perserving MC awake and stop charging. In this case, improve setting accuracy and control high accuracy can be performed by expanded scale of meter relay.

(Note: Voltage fluctuation range of meter relay control power must be definition.)

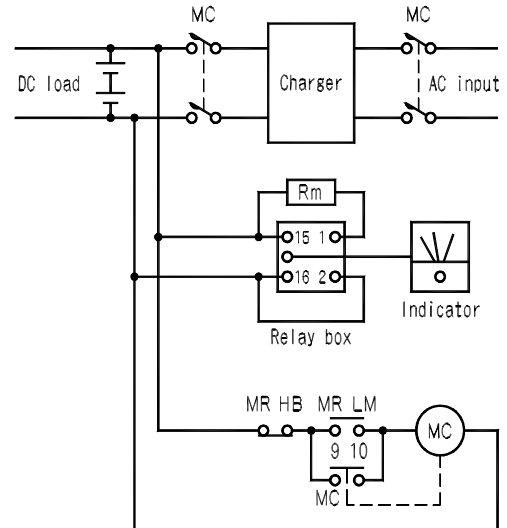


Figure 2

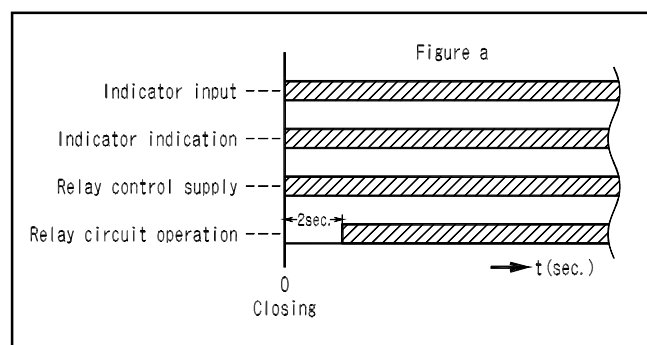
## EXPOSITION FOR:

### Various Protection and Compensation Circuit

#### 1) Secondary contact operation prevention circuit when power on (Standard Equipment)

All our models have fitted with delay circuit device which will function when power supply for the relay circuit is done with the time delay about 2 sec. from relay control power is on. This device will prevent the instantaneous operation of secondary contact, when the pointer of indicator meter passes the setting point at L side or passes through the point at H side. (refer to Figure a). After that, operation of secondary contact will become instantaneous reset. For configure the circuit of indicator input and relay control power

For normal operation of this circuit, the circuit must be configure with indicator input and relay control power ON-OFF simultaneously for operation this circuit in normally. (EL-110C is approx 4 sec.)



# PHOTOELECTRIC NON-CONTACT METER RELAY

## EL / EP / EK / EF Series

### 2) DC Power Surge Protection Circuit (Standard Equipment)

In case relay control power is DC, surge protection circuit is provided on all our models to prevent power surge influence. Please specify the fluctuation range when voltage variation is wide.

### 3) Prevention Circuit Damage by DC Power Incorrect Wiring (Standard Equipment)

All our DC power models is fitted with protection circuit, which will prevent damage from polarity incorrect wiring.

### 4) Contact Delay (Delay operation instantaneous reset) With circuit (Specify if Require)

This circuit is for secondary relay contact which will be operate at the time when input of indicator is exceeds a setting value and is being held continuously for more than the setting time. Time setter is contained in relay box and optional time setting within the range form 0 to 60 sec. is possible. Secondary relay contact will reset simultaneously when input of the indicator go up and down from the setting value. The model of the relay box is DM-63 for this circuit. Note: EL-110C, EP-120NC, EP-100NC, EK-12NC, EF-17, EF-15 can not be manufactured.

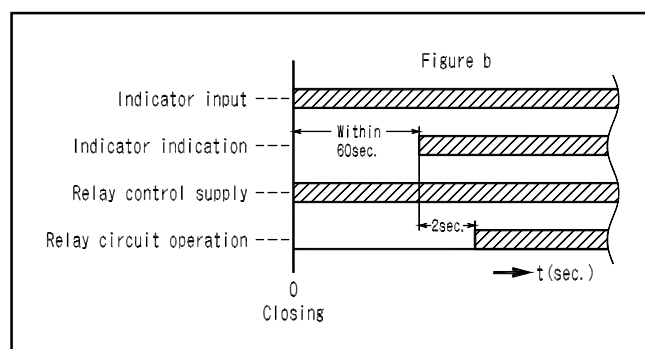
### 5) Protection Circuit for Overcurrent and Overvoltage (Specify if Require)

When input of the indicator supplied is more than twice of the max. scale value, this protection cuicuit overcurrent and overvoltage can be manufactured for protect instrument.

### 6) Starting Current Protection Circuit (Specify if Require)

This circuit is for protect the indicator from starting current and also prevention the operation of secondary contact as well. This circuit is composed with delay circuit and small sized relay.

Operation: when the setting time is delay after power meter relay control is ON (standard setting is within 60 sec. and set longer than duration time of the starting current), input of the indicator is supplied by meter, and after the pointer swings wobbling to normal position, power meter relay of the relay circuit is supplied approximately 2 sec. (Fig. b). Operation of secondary contact afterwards is instantaneous operation and instantaneous reset. Circuit must be configure in order with indicator input and power relay control will become simultaneously 'ON-OFF'. Model EP-120NC, EP-100NC, EK-12NC, EF-17, EF-15 can not be manufactured.



# PHOTOELECTRIC NON-CONTACT METER RELAY

## EL / EP / EK / EF Series

### 7) Relay Operation Control System (Specify if Require)

Standard type is H, L, and HL, but HH and LL type also can be manufactured if specify.

HH (2 steps of upper limit)

HH (2 steps of upper limit)

Pointer state			
Applicable type			
• Wide angle • Square • Oblong			
• Edgewise			

LL (2 steps of lower limit)

LL (2 steps of lower limit)

Pointer state			
Applicable type			
• Wide angle • Square • Oblong			
• Edgewise			

### 8) Approximate Effective (RMS) Value Rectification System (Specify if Require)

AC voltage and current meter relay are rectifier type and corrected in RMS value. Depend of operation principle, error is generated when there is distortion waveform as average value of indicator. To decrease this error, attached waveform compensation circuit can be manufactured by specify.

### 9) Partial Expansion Scale & Extended Scale Meter Circuit (Specify if Require)

Circuit to expand and reduce for indicator scale, the range expended is more that 20% of max. scale value and extended scale is upto 5 times of max. scale value can be manufactured.

### 10) Contact Self-holding Circuit (Specify if Require)

Only Model EP-120NC, EP-100NC, EK-12NC can be manufactured. Even pointer reach to upper limit or lower limit setting value, secondary relay and self-holding circuit will be operate, pointer will continued to self-hold when pointer is beyond setting range afterwards. Self-holding will be release by short circuit between reset terminal (HR, LR) and common (C). Or, constant short circuit between reset terminal and common, self-holding circuit will be released and instantaneous return will be operate.

# PHOTOELECTRIC NON-CONTACT METER RELAY

## EL / EP / EK / EF Series

### ACCESSORY

Model EP and EK type meter relay: Meter and relay box are connected by special cable (1m).

Connect intermediate cable to special cable (1m) when special cable is shot.

3 type of intermediate cable is 1.5m, 4m and 9m.

For model EL type, EP-120NC, EP-100NC, EK-12NC & EF-17, cable is not necessary because that is an integral part of meter and relay.

### CAUTIONS WHEN USE EL-110 METER RELAY

#### 1) Application of Power

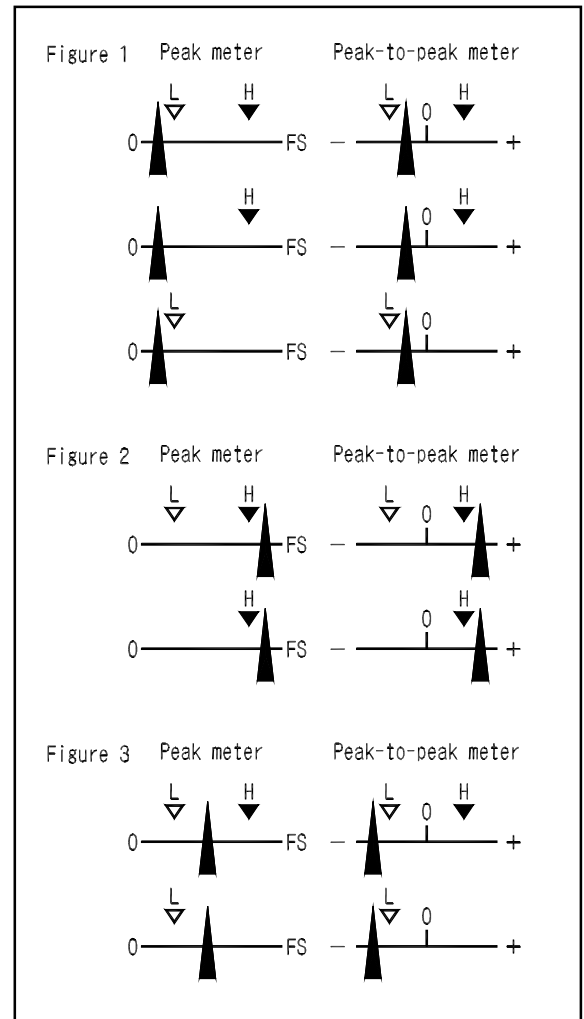
\* ON the relay control power when indicator is like positioned as figure 1. When indicator is done simultaneously with the power ON, because of secondary contact working prevention circuit attaching, there is no miss work which may occur at the time the indicator meter passes the L-setting. Use switch to ON the power. Miss work will occur when SLIDAC is work.

\* When ON the relay control power indicator like positioned as figure 2, because of H-side relay in peak is not operate and reset it by putting H-setting index on indicator. If L-side is no operate reset it by putting L-setting index on indicator. When H-side relay peak-to-peak indicator is not operate, reset it by putting only H-setting index on indicator.

\* When ON the relay control power indicator like positioned as figure 3, because of L-side relay in peak operate and L-side relay peak-to-peak is not operate so reset it by putting the L-setting index on indicator.

#### 2) ON-OFF Interval of Relay Control Power

The interval must be more than 1sec of relay control power. The interval less than 1sec, that will become miss work.

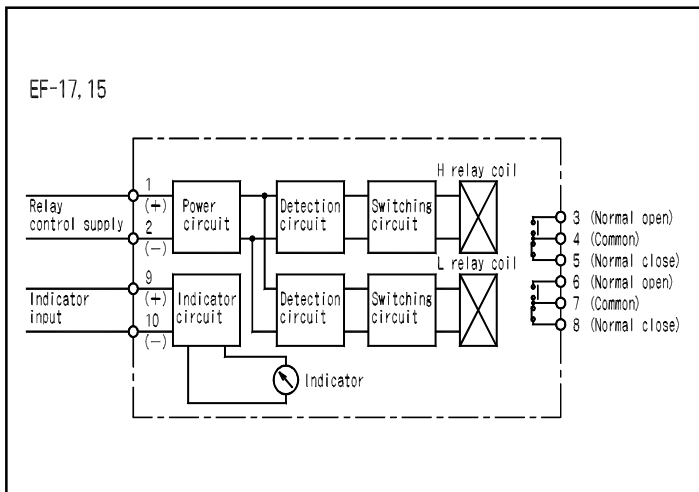
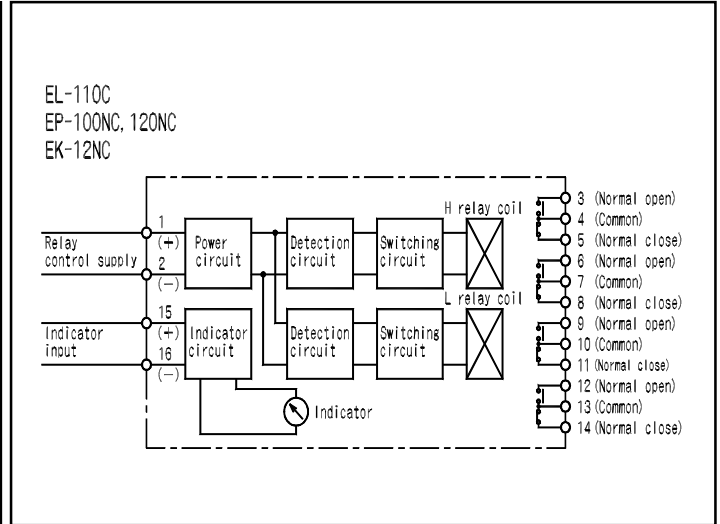
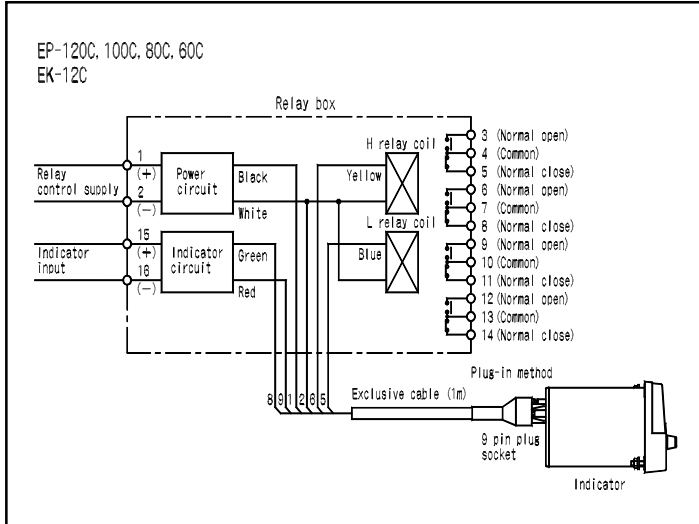


# PHOTOELECTRIC NON-CONTACT METER RELAY

## EL / EP / EK / EF Series

### METER RELAY CIRCUIT DIAGRAM

\* Contact constitution before control power sourcing of the relay is as same as below figure.



\* Secondary Relay Terminal List By Control System

Series		EL / FP / EK					EF				
Terminal No.		HL	HH	LL	H	L	HL	HH	LL	H	L
3	M1	H	H 2	L 1	H	/	H	H 2	L 1	H	/
4	C1										
5	B1										
6	M2	H	H 2	L 1	H	/	L	H 1	L 2	/	L
7	C2										
8	B2										
9	M1	L	H 1	L 2	/	L	/	/	/	/	/
10	C1										
11	B1										
12	M2	L	H 1	L 2	/	L	/	/	/	/	/
13	C2										
14	B2										



# PHOTOELECTRIC NON-CONTACT METER RELAY

## EL / EP / EK / EF Series

### TYPE CODE DESIGNATION

#### ① For Wide Angle, Square, Oblong Meter Relay

(1) (2) (3) (4) (5) (6) (7) (8)  
 E  -  C  -  -

#### ② For Edge Wise Meter Relay

(1) (2) (3) (8) (7) (6)  
 EF -  -  -

#### (1) Type of Measurand

Mark	Measurand	Operation Principle
M	DC current, voltage	Permanent magnet moving coil
X	DC receiving indicator	Permanent magnet moving coil
Y	AC receiving indicator	Rectifier type
C	AC current, voltage	Rectifier type/ RMS value rectifier type
W	AC power <sup>(2)</sup>	Transducer type
WVB	Reactive power (balanced) <sup>(2)</sup>	Transducer type
WV	Reactive power (unbalanced) <sup>(2)</sup>	Transducer type
PB	Power factor (balanced) <sup>(2)</sup>	Rectifier type
P	Power factor (unbalanced) <sup>(2)</sup>	Transducer type
A	Frequency	Transducer type

#### (2) Series Name

Mark	Series Name
L	Wide Angle Meter Relay
P	Square Meter Relay
K	Oblong Meter Relay
F	Edge-wise Meter Relay

#### (5) Waveform Compensation Circuit <sup>(1)</sup>

Mark	Waveform Compensation Circuit
E	Approx. RMS value rectifier system

#### (3) Shape

Mark	Shape	
110	Wide angle meter	110 × 110
120	Square meter	120 × 120
100		100 × 100
80		80 × 80
60		60 × 60
12	Oblong meter	120 × 100
17	Edge-wise meter	170 × 40
15		150 × 40

#### (6) Contact

Mark	Contact
H	Upper limit set
L	Lower limit set
HL	Upper & lower limit set
HH	Upper limit set × 2
LL	Lower limit set × 2

#### (7) Type of Circuit <sup>(2)</sup>

Mark	Circuit
12	Single phase
13	Single phase 3 wire
33	3 phase 3 wire
34	3 phase 4 wire

#### (4) Structure

Mark	Structure
N	Relay Integral Type <input type="checkbox"/> EP-120NC <input type="checkbox"/> EP-100NC <input type="checkbox"/> EK-12NC

#### (8) Meter Mounting Direction <sup>(3)</sup>

Mark	Mounting Direction
1T	Vertically mounting
1Y	Horizontally mounting

Note:

<sup>(1)</sup> Please specify this for CEP, CEK waveform compensation.

For voltmeter, not need specify this (5) and VT-62ME will be external.

<sup>(2)</sup> Please specify type of circuit for power, reactive power & power factor meter.

<sup>(3)</sup> Please specify this for edge-wire type.

# PHOTOELECTRIC NON-CONTACT METER RELAY

## EL SERIES

### EL SERIES LIST

Item	Operating Principle	Type	Class	Max. scale value/ rated value	Internal resistance / Voltage fall / Current consumption / Consumption VA		Accessory Transducer	Diagram	Note	
DC Current	Permanent Magnet Moving Coil Type	MEL-110C	1.5	200 $\mu$ A	2500 $\Omega$		-	C-1	-	
				1mA	400 $\Omega$					
				5mA	730 $\Omega$					
				10mA	7.3 $\Omega$					
				20mA	3 $\Omega$					
				20~750mA	60mV					
				1A~10kA	60mV		Shunt			
DC Voltage	Permanent Magnet Moving Coil Type	MEL-110C	1.5	60~900mV	5mA		-	C-2	-	
				1~600V	1mA					
				750~25kV	1mA					
							Series resistor			
DC Receiving meter	Permanent Magnet Moving Coil Type	XEL-110C	1.5	1mA	400 $\Omega$		-	C-1 C-2	-	
				4~20mA	5.4 $\Omega$					
				1~300V	1mA					
AC Current	Rectifier Type	CEL-110C	1.5	10~300mA	1VA or less		-	C-3	-	
				0.35~100A	1VA					
							MR-CTN			
AC Voltage	Rectifier Type	CEL-110C	1.5	3~600V	1mA		-	C-4	-	
				750V~25kV	1mA					
							Series resistor			
AC Receiving meter	Rectifier Type	YEL-110C	1.5	1mA	1300 $\Omega$		-	C-3 C-4	-	
				3~300V	1mA					
Watt Meter	single phase	Transducer Type	WEL-110C-12	1.5	110V, 5A 220V, 5A	voltage 2VA voltage 3.5VA	current 1VA current 1VA	WT-62M-12	C-8	* Refer to accessory transducer outline drawing page. * Refer to meter manufacturing limit and max. scale value page.
	single phase 3 wire		WEL-110C-13	1.5	110V, 5A	voltage each phase 2VA	current each phase 1VA	WT-83M-13	C-5	
	3 phase		WEL-110C-33	1.5	110V, 5A 220V, 5A	voltage each phase 2VA voltage each phase 3.5VA	current each phase 1VA current each phase 1VA	WT-83M-33	C-5	
	3 phase 4 wire		WEL-110C-34	1.5	110/ $\sqrt{3}$ V, 5A 220/ $\sqrt{3}$ V, 5A	voltage each phase 1.5VA voltage each phase 3VA	"	WT-83M-34	C-6	
Var Meter	single phase	Transducer Type	WVVEL-110C-12	1.5	110V, 5A 220V, 5A	voltage each phase 3.5VA voltage each phase 3.5VA	current each phase 1.5VA current each phase 1.5VA	* WVT-62M-12	C-8	* Specify frequency (50/60Hz). * Scale: Lead $\square$ var-0~Lag $\square$ var * Refer to accessory transducer outline drawing page. * Refer to meter manufacturing limit & max. scale value.
	3 phase (balanced)		WVBEL-110C-33	1.5	110V, 5A 220V, 5A	voltage each phase 3.5VA voltage each phase 3.5VA	current each phase 1.5VA current each phase 1.5VA	WVBT-83M-33	C-5	
	3 phase (unbalanced)		WVVEL-110C-33	1.5	110V, 5A 220V, 5A	"	"	* WVT-83M-33	C-5	
	3 phase 4-wire		WVVEL-110C-34	1.5	110V, 5A 220V, 5A	"	"	WVT-83M-34	C-7	
Power Factor Meter	single phase	Rectifier Type	PEL-110C-12	5.0	110V, 5A 220V, 5A	voltage 1VA voltage 2VA	current 1VA current 1VA	* PT-62M-12	C-8	* Specify frequency (50/60Hz). * Scale: Lead 0.5~1~Lag 0.5. * Refer to accessory transducer outline drawing page.
	3 phase (balanced)		PBEL-110C-33		110V, 5A 220V, 5A	voltage each phase 1VA voltage each phase 2VA	current each phase 1VA current each phase 1VA	PBT-62M-33	C-9	
	3 phase (unbalanced)	Transducer Type	PEL-110C-33		"	"	"	* PT-63M-33	C-10	
	3 phase 4-wire (balanced)	Rectifier Type	PBEL-110C-34		110V, 5A 220V, 5A	"	"	PBT-62M-34	C-11	
	3 phase 4-wire (unbalanced)	Transducer Type	PEL-110C-34		110V, 5A 220V, 5A	"	"	* PT-64M-34	C-12	
Frequency	Transducer Type	AEL-110C	1.0	110V 220V	45~55Hz 55~65Hz 45~65Hz 350~450Hz	For 110V, 1.7VA For 220V, 2.5VA	FT-62M	C-13	-	

# PHOTOELECTRIC NON-CONTACT METER RELAY

## EL SERIES

### COMMON STANDARD SPECIFICATION

Item	Specification	
Class	Refer to [EL series list]	
Support System	Pivot system	
Meter deflection angle	230°	
Dimensions meter from front	110 × 110mm	
Scale length	172mm	
Scale plate	White paint	
Pointer	Lance (black)	
Meter mounting position	Vertical (⊥)	
Material panel	Iron plate or non-iron plate	
Mounting panel thickness	10mm or less	
Type according to output signal	Continuance output type	
Pointer moving range	Passing full scale type	
Setting range	Full scale	
Tolerance of pick up value	±1.0% of scale length	
Dead band	1.0% of scale length	
Min. setting width	3% of scale length	
Relay operation control system	H (upper limit) , L (lower limit), HL (upper and lower limit)	
Setting index	Triangle type, H : red, L : yellow	
Relay control power	AC 110V, 220V (4.5VA) +10% -15% (50/ 60Hz) DC 24V (2.5W), 48V (5W), 110V (12W) ±15%	
Contact configuration	2C contact for HL	
Contact capacity	AC 200V, 5A (resistance load) DC 30V, 5A (resistance load)	
Color of cover	Dark blue: (Munsell 7.5BG4/1.5) Black: (Munsell N 1.5)	
Material of case	Cover: Methacrylic acid resin molding (Antistatic prevention treatment) Base: Flame-retarded ABS resin	
Insulation resistance	Between electric circuit and outer case	DC 500V, 50MΩ or more
Voltage test	Between electric circuit and outer case	AC 3320V, between 5sec.
Safety requirements	Standard	JISC 1010-1
	Insulation	Between electric circuit and outer case: Base of insulation
	Use	For indoor use (Cubicle etc.)
	High altitude	2000m or less
	Pollution	Pollution level 2
	Measure category	CAT III
	Max. circuit voltage	600V (Am meter)
Operation temperature/ humidity range	-10~55°C, Average day temperature is 40°C or less, 25~85% RH	
Storage temperature range	-20~70°C	

# PHOTOELECTRIC NON-CONTACT METER RELAY

EL

## COMMON SPECIAL SPECIFICATIONS

Item		Specification
Scale	Extend scale	CEL: 2~5-time extend (Please specify)
	Color line	Red, Green, Yellow (Please specify)
	Color area (bar)	Red, Green, Yellow (Please specify)
	Double scale	Please specify
	Double seal	Please specify
	Max. scale section	110 angle : 100 sections
	Special scale	Please specify
Indicator manufacturing limit		DC200 $\mu$ A, DC60mV
DC relay control power		DC50V up to 350V (specify for variation range).
Relay operation control system		HH (upper limit 2 steps) ; LL (lower limit 2 steps)
Start current protection circuit		Variable or Fixed within 0~60 sec.
Mounting panel thickness		Above 12mm auxiliary fixture is required.
Tropical specification		Rust preventative, 「FOR TROPICS」 will display at the name plate.
Pointer		Stick-type (multiple scale)
Meter mounting position		Horizontal, inclination installation (angle specified)
Flame-retarded material		Cover Polycarbonate resin
Protection circuit of meter	Overcurrent	Specify for necessary tolerated dose.
	Overvoltage	Specify for necessary tolerated dose.
Extended part of scale	Voltmeter	$\pm 10\%$ , $\pm 20\%$ , $\pm 30\%$ of central scale value 75% or more of scale length
		up to 20% of upper limit value of effective measuring range. 95% or more of scale length.
	Am meter	up to 50% of upper limit value of effective measuring range. 75% or more of scale length.
For RMS value rectifier type		AC Current, AC Voltage
For SCR control waves use		AC Current, AC Voltage, Frequency
Test report		Specify the useful frequency and copies of test report require.
Color of cover		Please specify
Terminal cover		Please specify
Others		Please consultation with us when special frequency is necessary.

## STANDARD SCALE SECTION

Max. Scale Value (10 times)	1	1.5	2	2.5	3	4	5	6	7.5	8	9
EL	50	30	40	50	30	40	50	30	37.5	40	45

# PHOTOELECTRIC NON-CONTACT METER RELAY

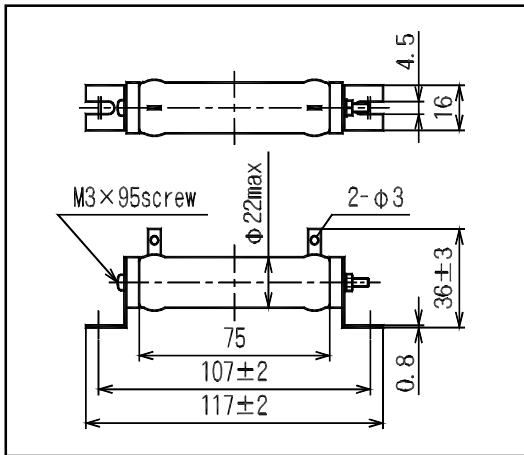
EL

## EXTERNAL SERIES RESISTOR (DC Control Power)

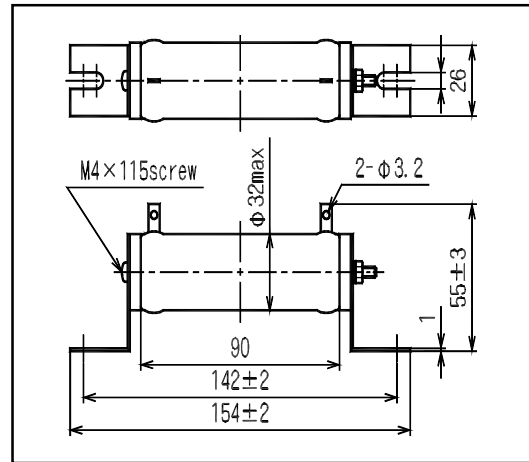
Rated Value	Series Resistor	Note
DC 48V	CRH 30G	
DC110V	CRH 60G	

### Outline Drawing

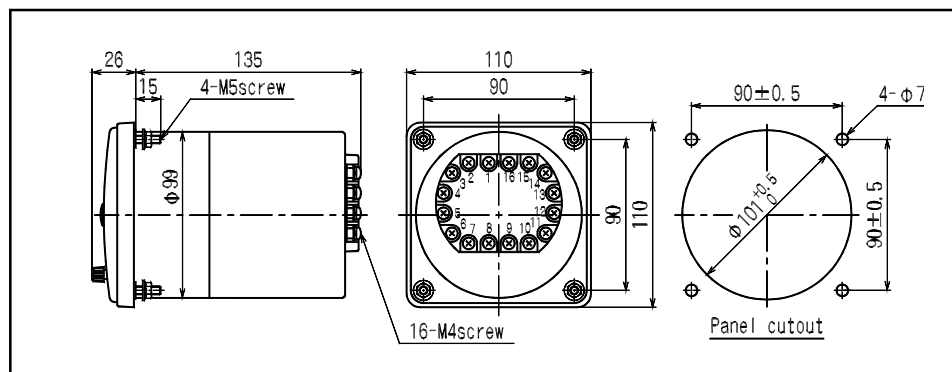
\* CRH 30G (For DC48V)



\* CRH 60G (For DC110V)



### Outline Drawing



# PHOTOELECTRIC NON-CONTACT METER RELAY

EP

## EP SERIES LIST

\* Use relay box DM-61 for type EP-120C, 100C, 80C and 60C. Specify DM-63 from special specification.

\* Relay box for type EP-120NC and 100NC is integral type.

Item	Operating Principle	Type	Max. scale value/ rated value	Internal resistance, Voltage fall, Current consumption, Consumption VA	Accessory Transducer	Diagram	Note	
DC Current	Permanent Magnet Moving Coil Type	MEP-120NC, 100NC, 120C, 100C, 80C, 60C	100μA	1500Ω	-	C-1	*MEP-120NC, 100NC: External with shunt when 750mA exceeded.	
			1mA	90Ω				
			5mA	20Ω				
			20mA	3Ω				
			30mA~30A	60mV				
			30A~10kA	60mV	Shunt		50mV, 100mV can manufactured	
DC Voltage	Permanent Magnet Moving Coil Type	MEP-120NC, 100NC, 120C, 100C, 80C, 60C	50~900mV	4.5mA	-	C-2	-	
			1~600V	1mA				
			750V~25kV	1mA				Series resistor
DC Receiving Indicator	Permanent Magnet Moving Coil Type	XEP-120NC, 100NC, 120C, 100C, 80C, 60C	1mA	90Ω	-	C-1 C-2	-	
			4~20mA	2.1Ω				
			1~300V	1mA				
AC Current	Rectifier Type	CEP-120NC, 100NC, 120C, 100C, 80C, 60C	10mA~15A	1VA or less	-	C-3	*CEP-120NC, 100NC: External MR-CTN when 350mA exceeded. *CEP-120C, 100C, 80C, 60C: External MR-CTN when 15A exceeded.	
			20~100A	1VA				MR-CTN
AC Current	Transducer Type	CEP-120CE, 100CE, 80CE, 60CE	10mA~15A	1VA or less	-	C-3		
			20~100A					MR-CTN
AC Voltage	Rectifier Type	CEP-120NC, 100NC, 120C, 100C, 80C, 60C	3~600V	1mA	-	C-4	-	
			750V~25kV	1mA				Series resistor
AC Voltage	Transducer Type	CTEP-120NC, 100NC, 120C, 100C, 80C, 60C	50~300V	1VA	VT-62ME	C-16	-	
AC Receiving Indicator	Rectifier Type	YEP-120NC, 100NC, 120C, 100C, 80C, 60C	1mA	1300Ω	-	C-3 C-4	-	
			3~300V	1mA				
Watt Meter	single phase	Transducer Type	WEP-120NC, 100NC, 120C, 100C, 80C, 60C-12	110V, 5A 220V, 5A	Voltage 2VA Voltage 3.5VA	Current 1VA Current 1VA	WT-62M-12	* Refer to accessory transducer outline drawing. * Refer to meter manufacturing limit and max. scale value.
	single phase 3 wire		WEP-120NC, 100NC, 120C, 100C, 80C, 60C-13	110V, 5A	Voltage each phase 2VA	Current each phase 1VA	WT-83M-13	
	3 phase		WEP-120NC, 100NC, 120C, 100C, 80C, 60C-33	110V, 5A 220V, 5A	Voltage each phase 2VA Voltage each phase 3.5VA	Current each phase 1VA Current each phase 1VA	WT-83M-33	
	3 phase 4 wire		WEP-120NC, 100NC, 120C, 100C, 80C, 60C-34	110/√3V, 5A 220/√3V, 5A	Voltage each phase 1.5VA Voltage each phase 3VA	"	WT-83M-34	
Var Meter	single phase	Transducer Type	WVEP-120NC, 100NC, 120C, 100C, 80C, 60C-12	110V, 5A 220V, 5A	Voltage each phase 3.5VA Voltage each phase 3.5VA	Current each phase 1.5VA Current each phase 1.5VA	* WVT-62M-12	* Specify frequency (50 or 60Hz). * Scale: Lead□var-0~Lag□var. * Refer to accessory transducer outline drawing. * Refer to meter manufacturing limit, max. scale value.
	3 phase (balanced)		WVBEP-120NC, 100NC, 120C, 100C, 80C, 60C-33	110V, 5A 220V, 5A	Voltage each phase 3.5VA Voltage each phase 3.5VA	Current each phase 1.5VA Current each phase 1.5VA	WVBT-83M-33	
	3 phase (unbalanced)		WVEP-120NC, 100NC, 120C, 100C, 80C, 60C-33	110V, 5A 220V, 5A	"	"	* WVT-83M-33	
	3 phase 4 wire		WVEP-120NC, 100NC, 120C, 100C, 80C, 60C-34	110V, 5A 220V, 5A	"	"	WVT-83M-34	
Power Factor Meter	single phase	Rectifier Type	PEP-120NC, 100NC, 120C, 100C, 80C, 60C-12	110V, 5A 220V, 5A	Voltage 1VA Voltage 2VA	Current 1VA Current 1VA	* PT-62M-12	* Specify frequency (50 or 60Hz). * Scale: Lead 0.5~1~Lag 0.5. * Refer to accessory transducer outline drawing.
	3 phase (balanced)		PBEP-120NC, 100NC, 120C, 100C, 80C, 60C-33	110V, 5A 220V, 5A	Voltage each phase 1VA Voltage each phase 2VA	Current each phase 1VA Current each phase 1VA	PBT-62M-33	
	3 phase (unbalanced)	Transducer Type	PEP-120NC, 100NC, 120C, 100C, 80C, 60C-33	110V, 5A 220V, 5A	"	"	* PT-63M-33	
	3 phase 4 wire (balanced)	Rectifier Type	PBEP-120NC, 100NC, 120C, 100C, 80C, 60C-34	110V, 5A 220V, 5A	"	"	PBT-62M-34	
	3 phase 4 wire (unbalanced)	Transducer Type	PEP-120NC, 100NC, 120C, 100C, 80C, 60C-34	110V, 5A 220V, 5A	"	"	* PT-64M-34	
Frequency	Transducer Type	AEP-120NC, 100NC, 120C, 100C, 80C, 60C	110V or 220V	45~55Hz 55~65Hz 45~65Hz 350~450Hz	For 110V, 1.7VA For 220V, 2.5VA	AEP-120NC, 100NC: FT-62M	C-13	* AEP-60C, 80C, 100C, 120C (external with DM-61) starting current protection circuit will external with FT-62M

# PHOTOELECTRIC NON-CONTACT METER RELAY

EP

## COMMON STANDARD SPECIFICATION

Item	Specification	
Class	EP-120: 1.5 class (Thermometer: 1.0 class) EP-100, 80, 60: 2.5 class (Thermometer: 2.0 class) Frequency Meter: 1.0 class, Power Factor Meter: 5.0 class	
Support System	Pivot system	
Meter deflection angle	75°	
Dimension meter from front	EP-120C: 120 × 120mm, EP-100C: 100 × 100mm EP-80C: 80 × 80mm, EP-60C: 60 × 60mm	
Scale length	EP-120C: 82.5mm, EP-100C: 70.5mm, EP-80C: 52mm, EP-60C: 38mm	
Scale plate	White paint	
Pointer	Stick-type (black)	
Meter mounting position	Vertical (⊥)	
Material panel	Iron plate or non-iron plate	
Mounting panel thickness	10mm or less (PK-80C, PK-60C: 6mm or less)	
Length of special cable (integral type excluded)	1m	
Type according to output signal	Continuance output type	
Pointer moving range	Passing full scale type	
Setting range	Full scale	
Tolerance of pick up value	±1.0% of scale length (1.5 class), ±2.0% (2.5 class)	
Dead band	0.5% of scale length	
Min. setting width	3% of scale length	
Relay operation control system	H (upper limit), L (lower limit), HL (upper and lower limit)	
Setting index	Lance type, H: red L: yellow	
Relay control power	AC110V, 220V (2VA): +10% -15% (50/60Hz) DC24V (2.5W), 48V (5W), 110V (12W) ±15%	
Contact configuration	2C contact for HL	
Contact capacity	AC200V, 5A (resistance load) DC30V, 5A (resistance load)	
Color of cover	Dark blue: (Munsell 7.5BG 4/ 1.5) Black: (Munsell N1.5)	
Material of cover	Methacrylic acid resin (anti-static treatment)	
Material of base	Phenol resin (EP-N: Flame-retarded ABS resin)	
Insulation resistance	Between electric circuit and outer case	DC500V, 50MΩ or more
Voltage test	Between electric circuit and outer case	AC2230V, between 5sec.
Safety requiment	Standard	JISC 1010-1
	Insulation	Between electric circuit and outer case: Base of insulation
	Use	For indoor use (Cubicle etc.)
	High altitude	2000m or less
	Pollution	Pollution level 2
	Measure Category	CATⅢ
	Max. circuit voltage	600V (Ammeter)
Operation temperature / Humidity range	-10~55℃, Average day temperature is 40℃ or less, 25~85% RH	
Storage temperature range	-20~70℃	

# PHOTOELECTRIC NON-CONTACT METER RELAY

EP

## COMMON SPECIAL SPECIFICATION

Item		Specification
Scale	Extend scale	CEP: 2~5-time extend (Please specify)
	Color line	Red, Green, Yellow (Please specify)
	Color area (bar)	Red, Green, Yellow (Please specify)
	Double scale	Please specify
	Double seal	Please specify
	Max. scale section	120 angle: 100 section, 100 angle: 75 section, 80 angle: 62.5 section, 60 angle: 50 section
	Special scale	Please specify
Indicator manufacturing limit		DC50 $\mu$ A, DC15mV
DC relay control power		DC50V up to 350V (specify for variation range).
Relay operation control system		HH (upper limit 2 steps) ; LL (lower limit 2 steps)
Total length of dedicated cable		2.5m, 5m, 10m (Junction cable use)
Start current protection circuit		Variable or Fixed within 0~60 sec. Except: EP-120NC, 100NC
Contact delay circuit		Variable or Fixed within 0~60 sec. (Relay box: DM-63) Except: EP-120NC, 100NC
Mounting panel thickness		Above 12mm auxiliary fixture is required.
Tropical specification		Rust preventative, 「FOR TROPICS」 will display at the name plate.
Pointer		Knife-edge (Red), Stick-type (Black), combine use with multiple scale etc.
Meter mounting position		Horizontal, inclination installation (angle specified)
Flame-retarded material		Cover Polycarbonate resin
Protection circuit of meter	Overcurrent	Specify for necessary tolerated dose.
	Overvoltage	Specify for necessary tolerated dose.
Extended part of scale	Voltmeter	$\pm 10\%$ , $\pm 20\%$ , $\pm 30\%$ of central scale value 75% or more of scale length
	Ammeter	up to 20% of upper limit value of effective measuring range. 95% or more of scale length.
		up to 50% of upper limit value of effective measuring range. 75% or more of scale length.
For RMS value rectifier type		AC Current, AC Voltage
For SCR control waves use		AC Current, AC Voltage, Wattmeter, Frequency

## EXTERNAL SERIES RESISTOR (DC Control Power)

Rated value	Series resistor	Note
DC 48V	CRH 30G	Attached for EP-NC only
DC 110V	CRH 60G	



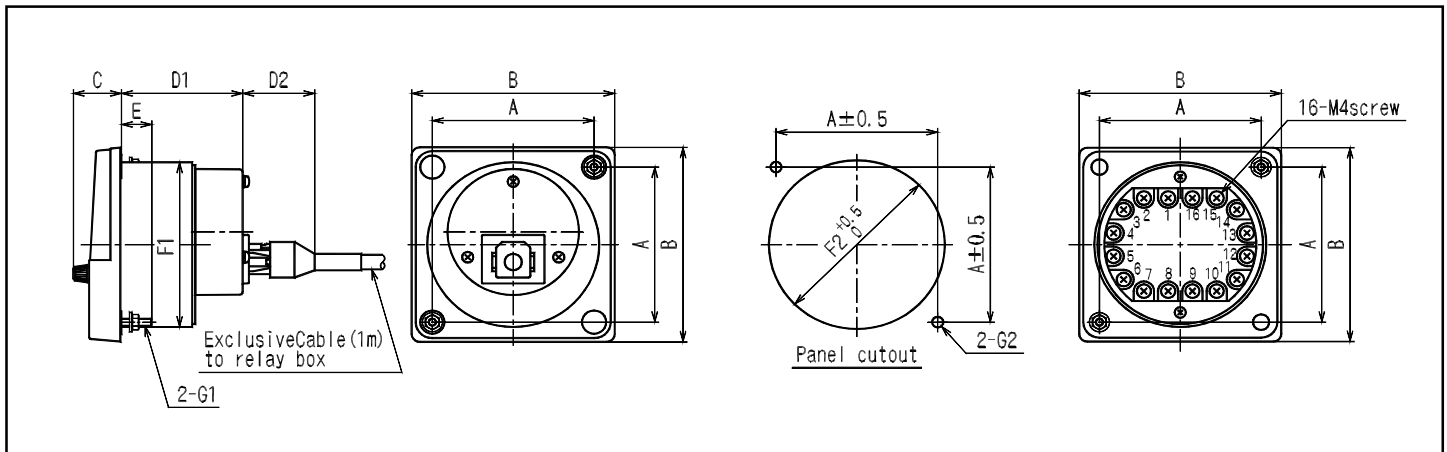
# PHOTOELECTRIC NON-CONTACT METER RELAY

EP

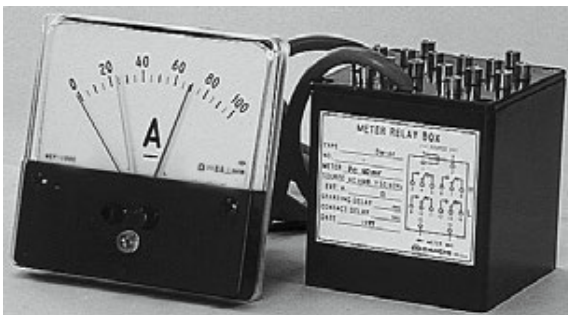
## STANDARD SCALE SECTION

Max. scale value	1	1.5	2	2.5	3	4	5	6	7.5	8	9
EP-120NC, EP-120C	20	30	40	25	30	40	25	30	37.5	40	45
EP-100NC, EP-100C, 80C, 60C	20	30	40	25	30	20	25	30	15	16	18

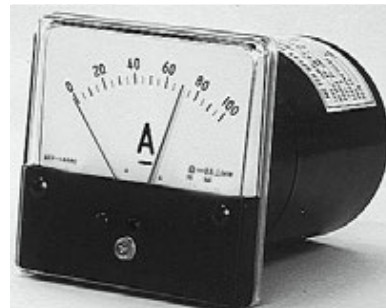
## Outline Drawing



Type	A	B	C	D1	D2	E	F1	F2	G1	G2	weight (g)
EP-120NC	100	123	27.8	116	10	15	110 $\Phi$	112 $\Phi$ hole	M5 screw	7 $\Phi$ hole	800
EP-100NC	80	100	23.8	116	10	15	85 $\Phi$	87 $\Phi$ hole	M4 screw	5.5 $\Phi$ hole	750
EP-120C	100	123	27.8	59.5	36	15	110 $\Phi$	112 $\Phi$ hole	M5 screw	7 $\Phi$ hole	1060
EP-100C	80	100	23.8	60	36	15	85 $\Phi$	87 $\Phi$ hole	M4 screw	5.5 $\Phi$ hole	1010
EP-80C	64	80	23.8	74.5	36	10	65 $\Phi$	67 $\Phi$ hole	M3 screw	4 $\Phi$ hole	930
EP-60C	48	60	24	74.5	33	10	52 $\Phi$	54 $\Phi$ hole	M3 screw	4 $\Phi$ hole	870



EP Type



EP-N Type

# PHOTOELECTRIC NON-CONTACT METER RELAY

EK

## EK SERIES LIST

\* Use relay box DM-61 for EK-12C. DM-63 is for special specification.

\* Relay box for type EP-12NC is integral type.

Product	Operation Principle	Type	Class	Max. scale value/ rated value	Internal resistance / Voltage fall / Consumption current / Consumption VA		Accessory Transducer	Diagram	Note	
DC Current	Permanent Magnet Moving Coil Type	MEK-12C MEK-12NC	1.5	100μA	1500Ω		-	C-1	* When 750mA is exceeded, shunt will external for MEK-12NC	
				1mA	90Ω					
				5mA	20Ω					
				20mA	3Ω					
				30mA~30A	60mV					
				30A~10kA	60mV		Shunt	50mV, 100mV can manufactured		
DC Voltage	Permanent Magnet Moving Coil Type	MEK-12C MEK-12NC	1.5	50~900mV	4.5mA		-	C-2	-	
				1~600V	1mA					
				750V~25kV	1mA					Series resistor
DC Receiving meter	Permanent Magnet Moving Coil Type	XEK-12C XEK-12NC	1.5	1mA	90Ω		-	C-1 C-2	-	
				4~20mA	2.1Ω					
				1~300V	1mA					
AC Current	Rectifier Type	CEK-12C CEK-12NC	1.5	10mA~15A	1VA or less		-	C-3	* When 350mA exceeded, MR-CTN will external for CEK-12NC	
				20~100A	1VA					MR-CTN
AC Current	Transducer Type	CEK-12CE		10mA~15A	1VA or less		-	C-3	* When 350mA exceeded, MR-CTN will external for CEK-12NC	
				20~100A			MR-CTN			
AC Voltage	Rectifier Type	CEK-12C CEK-12NC	1.5	3~600V	1mA		-	C-4	-	
				750V~25kV	1mA					Series resistor
AC Voltage	Transducer Type	CTEK-12NC CTEK-12C	1.5	50-300V	1VA		VT-62ME	C-16	-	
AC Receiving meter	Rectifier Type	YEK-12C YEK-12NC	1.5	1mA	1300Ω		-	C-3 C-4	-	
				3~300V	1mA					
Watt Meter	single phase	Transducer Type	1.5	WEK-12C-12 WEK-12NC-12	110V, 5A 220V, 5A	Voltage 2VA Voltage 3.5VA	Current 1VA Current 1VA	WT-62M-12	C-8	* Refer to accessory transducer outline drawing. * Refer to meter manufacturing limit and max. scale value.
	single phase 3 wire			WEK-12C-13 WEK-12NC-13	110V, 5A	Voltage each phase 2VA	Current each phase 1VA	WT-83M-13	C-5	
	3 phase			WEK-12C-33 WEK-12NC-33	110V, 5A 220V, 5A	Voltage each phase 2VA Voltage each phase 3.5VA	Current each phase 1VA Current each phase 1VA	WT-83M-33	C-5	
	3 phase 4 wire			WEK-12C-34 WEK-12NC-34	110/√3V, 5A 220/√3V, 5A	Voltage each phase 1.5VA Voltage each phase 3VA	"	WT-83M-34	C-6	
Var Meter	single phase	Transducer Type	1.5	WVEK-12C-12 WVEK-12NC-12	110V, 5A 220V, 5A	Voltage each phase 3.5VA Voltage each phase 3.5VA	Current each phase 1.5VA Current each phase 1.5VA	* WVT-62M-12	C-8	* Specify frequency (50/ 60Hz). * Scale: Lead□var~0~Lag□var * Refer to accessory transducer outline drawing. * Refer to meter manufacturing limit and max. scale value.
	3 phase (balanced)			WVBEK-12C-33 WVBEK-12NC-33	110V, 5A 220V, 5A	Voltage each phase 3.5VA Voltage each phase 3.5VA	Current each phase 1.5VA Current each phase 1.5VA	WVBT-83M-33	C-5	
	3 phase (unbalanced)			WVEK-12C-33 WVEK-12NC-33	110V, 5A 220V, 5A	"	"	* WVT-83M-33	C-5	
	3 phase 4 wire			WVEK-12C-34 WVEK-12NC-34	110V, 5A 220V, 5A	"	"	WVT-83M-34	C-7	
Power Factor Meter	single phase	Rectifier Type	5.0	PEK-12C-12 PEK-12NC-12	110V, 5A 220V, 5A	Voltage 1VA Voltage 2VA	Current 1VA Current 1VA	* PT-62M-12	C-8	* Specify frequency (50/ 60Hz). * Scale: Lead0.5~1~Lag0.5 * Refer to accessory transducer outline drawing.
	3 phase (balanced)			PBEK-12C-33 PBEK-12NC-33	110V, 5A 220V, 5A	Voltage each phase 1VA Voltage each phase 2VA	Current each phase 1VA Current each phase 1VA	PBT-62M-33	C-9	
	3 phase (unbalanced)	Transducer Type		PEK-12C-33 PEK-12NC-33	110V, 5A 220V, 5A	"	"	* PT-63M-33	C-10	
	3 phase 4 wire (balanced)			PBEK-12C-34 PBEK-12NC-34	110V, 5A 220V, 5A	"	"	PBT-62M-34	C-11	
	3 phase 4 wire (unbalanced)			PEK-12C-34 PEK-12NC-34	110V, 5A 220V, 5A	"	"	* PT-64M-34	C-12	
Frequency	Transducer Type	AEK-12C AEK-12NC	1.0	110V 220V	45~55Hz 55~65Hz 45~65Hz 350~450Hz	For 110V, 1.7VA For 220V, 2.5VA	FT-62M for AEK-12NC only	C-13	* AEK-12C (external with DM-61) starting current protection circuit will external with FT-62M	

# PHOTOELECTRIC NON-CONTACT METER RELAY

EK

## COMMON STANDARD SPECIFICATION

Item	Specification	
Class	Please refer to [ EK Series List ]	
Support System	Pivot system	
Meter deflection angle	75°	
Dimension meter from front	EK-12C: 120 × 100mm	
Scale length	EK-12C: 82.5mm	
Scale plate	White paint	
Pointer	Stick-type (black)	
Meter mounting position	Vertical ( ⊥ )	
Material panel	Iron or non-iron plate	
Mounting panel thickness	10mm or less	
Length of special cable (integral type excluded)	1m	
Type according to output signal	Continuance output type	
Pointer moving range	Passing full scale type	
Setting range	Full scale	
Tolerance of pick up value	±1.0% of scale length	
Dead band	0.5% of scale length	
Min. setting width	3% of scale length	
Relay operation control system	H (upper limit), L (lower limit), HL (upper and lower limit)	
Setting index	Lance type, H: Red L: Yellow	
Relay control power	AC110V, 220V (2VA): +10% -15% (50/60Hz) DC24V (2.5W), 48V (5W), 110V (12W) ±15%	
Contact configuration	2C contact for HL	
Contact capacity	AC200V, 5A (resistance load) DC30V, 5A (resistance load)	
Color of cover (F series: color of mounting frame )	Dark blue: (Munsell 7.5BG 4/ 1.5) Black: (Munsell N1.5)	
Material of base (F series: Material of mouting frame)	Cover: Methacrylic acid resin (anti-static treatment) Base: Phenol resin (EK-N: Flame-retarded ABS resin)	
Insulation resistance	Between electric circuit and outer case	DC500V, 50MΩ or more
Voltage test	Between electric circuit and outer case	AC2230V, between 5sec.
Safety requiment	Standard	JISC 1010-1
	Insulation	Between electric circuit and outer case: Base of insulation
	Use	For indoor use (Cubicle etc.)
	High altitude	2000m or less
	Pollution	Pollution level 2
	Measure Category	CAT III
	Max. circuit voltage	600V (Am meter)
Operation temperature / Humidity range	-10~55°C, Average day temperature is 40°C or less, 25~85% RH	
Storage temperature range	-20~70°C	

# PHOTOELECTRIC NON-CONTACT METER RELAY

EK

## COMMON SPECIAL SPECIFICATION

Item		Specification
Measurement Frequency		Please specify
Scale	Extend scale	CEK: 2~5 time extend (Please specify)
	Color line	Red, Green, Yellow (Please specify)
	Color area (bar)	Red, Green, Yellow (Please specify)
	Double scale	Please specify
	Double seal	Please specify
	Max. scale section	100 sections
	Special scale	Please specify
Indicator manufacturing limit		DC50 $\mu$ A, DC15mV
DC relay control power		DC50V until 350V (specify for variation range).
Total length of dedicated cable		2.5m, 5m, 10m (Junction cable use)
Relay operation control system		HH (upper limit 2 steps) ; LL (lower limit 2 steps)
Start current protection circuit		Variable or Fixed within 0~60 sec. (Except: EK-12NC)
Contact delay circuit		Variable or Fixed within 0~60 sec. (Relay box: DM-63) Except: EK-12NC
Mounting panel thickness		Auxiliary fixture used for 12mm or more.
Tropical specification		Rust preventative, 「FOR TROPICS」 will display at the name plate.
Pointer		Knife-edge (Red), Stick-type (Black), combine use with multiple scale etc.
Meter mounting position		Horizontal, inclination installation (specify for angle)
Flame-retarded material		Cover Polycarbonate resin
Protection circuit of meter	Overcurrent	Specify for necessary tolerated dose.
	Overvoltage	Specify for necessary tolerated dose.
Extended part of scale	Voltmeter	$\pm 10\%$ , $\pm 20\%$ , $\pm 30\%$ of central scale value 75% or more of scale length
	Ammeter	up to 20% of upper limit value of effective measuring range. 95% or more of scale length. up to 50% of upper limit value of effective measuring range. 75% or more of scale length.
For RMS value rectifier type		AC Current, AC Voltage
For SCR control waves use		AC Current, AC Voltage, Wattmeter, Frequency

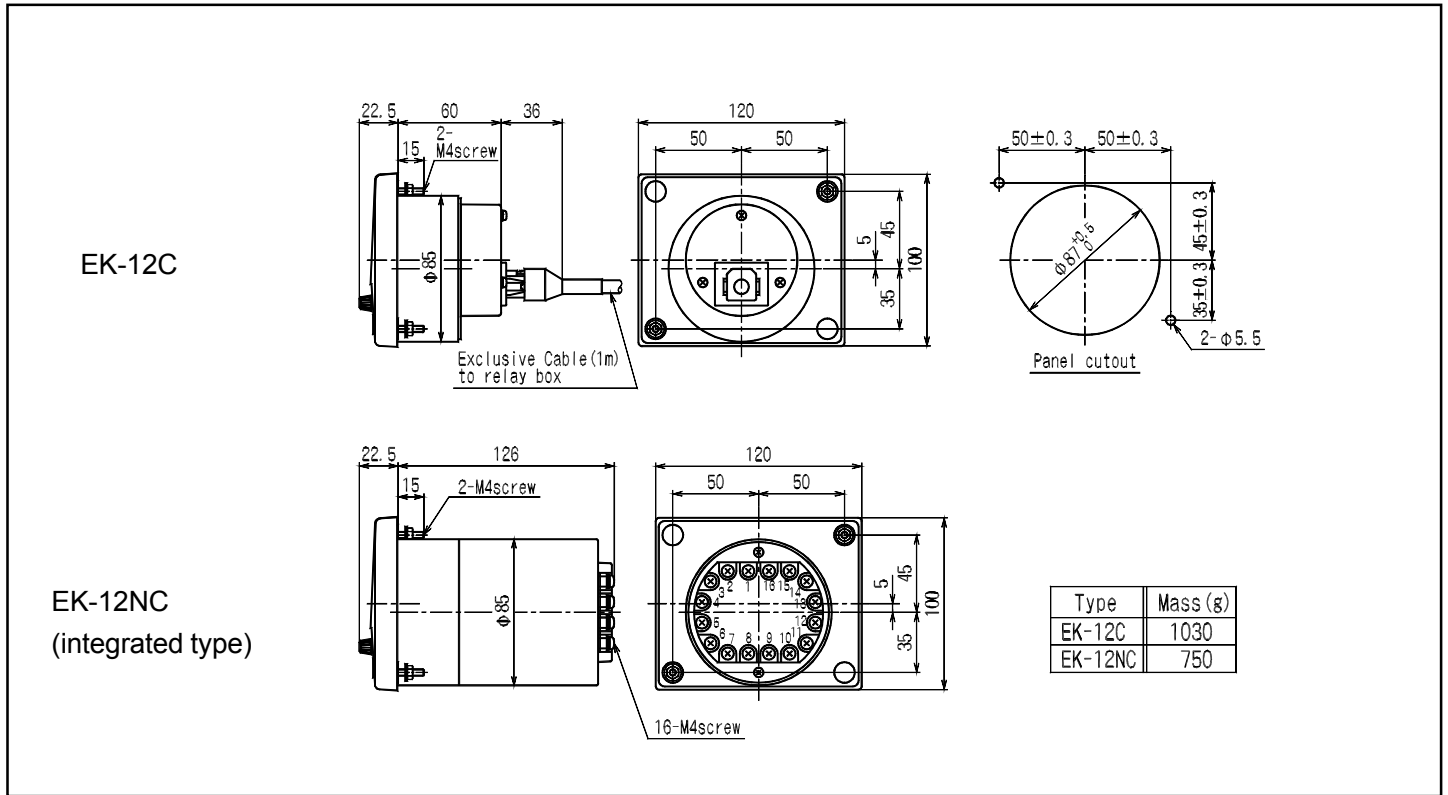
## EXTERNAL SERIES RESISTOR (DC Control Power)

Rated value	Series resistor	Note
DC48V	CRH 30G	Only for EK-12NC
DC110V	CRH 60G	

# PHOTOELECTRIC NON-CONTACT METER RELAY

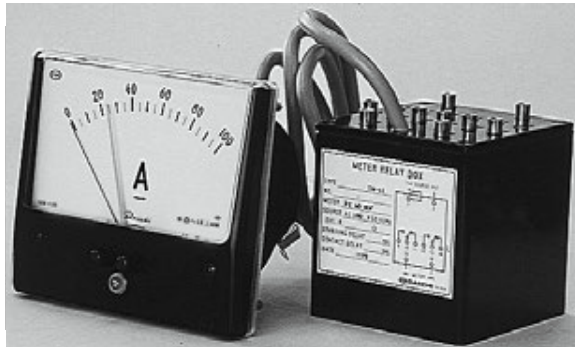
EK

## Outline Drawing

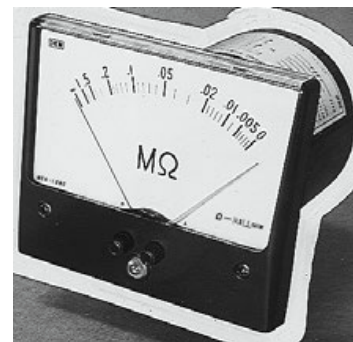


## STANDARD SCALE SECTION

Max. scale value (10 times)	1	1.5	2	2.5	3	4	5	6	7.5	8	9
EK-12NC, EK-12C	20	30	40	25	30	40	25	30	37.5	40	45



EK-12C



EK-12NC (integrated type)

# PHOTOELECTRIC NON-CONTACT METER RELAY

EF

## EF SERIES LIST

Product	Operation Principle	Type	Class	Max. scale value/ rated value	Internal resistance / Voltage fall / Consumption current / Consumption VA		Accessory Transducer	Diagram	Note	
DC Current	Permanent Magnet Moving Coil Type	MEF-17 MEF-15	1.0	100μA	4500Ω		-	C-1	-	
				200μA	1400Ω					
				1mA	130Ω					
				5mA	9.1Ω					
				10mA	6.8Ω					
				20mA	6Ω					
				30~500mA	60mV					
				1A~10kA	60mV		Shunt	50mV, 100mV can manufactured		
DC Voltage	Permanent Magnet Moving Coil Type	MEF-17 MEF-15	1.0	50~900mV	5mA		-	C-2	-	
				1~600V	1mA					
				750V~25kV	1mA		Series resistor			
DC Receiving meter	Permanent Magnet Moving Coil Type	XEF-17 XEF-15	1.0	1mA	130Ω		-	C-1 C-2	-	
				4~20mA	6.3Ω					
				1~300V	1mA					
AC Current	Rectifier Type	CEF-17 CEF-15	1.5	10~300mA	0.5VA		-	C-3	-	
				0.35~100A	1VA		MR-CTN			
AC Voltage	Rectifier Type	CEF-17 CEF-15	1.5	3~600V	1mA		-	C-4	-	
				750~25kV	1mA		Series resistor			
AC Receiving meter	Rectifier Type	YEF-17 YEF-15	1.5	1mA	1350Ω		-	C-3 C-4	-	
				3~300V	1mA					
Watt Meter	Single phase	Transducer Type	1.5	WEF-17-12 WEF-15-12	110V, 5A 220V, 5A	Voltage 2VA Voltage 3.5VA	Current 1VA Current 1VA	WT-62M-12	C-8 C-5 C-5 C-6	* Refer to accessory transducer outline drawing. * Refer to meter manufacturing limit, max. scale value.
	Single phase 3 wire			WEF-17-13 WEF-15-13	110V, 5A	Voltage each phase 2VA	Current each phase 1VA	WT-83M-13		
	3 phase			WEF-17-33 WEF-15-33	110V, 5A 220V, 5A	Voltage each phase 2VA Voltage each phase 3.5VA	Current each phase 1VA Current each phase 1VA	WT-83M-33		
	3 phase 4 wire			WEF-17-34 WEF-15-34	110/√3V, 5A 220/√3V, 5A	Voltage each phase 1.5VA Voltage each phase 3VA	"	WT-83M-34		
Var Meter	single phase	Transducer Type	1.5	WVEF-17-12 WVEF-15-12	110V, 5A 220V, 5A	Voltage 3.5VA Voltage 3.5VA	Current each phase 1.5VA Current each phase 1.5VA	* WVT-62M-12	C-8 C-5 C-5 C-7	* Specify frequency (50/60Hz). * Scale: Lead □ var-0-Lag □ var. * Refer to accessory transducer outline drawing. * Refer to meter manufacturing limit, max. scale value.
	3 phase (balanced)			WVBEF-17-33 WVBEF-15-33	110V, 5A 220V, 5A	Voltage each phase 3.5VA Voltage each phase 3.5VA	Current each phase 1.5VA Current each phase 1.5VA	WVBT-83M-33		
	3 phase (unbalanced)			WVEF-17-33 WVEF-15-33	110V, 5A 220V, 5A	"	"	* WVT-83M-33		
	3 phase 4 wire			WVEF-17-34 WVEF-15-34	110V, 5A 220V, 5A	"	"	WVT-83M-34		
Power Factor Meter	single phase	Rectifier Type	5.0	PEF-17-12 PEF-15-12	110V, 5A 220V, 5A	Voltage 1VA Voltage 2VA	Current 1VA Current 1VA	* PT-62M-12	C-8 C-9 C-10 C-11 C-12	* Specify frequency (50/60Hz). * Scale: Lead 0.5~1-Lag 0.5 * Refer to accessory transducer outline drawing.
	3 phase (balanced)			PBEF-17-33 PBEF-15-33	110V, 5A 220V, 5A	Voltage each phase 1VA Voltage each phase 2VA	Current each phase 1VA Current each phase 1VA	PBT-62M-33		
	3 phase (unbalanced)	PEF-17-33 PEF-15-33		110V, 5A 220V, 5A	"	"	* PT-63M-33			
	3 phase 4 wire (balanced)	PBEF-17-34 PBEF-15-34		110V, 5A 220V, 5A	"	"	PBT-62M-34			
	3 phase 4 wire (unbalanced)	PEF-17-34 PEF-15-34		110V, 5A 220V, 5A	"	"	* PT-64M-34			
Frequency	Transducer Type	AEF-17 AEF-15	1.0	110V 220V	45~55Hz 55~65Hz 45~65Hz 350~450Hz	For 110V, 1.7VA For 220V, 2.5VA	FT-62M	C-13		

# PHOTOELECTRIC NON-CONTACT METER RELAY

EF

## COMMON STANDARD SPECIFICATION

Item	Specification	
Class	Please refer to [ EF Series List ]	
Support System	Pivot system	
Meter deflection angle	49°	
Dimension meter from front	EF-17C: 170 × 40mm ; EF-15C: 150 × 40mm	
Scale length	F-17, 15:86mm	
Scale plate	White paint	
Pointer	Triangle (red)	
Meter mounting position	Vertical ; 1T: Vertical ; 2T: Horizontal	
Material panel	Iron plate or non-iron plate	
Mounting panel thickness	7mm or less	
Type according to output signal	Continuance output type	
Pointer moving range	Passing full scale type	
Setting range	Full scale	
Tolerance of pick up value	±1.0% of scale length	
Dead band	0.5% of scale length	
Min. setting width	3% of scale length	
Relay operation control system	H (upper limit), L (lower limit), HL (upper and lower limit)	
Setting index	Triangle type, H: Orange L: Green	
Relay control power	AC 110V, 220V (2VA): +10% -15% (50/60Hz) DC 24V (2.5W), 48V (5W), 110V (12W) ±15%	
Contact configuration	2C contact for HL	
Contact capacity	AC 200V, 0.25A (resistance load) DC 30V, 0.8A (resistance load)	
Color of mounting frame (F-17,15)	Dark blue: (Munsell 7.5BG) Black: (Munsell N1.5)	
Material of mounting frame	Almi-diecast	
Insulation resistance	Between electric circuit and outer case	DC 500V, 50MΩ or more
Voltage test	Between electric circuit and outer case	AC 2230V, between 5sec.
Safety requirement	Standard	JISC 1010-1
	Insulation	Between electric circuit and outer case: Base of insulation
	Use	For indoor use (Cubicle etc.)
	High altitude	2000m or less
	Pollution	Pollution level 2
	Measure Category	CAT III
Max. circuit voltage	600V (Ammeter)	
Operation temperature / Humidity range	-10~55°C, Average day temperature is 40°C or less, 25~85% RH	
Storage temperature range	-20~70°C	

# PHOTOELECTRIC NON-CONTACT METER RELAY

EF

## COMMON SPECIAL SPECIFICATION

Item		Specification
Measurement Frequency		Please specify
Scale	Extend scale	2~5-time extend (Please specify)
	Color line	Red, Green, Yellow (Please specify)
	Color area (bar)	Red, Green, Yellow (Please specify)
	Double scale	Please specify
	Double seal	Please specify
	Max. scale section	F-17,15: 100 sections; F-10: 75 sections
	Special scale	Please specify
Indicator manufacturing limit		DC50 $\mu$ A, DC15mV
DC relay control power		DC50V up to 350V (specify for variation range).
Relay operation control system		HH (upper limit 2 steps) ; LL (lower limit 2 steps)
Tropical specification		Rust preventative, 「FOR TROPICS」 will display at the name plate.
Pointer		Stick-type (Black), combine use with multiple scale etc.
Meter mounting position		Horizontal, inclination installation (angle specified)
Flame-retarded material		Cover Polycarbonate resin
Protection circuit of meter		Overcurrent Specify for necessary tolerated dose.
		Overvoltage Specify for necessary tolerated dose.
Extended part of scale		Voltmeter $\pm 10\%$ 、 $\pm 20\%$ 、 $\pm 30\%$ of central scale value 75% or more of scale length
		Am meter up to 20% of upper limit value of effective measuring range. 95% or more of scale length. up to 50% of upper limit value of effective measuring range. 75% or more of scale length.
For RMS value rectifier type		AC Current, AC Voltage
For SCR control waves use		AC Current, AC Voltage, Wattmeter, Var Meter, Frequency

## STANDARD SCALE SECTION

Max. Scale Value (10 times)	1	1.5	2	2.5	3	4	5	6	7.5	8	9
EF-17, 15	50	75	40	50	60	40	50	60	75	40	45

## ITEMS TO SPECIFY WHEN PURCHASE

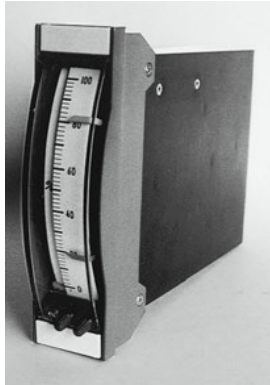
- |                                |  |
|--------------------------------|--|
| (1) Type                       | (6) Start current protection circuit         |
| (2) Setting formal             | (7) Protection and attested circuit          |
| (3) Rated (max. scale / input) | (8) Terminal cover                           |
| (4) Relay control power        | (9) Quantity                                 |
| (5) Material panel             | (10) Option (refer to special specification) |



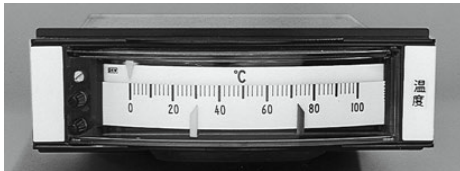
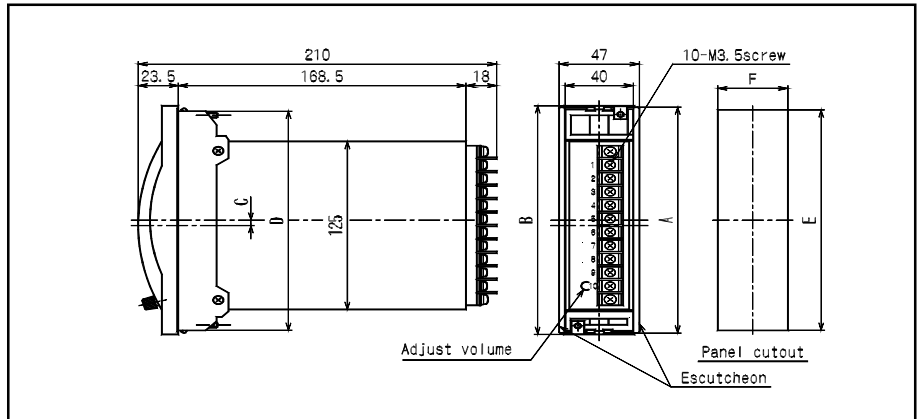
# PHOTOELECTRIC NON-CONTACT METER RELAY

EF

## Outline Drawing



EF-15-1T



EF-15-1Y

\* n = unit meter

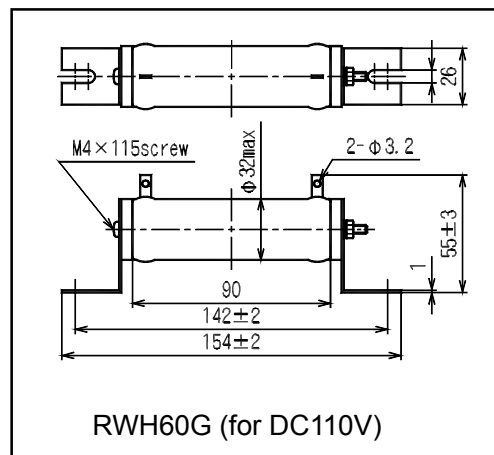
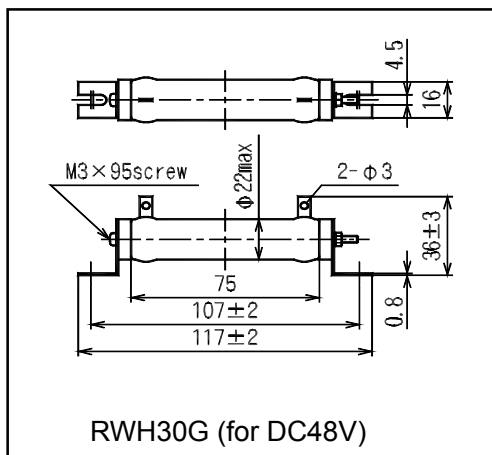
Rated value	A	B	C	D	E	F	
						1 unit	2 units or more
EF-17	168	170	4	163	164 ±0.5	41 <sup>+1</sup> <sub>-0</sub>	(41 × n) <sup>+1</sup> <sub>-0</sub>
EF-15	148	150	0	145	146 ±0.5	41 <sup>+1</sup> <sub>-0</sub>	(41 × n) <sup>+1</sup> <sub>-0</sub>

Please assemble the meter in the center of the panel if you need continuous assemble.  
Or please contact and discuss with us if you need to continuous assemble more than 10 units.

## EXTERNAL SERIES RESISTOR (DC Control Power)

Rated value	Series resistor	Note
DC48V	CRH 30G	
DC110V	CRH 60G	

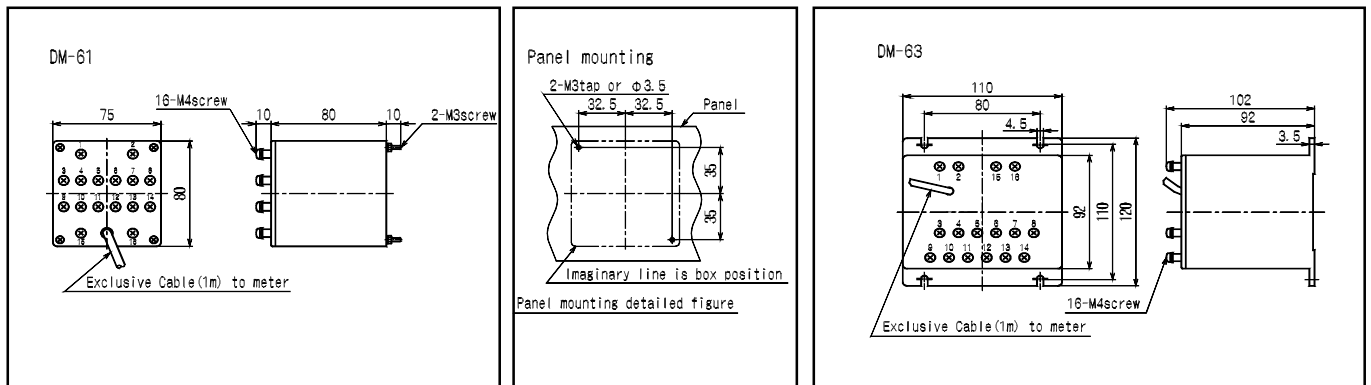
## Outline Drawing



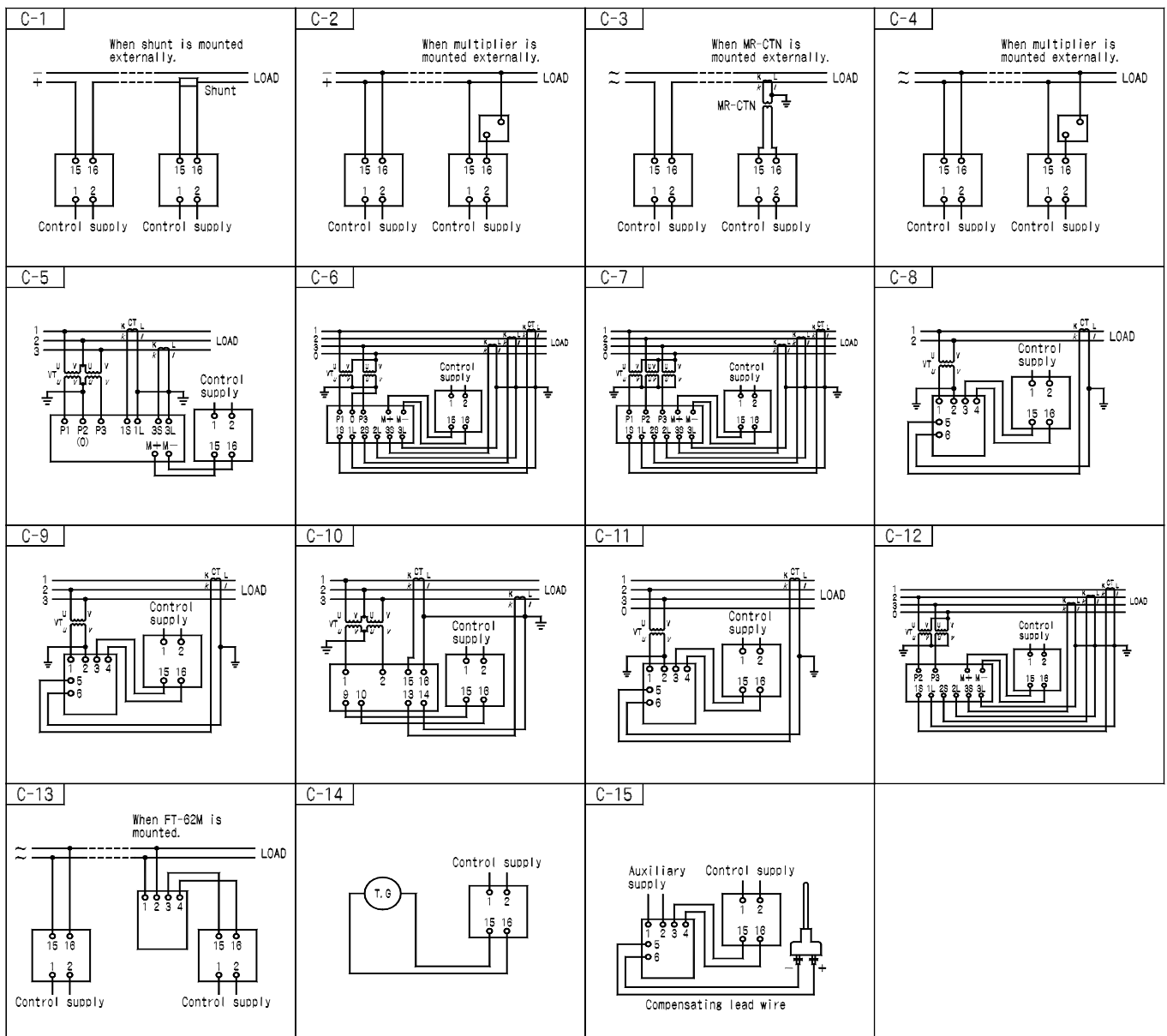
# PHOTOELECTRIC NON-CONTACT METER RELAY

EL / EP / EK / EF

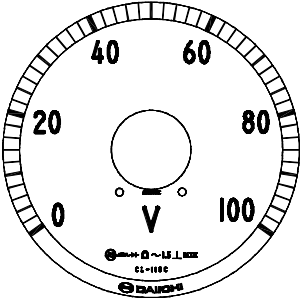
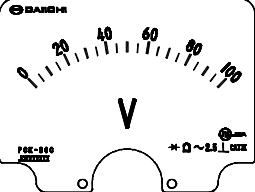
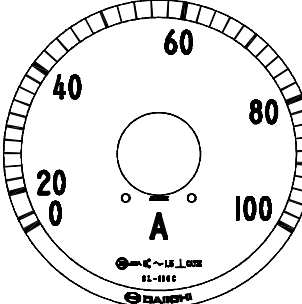
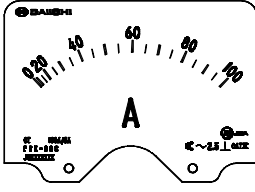
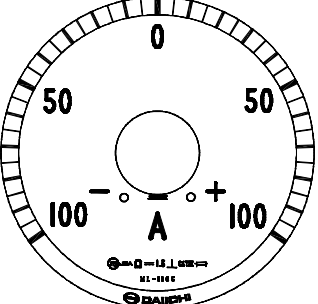
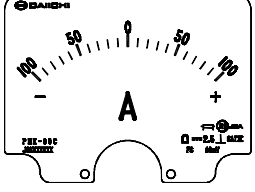
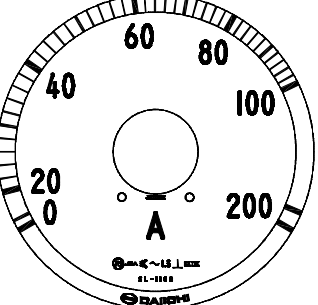
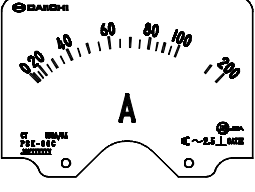
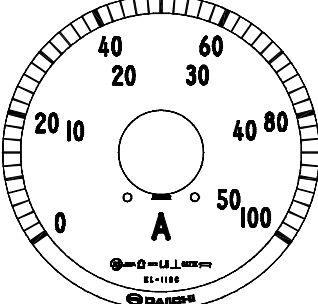
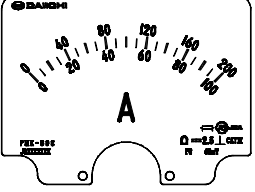
## Meter Relay Box Outline Drawing



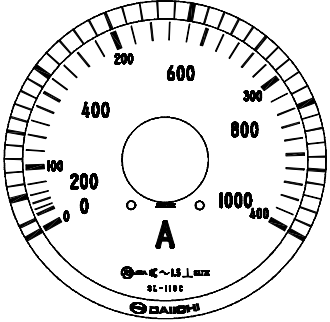
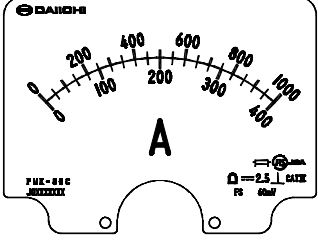
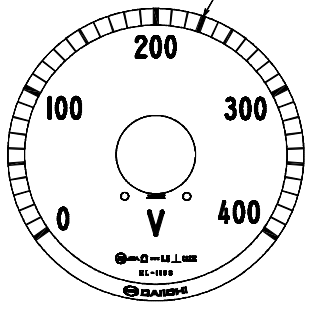
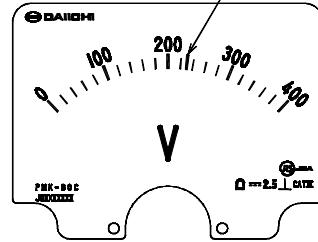
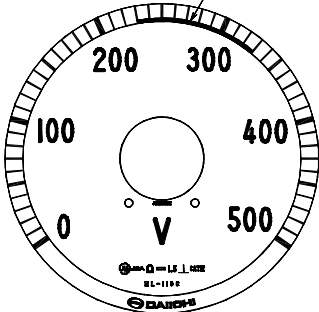
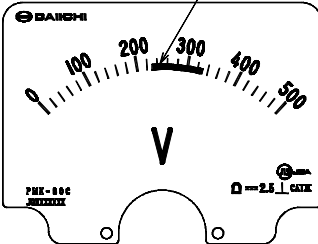
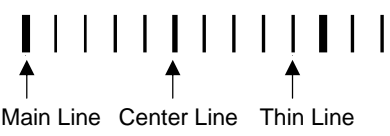
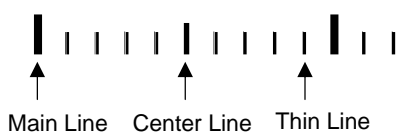
## Connection Diagram



# EX. SCALE

Scale Specification	Wide Angle Meter Ex.: L-110C	Square Shape Meter Ex.: PK-80C
<p><b>Standard Scale</b></p> <p>Scale digit: Black Scale line : Black Unit mark : Black Scale division : Refer to standard lancet shape pointer division</p>		
<p>Moving iron type can be left out the lower value part of scale Scale division : Refer to standard lancet shape pointer division</p>		
<p><b>± Scale Meter (Both Side Deflect Meter)</b></p> <p>Scale digit: Black Scale line : Black Unit mark : Black</p>		
<p><b>Extend Scale (2-Fold Extend)</b></p> <p>Scale digit: Black ; Extend part: Red Scale line : Black ; Extend part: Red Unit mark : Black</p>		
<p><b>Single Scale Double Seal Meter</b></p> <p>Scale digit: Black Scale line : Black Unit mark : Black Standard place a seal of scale figure : Higher value will display at inside &amp; smaller value will display at outside</p>		

# EX. SCALE

Scale Specification	Wide Angle Meter Ex.: L-110C	Square Shape Meter Ex.: PK-80C
<p><b>Double Scale Double Seal</b></p> <p>Scale digit: Black Scale line : Black Unit mark : Black Scale division : Refer to standard lancet shape pointer division Standard place a seal of scale figure : Higher value will display at outside &amp; smaller value will display at inside For wide angle meter : Higher value will display at inside &amp; smaller value will display at outside</p>		
<p><b>Coloring Scale (Color Line)</b></p> <p>Scale color line : Red, Yellow, Green Possible combine the color line &amp; color figure to use for double scale</p>		
<p><b>Color Belt</b></p> <p>Color Belt : Red, Yellow, Green</p>		
<p><b>Scale line and Scale figure</b></p> <p>1) Type of scale line Scale figure will print at main line Please refer to standard lancet shape pointer division &amp; standard knife shape pointer division</p> <p>2) Figure of scale : Max. 4-digit (9999) If 10000 is exceed, unit will be change like 6.6kV or use multiple like <math>36 \times 1000 \text{min}^{-1}</math></p> <p>3) Please have a consultation with us if scale division is different with standard division (odd scale) Please specify for Max. division</p> <p>4) Display 「0」 will be left out if the scale figure after decimal point is Zero. (like scale figure 1 as below)</p> <p>5) Display 「0」 will be left out if the scale figure before decimal point is Zero. (like scale figure 0.5 as below)</p> <p>Ex. : For range value 1.5</p> <p>Wide Angle Meter Scale will display by 「1.0」 for wide angle meter (except BRL &amp; RL series)</p> <p>Square Share Meter BRL &amp; RL series is same scale as square share meter</p>		

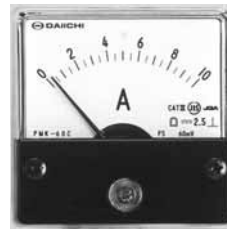


## § Wide Angle METER §

### STANDARD DIVISION OF LANCET-SHAPED POINTER



L series



PK series

MODEL	L-65C PK-60C, 80C, 100C LK-8C, 10C BRL-110CH Instant Meter		RL-80C PK-120C LK-12C F-10	
MAX. SCALE VALUE	SCALE DIVISION DIAGRAM	DIV.	SCALE DIVISION DIAGRAM	DIV.
1		20		20
1.5		30		30
2		20		40
2.5		25		25
3		30		30
4		20		40
5		25		25
6		30		30
7.5		15		37.5
8		16		40
9		18		45

## § Wide Angle METER §



LK series



F series



F series

MODEL	RL-110C BRL-110CH Utility meter		F-15, 17 Note) 4-digit scale of 2T is not manufacturable. L-110C L-80C EL-110C			
	MAX. SCALE VALUE	SCALE DIVISION DIAGRAM	DIV.	SCALE DIVISION DIAGRAM	DIV.	
1	*2	0 2 4 6 8 10	50	*2	0 2 4 6 8 10	50
1.5		0 5 10 15	30	*8	0 5 10 15	75
2	*2	0 5 10 15 20	40		0 5 10 15 20	40
2.5	*4	0 5 10 15 20 25	50		0 5 10 15 20 25	50
3		0 10 20 30	30	*8	0 5 10 15 20 25 30	60
4	*2	0 10 20 30 40	40		0 10 20 30 40	40
5	*4	0 10 20 30 40 50	50		0 10 20 30 40 50	50
6		0 20 40 60	30	*8	0 10 20 30 40 50 60	60
7.5		0 20 40 60 75	37.5	I-110 & I-80: 37.5 DIVISION *9	0 20 40 60 75	75
8		0 20 40 60 80	40		0 20 40 60 80	40
9		0 30 60 90	45	*5	0 20 40 60 80 90	45

## § Wide Angle METER §

### STANDARD DIVISION OF KNIFE-EDGE POINTER

MODEL	PK-60C, 80C, 100C LK- 8C, 10C FK- 5C,		PK-120C LK- 12C FK- 7C		
	MAX. SCALE VALUE	SCALE DIVISION DIAGRAM	DIV.	SCALE DIVISION DIAGRAM	DIV.
1	0 2 4 6 8 10		50		50
1.5	0 5 10 15		30		75
2	0 5 10 15 20		40		40
2.5	0 5 10 15 20 25		50		50
3	0 10 20 30		30		60
4	0 10 20 30 40		40		80
5	0 10 20 30 40 50		50		50
6	0 20 40 60		30		60
7.5	0 20 60 60 75		37.5		75
8	0 20 40 60 80		40		80
9	0 30 60 90		45		45

- ▶ Division line part of is omitted for moving iron type meter.
- ▶ For scale extended meter, red color line and numbers of extended part.
- ▶ Have a consultation with us for +/- meter, notation of max. scale value, multiple scale meter, etc.
- ▶ \*1, becomes 15 divisions for scale extended ammeter PK-60C, PK-80C and LK-8C.
- ▶ \*2, becomes 20 divisions for scale extended ammeter PK-120C, LK-12C, F-10, 15, 17, RL-80C and RL-110C.
- ▶ \*3, becomes 15 divisions for scale extended ammeter PK-120C, LK-12C, F-10, 15, 17 and RL-80C.
- ▶ \*4, becomes 25 divisions for scale extended ammeter RL-110C.
- ▶ \*5, seal numbers: 0, 30, 60, 90 for type meter F-15, and 17.
- ▶ \*6, becomes 16 divisions for scale extended ammeter PK-120C, LK-12C, F-10, RL-80C.
- ▶ \*7, becomes 18 divisions for scale extended ammeter PK-120C, LK-12C, F-10, RL-80C.
- ▶ \*8, becomes 30 divisions for scale extended ammeter F-15, 17.
- ▶ \*9, becomes 37.5 divisions for scale extended ammeter F-15, 17.