## Power analyzers and Energy Meters

### Multifunction indicator

**Type WM12-96**

- **Accuracy ±0.5 F.S. (current/voltage)**
- **Multifunction indicator**
- **Display of instantaneous variables: 3x3 digit**
- **Variable system and phase measurements: W, Wdmd, var, VA, VAdmd, PF, V, A, An, Hz**
- **A max, W med max indication**
- **TRMS meas. of distorted sine waves (voltages/currents)**
- **Power supply: 24V, 48V, 115V, 230V, 50-60Hz; 18 to 60VDC**
- **Protection degree (front): IP 50**
- **Front dimensions: 96x96**
- **Optional RS422/485 serial output**
- **Alarms (visual only) V LN, An**
- **Specifications are subject to change without notice**

### Product Description

3-phase multifunction power indicator with built-in programming key-pad. Particularly recommended for displaying the main electrical variables. Housing for panel mounting, (front) protection degree IP50 and optional RS485 serial output.

### Type Selection

<table>
<thead>
<tr>
<th>Model</th>
<th>Range code</th>
<th>System</th>
<th>Power supply</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>WM12-96</td>
<td>AV5 3 D X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### How to order

**Range codes**

- **AV5:** 400/660V<sub>L-L</sub>/5(6)AAC
  - VL-N: 185 V to 460 V
  - VL-L: 320 V to 800 V
- **AV6:** 100/208V<sub>L-L</sub>/5(6)AAC
  - VL-N: 45 V to 145 V
  - VL-L: 78 V to 250 V

**Range code**
- **AV5:** 400/660V<sub>L-L</sub>/5(6)AAC
- **AV6:** 100/208V<sub>L-L</sub>/5(6)AAC

### Input specifications

**Rated inputs**

- **Current**
  - 3
  - 4
- **Voltage**
  - 3
  - 4

**Accuracy (display, RS485)**

- **Current**
  - 0.25 to 6A: ±(0.5% FS +1DGT)
  - 0.03A to 0.25A: ±7DGT
- **Neutral current**
  - 0.25 to 6A: ±(1.5% FS +1DGT)
  - 0.03A to 0.25A: ±7DGT
- **Phase-phase voltage**
  - ±(1.5% FS +1 DGT)
- **Phase-neutral voltage**
  - ±(0.5% FS + 1 DGT)
- **Active and Apparent power, Power factor**
  - 0.25 to 6A: ±(1% FS +1DGT); 0.03A to 0.25A: ±1% FS +5DGT
- **Reactive power**
  - 0.25 to 6A: ±(2% FS +1DGT); 0.03A to 0.25A: ±2% FS +5DGT
- **Frequency**
  - ±0.1%Hz (48 to 62Hz)

**Additional errors**

- **Humidity**
  - ±0.3% FS, 60% to 90% RH
- **Temperature drift**
  - ≤ 200ppm/°C
- **Display refresh time**
  - 700ms

**Display**

- **Type**
  - Read-out for the instant. var.
- **LED**
  - 3x3 dgt

**Measurements**

- **Input impedance**
  - 400/660V<sub>L-L</sub> (AV5)
  - 100/208V<sub>L-L</sub> (AV6)
  - 1 MΩ
  - 453 KΩ
- **Frequency**
  - 50 to 60 Hz

Specifications are subject to change without notice.
### RS485 Serial Output Specifications

<table>
<thead>
<tr>
<th><strong>RS422/RS485</strong> (on request)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Connections</strong></td>
</tr>
<tr>
<td><strong>Addresses</strong></td>
</tr>
<tr>
<td><strong>Protocol</strong></td>
</tr>
</tbody>
</table>

#### Software functions

<table>
<thead>
<tr>
<th><strong>Password</strong></th>
<th>Encrypting of the programming data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st level</td>
<td>Password &quot;0&quot;, no protection</td>
</tr>
<tr>
<td>2nd level</td>
<td>Password from 1 to 999, all data are protected</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>System selection</strong></th>
<th>3-phase with neutral 3-phase without neutral 3-phase ARON 2-phase Single phase</th>
</tr>
</thead>
</table>

| **Transformer ratio** | CT 1 to 999 VT 1.0 to 99.9 |

| **Filter** | Operating range 0 to 99.9% of the input electrical scale Filtering coefficient 1 to 16 Filter action Measurements, alarms, serial output (fundamental variables: V, A, W and their derived ones). |

| **Displaying** | Up to 3 variables per page |

| **Page 1** | V L1, V L2, V L3 |
| **Page 2** | V L12, V L23, V L31 |
| **Page 3** | A L1, A L2, A L3 |
| **Page 4** | An |
| **Page 5** | WL1, WL2, WL3 |
| **Page 6** | PF L1, PF L2, PF L3 |
| **Page 7** | var L1, var L2, var L3 |
| **Page 8** | VA L1, VA L2, VA L3 |
| **Page 9** | VA ∑, W ∑, var ∑ |
| **Page 10** | VA dmd, W dmd, Hz |
| **Page 11** | Wdmd MAX |
| **Page 12** | V L, PF ∑ |
| **Page 13** | A MAX |

| **Alarms** | Programmable, for the V L, W dmd, and An (neutral current). Note: the alarm is only visual, by means of LED on the front of the instrument. |

| **Reset** | independent alarm (V L, An) max: A, Wdmd |

#### Power Supply Specifications

<table>
<thead>
<tr>
<th><strong>Auxiliary power supply</strong></th>
<th>230VAC -15 +10%, 50-60Hz 115VAC -15 +10%, 50-60Hz 48VAC -15 +10%, 50-60Hz</th>
</tr>
</thead>
</table>

| **24VAC** | -15 +10%, 50-60Hz 18 to 60VDC |

#### General Specifications

| **Operating temperature** | 0 to +50°C (RH < 90% non condensing at 40°C) |
| **Storage temperature** | -10 to +60°C (RH < 90% non condensing at 40°C) |
| **Installation category** | Cat. III (IEC 60664) |
| **Insulation** | 2000 VAC between inputs/outputs for 1 minute |

| **Dielectric strength** | 4000 VAC for 1 minute |

| **EMC** | EN50084-1 (class A) residential environment, commerce and light industry |
| **Immunity** | EN 61000-6-2 (class A) industrial environment. |
| **Pulse voltage (1.2/50μs)** | EN61000-4-5 |

Specifications are subject to change without notice.
General Specifications (cont.)

<table>
<thead>
<tr>
<th>Specifications</th>
<th>IEC 60664</th>
<th>Material</th>
<th>ABS self-extinguishing: UL 94 V-0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approvals</td>
<td>CE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connections</td>
<td>5(6) A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max cable cross sect. area</td>
<td>Screw-type 2.5 mm²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td>96 x 96 x 63 mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Waveform of the signals that can be measured

**Figure D**
Sine wave, undistorted
Fundamental content 100%
Harmonic content 0%
\[ A_{max} = 1.1107 \ \text{A} \]

**Figure E**
Sine wave, indented
Fundamental content 10...100%
Harmonic content 0...90%
Frequency spectrum: 3rd to 16th harmonic
Additional error: <1% FS

**Figure F**
Sine wave, distorted
Fundamental content 70...90%
Harmonic content 10...30%
Frequency spectrum: 3rd to 16th harmonic
Additional error: <0.5% FS

Display pages

Display variables in 3-phase systems (in a 3-phase system with neutral)

<table>
<thead>
<tr>
<th>No</th>
<th>1ˢᵗ variable</th>
<th>2ⁿᵈ variable</th>
<th>3ʳᵈ variable</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V L1</td>
<td>V L2</td>
<td>V L3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>V L12</td>
<td>V L13</td>
<td>V L31</td>
<td>Decimal point blinking on the right of the display</td>
</tr>
<tr>
<td>3</td>
<td>A L1</td>
<td>A L2</td>
<td>A L3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>An</td>
<td>AL.n</td>
<td>AL.n if neutral current alarm is active</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>W L1</td>
<td>W L2</td>
<td>W L3</td>
<td>Decimal point blinking on the right of the display if generated power</td>
</tr>
<tr>
<td>6</td>
<td>PF L1</td>
<td>PF L2</td>
<td>PF L3</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>VAR L1</td>
<td>VAR L2</td>
<td>VAR L3</td>
<td>Decimal point blinking on the right of the display if generated power</td>
</tr>
<tr>
<td>8</td>
<td>VA L1</td>
<td>VA L2</td>
<td>VA L3</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>VA system</td>
<td>W system</td>
<td>VAR system</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>VA dmd (system)</td>
<td>W dmd (system)</td>
<td>Hz (system)</td>
<td>dmd = demand (integration time selectable from 1 to 30 minutes)</td>
</tr>
<tr>
<td>11</td>
<td>W dmd MAX</td>
<td></td>
<td></td>
<td>Maximum sys power demand</td>
</tr>
<tr>
<td>12</td>
<td>V LN dmd</td>
<td>AL.U</td>
<td>PF system</td>
<td>AL.U= is activated only if one of VLN is not within the set limits</td>
</tr>
<tr>
<td>13</td>
<td>A MAX</td>
<td></td>
<td></td>
<td>max. current among the three phases</td>
</tr>
</tbody>
</table>

Specifications are subject to change without notice
Used calculation formulas

**Phase variables**
- Instantaneous effective voltage
  \[ V_{i,n} = \frac{1}{n} \sum_{i=1}^{n} V_{in} \]
- Instantaneous active power
  \[ W_i = \frac{1}{n} \sum_{i=1}^{n} (V_{in}) (I_{in}) \]
- Instantaneous power factor
  \[ \cos \phi_i = \frac{W_i}{V_{i,n} I_{i,n}} \]
- Instantaneous effective current
  \[ I_i = \sqrt{\frac{1}{n} \sum_{i=1}^{n} (I_{in})^2} \]

**Instantaneous apparent power**
\[ V_A = V_{i,n} I_A \]

**Instantaneous reactive power**
\[ V_{AR} = \sqrt{(V_A)^2 - (W_i)^2} \]

**System variables**
- Equivalent 3-phase voltage
  \[ V_{el} = \frac{V_1 + V_2 + V_3}{\sqrt{3}} \]
- 3-phase active power
  \[ W_3 = W_1 + W_2 + W_3 \]
- 3-phase apparent power
  \[ V_{A3} = \sqrt{W_3^2 + V_{AR3}^2} \]
- 3-phase power factor
  \[ \cos \phi_3 = \frac{W_3}{V_{A3}} \]

Wiring diagrams

**Fig. 1**
CT connection

**Fig. 2**
3CT and 3VT connection

**Fig. 3**
ARON connection

**Fig. 4**
ARON and VT connection

**Fig. 5**
2-phase connection

**Fig. 6**
RS485 serial connection

NOTE: the current inputs can be connected to the lines ONLY by means of current transformers. The direct connection is not allowed.
Front Panel Description

1. Key-pad
   To program the configuration parameters and the display of the variables.
   - S
     Key to enter programming and confirm selections;
   - ▲ ▼
     Keys to:
     - programme values;
     - select functions;
     - display measuring pages.

2. Display
   LED-type with alphanumeric indications to:
   - display configuration parameters;
   - display all the measured variables.

Dimensions and Panel Cut-out