

L-65C



L-80C





L series are wide-angle meters. The series have three types, 110mm angle, 80mm angle and 65mm angle, and the series are in conformity with JIS C 1103 in panel cut-out size.

With long and stepped scales, L series are easy to read and the reading error is small. Also the series are highly reliable meters by adopting the most suitable operational principle in accordance with the measuring object, thus meet the JIS C 1102-1~9 standards adequately (IEC 60051-1 compliance).

**For** usage in excessive environmental conditions, special treatments such as cold resistance and tropical specifications are implemented to improve the reliability. The series are most suitable for equipment for exportation to frigid / tropical zone.

#### FEATURES

- ► High quality, high reliability oriented design.
- Taut-band supporting method is adopted. (SL, DL works on the jewel and pivot method)
- ► 65mm angle type is most suitable for congested equipment.
- By adopting transducer based on electronic technology, more variety is extended.
- Meter made of incombustible material is available by designation.

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#### 1. TYPE CODE DESIGNATION

■ WIDE ANGLE METER

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(1) L - (2) (3) C_{or} (4) - (5)
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(1) Operational principle

| DC current / voltage Permanent magnet moving coil       |                                 |     |  |
|---|---------------------------------|-----|--|
| DC receiving indicator                                  | Permanent magnet moving coil    | Х   |  |
| AC receiving indicator                                  | Rectifier                       | Y   |  |
| AC current / voltage                                    | Moving iron                     | S   |  |
| AC current / voltage                                    | Rectifier / RMS value rectifier | С   |  |
| AC watt meter   | Transducer                      | W   |  |
| Var meter (unbalanced)                                  | Transducer                      | WV  |  |
| Power factor (balanced)                                 | Rectifier                       | PB  |  |
| Power factor (unbalanced)                               | Transducer                      | Р   |  |
| Frequency meter   | Transducer                      | А   |  |
| Synchroscope detector                                   | Transducer                      | D   |  |
| Power flow power factor meter<br>(3-phase) (unbalanced) | Transducer                      | FPD |  |
| Thermocouple type thermometer                           | Permanent magnet moving coil    | Н   |  |
| Thermocouple type thermometer                           | Transducer                      | HT  |  |
| Revolution indicator                                    | Rectifier                       | V   |  |

#### **(2)** Size

| Wide angle meter | 110×110 | 110 |
|------------------|---------|-----|
|                  | 80×80   | 80  |
|                  | 65×65   | 65  |

#### (3) Structure

| Transducer all-in-one type | Ν    |  |
|----------------------------|------|--|
| Separate or no attachment  | None |  |

#### (4) Special specifications

| For SCR       | Н |
|---------------|---|
| Cycle control | С |

| (5) Kind of circuit |    |  |  |  |  |
|---------------------|----|--|--|--|--|
| Single phase        | 12 |  |  |  |  |
| Single phase 3-wire | 13 |  |  |  |  |
| 3-phase 3-wire      | 33 |  |  |  |  |
| 3-phase 4-wire      | 34 |  |  |  |  |

#### 2. COMMON STANDARD SPECIFICATIONS

| ITEM              | SPECIFICATIONS   |
|-------------------|--|
|                   | JIS C 1102 : 2007 Direct Acting Indicating Analogue Electrical Measuring Instruments |
| Standard          | JIS C 1103 Dimensions of Electrical Indicating Instruments for Switchboards          |
|                   | IEC 60051-1 compliance   |
| Class             | Refer to [List of L series].   |
| Support method    | Taut-band (SL, DL is pivot method)   |
| Deflection angle  | 250° (SL : 240°; DL, FPDL : 360°)  |
|                   | L-110C : 200mm (SL : 194mm)  |
| Length of scale   | L-80C : 143mm (SL : 135mm)   |
|                   | L-65C : 107mm (SL : 103mm)   |
| Scale plate color | White  |
| Pointer           | Lancet-shaped (black)  |

| ITEM                  |  | SPECIFICATIONS  |  |  |  |  |
|-----------------------|--|---|--|--|--|--|
| Installation posit    | ion  | Vertical ( )  |  |  |  |  |
| Material of instal    | lation panel                                 | Iron plate or non-iron plate                                |  |  |  |  |
| Thickness of inst     | allation panel                               | 10mm (SL-80C, L-65C 6mm)                                    |  |  |  |  |
| Color of cover        |  | Black (munsell N1.5); dark blue (munsell 7.5BG 4/1.5)       |  |  |  |  |
| Material of cover     | er Methacrylate resin (Antistatic treatment) |   |  |  |  |  |
| Insulation resistance | Between electrical circuit                   | 50MΩ or more at DC500V                                      |  |  |  |  |
| Voltage test          | and outer case                               | AC3320V, 5 seconds  |  |  |  |  |
|                       | Standard                                     | JIS C1010-1   |  |  |  |  |
|                       | Insulation                                   | Between electrical circuit and outer case: basic insulation |  |  |  |  |
|                       | Service space                                | Indoor use (cubicle etc.)                                   |  |  |  |  |
| About safety          | Height                                       | 2000m   |  |  |  |  |
| requirements          | Pollution degree                             | Pollution Degree 2  |  |  |  |  |
|                       | Measurement Category                         | CAT   |  |  |  |  |
|                       | Max. circuit voltage                         | 600V (Ammeter)  |  |  |  |  |
| Operating temper      | rature & humidity                            | -10~+55 (daily average temperature 40), 25~85%RH            |  |  |  |  |
| Storage temperat      | ure range                                    | -20~ + 70   |  |  |  |  |

#### 3. COMMON SPECIAL SPECIFICATIONS (Please specify.)

|                             | ITEM               | SPECIFICATIONS  |  |  |  |  |  |
|-----------------------------|--------------------|---|--|--|--|--|--|
|                             | Color line         | Red, green, yellow (Specify, please.)   |  |  |  |  |  |
|                             | Extension scale    | CL: 3-time exten  | sion; SL: from 2 to 5 times extension.                     |  |  |  |  |
| Scale                       | Color zone(belt)   | Red, green, yello   | w (Specify, please.)                                       |  |  |  |  |
|                             | Dual scale         | Please specify.   |  |  |  |  |  |
|                             | Dual printing      | Please specify.   |  |  |  |  |  |
|                             | Max. division      | 110 angle:100 div   | vision, 80 angle:75 division, 65 angle:60 division         |  |  |  |  |
|                             | Special symbol     | Please specify.   |  |  |  |  |  |
| Vilantian                   |                    | Vibration   | 2-10Hz; amplitude: 15mm p-p; 10~55Hz, 29.4m/s <sup>2</sup> |  |  |  |  |
| v ibration r                | esistant structure | Shock   | 147m/s <sup>2</sup> , 30 times                             |  |  |  |  |
| Tropical specification      |                    | Anticorrosive treatment. "FOR TROPICS" indication                             |  |  |  |  |  |
| Pointer                     |                    | Rod-shaped (multiple scale)   |  |  |  |  |  |
| Manageme                    | nt pointer         | Lancet-shaped (red)   |  |  |  |  |  |
| Installation                | position           | Horizontal, slope installation (angle by specification); not for DL.          |  |  |  |  |  |
| Flame-reta                  | rdant material     | Cover: polycarbonate resin  |  |  |  |  |  |
|                             |                    | Overcurrent   | Specify please the required tolerance dose.                |  |  |  |  |
| Protection circuit of meter |                    | Overvoltage   | Specify please the required tolerance dose.                |  |  |  |  |
| For SCR co                  | ontrol waveform    | AC ammeter / voltmeter, frequency meter                                       |  |  |  |  |  |
| For cycle c                 | ontrol             | AC ammeter / voltmeter (rectifiate type)                                      |  |  |  |  |  |
| Test report                 |                    | Specify please the frequency applied and the quantity of report.              |  |  |  |  |  |
| Others                      |                    | For special frequency, partially extended scale etc., please consult with us. |  |  |  |  |  |

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#### 4. STANDARD SCALE DIVISION

| Max. scale value (10's power of integer) |                 |    | 1.5 | 2  | 2.5 | 3  | 4  | 5  | 6  | 7.5  | 8  | 9  |
|--|-----------------|----|-----|----|-----|----|----|----|----|------|----|----|
|  | L-110C, L-110NC | 50 | 75  | 40 | 50  | 60 | 40 | 50 | 60 | 37.5 | 40 | 45 |
| Kind                                     | L-80C , L-80NC  | 50 | 30  | 40 | 50  | 60 | 40 | 50 | 60 | 37.5 | 40 | 45 |
|  | L-65C           | 20 | 30  | 20 | 25  | 30 | 20 | 25 | 30 | 15   | 16 | 18 |

#### 5. A LIST OF L SERIES

| KIND                                |                |                          | L-110(N)C/D  |              |                | L-80(N)C  |             |                | L-65C     |                         |                |            |
|-------------------------------------|----------------|--------------------------|--|--------------|----------------|-----------|-------------|----------------|-----------|-------------------------|----------------|------------|
| JIS MARK                            |                |                          | KW   | /-3a         |                | KW-6      |             |                | -         |                         |                |            |
| Product                             |                | Operational<br>principle | Type code  | Class        | Weight<br>(kg) | Type code | Class       | Weight<br>(kg) | Type code | Class                   | Weight<br>(kg) |            |
| DC amm                              | eter           |                          | Marina aril  | ML-110C      | 1.5            | 0.5       | ML-80C      | 1.5            | 0.4       | ML-65C                  | 2.5            | 0.3        |
| DC voltm                            | ieter          |                          | Moving coll  | ML-110C      | 1.5            | 0.5       | ML-80C      | 1.5            | 0.4       | ML-65C                  | 2.5            | 0.3        |
| DC receiv                           | ing indic      | ator                     | Moving coil  | XL-110C      | 1.5            | 0.5       | XL-80C      | 1.5            | 0.4       | XL-65C                  | 2.5            | 0.3        |
| AC receiv                           | ing indic      | ator                     | Rectifier  | YL-110C      | 1.5            | 0.6       | YL-80C      | 1.5            | 0.5       | YL-65C                  | 2.5            | 0.3        |
| AC amm                              | eter           |                          | Moving iron  | SL-110C      | 1.5            | 0.35      | SL-80C      | 1.5            | 0.3       | SL-65C                  | 2.5            | 0.2        |
| AC voltm                            | ieter          |                          | Noving non   | SL-110C      | 1.5            | 0.5       | SL-80C      | 1.5            | 0.45      | SL-65C                  | 2.5            | 0.2        |
| AC amm                              | ator           |                          | Transducer   | CL-110NC     | 1.5            | 0.5       | CL-80NC     | 1.5            | 0.5       | -                       | -              | -          |
| AC anim                             | AC ammeter     |                          | Rectifier  | CL-110C      | 1.5            | 0.5       | CL-80C      | 1.5            | 0.5       | CL-65C                  | 2.5            | 0.3        |
| AC voltr                            | ator           |                          | Transducer   | CL-110NC     | 1.5            | 0.5       | CL-80NC     | 1.5            | 0.5       | -                       | -              | -          |
| AC VOID                             | AC voltmeter   |                          | Rectifier  | CL-110C      | 1.5            | 0.5       | CL-80C      | 1.5            | 0.5       | CL-65C                  | 2.5            | 0.3        |
|                                     | 1 phase        | 9                        |  | WL-110NC-12  | 1.5            | 0.6       | WL-80C-12   | 1.5            | 0.8       | WL-65C-12               | 2.5            | 0.8        |
| Watt                                | 1 phase 3-wire |                          | Trongdugor   | WL-110NC-13  | 1.5            | 0.6       | WL-80C-13   | 1.5            | 0.8       | WL-65C-13               | 2.5            | 1.1        |
| meter                               | 3-phas         | e                        | Transducer   | WL-110NC-33  | 1.5            | 0.6       | WL-80C-33   | 1.5            | 0.8       | WL-65C-33               | 2.5            | 1.1        |
|                                     | 3-phas         | e 4-wire                 |  | WL-110NC-34  | 1.5            | 0.6       | WL-80C-34   | 1.5            | 0.8       | WL-65C-34               | 2.5            | 1.1        |
|                                     | 1 phase        | 9                        |  | WVL-110NC-12 | 1.5            | 0.6       | WVL-80C-12  | 1.5            | 0.8       | WVL-65C-12              | 2.5            | 0.8        |
| Var<br>meter                        | 3-phas         | e                        | Transducer   | WVL-110NC-33 | 1.5            | 0.6       | WVL-80C-33  | 1.5            | 0.8       | WVL-65C-33              | 2.5            | 1.1        |
|                                     | 3-phase 4-wire |                          |  | WVL-110NC-34 | 1.5            | 0.6       | WVL-80C-34  | 1.5            | 0.8       | WVL-65C-34              | 2.5            | 1.1        |
|                                     | 1 phase        | 9                        | Transducer   | PL-110NC-12  | 5.0            | 0.6       | PL-80NC-12  | 5.0            | 0.5       | PL-65C-12<br>PBL-65C-33 | 5.0<br>5.0     | 0.8<br>0.8 |
| Power<br>factor                     | 3-phas         | e (balanced)             | Rectifier  | PBL-110NC-33 | 5.0            | 0.6       | PBL-80NC-33 | 5.0            | 0.5       | -                       | -              | -          |
| meter                               | 3-phas         | e (unbalanced)           | Transducer   | PL-110NC-33  | 5.0            | 0.6       | PL-80C-33   | 5.0            | 0.8       | PL-65C-33               | 5.0            | 1.1        |
| 3-phase 4-wire<br>(unbalanced)      |                |                          | PL-110NC-34  | 5.0          | 0.7            | PL-80C-34 | 5.0         | 0.8            | PL-65C-34 | 5.0                     | 1.4            |            |
| Frequenc                            | y meter        |                          | Transducer         AL-110NC         0.5<br>(1.0)         0.6         AL-80NC         0.5<br>(1.0)         0.4         AL-650 |              | AL-65C         | 1.0       | 0.7         |                |           |                         |                |            |
| Synchro-                            | ter            | 1 phase                  | Transducer   | DL-110ND-12  | 2.5            | 0.6       | -           | -              | -         | -                       | -              | -          |
| Power fle                           |                | 3-phase                  |  | DL-110ND-33  |                | 0.6       |             |                |           |                         |                |            |
| Power flow<br>power factor<br>meter |                | 3-phase                  | Transducer   | FPDL-110D-33 | 5.0            | 1.6       | -           | -              | -         | -                       | -              | -          |

#### 6. PURCHASE SPECIFICATIONS

1) Type name 2) Rating (Max. scale / input) \*1

3) Quantity 4) Options (See common special specifications)

5) Test report (Specify please frequency and quantity of report if you need it)

6) Auxiliary supply (in the case of FPDL-110C-33 with Aux. supply)

\*1: See the list of [standard characteristic max. scale value] for the max. scale value of watt and var meter. As for power factor meter, specify frequency according to the specification table.

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#### *§ Wide Angle METER § L Series* DC AMMETER / VOLTMETER / RECEIVING INDICATOR (MOVING COIL TYPE)/ ML XL

#### 1. DC AMMETER

| Maximum Scale | Approx . Intern<br>Voltag | Attachment |       |
|---------------|---------------------------|------------|-------|
| value         | ML-110C, 80C              | ML-65C     |       |
| 200μΑ         | 1.6kΩ                     | 1.6kΩ      |       |
| 1mA           | 185Ω                      | 185Ω       |       |
| 5mA           | 10Ω                       | $12\Omega$ | -     |
| 20mA          | 2.5Ω                      | 3Ω         |       |
| 50mA~30A      | 50mV                      | 60mV       | -     |
| 30A~10kA      | 601                       | mV         | Shunt |

► Any max. scale value exceeding 30A is dealt by a 60mV meter with an external shunt.

A meter with a built-in adjustable resistor for external resistance correction can be manufactured.

Shunt lead wire is not attached. The standard of lead wire resistance is  $0.07\Omega(1.25 \text{ mm}^2)$ 

#### 2. DC VOLTMETER

| Maximum Saala Valua | Approx . Consu | Attachmont |                 |
|---------------------|----------------|------------|-----------------|
| waxinum scale value | ML-110C, 80C   | ML-65C     | Attachment      |
| 50mV~900mV          | 2mA            | 2mA        | -               |
| 1V~600V             | 1mA            | 1mA        | -               |
| 750V/1mA~25kV/1mA   | 1mA            | 1mA        | Series resistor |

► Any maximum scale value exceeding 600V is dealt by a 1mA meter with series resistor.

#### **CONNECTION DIAGRAM**

#### Ammeter





Voltmeter

Ammeter with External Shunt



Voltmeter with External Series Resistor (DM-1)



Voltmeter with External Series Resistor (DM-2~25)



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DC AMMETER / VOLTMETER / RECEIVING INDICATOR (MOVING COIL TYPE)/ ML XL

#### 3. DC RECEIVING INDICATOR

A receiving indicator is an ammeter or a voltmeter that is used to receive electrical signal from a detector or a transmitter, and then measures and indicates various physical quantities, power, power factor, and frequency and so on.

| Volume Of | Approx . Internal Re | sistance | Volume Of Electrical | <b>Consumption Current</b> |        |
|-----------|----------------------|----------|----------------------|----------------------------|--------|
| Input     | XL-110C, XL- 80C     | XL-65C   | Input                | XL-110C, XL- 80C           | XL-65C |
| 200μΑ     | 1.6kΩ                | 1.6kΩ    | 1V                   |                            | 2mA    |
| 500μΑ     | 630Ω                 | 630Ω     | 2V                   |                            | 2mA    |
| 1mA       | 185Ω                 | 185Ω     | 1~5V                 |                            | 1mA    |
| 2mA       | 18Ω                  | 18Ω      | 5V                   | 1mA                        | 1mA    |
| 5mA       | 10Ω                  | 12Ω      | 10V                  |                            | 1mA    |
| 10mA      | 5Ω                   | 6Ω       | 20V                  |                            | 1mA    |
| 20mA      | 2.5Ω                 | 3Ω       | 50V                  | *                          | 1mA    |
| 4~20mA    | $6\Omega$            | 6Ω       | 2                    |                            | 1mA    |
| 10~50mA   | 12.5Ω                | 1.5Ω     | 300V                 |                            | 1mA    |

► For a receiving indicator that receives biased signal such as input DC1~5V, DC4~20mA, zero point adjustment is required when receiving such biased input.

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PANEL CUTOUT

\* Consumption current of VR built-in measuring is 2mA(XL-65C is 1mA)

#### DIMENSIONS













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#### **CONNECTION DIAGRAM**

DC Receiving Indicator



• A meter with bidirectionally swinging pointer can be manufactured.

AC AMMETER / VOLTMETER / RECEIVING INDICATOR (TRANSDUCER TYPE / RECTIFIER TYPE) CL YL

#### 1. AC AMMETER

| Maximum Scale Value |                  | Approx . Internal Resistance or<br>Voltage Drop |         |                    | Onerational Principle |  |
|---------------------|------------------|---|---------|--------------------|-----------------------|--|
| Normal scale        | 3-time extension | CL-110NC  | CL-80NC | CL-110C,<br>CL-80C | CL-65C                | Operational Frinciple                          |
| 1mA                 |                  |   |         |                    | 1 5V                  |  |
| 10mA                |                  |   |         | 3V                 |                       | Pactifiar type                                 |
| 2                   | -                | -   | -       | 54                 | 0.5¥A                 | Reetiner type                                  |
| 300mA               |                  |   |         |                    | 0.5VA                 |  |
| 0.5A                | 1.5A             |   |         |                    |                       |  |
| 1A                  | 3A               |   |         |                    |                       |  |
| 5A                  | 15A              |   | 0.4VA   | -                  | 1VA *                 |  |
| 7.5A                | 22.5A            | 0.437.4   |         |                    |                       |  |
| 10A                 | 30A              | 0.4 V A   |         |                    |                       | CL-110NC, 80NC are                             |
| 15A                 | -                |   |         |                    |                       | transducer type (RMS value rectifying method): |
| 20A                 | -                |   | -       | -                  | 1VA *                 | CL-65C is rectifier type.                      |
| 30A                 | -                |   |         |                    |                       |  |
| 5/5A                | 15/5A            |   |         |                    |                       |  |
| 2                   | 1                | 0.4VA   | 0.4VA   | -                  | 1VA *                 |  |
| 10k/5A              | 30k/5A           |   |         |                    |                       |  |

▶ When the maximum scale value exceeds 30A or the circuit voltage exceeds 600V, use a 5A (1A) meter together with an external CT (current transformer).

\* MR-CTN is attached to L-65C. AT-62M is attached in the case of scale extension.

► Use a cycle control type for cycle control waveform.

Type name: CTL-110NCC (in the case of input from301V to 600V with an attachment : T2-72), CTL-80CC (with attachment: AT-62MEC)

#### 2. AC VOLTMETER

| Maximum Scale | Operating Cur  |              |                         |                                       |
|---------------|----------------|--------------|-------------------------|---------------------------------------|
| Value         | CL-110NC, 80NC | CL-110C, 80C | CL-65C                  | Operational Principle                 |
| 3V            |                |              |                         |                                       |
| 2             | -              | 3mA          |                         |                                       |
| 25V           |                |              |                         |                                       |
| 30V           |                |              |                         |                                       |
| 2             | -              | 1.1mA 1.1m   | 1.1mA                   |                                       |
| 100V          |                |              |                         | CL-110NC, 80NC are transducer type    |
| 150V          | 0.8VA          |              |                         | (RMS value rectifying method);        |
| 300V          | 1.8VA          | -            | - CL-110C, 80C, 65C are | CL-110C, 80C, 65C are rectifier type. |
| 600V          | -              | 0.7VA        |                         |                                       |
| 600V/150V     |                |              |                         | ]                                     |
| 2             | 0.8VA          | -            | -                       |                                       |
| 500k/150V     |                |              |                         |                                       |

► For any maximum scale value exceeding 600V, please use a 150V meter together with an external transformer for meter. Series resistor method meter can be manufactured as well, have a consultation with us if you need it.

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AC AMMETER / VOLTMETER / RECEIVING INDICATOR (TRANSDUCER TYPE / RECTIFIER TYPE) CL YL

#### **3. AC RECEIVING INDICATOR**

A receiving indicator is an ammeter or a voltmeter that is used to receive electrical signal from a detector or a transmitter, and then measures and indicates various physical quantities, power, power factor, and frequency and so on.

| Volume of Electrical | Approx. Internal Re | sistance      | Volume of Electrical | <b>Consumption Current</b> |         |
|----------------------|---------------------|---------------|----------------------|----------------------------|---------|
| Input                | YL-110C, YL-80C     | YL-65C        | Input                | YL-110C, YL-80C            | YL-65C  |
| 500μΑ                | 6kΩ                 | 3kΩ           | 3~6V                 | 3.3mA                      |         |
| 1mA                  | 3kΩ                 | $1.5 k\Omega$ | 7.5~12V              | 3.15mA                     |         |
| 3mA                  | lkΩ                 | $670\Omega$   | 15~25V               | 2.94mA                     | 1.1     |
| 5mA                  | 600Ω                | 250Ω          | 30V                  |                            | 1.11IIA |
| 10mA                 | 300Ω                | 50Ω           | 2                    | 1.1mA                      |         |
| 20mA                 | 150Ω                | 25Ω           | 300V                 |                            |         |

#### **CONNECTION DIAGRAM**

LOAD

1.5.



Ammeter

#### Voltmeter with External VT



Ammeter with External CT



## AC Receiving Indicator



#### External MR-CTN



#### DIMENSIONS

L-110C









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#### *§ Wide Angle METER § L Series* AC AMMETER / VOLTMETER (MOVING IRON TYPE) **SL**

#### 1. AMMETER

| Normal Scale     | Extended Scale |        |        | Appr   | ox . VA Cons | sumption |        |
|------------------|----------------|--------|--------|--------|--------------|----------|--------|
| Max. scale value | 2-time         | 3-time | 4-time | 5-time | SL-110C      | SL-80C   | SL-65C |
| 100mA            | 200mA          | 300mA  | 400mA  | 500mA  |              |          |        |
| 500mA            | 1A             | 1.5A   | 2A     | 2.5A   |              |          |        |
| 1A               | 2A             | 3A     | 4A     | 5A     |              |          |        |
| 3A               | 6A             | 9A     | 12A    | 15A    |              |          |        |
| 5A               | 10A            | 15A    | 20A    | 25A    | 3VA          | 3VA      | 3VA    |
| 7.5A             | 15A            | 22.5A  | 30A    | 37.5A  |              |          |        |
| 10A              | 20A            | 30A    | 40A    | 50A    |              |          |        |
| 15A              | 30A            | 45A    | 60A    | 75A    |              |          |        |
| 20A              | 40A            | 60A    | 80A    | 100A   |              |          |        |
| 30A              | 60A            | 90A    | 120A   | 150A   |              |          |        |
| 5/5A             | 10A            | 15A    | 20A    | 25A    |              |          |        |
| 2                | 2              | 2      | 2      | 2      | 3VA          | 3VA      | 3VA    |
| 10kA/5A          | 20kA           | 30kA   | 40kA   | 50kA   |              |          |        |

► When the maximum scale value exceeds 30A or the circuit voltage exceeds 600V, use a 5A (0.1A, 1A) meter together with an external CT (current transformer).

• Meter for SCR waveform input (distortion waveform) can be manufactured as well. (With H at the end of type name) Type name: SL-110CH

#### **CONNECTION DIAGRAM**

#### Ammeter

#### Ammeter with External CT





#### DIMENSIONS

L-110C



L-80C



L-65C

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#### § Wide Angle METER § L Series AC AMMETER / VOLTMETER (MOVING IRON TYPE) SL

#### 2. VOLTMETER

| May SaalaValua    | Approx . V          | A Consumption | Attachment              |  |
|-------------------|---------------------|---------------|-------------------------|--|
| wax. Scale v alue | SL-110C SL-80C, 65C |               | (Series Resistor)       |  |
| 50V               |                     |               |                         |  |
| 100V              |                     |               |                         |  |
| 150V              | 8VA                 | 8VA           |                         |  |
| 300V              |                     |               |                         |  |
| 600V              |                     |               | SL-80C,SL-65C:<br>DM-41 |  |
| 600/150V          |                     |               |                         |  |
| 2                 | 8VA                 | 8VA           |                         |  |
| 550k/150V         |                     |               |                         |  |

 For any max. scale value exceeding 600V, please use a 150V meter together with an external transformer for meter.
 Meter for SCR waveform input (distortion waveform) can be manufactured as well. (With H at the end of type name) Type name: SL-110CH

Voltmeter with External Series Resistor

DM-4

LOAD

#### **CONNECTION DIAGRAM**

#### Voltmeter



Voltmeter with External VT



#### **DIMENSIONS**





**DIMENSIONS (DM-41)** 

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FREQUENCY METER / POWER FACTOR METER (TRANSDUCER TYPE) AL PL

#### 1. FREQUENCY METER

| Dated Valtage | Massuramont Danga | Approx. VA C   | Attachment |              |
|---------------|-------------------|----------------|------------|--------------|
| Kateu voltage | Measurement Kange | AL-110NC, 80NC | AL-65C     | (transducer) |
|               | 45~55Hz           |                |            |              |
| 1101          | 55~65Hz           | 1.537.6        | 1.7VA      |              |
| 1100          | 45~65Hz*          | 1.5VA          |            | AL-65C:      |
|               | 350~450Hz*        |                |            | FT-62M       |
|               | 45~55Hz           |                |            |              |
| 22014         | 55~65Hz           | 1.537.6        | 2.537.4    |              |
| 2200          | 45~65Hz*          | 1.5VA          | 2.3 V A    |              |
|               | 350~450Hz*        |                |            |              |

\* Class 1.0

• Meter of special frequency range can be manufactured as well (up to 1000Hz)

• Meter for SCR waveform input (distortion waveform) can be manufactured as well. (With H at the end of type name) Type name: AL-110CH

► Applicable voltage range: 90~130V for 110V; 180~260V for 220V.

▶ Rated voltage and applicable voltage range other than those above can be manufactured. Have a consultation with us.

#### 2. POWER FACTOR METER

| Application  | Type        | Deting   | Approx. VA                           | Consumption                          | Attachment (transducer) |            |
|--------------|-------------|--|--------------------------------------|--------------------------------------|-------------------------|------------|
| Application  | гуре        | Katilig  | Voltage side                         | Current side                         | 80C                     | 65C        |
| Single phase | PL-110NC-12 |  | 0.011                                | 0.0111                               |                         |            |
| 5 5 F        | 80NC-12     | 110V, 5A(1A)<br>220V 5A(1A)                        | 0.6VA<br>1.2VA                       | 0.9VA<br>0.9VA                       | -                       | PT-62M-12  |
|              | 65C-12      | 2201, 511(111)                                     | 1.2 / 11                             | 0.9 111                              |                         |            |
| 3-phase      | PBL-110NC33 |  |                                      |                                      |                         |            |
| (balanced)   | 80NC33      | 110V, 5A(1A)<br>220V 5A(1A)                        | 0.6VA each phase<br>1 2VA each phase | 0.9VA each phase<br>0.9VA each phase | -                       | PBT-62M-33 |
|              | 65C33       | 2201, 511(111)                                     | 1.2 TT cuch phase                    | 0.9 The cuch phase                   |                         |            |
| 3-phase      | PL-110NC-33 |  | 1.0774                               |                                      |                         |            |
| (unbalanced) | 80C-33      | 110V, 5A(1A)<br>220V 5A(1A)                        | 1.9VA each phase<br>4 0VA each phase | 1.1VA each phase<br>1.1VA each phase | PT-53MC-33              | PT-63M-33  |
|              | 65C-33      | 2201, 511(111)                                     | 1.6 TT cuch phase                    | 1.1 v I cuch phuse                   |                         |            |
| 3-phase      | PL-110NC-34 |  |                                      |                                      |                         |            |
| 4-wire       | 80C-34      | $110/\sqrt{3}V, 5A(1A)$<br>$220/\sqrt{3}V, 5A(1A)$ | 0.8VA each phase<br>2 5VA each phase | 1.1VA each phase                     | PT-53MC-34              | PT-64M-33  |
| (unbalanced) | 65C-34      | 220, 15 1,511(111)                                 | 2.5 The cach phase                   | 1.1 v i vach phuse                   |                         |            |

Except meter for balanced 3 phase circuit, specify please the frequency either 50Hz or 60Hz.

Standard scale is Lead0.5~1~Lag0.5. Lead0~1~Lag0 (effective measuring range: Lead0.3~1~Lag0.3) is only available for 3-phase 3-wire.

▶ In the case of rating exceeding those above, use an 110V, 5A (1A) meter together with a CT or a VT respectively.

► Applicable voltage range: 90~130V for 110V; 180~260V for 220V.

▶ Please use the meter in positive phase sequence. (Sine waveform)

► Voltage side consumption VA of PL-65 is max. 2VA.

#### **CONNECTION DIAGRAM**

#### Frequency Meter



#### Frequency Meter with External FT-62M



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#### § Wide Angle METER § L Series FREQUENCY METER / POWER FACTOR METER (TRANSDUCER TYPE) AL PL

#### L-110C





3-phase 3-wire Power Factor Meter (balance)



3-phase 3-wire Power Factor Meter (unbalance)



L-110C

3-phase 4-wire Power Factor Meter





3-phase 4-wire

Power Factor Meter (unbalance)

with External PT-53MC-34

LOAD

L-80C

Single Phase

**Power Factor Meter** 

L-65C

LOAD

3-phase 3-wire **Power Factor Meter (unbalance)** 



L-80C

3-phase 3-wire Power Factor Meter (unbalance) with External PT-53MC-33







3-phase balanced balanced **Power Factor Meter** with External PBT-62M-33











3-phase 4-wire unbalanced **Power Factor Meter** with External PT-64M-34



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#### *§ Wide Angle METER § L Series* FREQUENCY METER / POWER FACTOR METER (TRANSDUCER TYPE) **AL PL**

#### DIMENSIONS



AL-110NC / PBL-110NC





PL-110NC



L80C / L-80NC



L-65C



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#### *§ Wide Angle METER § L Series* WATT METER / VAR METER (TRANSDUCER TYPE) **WL WVL**

#### 1. WATT METER

| Application            | Type                            | Dating  | Approx. VA Consumption               |                                      | tion Attachmen (transducer) |           |
|------------------------|---------------------------------|---|--------------------------------------|--------------------------------------|-----------------------------|-----------|
| Application            | туре                            | Kating  | Voltage side                         | Current side                         | 80C                         | 65C       |
| Single phase           | WL-110NC-12<br>80C-12<br>65C-12 | 110V, 5A(1A)<br>220V, 5A(1A)                        | 1.7VA<br>3.7VA                       | 0.5VA<br>0.5VA                       | WT-53MC-12                  | WT-62M-12 |
| Single phase<br>3-wire | WL-110NC-13<br>80C-13<br>65C-13 | 110V, 5A(1A)  | 1.7VA each phase                     | 0.5VA each phase                     | WT-53MC-13                  | WT-83M-13 |
| 3-phase<br>3-wire      | WL-110NC-33<br>80C-33<br>65C-33 | 110V, 5A(1A)<br>220V, 5A(1A)                        | 1.7VA each phase<br>3.7VA each phase | 0.5VA each phase<br>0.5VA each phase | WT-53MC-33                  | WT-83M-33 |
| 3-phase<br>4-wire      | WL-110NC-34<br>80C-34<br>65C-34 | $110/\sqrt{3}V, 5A(1A)$<br>220/ $\sqrt{3}V, 5A(1A)$ | 0.8VA each phase<br>2.5VA each phase | 0.5VA each phase<br>0.5VA each phase | WT-53MC-34                  | WT-83M-34 |

► 3-phase 4-wire is voltage balancing.

▶ In the case of rating exceeding those above, use an 110V, 5A (1A) meter together with a CT or a VT respectively.

► Applicable voltage range: 90~130V for 110V; 180~260V for 220V.

#### 2. VAR METER

| Application       | Type         | Dating                     | Approx . VA                          | Consumption                          | Attachment (transduecer) |            |
|-------------------|--------------|----------------------------|--------------------------------------|--------------------------------------|--------------------------|------------|
| Application       | туре         | Kating                     | Voltage side                         | Current side                         | 80C                      | 65C        |
|                   | WVL-110NC-12 |                            | 1 577.4                              | 0.5114                               |                          |            |
| Single phase      | 80C-12       | 110V,5A(1A)<br>220V 5A(1A) | 1.7VA<br>1.4VA                       | 0.5VA<br>0.5VA                       | WVT-53MC-12              | WVT-62M-12 |
|                   | 65C-12       | 2201,511(111)              | 1.1.71                               | 0.5 11                               |                          |            |
|                   | WVL-110NC-33 |                            |                                      | 0.5334                               |                          |            |
| 3-phase<br>3-wire | 80C-33       | 110V,5A(1A)<br>220V 5A(1A) | 1.7VA each phase<br>3.7VA each phase | 0.5VA each phase<br>0.5VA each phase | WVT-53MC-33              | WVT-83M-33 |
| 5                 | 65C-33       | 2201,011(111)              | 5., the each phase                   | o.o (11 ouon phuoo                   |                          |            |
|                   | WVL-110NC-34 |                            |                                      | 0.5334                               |                          |            |
| 3-phase           | 80C-34       | 110V,5A(1A)<br>220V 5A(1A) | 1.7VA each phase                     | 0.5VA each phase                     | WVT-53MC-34              | WVT-83M-34 |
| , whe             | 65C-34       | 2201,511(111)              | 5.7 Treaten phuse                    | 0.5 VII eden plidse                  |                          |            |

► 3-phase 4-wire is voltage balancing.

► Specify please the frequency either 50Hz or 60Hz for a meter for single phase circuit.

► The scale of var meter is Lead var~0~Lag var.

▶ In the case of rating exceeding those above, use an 110V, 5A (1A) meter together with a CT or a VT respectively.

► Applicable voltage range: 90~130V for 110V; 180~260V for 220V.

▶ 3-phase 3-wire and 3-phase 4-wire are voltage balanced, use in positive phase sequence, please.

## CONNECTION DIAGRAM

#### Single Phase Watt Meter / Var Meter



#### Single Phase 3-Wire & 3-phase 3-wire Watt Meter/ Var Meter



3-phase 4-wire Watt Meter



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#### *§ Wide Angle METER § L Series* WATT METER / VAR METER (TRANSDUCER TYPE) **WL WVL**



3-phase 4-wire Var Meter





3-phase 4-wire Watt Meter with External WT-53MC-34



Single Phase 3-Wire Watt Meter/Var Meter, 3-phase Watt Meter/Var Meter with External WT (WVT)-83M-33



#### L-80C

Single Phase Watt Meter/ Var Meter with External WT (WVT)-53MC-12



3-phase 4-wire Var Meter

with External WVT-53MC-34

Single Phase 3-wire & 3-phase 3-wire Watt Meter/ Var Meter with External WT (WVT)-53MC-33



L-65C

LOAD

C

Single Phase Watt Meter/ Var Meter with External WT (WVT)-62M-12



3-phase 4-wire Watt Meter with External WT-53MC-34



3-phase 4-wire Var Meter with EXTERNAL WVT-83M-34











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#### § Wide Angle METER § L Series WATT METER / VAR METER (TRANSDUCER TYPE) WL WVL



#### MANUFACTURABLE CHARACTERISTIC RANGE OF MAXIMUM SCALE VALUE

PANEL CUTOUT

The characteristic ranges of maximum scale value listed in the table can be manufactured. However, in the case of a meter with external VT / CT, the characteristic ranges of maximum scale value can be calculated with the following formula.

|   | Maximum Scale Value   |
|---|-----------------------|
| Characteristic range of maximum scale value = | (VT ratio × CT ratio) |

| Circuit             | Rating       |              |                      | Manufacturable Characteristic Range |                           |  |
|---------------------|--------------|--------------|----------------------|-------------------------------------|---------------------------|--|
| Circuit             |              |              |                      | Watt Meter                          | Var Meter                 |  |
| 110V, 5A(1A         |              | 110V, 5A(1A) |                      | 350~ 600W (70-120W)                 | 350~ 600var (70-120var)   |  |
| Single phase        | 220V, 5A(1A) |              |                      | 700~1200W (140-240W)                | 700~1200var (140-240var)  |  |
| Single phase 3-wire |              | 110V, 5A(1A) |                      | 600~1200W (120-240W)                | -                         |  |
| 2 mbaga 2 mina      | 110V, 5A(1A) |              | 600~1200W (120-240W) | 600~1200var (120-240var)            |                           |  |
| 5-phase 5-whe       | 220V, 5A(1A) |              |                      | 1200~2400W (240-480W)               | 1200~2400var (240-480var) |  |
|                     | Line         | Phase        | Current              | -                                   | -                         |  |
| 3-phase 4-wire      | 110V         | 110/√3V      | 5A(1A)               | 600~1200W (120-240W)                | 600~1200var (120-240var)  |  |
|                     | 220V         | 220/√3V      | 5A(1A)               | 1200~2400W (240-480W)               | 1200~2400var (240-480var) |  |

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WATT METER / VAR METER (TRANSDUCER TYPE) WL WVL

#### MAXIMUM SCALE VALUE OF 3 PHASE WATT METER

This table is the standard of 3-phase watt meter. 3-phase 4-wire and single-phase 3-wire watt meter, var meter are pursuant to this standard, too. Single phase watt meter values equal the values in the table multiplying 1/2.

| Line vol <b>tage</b><br>CT ratio | 6600V    | 7 (VT6600 | /110V)   | 3300V    | (VT3300/ | '110V)   | 440V (  | (VT440/1 | 1 <b>10V</b> ) |         | 220V      |           |         | 110V      |           |
|----------------------------------|----------|-----------|----------|----------|----------|----------|---------|----------|----------------|---------|-----------|-----------|---------|-----------|-----------|
| 5/5A                             | kW<br>60 | kW<br>50  | kW<br>40 | kW<br>30 | kW<br>25 | kW<br>20 | kW<br>4 | kW<br>5  | kW<br>3        | kW<br>2 | kW<br>1.5 | kW<br>1.2 | kW<br>1 | kW<br>0.8 | kW<br>0.6 |
| 7.5/5A                           | 90       | 75        | 60       | 45       | 40       | 30       | 6       | 5        | 4              | 3       | 2.5       | 2         | 1.5     | 1.2       | 1         |
| 10/5A                            | 120      | 100       | 80       | 60       | 50       | 40       | 8       | 7.0      | 6              | 4       | 3         | 2.5       | 2       | 1.5       | 1.2       |
| 15/5A                            | 200      | 150       | 120      | 100      | 75       | 60       | 12      | 10       | 8              | 6       | 5         | 4         | 3       | 2.5       | 2         |
| 20/5A                            | 240      | 200       | 150      | 120      | 100      | 80       | 15      | -        | 12             | 8       | 6         | 5         | 4       | 3         | 2.5       |
| 25/5A                            | 300      | 250       | 200      | 150      | 120      | 100      | 20      | -        | 15             | 10      | 8         | 7.5       | 5       | 4         | 3         |
| 30/5A                            | 400      | 300       | 240      | 200      | 150      | 120      | 24      | -        | 20             | 12      | 10        | 8         | 6       | 5         | 4         |
| 40/5A                            | 480      | 400       | 300      | 240      | 200      | 150      | 30      | -        | 24             | 15      | 12        | 10        | 8       | 7.5       | 5         |
| 50/5A                            | 600      | 500       | 400      | 300      | 250      | 200      | 40      | -        | 30             | 20      | 15        | 12        | 10      | 8         | 6         |
| 60/5A                            | 750      | 600       | 480      | 400      | 300      | 240      | 48      | -        | 40             | 24      | -         | 20        | 12      | 10        | 8         |
| 75/5A                            | 900      | 750       | 600      | 450      | 400      | 300      | 60      | 50       | 40             | 30      | 25        | 20        | 15      | 12        | 10        |
| 100/5A                           | 1200     | 1000      | 800      | 600      | 500      | 400      | 80      | 75       | 60             | 40      | 30        | 25        | 20      | 15        | 12        |
| 150/5A                           | 2000     | 1500      | 1200     | 1000     | 750      | 600      | 120     | 100      | 80             | 60      | 50        | 40        | 30      | 25        | 20        |
| 200/5A                           | 2400     | 2000      | 1500     | 1200     | 1000     | 800      | 150     | -        | 120            | 80      | 60        | 50        | 40      | 30        | 25        |
| 250/5A                           | 3000     | 2500      | 2000     | 1500     | 1200     | 1000     | 200     | -        | 150            | 100     | 80        | 75        | 50      | 40        | 30        |
| 300/5A                           | 4000     | 3000      | 2400     | 2000     | 1500     | 1200     | 240     | -        | 200            | 120     | 100       | 80        | 60      | 50        | 40        |
| 350/5A                           | 4000     | -         | 3000     | 2000     | -        | 1500     | 300     | 250      | 200            | 150     | 120       | 100       | 75      | 60        | 50        |
| 400/5A                           | 4800     | 4000      | 3000     | 2400     | 2000     | 1500     | 300     | -        | 250            | 150     | 120       | 100       | 80      | 75        | 50        |
| 450/5A                           | 6000     | 5000      | 4000     | 3000     | 2500     | 2000     | 400     | 300      | 250            | 200     | 150       | 120       | 100     | 75        | 60        |
| 500/5A                           | 6000     | 5000      | 4000     | 3000     | 2500     | 2000     | 400     | -        | 300            | 200     | 150       | 120       | 100     | 75        | 60        |
| 600/5A                           | 7500     | 6000      | 4800     | 4000     | 3000     | 2400     | 500     | -        | 400            | 240     | -         | 200       | 120     | 100       | 70        |
| 750/5A                           | 9000     | 7500      | 6000     | 4500     | 4000     | 3000     | 650     | 500      | 400            | 300     | 250       | 200       | 150     | 120       | 100       |
| 800/5A                           | 10MW     | 8000      | 7500     | 5000     | -        | 4000     | 700     | 600      | 500            | 300     | 250       | 200       | 150     | 120       | 100       |
| 1000/5A                          | 12MW     | 10MW      | 8000     | 6000     | 5000     | 4000     | 800     | 750      | 600            | 400     | 300       | 250       | 200     | 150       | 120       |
| 1200/5A                          | 15MW     | 12MW      | 10MW     | 7500     | 6000     | 5000     | 1000    | 800      | 750            | 500     | 400       | 300       | 250     | 200       | 150       |
| 1500/5A                          | 20MW     | 15MW      | 12MW     | 10MW     | 7500     | 6000     | 1200    | 1000     | 800            | 600     | 500       | 400       | 300     | 250       | 200       |

#### DIMENSIONS OF ATTACHMENT TRANSDUCER

#### T-62M -











T-64M-







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#### **§** Wide Angle METER **§** L Series Synchroscope meter (transducer type) **DL**

#### 1. SYNCHROSCOPE METER

| Method       | Туре        | Rated<br>Voltage | Rated Frequency   | Approx . Con        | sumption VA |
|--------------|-------------|------------------|-------------------|---------------------|-------------|
|              |             | voltage          |                   | Start side          | Bus side    |
| Single phase | DL-110ND-12 | 110V             | Serve 50Hz & 60Hz | 0.2VA               | 4.0VA       |
| 2 mbarr      | DI 110ND 22 | 110V             | Serve 50Hz & 60Hz | 0.4VA<br>each phase | 4.0VA       |
| 5-pnase      | DL-110ND-33 | 220V             | Serve 50Hz & 60Hz | 0.4VA<br>each phase | 4.0VA       |

▶ In the case of rating exceeding those above, use an 110V meter together with an external CT.

#### **CONNECTION DIAGRAM**

Single Phase DL-110ND-12





3-phase

DL-110ND-33

#### DIMENSIONS

Single phase DL-110ND-12 3-phase DL-110ND-33



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POWER FLOW 3 PHASE POWER FACTOR METER (TRANSDUCER TYPE) FPDL

#### 1. POWER FACTOR METER

| Mathad  | Type         | Dated Voltage    | Rated     | Auxiliary                  | Approx . Consumption VA |              |                     |  |  |  |
|---------|--------------|------------------|-----------|----------------------------|-------------------------|--------------|---------------------|--|--|--|
| Wiethou | туре         | Kateu voltage    | Frequency | supply                     | Voltage side            | Current side | Aux.supply          |  |  |  |
|         |              | $110V_{5A}(1A)$  | 50Hz      |                            |                         |              |                     |  |  |  |
| 3-phase | EDDI 110D 22 | 110V, 3A(1A)     | 60Hz      | AC110V<br>AC220V<br>DC110V | P1-P2 6.5VA;            | 1VA or less  | DC4.5VA             |  |  |  |
|         | FPDL-110D-33 | $220 V_{5A}(1A)$ | 50Hz      |                            | aux.supply              | each         | In the case of with |  |  |  |
|         |              | 220V, 3A(1A)     | 60Hz      |                            |                         |              | aux. supply         |  |  |  |

► Specify the frequency either 50Hz or 60Hz.

▶ In the case of rating exceeding those above, use a 110V, 5A (1A) meter together with a CT or a VT respectively.

Please use the meter in positive phase sequence.

► For standard scale, upper part shows receiving power and under part shows power transmission. Please specify if using in the reverse case.

(1) Without Aux. Supply

#### **SCALE BOARD**

#### **CONNECTION DIAGRAM**





7.5

(2) With Aux. Supply

#### **DIMENSIONS**



#### ATTACHMENT TRANSDUCER (FSPT-83M-33)

(1) Without Aux. Supply (Supplied by Input Voltage)





► At the time of installation, select a place with less mechanical shock, dust and corrosive gas, a place free from the affection of electromagnetic field of a heavy current bus or a saturable reactor nearby.

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# Instrument Accessory

## Current Transformers (CT) & Voltage Transformers (VT)





It is possible to combine the instrument in 5A or 1A after converted by current transformer when measuring a large current.

Primary Winding Type, Circle Window Type & Square Window Type. There are 3 types can use depending on the magnitude of the current.

It is possible to combine the instrument in 110V after converted by voltage transformer when measuring a large voltage.

#### FEATURES

High quality & high performance current transformer. This product is compliance with:

JIS C-1731-1 standard Instrument current transformer & JED-1201 standard Instrument voltage transformer.

Class: 1.0

Tolerance: ±1.0%

► Depending to the intended use, we have few selections for current transformer & voltage transformer like mold type or dry open type can be choice.



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#### Instrument Transformers

- ◆ JIS C 1731-1 standard for Current Transformer & JEC-1201 standard for Voltage Transformer
- Instrument transformer have few selections depending to the intended use like mold type or dry open type etc.
- Low voltage transformer wiring work is easy & compact.
- Please use epoxy resin mould type for high insulation speicificaton.

#### List of Current Transformers

| Max. circuit<br>voltage (V) | Construction       | Insulated<br>system | Type<br>Name | Primary<br>current (A) | Secondary<br>current (A) | Rated<br>burden<br>(VA) | Class | Frequency<br>(Hz) | Over<br>current<br>(Times) | weight<br>(kg) |
|-----------------------------|--------------------|---------------------|--------------|------------------------|--------------------------|-------------------------|-------|-------------------|----------------------------|----------------|
|                             |                    | ABS resin           | CPI-1TR      | 5~300                  | * 5                      | 10                      | 1.0   | 50/60             | 40                         | 0.5            |
|                             | Circle Window      | Epoxy resin         | CR2–5        | 10~750                 | 5                        | 5                       | 1.0   | 50/60             | 40                         | 0.8            |
|                             | Circle Window      | Mould ABS           | CR2–15       | 10~750                 | 5                        | 15                      | 1.0   | 50/60             | 40                         | 0.7            |
| Below<br>1,150              |                    | coated              | CR2-40       | 20~750                 | 5                        | 40                      | 1.0   | 50/60             | 40                         | 0.9            |
|                             | Square             | Epoxy resin         | CS1–15       | 200~750                | 5                        | 15                      | 1.0   | 50/60             | 40                         | 1.2            |
|                             | Window             | coated              | CS1–40       | 200~2,000              | 5                        | 40                      | 1.0   | 50/60             | 40                         | 1.1            |
|                             | Primary<br>Winding | ABS resin           | CPX–15       | 5~30                   | * 5                      | 15                      | 1.0   | 50/60             | 40                         | 0.75           |

• Product with mark \* can be manufacture by secondary current 1A.

#### List of Voltage Transformers

| Max.<br>circuit<br>voltage (V) | Construction   | Insulated system | Type<br>Name | Primary<br>current<br>(A) | Secondary current (A) | Rated<br>burden<br>(VA) | Class | Frequency<br>(Hz) | AC<br>Withstand<br>voltage | weight<br>(kg) |
|--------------------------------|----------------|------------------|--------------|---------------------------|-----------------------|-------------------------|-------|-------------------|----------------------------|----------------|
| Below                          |                | Deri             |              | 220                       |                       | 15                      |       |                   | 2kV, 1 min                 | 2.2            |
| 230                            | Winding        | opening          | PDI–1        |                           | 110                   | 50                      | 1.0   | 50/60             |                            | 3.6            |
| Below<br>460                   | туре           | type             |              | 440                       |                       | 100                     |       |                   | 3kV, 1 min                 | 6.5            |
|                                |                |                  | PD_111N      | 220                       | 110                   | 50                      | 1.0   | 50/60             | 2kV, 1 min                 | 5.0            |
|                                |                | Epoyy            |              | 440                       | 110                   | 50                      | 1.0   | 50/00             | 3kV, 1 min                 | 5.0            |
| Below                          | With a fuse    | resin            | PP_112N      | 220                       | 110                   | 100                     | 10    | 50/60             | 2kV, 1 min                 | 6.0            |
| 460                            | 60 With a fuse | resin            | KF-HZN       | 440                       | 110                   | 100                     | 1.0   | 50/00             | 3kV, 1 min                 | 0.0            |
|                                |                | moulu            | DD 112N      | 220                       | 110                   | 200                     | 1.0   | 50/60             | 2kV, 1 min                 | 9 5            |
|                                |                |                  | RP-113N      | 440                       | 110                   | 200                     | 1.0   | 00/00             | 3kV, 1min                  | 0.5            |

## Current Transformers (CT)

#### Circle Window Type (Below 1,150V)

| Insulated | Туре    |    |    |    |    |    |    |    |    |    |    | Prim | ary c | urrent | (A) |     |     |     |     |     |     |     |     | Secondary current | Rated<br>Burden |
|-----------|---------|----|----|----|----|----|----|----|----|----|----|------|-------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------------------|-----------------|
| System    | Name    | /  | 5  | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 60 | 75   | 80    | 100    | 120 | 150 | 200 | 250 | 300 | 400 | 500 | 600 | 750 | (A)               | (VA)            |
| ABS resin | CPI-1TR | *Т | 24 | 15 | 10 | 8  | 6  | 5  | 4  | 3  | 3  | 2    | 2     | 2      | 1   | 1   | 1   | 1   | 1   | -   | -   | -   | -   | 5                 | 10              |
| Ероху     | CR2-5   | *T | -  | 10 | 8  | 5  | 4  | 4  | 3  | 2  | 2  | 2    | -     | 1      | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 5                 | 5               |
| resin     | CR2-15  | *T | -  | 15 | 10 | 10 | 6  | 5  | 5  | 3  | 4  | 2    | 3     | 2      | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 5                 | 15              |
| coated    | CR2-40  | *T | -  | -  | -  | 10 | 8  | 7  | 5  | 4  | 4  | 4    | 3     | 2      | 2   | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 5                 | 40              |

\* T = Number of primary conductor penetration.

#### CPI-1TR 10VA





<u>CR2 – 5</u>





| Primary Current (A) | А   | В  | С  | ΦD | ΦE | F  | G  |
|---------------------|-----|----|----|----|----|----|----|
| 10~200              | 85  | 70 | 57 | 23 | 61 | 70 | 37 |
| 240~400             | 85  | 70 | 55 | 32 | 70 | 77 | 42 |
| 500~750             | 100 | 85 | 57 | 50 | 86 | 93 | 50 |

## Current Transformers (CT)

#### Circle Window Type (Below 1,150V)







|         |                      | Prima   | ry Curre | ent (A) |     |     | А   | В  | С  | ΦD | ΦE | F  | G  |
|---------|----------------------|---------|----------|---------|-----|-----|-----|----|----|----|----|----|----|
| 10      | 0 15 25 30 50 75 150 |         |          |         |     | 150 | 100 | 85 | 57 | 25 | 76 | 83 | 45 |
| 60      | 80 120 240~400       |         |          |         |     |     | 85  | 70 | 55 | 32 | 70 | 77 | 42 |
| 20      | 40                   | 100 200 |          |         |     |     | 100 | 85 | 55 | 32 | 70 | 77 | 42 |
| 500~750 |                      |         |          |         | 100 | 85  | 57  | 50 | 86 | 93 | 50 |    |    |







| Primary Current (A) | А   | В  | С  | ΦD | ΦE | F  | G  |
|---------------------|-----|----|----|----|----|----|----|
| 20~400              | 100 | 85 | 72 | 32 | 86 | 93 | 50 |
| 500~750             | 100 | 85 | 57 | 50 | 86 | 93 | 50 |

## Current Transformers (CT)

#### Square Window Type (Below 1,150V)

| Insulated<br>System | Type<br>Name | Primary<br>Current (A)        | Secondary<br>Current<br>(A) | Rated<br>Burden<br>(VA) | A   | В   | С   | D   | E   | F  | G  | Н  | J  | W   | t  |
|---------------------|--------------|-------------------------------|-----------------------------|-------------------------|-----|-----|-----|-----|-----|----|----|----|----|-----|----|
|                     | CS1-15       | 200, 300,<br>400, 500         | 5                           | 15                      | 137 | 118 | 101 | 75  | 73  | 39 | 50 | 53 | 69 | 55  | 14 |
| Ероху               |              | 600, 750                      |                             |                         | 150 | 131 | 114 | 64  | 62  | 33 | 50 | 53 | 69 | 80  | 14 |
| resin               |              | 200                           |                             |                         | 163 | 144 | 130 | 107 | 104 | 55 | 65 | 68 | 84 | 55  | 14 |
| ABS                 |              | 300,400,500                   |                             |                         | 137 | 118 | 101 | 75  | 73  | 39 | 50 | 53 | 69 | 55  | 14 |
| coated              | CS1-40       | 600, 750                      | 5                           | 40                      | 150 | 131 | 114 | 64  | 62  | 33 | 50 | 53 | 69 | 80  | 14 |
|                     |              | 1,000, 1,200,<br>1,500, 2,000 |                             |                         | 169 | 150 | 133 | 82  | 80  | 42 | 50 | 53 | 69 | 105 | 28 |

• Fitting metal for bus bar also available (Option onerous)

#### CS1-15, CS1-40







#### Primary Winding Type

| Insulated System | Type Name | Primary Current (A) | Secondary Current (A) | Rated Burden (VA) |
|------------------|-----------|---------------------|-----------------------|-------------------|
| ABS resin        | CPX-15    | 5, 10, 15, 20, 30   | 5                     | 15                |

#### <u>CPX – 15</u>





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## Voltage Transformers (VT)

#### For low voltage Instrument use below 460V & 230V

#### 1) Dry Open Type

| Туре    | Max. Circuit | Primary     | Secondary   | Rated       |     |     | Di  | mension ( | mm) |                 |
|---------|--------------|-------------|-------------|-------------|-----|-----|-----|-----------|-----|-----------------|
| Name    | Voltage (V)  | Voltage (V) | Voltage (V) | Burden (VA) | А   | В   | С   | A'        | B'  | D' (Attachment) |
|         |              |             |             | 15          | 100 | 90  | 110 | 70        | 75  | 6×15 cut        |
|         | 230          | 220         | 110         | 50          | 120 | 100 | 125 | 74        | 85  | 7 × 15 cut      |
| 1 וחס   |              |             |             | 100         | 135 | 130 | 140 | 84        | 105 | 7 × 15 cut      |
| FDI - I |              |             |             | 15          | 100 | 90  | 110 | 70        | 75  | 6×15 cut        |
|         | 460          | 460 440     | 110         | 50          | 120 | 100 | 125 | 74        | 85  | 7 × 15 cut      |
|         |              |             |             | 100         | 135 | 130 | 140 | 84        | 105 | 7 × 15 cut      |

#### For below 460V

#### 2) Epoxy Resin Mould

|            | Max. Circuit | Primary     | Secondary   | Rated       |     | Dir | nension ( | (mm) |     |
|------------|--------------|-------------|-------------|-------------|-----|-----|-----------|------|-----|
| туре матте | Voltage (V)  | Voltage (V) | Voltage (V) | Burden (VA) | А   | В   | С         | F    | Н   |
| RP-111N    |              |             |             | 50          | 100 | 90  | 70        | 116  | 135 |
| RP-112N    | 460          | 220, 440    | 110         | 100         | 114 | 90  | 70        | 134  | 160 |
| RP-113N    |              |             |             | 200         | 114 | 100 | 80        | 154  | 162 |

#### <u>RP-111N, RP-112N, RP-113N</u>











#### Item To Specify When make Purchase

- 1) Type name
- 2) Primary current (voltage) / Secondary current (voltage)
- 3) Rated burden (VA)

# Instrument Accessory

## **Direct Current Shunt & Resistor Series**



#### SHUNT

Shunt is possible to combine with mill voltmeter for measuring a large current.

There are 2 types wire connection with insulating stand & bus bar connection can use depending on the magnitude of the current.

#### FEATURES

High reliability & high performance shunt.
 This product is compliance with:

JIS C-1721-1976 standard.

Class: 1.0

Tolerance: ±1.0%

► Continuous excitation current have set at 80% or less on the rated value.

► We have 2sets voltage terminal DSW type.

► Also have 3sets output terminal DST type for consideration of the heat dissipation and avoid rise in the temperature.



#### **RESISTOR SERIES**

External with resistor series is possible to combine with milliampere meter for measuring a large voltage.

#### FEATURES

- ► High reliability & high performance resistor series.
- ► There are 7 types from DM-1 (750V) until DM-25 (25kV) can use depending on the magnitude of the voltage.
- $\blacktriangleright$  DM-2 $\sim$ 25 will built-in the measures against open resistor.

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### DC SHUNTS

#### For DC Shunts

- Shunts type DS, DSW and DST is compliance with standard JIS (JIS C-1721-1976). Continuous excitation current is 80% or less of the range value.
   Please consultation with us when specification overload capacity or other is different.
- Standard for shunts terminal voltage is 60mV and 100mV, Please refer to diagram at below and specify it.
- Power consumption of shunt is (Current) X (Millivolt) which becomes larger in proportionality of the rated current.
- Please attach especially a large current shunt in consideration of radiation to make the minimize temperature rise of a resistor part.
- Please clamping enough the connection of the electric wire, so that contact resistance becomes small.
- Pay attention not to make a contact between current terminal and voltage terminal electrically to prevent error.







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### **DS SHUNTS**







- Please consultation with us when 5000A is exceeding.
- Please inform us if the load resistance value is less then 900A (by our indication meter type name)
- Please specify the item as below when make order
  - 1) Type Name
  - 2) Input (A)/ output (mV)
  - 3) Option (with or without shunt stand etc.)

#### **DS SHUNTS**

#### For DST Type Shunt

- Standard JIS C 1721-1976.
- Standard shunt terminal voltage is 60mV and 100mV, other voltage also can manufacture please request.
- There are 3 sets output terminal.
- Manufactured this product in consideration of the heat dissipation avoid rise in the temperature.







Please consultation with us when 5000A is exceeded.

#### **RESISTOR SERIES**

#### **External with Resistor Series**

DM - 1 (Below 1000V)



DM - 1T (Rectifier built in)



DM - 2 (Below 2500V)



DM - 5, 10, 15, 20, 25 (5~25kV)



| Type Name | Rated | А   | В   | С   | D   | E   | F   | G   | d |
|-----------|-------|-----|-----|-----|-----|-----|-----|-----|---|
| DM – 5    | 5000V | 170 | 120 | 110 | 154 | 170 | 140 | 106 | 4 |
| DM – 10   | 10kV  | 220 | 160 | 140 | 194 | 210 | 140 | 106 | 4 |
| DM – 15   | 15kV  | 290 | 210 | 200 | 248 | 264 | 190 | 146 | 5 |
| DM – 20   | 20kV  | 390 | 260 | 300 | 294 | 310 | 220 | 176 | 5 |
| DM – 25   | 25kV  | 500 | 330 | 400 | 356 | 372 | 280 | 236 | 5 |

## **OPTIONS**

#### 1. TERMINAL COVER FOR TYPE WIDE ANGLE L SERIES

#### Terminal Cover for Type ML- 6 and ML- 5



Set into terminal block

|                            | Units Required       |      |  |  |
|----------------------------|----------------------|------|--|--|
| i ype Name                 | ML-6                 | ML-5 |  |  |
| ML-110C, YL-110C, XL-110C, | C, YL-110C, XL-110C, |      |  |  |
| CL-110C, AL-110C,          |                      | 1    |  |  |
| PL-110NC-12, PBL-110NC-33, | -                    | I    |  |  |
| WL-110NC-12, WVL-110NC-12, |                      |      |  |  |
| WL-110NC-33, 34            | 1                    | 1    |  |  |
| WVL-110NC-33, 34           | I                    | I    |  |  |

#### Terminal Cover for Type ML-3



Set into terminal block

| Tuno Nomo   | Units Required  |   |   |      |  |  |
|---|-----------------|---|---|------|--|--|
| i ype Name  |                 |   |   | ML-3 |  |  |
| ML-80C, YL-80C, XL-80C,   |                 |   |   | 1    |  |  |
| CL-80C, AL-80C, PL-80C-12   |                 | - | - | 1    |  |  |
| WIL 80C 12 22 24  | WT-53MC-12      | - | 1 | -    |  |  |
| WL-80C-12, 33, 34<br>Attach with transducer   | WT-53MC-33      | 1 | 1 | 1    |  |  |
|   | WT-53MC-34 (1)  | 1 | 1 | 1    |  |  |
| WVL-80C-12, 33, 34  |                 | - | - | 1    |  |  |
| Attach with transducer  | WVT-53MC-12     | - | 1 | -    |  |  |
|   | WVT-53MC-33     | 1 | 1 | 1    |  |  |
|   | WVT-53MC-34 (2) | 1 | 1 | 1    |  |  |
| PL-80C-33, 34   |                 | - | - | 1    |  |  |
| Attach with transducer  | PT-53MC-33, 34  | 1 | 1 | 1    |  |  |
| <ul> <li><sup>(1)</sup> For WT-53MC-34, use two OA-BCP3 made by OHM.</li> <li><sup>(2)</sup> For WVT-53MC-34, use two OA-BCP3 made by OHM.</li> </ul> |                 |   |   |      |  |  |

#### 2. TERMINAL COVER FOR TYPE WIDE ANGLE L SERIES

#### Terminal Cover For Type SL



Set into terminal block

#### **Terminal Cover For Narrow Angle**



| Typo Namo  | Units Required    |                             |  |  |  |
|------------|-------------------|-----------------------------|--|--|--|
| i ype Name | SL terminal cover | Narrow-angle terminal cover |  |  |  |
| SL-110C    | 1                 | -                           |  |  |  |
| SL-80C     | 1                 | -                           |  |  |  |
| L-65C      | -                 | 1                           |  |  |  |

#### 3. TERMINAL COVER FOR TYPE WIDE ANGLE L SERIES



**Multiplier** covers for single phase Synchroscope meter (Cover: DMD-50) Lock screw on pillar.

Set into terminal fitting

|             | Unit Required |              |  |  |  |
|-------------|---------------|--------------|--|--|--|
| i ype Name  | OA-BCP5       | Cover DMD-50 |  |  |  |
| DL-110C-12  | 6             | 1            |  |  |  |
| DL-110NC-33 | 5             | -            |  |  |  |

\* Please specify cover DMD-50 when ordering. The meter shall be shipped with the cover fixed.

#### 4. TERMINAL COVER FOR TYPE NARROW ANGLE METER COMMON

#### **Narrow Angle Terminal Cover**

#### Hz Terminal Cover



Set into terminal fitting



|  |                              |      | Narrow Angle        | Hz             |  |
|--|------------------------------|------|---------------------|----------------|--|
| Type Name  | Measurement Element          | Mark | Terminal Cover      | Terminal Cover |  |
|  |                              |      | Units Required      |                |  |
| P K-120C/ 100C/ 80C/ 60C                         | DC Current / Voltage         | М    |                     |                |  |
| (Except 120NC1, 100NC)                           | DC Receiving Indicator Meter | Х    |                     |                |  |
| L K-12C/ 10C/ 8C                                 | AC Receiving Indicator Meter | Y    |                     |                |  |
| (Except 12C, 10C, 8C)                            | AC Current / Voltage         | S    |                     |                |  |
| P D-96   | AC Current / Voltage         | С    | 2pcs terminal cover |                |  |
| (Except P D-96N)                                 | AC Watthour Meter            | W    | is necessarily for  |                |  |
| F K-7/5  | AC Var Meter (balanced)      | WVB  | P D-96 Series       |                |  |
| FAK-7C/ 5C                                       | AC Var Meter (unbalanced)    | WV   | 2 Pointers type     | -              |  |
| PAD-96   | Power Factor (balanced)      | PB   |                     |                |  |
|  | Power Factor (unbalanced)    | Р    | 1                   |                |  |
|  | Heat Electric Temperature    | Н    |                     |                |  |
|  | Heat Electric Temperature    | HT   |                     |                |  |
|  | Revolutions (DC)             | Z    |                     |                |  |
|  | Revolutions (AC)             | V    |                     |                |  |
| PAK-120C/ 100C/ 80C/ 60C<br>LAK-12C/ 10C/ 8C/ 6C | Frequency                    | А    | -                   | 1              |  |

#### 5. TERMINAL COVER FOR TYPE NARROW ANGLE PK/ LK INTERGRATED



 Meter Type
 Units Required

 P
 K NC 

 L
 K NC

Set into terminal block

#### 6. TERMINAL COVER FOR TYPE F SERIES

#### Terminal Cover For Type MF



Use specify terminal cover or OA-BCP3 for attachment transducer

| Туре   | Magaurament Floment          | Mork    | Units R    | equired    |  |
|--------|------------------------------|---------|------------|------------|--|
| Name   | measurement Element          | IVIAR K | 1 Pointers | 2 Pointers |  |
|        | DC Current/ Voltage          | М       | 1          | 2          |  |
|        | DC Receiving Indicator Meter | Х       |            |            |  |
|        | AC Receiving Indicator Meter | Y       |            |            |  |
|        | AC Current/ Voltage          | С       |            |            |  |
|        | AC Watthour Meter            | W       |            |            |  |
|        | AC Var Meter (balanced)      | WVB     |            |            |  |
| F = 17 | AC Var Meter (unbalanced)    | WV      |            |            |  |
| F = 10 | Power Factor (balanced)      | PB      | 1          | 2          |  |
| F = 10 | Power Factor (unbalanced)    | Р       |            |            |  |
|        | Frequency                    | A       |            |            |  |
|        | Heat Electric Temperature    | Н       |            |            |  |
|        | Heat Electric Temperature    | HT      |            |            |  |
|        | Revolutions (DC)             | Z       |            |            |  |
|        | Revolutions (AC)             | V       |            |            |  |

#### 7. TERMINAL COVER FOR TYPE PWD – 96

#### Terminal Cover For Tye PWD – 96



Please use nut to lock the meter stud.

#### Narrow Angle Terminal Cover



|   | Type Name Measurement Element |                           | Mork    | Unit Required         |                 |               |  |
|---|-------------------------------|---------------------------|---------|-----------------------|-----------------|---------------|--|
|   |                               |                           | IVIAI K | Terminal Cover PWD-96 | Narrow Angle Te | erminal Cover |  |
| Ρ | D-96N-                        | Power                     | W       |                       | 1 Pointer       | 2 Pointers    |  |
|   |                               | Reactive Power            | WV      | 1                     |                 |               |  |
|   |                               | Power Factor (balanced)   | Р       | I                     | -               | -             |  |
|   |                               | Power Factor (unbalanced) | PB      |                       |                 |               |  |
| Ρ | D-96                          | Power                     | W       |                       |                 |               |  |
|   |                               | Reactive Power            | WV      |                       |                 |               |  |
|   |                               | Power Factor (balanced)   | Р       | -                     | I               | I             |  |
|   |                               | Power Factor (unbalanced) | PB      |                       |                 |               |  |

Use specify terminal cover or OA-BCP3 for attachment transducer

#### 8. TERMINAL COVER FOR TYPE EL SE

#### Terminal Cover For Type EL



Lock screw on pillar.

|                                    | Moocurement Element          | Mork | Terminal Cover Type EL |
|------------------------------------|------------------------------|------|------------------------|
| Type Name                          | Measurement Element          | Walk | Units Required         |
| Wide Angle Meter Relay             | DC Current/ Voltage          | М    |                        |
| EL-110C                            | DC Receiving Indicator Meter | Х    |                        |
| EP Series Normal Angle Meter Relay | AC Receiving Indicator Meter | Y    |                        |
| (All-in-one Type Ralay Box)        | AC Current/ Voltage          | S    |                        |
| EP-100NC/ 120NC                    | AC Current/ Voltage          | С    |                        |
| EK Series Normal Angle Meter Relay | AC Watthour Meter            | W    |                        |
| (All-in-one Type Relay Box)        | AC Var Meter (balanced)      | WVB  |                        |
| EK-12NC                            | AC Var Meter (unbalanced)    | WV   | 1                      |
|                                    | Power Factor (balanced)      | PB   |                        |
|                                    | Power Factor (unbalanced)    | Р    |                        |
|                                    | Frequency                    | Α    |                        |
|                                    | Heat Electric Temperature    | Н    |                        |
|                                    | Heat Electric Temperature    | HT   |                        |
|                                    | Revolutions (DC)             | Z    |                        |
|                                    | Revolutions (AC)             | V    |                        |

#### 9. TERMINAL COVER FOR TYPE DM – 61

#### <u>Terminal Cover For Type DM – 61</u>



| Attached Relay Box | Terminal Cover Type DM – 61 |  |  |  |  |
|--------------------|-----------------------------|--|--|--|--|
| Type Name          | Units Required              |  |  |  |  |
| DM – 61            | 1                           |  |  |  |  |

Lock screw on pillar.

\* Please use EP/ EK series normal angle attached relay box for DM-61 terminal cover.

#### **10. TERMINAL COVER FOR TYPE EF SERIES**

#### **Terminal Cover For EF Serise**



| Type Name | Measurement Element          | Mark | Terminal Cover<br>For EF Series |
|-----------|------------------------------|------|---------------------------------|
|           |                              |      | Units Required                  |
| EF – 17   | DC Current/ Voltage          | М    |                                 |
| EF – 15   | DC Receiving Indicator Meter | Х    |                                 |
|           | AC Receiving Indicator Meter | Y    |                                 |
|           | AC Current/ Voltage          | S    |                                 |
|           | AC Current/ Voltage          | С    |                                 |
|           | AC Watthour Meter            | W    |                                 |
|           | AC Var Meter (balanced)      | WVB  |                                 |
|           | AC Var Meter (unbalanced)    | WV   | 1                               |
|           | Power Factor (balanced)      | PB   |                                 |
|           | Power Factor (unbalanced)    | Р    |                                 |
|           | Frequency                    | А    |                                 |
|           | Heat Electric Temperature    | Н    |                                 |
|           | Heat Electric Temperature    | HT   |                                 |
|           | Revolutions (DC)             | Z    |                                 |
|           | Revolutions (AC)             | V    |                                 |
|           |                              |      |                                 |
| БТЕ       | 45                           | 1    | 4                               |



| RTF – 15 | - | 1 |
|----------|---|---|
| RTF – 10 | - | 1 |

#### **11. TERMINAL COVER FOR HIGHEST (LOWEST) INDICATOR METER**

#### **Terminal Cover MRL**



Set into terminal fitting

| Type Name        | Measurement Element          | Mark | Terminal cover for<br>MRL |
|------------------|------------------------------|------|---------------------------|
| Highest (Lowest) | DC Current/ Voltage          | М    | 2                         |
| Indicator Meter  | DC Receiving Indicator Meter | Х    |                           |
|                  | AC Receiving Indicator Meter | Y    |                           |
| RL-110CH,        | AC Current/ Voltage          | S    |                           |
| 110CL, 110CHL    | AC Current/ Voltage          | С    |                           |
|                  | AC Watthour Meter            | W    |                           |
| RL-80CH, 80CL,   | AC Var Meter (balanced)      | WVB  | 2 addition for            |
| 80CHL            | AC Var Meter (unbalanced)    | WV   | electromagnetism return   |
|                  | Power Factor (balanced)      | PB   | 2 addition for            |
|                  | Power Factor (unbalanced)    | Р    | Aux. Power Supply         |
|                  | Frequency (Except PAK, LAK)  | Α    |                           |
|                  | Heat Electric Temperature    | Н    |                           |
|                  | Heat Electric Temperature    | HT   |                           |
|                  | Revolutions (DC)             | Z    |                           |
|                  | Revolutions (AC)             | V    |                           |

\* Please Use specify terminal cover or OA-BCP3 for attachment transducer

#### 12. TERMINAL COVER FOR HIGHEST (LOWEST) INDICATOR (ALARM CONTACT)

#### **Terminal Cover ERL**



Lock by screw

| Type Name        | Measurement Element          | Mark | Terminal cover<br>for ERL |
|------------------|------------------------------|------|---------------------------|
| Highest (Lowest) | DC Current/ Voltage          | М    |                           |
| Indicator Meter  | DC Receiving Indicator Meter | Х    |                           |
| (Alarm Contact)  | AC Receiving Indicator Meter | Y    |                           |
|                  | AC Current/ Voltage          | S    |                           |
| ERL-110C-H,      | AC Current/ Voltage          | С    |                           |
| 110C-L, 110C-HL  | AC Watthour Meter            | W    |                           |
|                  | AC Var Meter (balanced)      | WVB  |                           |
|                  | AC Var Meter (unbalanced)    | WV   | 1                         |
|                  | Power Factor (balanced)      | PB   |                           |
|                  | Power Factor (unbalanced)    | Р    |                           |
|                  | Frequency (Except PAK, LAK)  | А    |                           |
|                  | Heat Electric Temperature    | Н    |                           |
|                  | Heat Electric Temperature    | HT   |                           |
|                  | Revolutions (DC)             | Z    |                           |
|                  | Revolutions (AC)             | V    |                           |

\* Please Use specify terminal cover or OA-BCP3 for attachment transducer

#### **13. TERMINAL COVER FOR MAX. DEMAND AMMETER**



Set into terminal fitting

| Type Name              | Terminal Cover<br>For Narrow Angle<br>Units Required |
|------------------------|--|
| Max. Demand Ammeter    | 1  |
| BRL – 110CH            |  |
| Max. Demand Ammeter    | 2  |
| (With warning contact) | 2  |

#### **TERMINAL COVER FOR AUXILIARY** 14. СТ



| Accessory CT Type | Units Required            |  |
|-------------------|---------------------------|--|
|                   | Terminal Cover For MR-CTN |  |
| MR – CTN          | 1                         |  |

Please use accessory CT cover for Accessory CT, MR-CTN.

#### 15. ATTACHMENT TRANSDUCER TERMINAL COVER



Set into terminal fitting

#### **Terminal Cover for T-83M**



| Attackment Transducer | Units required |                     |  |  |
|-----------------------|----------------|---------------------|--|--|
| Attachment Transducer | OA-BCP3        | T-83 terminal cover |  |  |
| A(V)T-62M             | 4              | -                   |  |  |
| W(WV, P, PB)T-62M     | 6              | -                   |  |  |
| PT-63M                | 8              | -                   |  |  |
| DM-63(H, L)           | 10             | -                   |  |  |
| DM-63(HL, HH, LL)     | 16             | -                   |  |  |
| W(WV, P, PB)T-64M-12  | 6              | -                   |  |  |
| W(WV, P, PB)T-64M-34  | 11             | -                   |  |  |
| PT-64M-34             | 10             | -                   |  |  |
| -T-83M-               | -              | 1                   |  |  |

\* Please Use specify terminal cover or OA-BCP3 for attachment transducer

#### **16. SERIES RESISTOR TERMINAL COVER**



| Turne   | Units Required |         |  |  |
|---------|----------------|---------|--|--|
| туре    | OA-BCP3        | OA-BCP5 |  |  |
| DM – 1  | 2              | -       |  |  |
| DM – 2  | -              | 3       |  |  |
| DM – 1T | 4              | -       |  |  |
| DM – 41 | -              | 2       |  |  |

Set into terminal fitting





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 Electrical Indicating Meter Catalog e-99-024/-





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BRL & RL series is same scale as square share meter

#### **§** Wide Angle METER §

#### STANDARD DIVOSION OF LANCET-SHAPED POINTER



L series



PK series

| MODEL            | L-65C<br>PK-60C, 80C, 100C<br>LK-8C, 10C<br>BRL-110CH Instant Meter                        |      | RL-80C<br>PK-120C<br>LK-12C<br>F-10                               |      |
|------------------|--|------|---|------|
| MAX. SCALE VALUE | SCALE DIVISION DIAGRAM   | DIV. | SCALE DIVISION DIAGRAM  | DIV. |
| 1                | $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                       | 20   | 0 2 4 6 8 10<br>  <u>1</u> 1+ + + + + + + + + + + + + + + + + + + | 20   |
| 1.5              | 0 <sup>*1</sup> 5 10 15<br>  | 30   | 0 5 10 15<br>   | 30   |
| 2                | $\begin{matrix} 0 & 5 & 10 & 15 & 20 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ \end{matrix}$ | 20   | 0 <sup>*2</sup> 5101520   | 40   |
| 2.5              | 0 5 10 15 20 25<br>  <u></u>   | 25   | 0 5 10 15 20 25   | 25   |
| 3                | 0 10 20 30   | 30   | 0 10 20 30<br>  <u></u>   | 30   |
| 4                | 0 10 20 30 40<br>  <u></u>   | 20   | 0 <sup>*2</sup> 10203040  | 40   |
| 5                | 0 10 20 30 40 50<br>  <u></u>  | 25   | 0 10 20 30 40 50  | 25   |
| 6                | 0 20 40 60<br>   | 30   | 0 20 40 60<br>II  | 30   |
| 7.5              | 0 20 40 60 75<br>  <u> </u>  | 15   | 0 <sup>*3</sup> 20406075  | 37.5 |
| 8                | 0 20 40 60 80<br>  <u> </u>  | 16   | 0 *6 20 40 60 80  | 40   |
| 9                | 0 30 60 90<br> _1  | 18   | 0 <sup>*7</sup> 306090  | 45   |

#### **§** Wide Angle METER §







|                  | LK series  | F series | s F series  |              |
|------------------|--|----------|---|--------------|
| MODEL            | RL-110C<br>BRL-110CH Utility meter               |          | F–15, 17 Note) 4-digit scale of 2T<br>L–110C not manufactural<br>L–80C<br>EL–110C   | ' is<br>ble. |
| MAX. SCALE VALUE | SCALE DIVISION DIAGRAM                           | DIV.     | SCALE DIVISION DIAGRAM  | DIV.         |
| 1                | 0 <sup>*2</sup> 2 4 6 8 10                       | 50       | 0 <sup>*2</sup> 246810  | 50           |
| 1.5              | 0 5 10 15<br>1 <u>11</u> 111111111111111111      | 30       | 0 <sup>*8</sup> 51015<br>   | 75           |
| 2                | 0 <sup>*2</sup> 5 10 15 20                       | 40       | 0 5 10 15 20<br>  <u>ddddd</u> dddddddddddddd   | 40           |
| 2.5              | 0 5 10 15 20 25                                  | 50       | 0 5 10 15 20 25<br>   | 50           |
| 3                | 0 10 20 30<br>  <u></u>                          | 30       | 0 *8 5 10 15 20 25 30   | 60           |
| 4                | *2<br>0 10 20 30 40                              | 40       | 0 10 20 30 40<br>I <u>m</u> tuuluuluuluuluuluuluul  | 40           |
| 5                | 0 10 20 30 40 50                                 | 50       | 0 10 20 30 40 50<br>I <u>mpe</u> lantadantadantadantad  | 50           |
| 6                | 0 20 40 60<br> I I I                             | 30       | 0 <sup>*8</sup> 10 20 30 40 50 60   | 60           |
| 7.5              | 0 20 40 60 75<br>I <u></u> tuuluutuuluutuuluutul | 37.5     | +110 & 1-80: 37.5 DIVISION *9<br>0 20 40 60 75<br>http://www.analandon.anal | 75           |
| 8                | 0 20 40 60 80<br>I <u></u> IIIIIII.              | 40       | 0 20 40 60 80<br>I <u></u> Innlantanlantanl   | 40           |
| 9                | 0 30 60 90<br>Juujuujuuluutuuluutuuluul          | 45       | *5<br>0 20 40 60 80 90<br>[]]   | 45           |

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 $Electrical\ indicating\ meter\ Catalog\ e\textbf{-99-024/-}$ 

#### **§** Wide Angle METER §

#### STANDARD DIVOSION OF KNIFE-EDGE POINTER

| MODEL           | PK-60C, 80C, 100C<br>LK- 8C, 10C<br>FK- 5C,   |      | PK-120C<br>LK- 12C<br>FK- 7C  |      |
|-----------------|---|------|---|------|
| MAX SCALE VALUE | SCALE DIVISION DIAGRAM  | DIV. | SCALE DIVISION DIAGRAM  | DIV. |
| 1               |   | 50   |   | 50   |
| 1.5             | 0 5 10 15<br>    _   _   _   _   _   _   _  | 30   |   | 75   |
| 2               | 0 5 10 15 20<br>  | 40   | 0 5 10 15 20<br>  | 40   |
| 2.5             | $0 \qquad 5 \qquad 10 \qquad 15 \qquad 20 \qquad 25 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ $ | 50   | $0 \qquad 5 \qquad 10 \qquad 15 \qquad 20 \qquad 25 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ $ | 50   |
| 3               | 0 10 20 30<br>  1111  111  111  111  111  | 30   | $\begin{array}{cccccccccccccccccccccccccccccccccccc$  | 60   |
| 4               | 0 10 20 30 40   | 40   | 0 10 20 30 40<br>11111111111111111111111111111111111  | 80   |
| 5               | 0 10 20 30 40 50  | 50   |   | 50   |
| 6               | 0 20 40 60<br>   + + + + + + + + + + + + + + + +  | 30   | 0 10 20 30 40 50 60   | 60   |
| 7.5             | 0 20 60 60 75   | 37.5 |   | 75   |
| 8               | 0 20 40 60 80   | 40   | 0 20 40 60 80   | 80   |
| 9               | 0 30 60 90  | 45   | 0 30 60 90  | 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.