CIRCUTOR

M I

M.1.01 GB

# ANALOGUE INSTRUMENTS

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# General Information on Analogue Instruments

Analogue measuring instruments display the measurement using a moving pointer or reed which moves along a graduated scale. These types of instruments are used for displaying the measurement due to their performance, quality of measurement and price.
Normally their use is very important on control, command and distribution panels in electrical installations.

ESSENTIAL FEATURES OF AN ANALOGIGUE MEASUREMENT INSTRUMENT

Below the equipment's scale a series of symbols may be seen which detail the features of the instrument.

## Measurement systems

| | |
|---|---|
| Moving iron | |
| Moving coil | |
| Moving coil with rectifier | |
| Moving coil with built in converter | |
| Built in converter | |
| Bimetal + HM | |
| Vibrating reeds | |
| Induction | |

## Operating position

| | |
|---|---|
| Vertical | |
| Horizontal | |
| • Inclined from the horizontal (i.e.: 60º) | |

## Instrument accuracy class

| |
|---|
| 1,5 |
| 3 |

## Signal type

| | |
|---|---|
| Continuous | |
| Alternating | |
| Alternating and continuous | |
| Alternating three phase | |
| One measurement element for a 3 wire system | |
| One measurement element for a 4 wire system | |
| Two measurement elements for a 3 wire unbalanced system | |
| Two measurement elements for a 4 wire unbalanced system | |
| Three measurement elements for a 4 wire unbalanced system | |

## Safety, test voltages

| | |
|---|---|
| Test voltage, 500 V | |
| Test voltage higher than 500 V (ex.: 2 kV) | |
| Instrument not subject to dielectric tests | |
| High voltage | |
| High voltage in accessories and/or instruments (i.e.: voltmeters) | |

## Electrical and Mechanical Features

**Insulation voltage**
2 kV for one minute between mechanism and casing, and between electrically insulated terminals.

**Permanent overloads**
Voltage circuits: 1.2 Un
1.2 In (1.5 In current circuits for moving iron).

**Short duration overloads**
Voltage circuits: 2 Un for 5 s
Current circuits: 5 In for 30 s
10 In for 5 s
40 In for 1 s

# Magnitudes of Influence for the Accuracy Class

**Fixing position**
All instruments are to be mounted in a vertical position. On request, other inclined or horizontal models are supplied The tolerance is ± 5º for any model.

**Ambient temperature**
The effect of temperature on the accuracy class depends on the scope of measurement. In general, the instruments maintain their accuracy class between +10 ºC and +30 ºC. This interval may be lower in particularly low measurement ranges. Here the limits are indicated on the scale.
On request the instruments may be adjusted for temperatures which are outside the above stated interval.

**Temperature limits**
The measuring instruments and their accessories withstand temperature variations from -25 ºC to +40 ºC (55 ºC in the tropical weather proof version) without permanent fault.

**Relative humidity**
The accuracy class is maintained within the interval of 25 to 80 % of non condensed relative humidity.

**Magnetic field**
All instruments maintain their accuracy class under the external influence of a magnetic field of <= 0.5 mT.

**Ferromagnetic support**
The nature and thickness of the panel cover does not affect the accuracy class except for highly sensitive instruments. Here, the scales are marked with the Fe symbol followed by the thickness of the cover.

**Auxiliary power supply**
The accepted tolerance for nominal values of the auxiliary power supply is:
• voltage: +10 % / -15 %
• frequency: 45...65 Hz.

**Vibrations**
The instruments and their accessories support a minimum vibration of ±0.25 mm of amplitude at a frequency of 50 cycles/s. This vibration is equivalent to applying an acceleration equal to 2.5 g for 20 minutes between the three perpendicular axes.

**Protection grade**
Under normal operation, the instrument cases have a protectin grade of IP 52 and their terminals IP 40 As an option, the cases comply with IP 54 or IP 55 and their terminals with IP 20 .

**Pointers**
According to DIN 43802.
On request, with blade tube pointers (fig. 1).

**Tropical weather resistant (TROP)**
For TROP, and according to the DIN 40040 standard, the instruments will be protected against corrosive atmospheres and will endure temperatures between -25 ºC and +55 ºC, with a non condensed relative humidity of 95 %. This humidity refers to a maximum temperature of 30 ºC and 30 days per year, the remaining 278 days of the year the humidity must not exceed 75 %.
For this, the instruments may be set for reference temperature values above 20 ºC. For these events the ranges are marked with the word TROP, followed by the temperature to which they have been set.

**Impacts**
The instruments and their accessories will support five impacts with an acceleration of 15 g, applied in the direction of the three perpendicular axes.

**Zero correction**
Setting the adjustment lengths for the zero corrector, on both sides of its standby position, is not above +/- 2 % of the range length.

**Casings**
The casings and frames for all instruments are made of self extinguishing ABS, according to UL 94, with high impact resistance.
The size of casings and frames are within the DIN 43700 and DIN 43718 standards, respectively.
The bases are made from self extinguishing reinforced PPO, according to UL 94, with high impact resistance and maximum electrical Insulation.

**Standards**
IEC 51, VDE 410, DIN 43780, BS 89, UL 94, EN 60051.

**Certificates**
Lloyd's Register of Shipping.

**Ranges**
According to standards:
DIN 43701 for end of scale values.
DIN 43802 for division values.
Divisions and numbering for standardised scopes follow the examples in figs. 2 and 3.
The final range values above 1000 are shown in units of one thousand.

**Fig. 1**

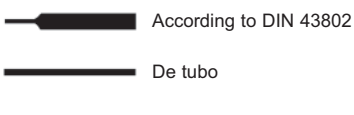
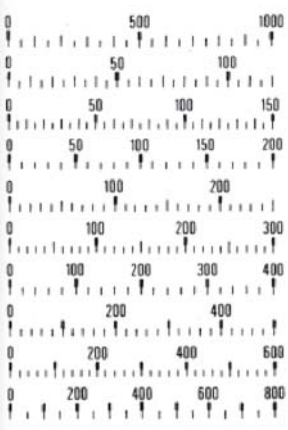
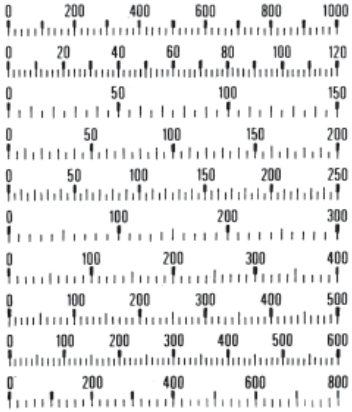



**Fig. 2**



**For instruments in casings DIN 48x48 and 72x72**

**Fig. 3**



**For instruments in casings DIN 96x96 and 144x144**

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| | Measuring system | Mounting | Specifications | Type | Range | Dimensions | Accuracy | Scale | Setting | Page |
|---|---|---|---|---|---|---|---|---|---|---|
| Ammeters | HM | Panel | milliammeter | EC | 100...600 mA | 48 x 48, 72 x 72, 96 x 96, 144 x 144 | 1,5 | 90º | P2 | 6 |
| | | | - | EC | 5...100 A,.../5A | | | | | |
| | | | | EZC | ---/5A | 72 x 72, 96 x 96 | | 240 º | | |
| | | | with switch | EC FA | ---/5A | | | 90º | P1 | |
| | | | with relays | CEC | ---/5A | 96 x 96 | | | | |
| | | DIN rail | - | EM 45 | 5...60 A, .../5A | 85 x 52 | | | P2 | |
| | BM | Panel | - | BC | 5...60 A, .../60 mV | 48 x 48, 72 x 72, 96 x 96, 144 x 144 | | | P1 | 10 |
| | | | with relays | CBC | ... / 60 mV | 96 x 96 | | | | |
| | | DIN rail | - | BM 45 | 5...60 A, .../60 mV | 85 x 52 | | | | |
| Voltmeters | HM | Panel | - | EC | 150 ... 600 V, .../110 V | 48 x 48, 72 x 72, 96 x 96, 144 x 144 | 1,5 | 90º | P1 | 8 |
| | | | | EZC | 250 V, 500 V | 72 x 72, 96 x 96 | | 240º | | |
| | | | with switch | EC F | 150 ... 600 V | | | 90º | | |
| | | | with relays | CEC | 150 ... 600 V, .../110 V | 96 x 96 | | | | |
| | | DIN rail | - | EM 45 | 300 V, 500 V, .../110 V | 85 x 52 | | | | |
| | BM | Panel | - | BC | 0...600 V | 48 x 48, 72 x 72, 96 x 96, 144 x 144 | | | P2 | 11 |
| | | | with relays | CBC | ... / 60 mV | 96 x 96 | | | P1 | |
| | | DIN rail | - | BM45 | 15...150 V | 85 x 52 | | | | |
| Process indicator | BM | Panel | - | BC | 0...10 V, 0/4... 20 mA | 48 x 48, 72 x 72, 96 x 96, 144 x 144 | 1,5 | 90º | P2 | 12 |
| | | | | ZC | 0...10 V, 4... 20 mA, .../60 mV | | | 240º | P1 | |
| | | DIN rail | | BM | 0...10 V, 0/4... 20 mA | 85 x 52 | | 90º | | |
| Power demand meters | - | Panel | Bimetal | MC | .../5 A | | | | P1,2 | 13 |
| | | | Bimetal + HM | EMC | | | | | P2 | |
| | - | DIN rail | Bimetal | MMC 45 | | 85 x 52 | 3 | | P1,2 | |
| Frequency meters | Pointer | Panel | - | HC | 45...65 according to type | 48 x 48, 72 x 72, 96 x 96, 144 x 144 | 0,5 | 90º | - | 14 |
| | | | - | HZC | | 96 x 96, 144 x 144 | | 240º | | |
| | | DIN rail | - | HM | | 85 x 52 | | 90 | | |
| | Reeds | Panel | - | HLC | | 72 x 72, 96 x 96, 144 x 144 | | - | | 15 |
| Wattmeter | | Panel | Single phase | WMC | 400 V, .../5 A | 96 x 96, 144 x 144 | 1,5 | 90º | P1 | 16 |
| | | | Three phase | WTC | | | | | | |
| Varmeter | | Panel | Single phase | YMC | 400 V, .../5 A | 96 x 96, 144 x 144 | 1,5 | 90º | P1 | 17 |
| | | | Three phase | YTC | | | | | | |
| Phasemeters | electronic | Panel | Single phase | FEMC | cos φ 0,5 - 1 - 0,5 | 96 x 96, 144 x 144 | 1,5 | 90º | P1 | 18 |
| | | | Three phase | FETC | | | | | | |
| | | | Single phase | FMZ | | | | 240 | | |
| | | | Three phase | FTZ | | | | | | |
| | induction | | Single phase | PIC | cos φ 0 - 1 - 0 | | | 90 | | 19 |
| | | | Three phase | PIC | cos φ 0 - 1 - 0 | | | | | |

# Moving Iron Ammeters

- Casings DIN 48-72-96-144
- Class 1.5
- Measurement in true effective value from 100 mA ... 100 A
- Interchangeable scales for EC48, EC72, EC96, EM 45, EC 72 FA, EC 96 FA
- Completely configurable alarm system for CEC 96

| Ammeters, 90° | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| **Type** | **EC 48** | **EC 72** | **EC 96** | **EC 144** | **EM 45** |
| **Class** | 1,5 | | | | |
| **Scale** | 90 ° , P2 | | | | |
| c b a / a b c | 48<br>48<br>66,2 | 72<br>72<br>49,2 | 96<br>96<br>49,2 | 144<br>144<br>71,8 | 85<br>52<br>65 |
| **Weight (g)** | 85 | 180 | 220 | 430 | 142 |
| **mA** | | | | | |
| **100** | M10111 | M10121 | M10131 | M10142 | M10151 |
| **150** | M10112 | M10122 | M10132 | M10142 | M10152 |
| **250** | M10114 | M10124 | M10134 | M10144 | M10154 |
| **300** | M10115 | M10125 | M10135 | M10145 | M10155 |
| **400** | M10116 | M10126 | M10136 | M10146 | M10156 |
| **500** | M10117 | M10127 | M10137 | M10147 | M10157 |
| **600** | M10118 | M10128 | M10138 | M10148 | M10158 |
| **A** | | | | | |
| **5** | M10212 | M10222 | M10232 | M10242 | M10152 |
| **10** | M10213 | M10223 | M10233 | M10243 | M10153 |
| **15** | M10214 | M10224 | M10234 | M10244 | M10154 |
| **20** | M10215 | M10225 | M10235 | M10245 | M10155 |
| **25** | M10216 | M10226 | M10236 | M10246 | M10156 |
| **30** | M10217 | M10227 | M10237 | M10247 | M10157 |
| **40** | M10218 | M10228 | M10238 | M10248 | M10158 |
| **50** | M10219 | M10229 | M10239 | M10249 | M10159 |
| **60** | M1021A | M1022A | M1023A | M1024A | M1015A |
| **75** | - | M1022B | M1023B | M1024B | - |
| **100** | - | M1022C | M1023C | M1024C | - |
| **.../5 A (*)** | M10210 | M10220 | M10230 | M10240 | M10150 |

| | Ammeters, 240° | | Ammeters with switch | | Ammeters with 2 relays |
|---|---|---|---|---|---|
| | | | | | |
| **Type** | **EZC 72** | **EZC 96** | **EC 72 FA** | **EC 96 FA** | **CEC 96** |
| **Class** | 1,5 | | | | |
| **Scale** | 240º, P2 | | 90º, P1 | | 90º, P1 |
| c b a / a b c | 72<br>72<br>49,2 | 96<br>96<br>49,2 | 72<br>72<br>49,2 | 96<br>96<br>49,2 | 96<br>96<br>85,3 |
| **Weight (g)** | 180 | 220 | 180 | 220 | 435 |
| **mA** | | | | | |
| **.../5 A(*)** | M10920 | M10930 | M10521 | M10531 | M14810 |

## Interchangeable scales

| (*) Interchangeable scales, HM ammeters | | | | | | |
|---|---|---|---|---|---|---|
| Type | SEC 48 | SEC 72 | SEC 96 | SEM 45 | SEC 72 FA | SEC 96 FA |
| Equipment | EC 48 | EC 72 | EC 96 | EM 45 | EC 72 FA | EC 96 FA |
| A | | | | | | |
| 50/5 | M102Z9 | M102Y9 | M102X9 | M105X9 | M105Y9 | M105X9 |
| 60/5 | M102ZA | M102YA | M102XA | M105XA | M105YA | M105XA |
| 75/5 | M102ZB | M102YB | M102XB | M102VB | M105YB | M105XB |
| 100/5 | M102ZC | M102YC | M102XC | M102VC | M105YC | M105XC |
| 125/5 | M102ZD | M102YD | M102XD | M102VD | M105YD | M105XD |
| 150/5 | M102ZE | M102YE | M102XE | M102VE | M105YE | M105XE |
| 200/5 | M102ZF | M102YF | M102XF | M102VF | M105YF | M105XF |
| 250/5 | M102ZG | M102YG | M102XG | M102VG | M105YG | M105XG |
| 300/5 | M102ZH | M102YH | M102XH | M102VH | M105YH | M105XH |
| 400/5 | M102ZJ | M102YJ | M102XJ | M102VJ | M105YJ | M105XJ |
| 500/5 | M102ZK | M102YK | M102XK | M102VK | M105YK | M105XK |
| 600/5 | M102ZL | M102YL | M102XL | M102VL | M105YL | M105XL |
| 750/5 | M102ZM | M102YM | M102XM | M102VM | M105YM | M105XM |
| 800/5 | M102ZN | M102YN | M102XN | M102VN | M105YN | M105XN |
| 1 000/5 | M102ZP | M102YP | M102XP | M102VP | M105YP | M105XP |
| 1 200/5 | M102ZQ | M102YQ | M102XQ | M102VQ | M105YQ | M105XQ |
| 1 500/5 | M102ZR | M102YR | M102XR | M102VR | M105YR | M105XR |
| 2 000/5 | M102ZS | M102YS | M102XS | M102VS | M105YS | M105XS |
| 2 500/5 | M102ZT | M102YT | M102XT | M102VT | M105YT | M105XT |
| 3 000/5 | M102ZU | M102YU | M102XU | M102VU | M105YU | M105XU |
| 4 000/5 | M102ZV | M102YV | M102XV | M102VV | M105YV | M105XV |
| 5 000/5 | M102ZW | M102YW | M102XW | M102VW | M105YW | M105XW |

| (*) Interchangeable scales, HM ammeters | | | |
|---|---|---|---|
| Type | SEC 48 | SEC 72 | SEC 96 |
| Equipment | EC 48 | EC 72 | EC 96 |
| A | | | |
| 5/5 | M102Z2 | M102Y2 | M102X2 |
| 10/5 | M102Z3 | M102Y3 | M102X3 |
| 15/5 | M102Z4 | M102Y4 | M102X4 |
| 20/5 | M102Z5 | M102Y5 | M102X5 |
| 25/5 | M102Z6 | M102Y6 | M102X6 |
| 30/5 | M102Z7 | M102Y7 | M102X7 |
| 40/5 | M102Z8 | M102Y8 | M102X8 |

## Features

| Type | EC | EM | EZC | EC FA | CEC 96 |
|---|---|---|---|---|---|
| **Auxiliary power supply** | | | | | 230 V a.c. |
| Consumption | | - | | | 2,5 V·A |
| Frequency | | - | | | 40 ... 90 Hz |
| **Input circuit** | | | | | |
| Consumption | | 0,3 ... 1,5 V·A | | | 0,2 V·A |
| Frequency | | 20 ... 100 Hz | | | 45 ... 65 Hz |
| Overloads | | 1,2 $I_n$ permanent<br>5 $I_n$ for 30 s<br>10 $I_n$ for 5 s<br>40 $I_n$ for 1 s | | | 1,2 $I_n$ permanent |
| **Accuracy** | | 1,5 % F.E. | | | |
| **Environmental conditions** | | | | | |
| Operating temperature | | +10 ºC / +30 ºC | | | + 5 ºC / +55 ºC |
| Limit temperature | | - 25 ºC / +40 ºC | | | -25º C / +70º C |
| **Assembly features** | | | | | |
| Dimensions | | See previous table | | | |
| Weight | | See previous table | | | |
| Casing type | panel | DIN rail | panel | panel | panel |
| Terminal protection grade | | IP 00 | | | IP 20 |
| Casing protection grade | | IP 52 | | | |
| Insulation voltage | | 2 kV for one minute between mechanism and casing | | | 3 kV , 50 Hz, 1min |
| **Standards** | | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318, CE** | | | **IEC 51, IEC 1010, IEC 529, IEC 255, IEC 278, IEC 414, IEC 144, LLOYD'S (TEST. ESP. Nº1)** |

# Moving Iron Voltmeters

- Casings DIN 48-72-96-144
- Class 1.5
- Measurement in true effective value from 0 V ... 600 V AC.
- Interchangeable scales for EC48, EC72, EC96, EM 45
- Completely configurable alarm system for CEC 96

| Voltmeters, 90º | | | | | | Voltmeters, 240º | | Voltmeters with 2 relays |
|---|---|---|---|---|---|---|---|---|
| Type | | | | | | | | |
| | EC 48 | EC 72 | EC 96 | EC 144 | EM 45 | EZC 72 | EZC 96 | CEC 96 |
| Class | 1,5 | | | | | 1,5 | | 1,5 |
| Scale | 90 º , P1 | | | | | 240º, P1 | | 90ª, P1 |
| a<br>b<br>c | 48<br>48<br>66,2 | 72<br>72<br>49,2 | 96<br>96<br>49,2 | 144<br>144<br>71,8 | 85<br>52<br>65 | 72<br>72<br>49,2 | 96<br>96<br>49,2 | 96<br>96<br>85,3 |
| Weight (g) | 85 | 180 | 220 | 430 | 142 | 180 | 220 | 435 |
| V | | | | | | | | |
| 150 | - | - | - | - | - | - | - | M14821 |
| 250 | M10415 | M10425 | M10435 | M10445 | - | M11125 | M11135 | M14822 |
| 300 | M10416 | M10426 | M10436 | M10446 | M10456 | - | - | M14823 |
| 400 | M10417 | M10427 | M10437 | M10447 | - | - | - | M14824 |
| 500 | M10418 | M10428 | M10438 | M10448 | M10458 | M11128 | M11138 | M14825 |
| 600 | M10419 | M10429 | M10439 | M10449 | - | - | - | M14826 |
| .../110 V(*) | M10410 | M10420 | M10430 | M10440 | M10450 | - | - | M14820 |

| Voltmeters with switch | | | | | |
|---|---|---|---|---|---|
| Type | | | | | |
| | Three phase 3 wire | | Three phase 4 wire | | with sequence meter |
| | EC 72 F III | EC 96 F III | EC 72 F III +N | EC 96 F III *N | EC 96 FN-S |
| Class | 1,5 | | | | |
| Scale | 90 º , P1 | | | | |
| a<br>b<br>c | 72<br>72<br>49,2 | 96<br>96<br>49,2 | 72<br>72<br>49,2 | 96<br>96<br>49,2 | 96<br>96<br>49,2 |
| Weight (g) | 180 | 220 | 180 | 220 | 220 |
| V | | | | | |
| 250 | M10625 | M10635 | M10725 | M10735 | - |
| 300 | M10626 | M10636 | M10726 | M10736 | - |
| 400 | M10627 | M10637 | M10727 | M10737 | - |
| 500 | M10628 | M10638 | M10728 | M10738 | M11038 |
| 600 | M10629 | M10639 | M10729 | M10739 | - |

## Interchangeable scales

| (*) Interchangeable scales, HM voltmeters | | | | |
|---|---|---|---|---|
| **Type** | **SEC 48** | **SEC 72** | **SEC 96** | **SEM 45** |
| **Equipment** | **EC 48** | **EC 72** | **EC 96** | **EM 45** |
| **V** | | | | |
| **1 000/110** | M104Z1 | M104Y1 | M104X1 | M104V1 |
| **3 300/110** | M104Z2 | M104Y2 | M104X2 | M104V2 |
| **6 600/110** | M104Z3 | M104Y3 | M104X3 | M104V3 |
| **13 200/110** | M104Z4 | M104Y4 | M104X4 | M104V4 |
| **15 000/110** | M104Z5 | M104Y5 | M104X5 | M104V5 |
| **20 000/110** | M104Z6 | M104Y6 | M104X6 | M104V6 |
| **22 000/110** | M104Z7 | M104Y7 | M104X7 | M104V7 |
| **25 000/110** | M104Z8 | M104Y8 | M104X8 | M104V8 |

## Features

| Type | EC | EM | EZC | EC F | CEC 96 |
|---|---|---|---|---|---|
| **Auxiliary power supply** | | | | | 230 V a.c |
| Consumption | | - | | | 2,5 V·A |
| Frequency | | - | | | 40 ... 90 Hz |
| **Input circuit** | | | | | |
| Consumption | | 1 ... 4 V·A | | | 0,2 V·A |
| Frequency | | 20 ... 100 Hz | | | 45 ... 65 Hz |
| Overloads | | 1,5 $U_n$ permanent<br>2 $U_n$ for 5 s | | | 1,2 $U_n$ permanent |
| **Accuracy** | | 1,5 % F.E. | | | |
| **Environmental conditions** | | | | | |
| Operating temperature | | +10 / +30 ºC | | | +5 ºC / +55 ºC |
| Limit temperature | | - 25 ºC / +40 ºC | | | -25 ºC / +70 ºC |
| **Assembly features** | | | | | |
| Dimensions | | See previous table | | | |
| Weight | | See previous table | | | |
| Casing type | panel | DIN rail | panel | panel | panel |
| Terminal protection grade | | IP 00 | | | IP 20 |
| Casing protection grade | | IP 52 | | | |
| Insulation voltage | | 2 kV for one minute between mechanism and casing | | | 3 kV 50 Hz 1 min |
| **Standards** | | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318, CE** | | | **IEC 51, IEC 1010, IEC 529, IEC 255, IEC 278, IEC 414, IEC 144, LLOYD'S (TEST. ESP. Nº1)** |

# Moving Coil Ammeters

- Casings DIN 48-72-96-144
- Class 1.5
- Measurement in DC. for 25 μA ... 60 A, or 60 ... mV.
- Interchangeable scales for BC48, BC72, BC96, BM 45
- Completely configurable alarm system for CBC 96

| Ammeters, 90º | | | | | | Ammeters with 2 relays |
|---|---|---|---|---|---|---|
| Type | | | | | | |
| | BC 48 | BC 72 | BC 96 | BC 144 | BM 45 | CBC 96 |
| Class | 1,5 | | | | | 1,5 |
| Scale | 90 º , P1 | | | | | 90º, P1 |
| a<br>b<br>c | 48<br>48<br>66,2 | 72<br>72<br>49,2 | 96<br>96<br>49,2 | 144<br>144<br>71,8 | 85<br>52<br>65 | 96<br>96<br>85,3 |
| Weight (g) | 75 | 170 | 210 | 420 | 110 | 435 |
| A | | | | | | |
| 5 | M11412 | M11422 | M11432 | M11442 | M11452 | - |
| 10 | M11413 | M11423 | M11433 | M11443 | M11453 | - |
| 25 | M11416 | M11426 | M11436 | M11446 | M11456 | - |
| 50 | M11419 | M11429 | M11439 | M11449 | M11459 | - |
| 60 | - | M1142A | M1143A | M1144A | M1145A | - |
| .../60 mV(*) | M11410 | M11420 | M11430 | M11440 | M11450 | M14830 |

| (*) Interchangeable scales | | | | |
|---|---|---|---|---|
| Type | SBC 48 | SBC 72 | SBC 96 | SBM 45 |
| Equipment | BC 48 | BC 72 | BC 96 | BM 45 |
| A / mV | | | | |
| 50/60 | M114Z9 | M114Y9 | M114X9 | M114V9 |
| 60/60 | M114ZA | M114YA | M114XA | M114VA |
| 75/60 | M114ZB | M114YB | M114XB | M114VB |
| 100/60 | M114ZC | M114YC | M114XC | M114VC |
| 150/60 | M114ZE | M114YE | M114XE | M114VE |
| 200/60 | M114ZF | M114YF | M114XF | M114VF |
| 250/60 | M114ZG | M114YG | M114XG | M114VG |
| 300/60 | M114ZH | M114YH | M114XH | M114VH |
| 400/60 | M114ZJ | M114YJ | M114XJ | M114VJ |
| 600/60 | M114ZL | M114YL | M114XL | M114VL |
| 1 000/60 | M114ZP | M114YP | M114XP | M114VP |
| 1 500/60 | M114ZR | M114YR | M114XR | M114VR |
| 2 500/60 | M114ZT | M114YT | M114XT | M114VT |

## Features

| | BC | BM | CBC 96 |
|---|---|---|---|
| **Auxiliary power supply** | | | 230 V a.c. |
| Consumption | - | | 2,5 V·A |
| Frequency | - | | 40 ... 90 Hz |
| **Input circuit** | | | |
| Consumption | 60 mV | | 0,2 V·A |
| Overloads | 1,2 $I_n$ permanent<br>5 $I_n$ for 30 s<br>10 $I_n$ for 5 s<br>40 $I_n$ for 1 s | | |
| **Accuracy** | 1,5 % F.E. | | |
| **Environmental conditions** | | | |
| Operating temperature | +10 ºC / +30 ºC | | +5 ºC / +55 ºC |
| Limit temperature | - 25 ºC / +40 ºC | | -25 ºC / +70 ºC |

| | BC | BM | CBC 96 |
|---|---|---|---|
| **Assembly features** | | | |
| Dimensions | See previous table | | |
| Weight | See previous table | | |
| Casing type | panel | DIN rail | panel |
| Terminal protection grade | IP 00 | | IP 20 |
| Casing protection grade | IP 52 | | |
| Insulation voltage | 2 kV for one minute between mechanism and casing | | |
| **Standards** | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318** | | **IEC 51, IEC 1010, IEC 529, IEC 255, IEC 278, IEC 414, IEC 144, LLOYD'S (TEST. ESP. Nº1)** |

# Moving Coil Voltmeters

- Casings DIN 48-72-96-144
- Class 1.5
- Measurement in DC. for 10 mV ... 600 V DC.
- Interchangeable scales for BC48, BC72, BC96, BM 45
- Completely configurable alarm system for CBC 96

| Type | Voltmeters , 90º | | | | | Voltmeters with relay |
|---|---|---|---|---|---|---|
| | BC 48 | BC 72 | BC 96 | BC 144 | BM 45 | CBC 96 |
| **Class** | 1,5 | | | | | |
| **Scale** | 90 º , P1 | | | | | 90º, P1 |
| **a**<br>**b**<br>**c** | 48<br>48<br>66,2 | 72<br>72<br>49,2 | 96<br>96<br>49,2 | 144<br>144<br>71,8 | 85<br>52<br>65 | 96<br>96<br>85,3 |
| **Weigth (g)** | 75 | 170 | 210 | 420 | 110 | 435 |
| **V** | | | | | | |
| **0...10 V** | M11813 | M11823 | M11833 | M11843 | - | - |
| **1** | M11711 | M11721 | M11731 | M11741 | - | - |
| **15** | M11714 | M11724 | M11734 | M11744 | M11754 | - |
| **30** | M11716 | M11726 | M11736 | M11746 | M11755 | - |
| **60** | M11718 | M11728 | M11738 | M11748 | M11756 | - |
| **100** | M11719 | M11729 | M11739 | M11749 | M11757 | - |
| **150** | M1171A | M1172A | M1173A | M1174A | M11758 | M14841 |
| **250** | M1171B | M1172B | M1173B | M1174B | - | M14842 |
| **300** | - | - | - | - | - | M14843 |
| **400** | M1171D | M1172D | M1173D | M1174D | - | M14844 |
| **500** | M1171E | M1172E | M1173E | M1174E | - | M14845 |
| **600** | M1171F | M1172F | M1173F | M1174F | - | M14846 |

# Features

| | BC | BM | CBC 96 |
|---|---|---|---|
| **Auxiliary power supply** | | | 230 V a.c. |
| Consumption | - | | 2,5 V·A |
| Frequency | - | | 40 ... 90 Hz |
| **Input circuit** | | | |
| Consumption | 1 000 Ω/V | | 0,2 V·A |
| Frequency | 20 ... 100 Hz | | 45 ... 65 Hz |
| Overloads | 1,5 $U_n$ permanent<br>2 $U_n$ for 5 s | | 1,2 $U_n$ permanent |
| Temp. coefficient | | | 100 ppm/ºC |
| **Accuracy** | 1,5 % F.E. | | |
| **Environmental conditions** | | | |
| Operating temperature | +10 ºC / +30 ºC | | +5 ºC / +55 ºC |
| Limit temperature | - 25 ºC / +40 ºC | | -25 ºC / +70 ºC |

| | BC | BM | CBC 96 |
|---|---|---|---|
| **Assembly features** | | | |
| Dimensions | See previous table | | |
| Weight | See previous table | | |
| Casing type | panel | DIN rail | panel |
| Terminal protection grade | IP 00 | | IP 20 |
| Casing protection grade | IP 52 | | |
| Insulation voltage | 2 kV for one minute between mechanism and casing | | |
| **Standards** | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318,** | | **IEC 51, IEC 1010, IEC 529, IEC 255, IEC 278, IEC 414, IEC 144, LLOYD'S (TEST. ESP. Nº1)** |

# Process Indicators

- Casings DIN 48-72-96-144
- Class 1.5
- Measurement in DC. for 25 μA ... 60 A DC., or 60 ... mVDC.
- Interchangeable scales for BC48, BC72, BC96, BM 45

| Process indicators, 90º | | | | | | Process indicators, 240º | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Type** | | | | | | | | | |
| | **BC 48** | **BC 72** | **BC 96** | **BC 144** | **BM 45** | **ZC 48** | **ZC 72** | **ZC 96** | **ZC 144** |
| **Class** | 1,5 | | | | | 1,5 | | | |
| **Scale** | 90 º , P1 | | | | | 240º, P1 | | | |
| **a**<br>**b**<br>**c** | 48<br>48<br>66,2 | 72<br>72<br>49,2 | 96<br>96<br>49,2 | 144<br>144<br>71,8 | 85<br>52<br>65 | 48<br>48<br>66,2 | 72<br>72<br>49,2 | 96<br>96<br>49,2 | 144<br>144<br>71,8 |
| **Weight (g)** | 75 | 170 | 210 | 420 | 110 | 75 | 170 | 210 | 420 |
| **Scope** | | | | | | | | | |
| **0...10 V** | M11813 | M11823 | M11833 | M11843 | M11853 | M12513 | M12523 | M12533 | M12543 |
| **0...20 mA** | M11812 | M11822 | M11832 | M11842 | M11852 | - | - | - | - |
| **4...20 mA** | M11811 | M11821 | M11831 | M11841 | M11851 | M12511 | M12521 | M12531 | M12541 |
| **.../60 mV (*)** | - | - | - | - | - | M12510 | M12520 | M12530 | M12540 |

| (*) Interchangeable scales | | | | |
|---|---|---|---|---|
| **Type** | **SIP 48** | **SIP 72** | **SIP 96** | **SIPM 45** |
| **Equipment** | **BC 48** | **BC 72** | **BC 96** | **BM 45** |
| **Scope** | | | | |
| **0...10 V** | M118Z3 | M118Y3 | M118X3 | M118V3 |
| **0...20 mA** | M118Z2 | M118Y2 | M118X2 | M118V2 |
| **4...20 mA** | M118Z1 | M118Y1 | M118X1 | M118V1 |

## Features

| | BC | BM | ZC |
|---|---|---|---|
| **Input circuit** | | | |
| Consumption | 1000 Ω/V | | V·A |
| Overloads | 1,5 $U_n$ permanent<br>2 $U_n$ for 5 s | | |
| **Accuracy** | 1,5 % F.E. | | |
| **Environmental conditions** | | | |
| Operating temperature | +10 ºC / +30 ºC | | |
| Limit temperature | - 25 ºC / +40 ºC | | |

| | BC | BM | ZC |
|---|---|---|---|
| **Assembly features** | | | |
| Dimensions | See previous table | | |
| Weight | See previous table | | |
| Casing type | panel | DIN rail | panel |
| Terminal protection grade | IP 00 | | |
| Casing protection grade | IP 52 | | |
| Insulation voltage | 2 kV for one minute between mechanism and casing | | |
| **Standards** | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318,** | | |

# Power Demand Meters

- Casings DIN 48-72-96-144
- Class 3
- Measurement in DC. for 25 μA ... 60 A DC, or
- 60 ... mVDC.
- Interchangeable scales for MC48, MC72, MC96, MMC 45, EMC72, EMC96
- Thermal inertia times of 15 mins (on request 8 and 30 mins)

| | Bimetal power demand meter ammeter | | | | | Bimetal power demand meter ammeter + moving iron ammeter | | |
|---|---|---|---|---|---|---|---|---|
| **Type** | | | | | | | | |
| | **MC 48** | **MC 72** | **MC 96** | **MC 144** | **MMC 45** | **EMC 72** | **EMC 96** | **EMC 144** |
| **Class** | 3 | | | | | Bimetal: 3; moving iron: 1.5 | | |
| **Scale** | 90 ° , P1,,2 | | | | | Two scales 90°, bimetal: 1.2P; moving iron: 2P | | |
| **a**<br>**b**<br>**c** | 48<br>48<br>66,2 | 72<br>72<br>49,2 | 96<br>96<br>49,2 | 144<br>144<br>71,8 | 85<br>52<br>65 | 72<br>72<br>49,2 | 96<br>96<br>49,2 | 144<br>144<br>71,8 |
| **Weight (g)** | 110 | 140 | 210 | 420 | | 220 | 260 | 470 |
| **A** | | | | | | | | |
| **.../ 5 A (*)** | M12211 | M12221 | M12231 | M12241 | M12651 | M12622 | M12632 | M12642 |

| (*) Interchangeable scales | | | | | | |
|---|---|---|---|---|---|---|
| **Type** | **SMC 48** | **SMC 72** | **SMC 96** | **SMMC 45-A** | **SEMC 72** | **SEMC 96** |
| **Equipment** | **MC 48** | **MC 72** | **MC 96** | **MMC 45** | **EMC 72** | **EMC 72** |
| **A** | | | | | | |
| **100/5** | M122ZC | M122YC | M122XC | M126VC | M126YC | M126XC |
| **200/5** | M122ZF | M122YF | M122XF | M126VF | M126YF | M126XF |
| **300/5** | M122ZH | M122YH | M122XH | M126VH | M126YH | M126XH |
| **400/5** | M122ZJ | M122YJ | M122XJ | M126VJ | M126YJ | M126XJ |
| **500/5** | M122ZK | M122YK | M122XK | M126VK | M126YK | M126XK |
| **600/5** | M122ZL | M122YL | M122XL | M126VL | M126YL | M126XL |
| **750/5** | M122ZM | M122YM | M122XM | M126VM | M126YM | M126XM |
| **800/5** | M122ZN | M122YN | M122XN | M126VN | M126YN | M126XN |
| **1 000/5** | M122ZP | M122YP | M122XP | M126VP | M126YP | M126XP |
| **1 500/5** | M122ZR | M122YR | M122XR | M126VR | M126YR | M126XR |
| **2 000/5** | M122ZS | M122YS | M122XS | M126VS | M126YS | M126XS |

## Features

| | MC | MMC | EMC |
|---|---|---|---|
| **Input circuit** | | | |
| Consumption | 3,25 V·A | | 4,25 V·A |
| Overloads | 1,5 $I_n$ permanent<br>15 $I_n$ for 1 s | | |
| **Accuracy** | ± 3 % F.E. | | ± 3 % Bim.<br>± 1,5 % H.M. |
| **Environmental conditions** | | | |
| Operating temperature | +10 ºC / +30 ºC | | |
| Limit temperature | - 25 ºC / +40 ºC | | |

| | MC | MMC | EMC |
|---|---|---|---|
| **Assembly features** | | | |
| Dimensions | See previous table | | |
| Weight | See previous table | | |
| Casing type | panel | DIN rail | panel |
| Terminal protection grade | IP 00 | | |
| Casing protection grade | IP 52 | | |
| Insulation voltage | 2 kV for one minute between mechanism and casing | | |
| **Standards** | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318,** | | |

# Pointer Frequency Meters

- Casings DIN 48-72-96-144
- Class 0.5
- Built in electronic converter

| Pointer frequency meters | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Frequency meters, 90º | | | | | Frequency meters, 240º | |
| Type | | | | | | | |
| | HC 48 | HC 72 | HC 96 | HC 144 | HM 45 | HZC 96 | HZC 144 |
| Class | 0,5 | | | | | 0,5 | |
| Scale | 90º | | | | | 240º | |
| a<br>b<br>c | 48<br>48<br>66,2 | 72<br>72<br>49,2 | 96<br>96<br>49,2 | 144<br>144<br>71,8 | 85<br>52<br>65 | 96<br>96<br>101.2 | 144<br>144<br>102 |
| Weight (g) | 95 | 175 | 215 | 425 | 250 | 180 | 520 |
| Hz | | | | | | | |
| 45...55 | M12711 | M12721 | M12731 | M12741 | M12751 | M12831 | M12841 |
| 57...63 | M12711001 | M12721001 | M12731001 | M12741001 | M12751001 | M12831001 | M12841001 |
| 55...65 | M12711003 | M12721003 | M12731003 | M12741003 | M12751003 | M12831003 | M12841003 |
| 45...65 | M12711004 | M12721004 | M12731004 | M12741004 | M12751004 | M12831004 | M12841004 |
| 47...63 | M12711005 | M12721005 | M12731005 | M12741005 | M12751005 | M12831005 | M12841005 |

## Features

| | HC | HM | HZC |
|---|---|---|---|
| **Input circuit** | | | |
| Consumption | 2...3 V·A | | |
| Frequency | 50 ... 400 Hz | | |
| Overloads | 1,2 $U_n$ permanent<br>2 $U_n$ for 5 s | | |
| Voltage | Standard 230 V a.c.<br>Optional 100-120 V a.c.<br>380-440 V a.c. | | |
| **Accuracy** | 0,5 % F.E. | | |
| **Environmental conditions** | | | |
| Operating temperature | +10 ºC / +30 ºC | | |
| Limit temperature | - 25 ºC / +40 ºC | | |

| | HC | HM | HZC |
|---|---|---|---|
| **Assembly features** | | | |
| Dimensions | See previous table | | |
| Weight | See previous table | | |
| Casing type | panel | DIN rail | panel |
| Terminal protection grade | IP 00 | | |
| Casing protection grade | IP 52 | | |
| Insulation voltage | 2 kV for one minute between mechanism and casing | | |
| **Standards** | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318,** | | |

# Reed Frequency Meters

- Casings DIN 72-96-144
- Class 0.5
- Independent measurement of the wave form

| Reed frequency meters | | | | |
|---|---|---|---|---|
| **Type** | | | | |
| | | **HLC 72** | **HLC 96** | **HLC 144** |
| **Class** | | | **0,5** | |
| | **a**<br>**b**<br>**c** | 72<br>72<br>49,2 | 96<br>96<br>49,2 | 144<br>144<br>71,8 |
| **Weight (g)** | | 230 | 300 | 423 |
| **Hz** | | | | |
| **47...53, 13 reeds** | **50 Hz** | M12921 | M12931 | M12941 |
| **45...55, 11 reeds** | | M12921002 | M12931002 | M12941002 |
| **47...53, 7 reeds** | | M12921005 | M12931005 | M12941005 |
| **57...63, 13 reeds** | **60 Hz** | M12921001 | M12931001 | M12941001 |
| **55...65, 11 reeds** | | M12921003 | M12931003 | M12941003 |
| **57...63, 7 reeds** | | M12921004 | M12931004 | M12941004 |

## Features

| | HLC |
|---|---|
| **Input circuit** | |
| Consumo | 1...3,6 V·A |
| Frequency | 50 / 60 Hz |
| Overloads | 1,2 $U_n$ permanent<br>2 $U_n$ for 5 s |
| Voltage | Standard 230 V a.c.<br>Optional 100-120 V a.c.<br>380-440 V a.c. |
| **Accuracy** | 0,5 % F.E. |
| **Environmental conditions** | |
| Operating temperature | +10 ºC / +30 ºC |
| Limit temperature | - 25 ºC / +40 ºC |

| | HLC |
|---|---|
| **Assembly features** | |
| Dimensions | See previous table |
| Weight | See previous table |
| Casing type | panel |
| Terminal protection grade | IP 00 |
| Casing protection grade | IP 52 |
| Insulation voltage | 2 kV for one minute between mecha-nism and casing |
| **Standards** | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318,** |

# Wattmeters

- Casings DIN 96-144
- Class 1.5
- Built in electronic converter
- Single phase and three phase balanced and unbalanced circuits

| Type | | Single phase | | Balanced three phase | | Three phase 3 wire (ARON) | | Three phase 4 wire | |
|---|---|---|---|---|---|---|---|---|---|
| | | WMC 96 | WMC 144 | WTC 96E | WTC 144E | WTC 96A | WTC 144A | WTC 96AN | WTC 144AN |
| Class | | 1,5 | | | | | | | |
| Scale | | 90 º P1 | | | | | | | |
| | a | 96 | 144 | 96 | 144 | 96 | 144 | 96 | 144 |
| | b | 96 | 144 | 96 | 144 | 96 | 144 | 96 | 144 |
| | c | 49,2 | 71,8 | 49,2 | 71,8 | 62,9 | 71,8 | 62,9 | 71,8 |
| Weight (g) | | 290 | 490 | 290 | 490 | 430 | 640 | 430 | 640 |
| Vphase-phase | | 400 | | 400 | | 110 | | 400 | |
| | | M13031 | M13041 | M13032 | M13032 | M13034 | M13044 | M13033 | M13043 |

| (*) Interchangeable scales | | | | | |
|---|---|---|---|---|---|
| | Single phase | | Three phase | | |
| Type | SWM 96 | | | SWT 96E | SWT 96AN |
| Equipment | WMC 96 | | | WTC 96E | WTC 96AN |
| A | Base Scale | Code | Base Scale | Code | Code |
| 50/5 | 20 kW | M130J9 | 30 kW | M130K9 | M130L9 |
| 75/5 | - | - | 50 kW | M130KB | M130LB |
| 100/5 | 40 kW | M130JC | 60 kW | M130KC | M130LC |
| 150/5 | 60 kW | M130JE | 90 kW | M130KE | M130LE |
| 200/5 | 80 kW | M130JF | 120 kW | M130KF | M130LF |
| 300/5 | 120 kW | M130JH | 180 kW | M130KH | M130LH |
| 400/5 | 160 kW | M130JJ | 240 kW | M130KJ | M130LJ |
| 500/5 | 200 kW | M130JK | 300 kW | M130KK | M130LK |
| 600/5 | 240 kW | M130JL | 360 kW | M130KL | M130LL |
| 1 000/5 | 400 kW | M130JP | 600 kW | M130KP | M130LP |
| 1 500/5 | 600 kW | M130JR | 900 kW | M130KR | M130LR |
| 2 000/5 | 800 kW | M130JS | 1,2 MW | M130KS | M130LS |
| 3 000/5 | 1,2 MW | M130JU | 1,8 MW | M130KU | M130LU |
| 4 000/5 | 1,6 MW | M130JV | 2,4 MW | M130KV | M130LV |
| 5 000/5 | 2,0 MW | M130JW | 3 MW | M130KW | M130LW |

(*2) On request, other values

(*3) Reference frequency 50 Hz

## Features

| Type | WMC | WTC |
|---|---|---|
| **Voltage circuit** | | |
| Voltage | 400 V (*2) | |
| Consumption | 1 ... 4 V·A | |
| Frequency | 45...65 Hz (*3) | |
| Overload | 1,25 $U_n$ permanent<br>2 $U_n$ for 5 s | |
| **Current circuit** | | |
| Nominal current | .../ 5 A (*2) | |
| Consumption | 0,3 ... 1,5 V·A | |
| Frequency | 45 ... 65 Hz | |
| Overloads | 1,2 $I_n$ permanent<br>5 $I_n$ for 30 s<br>10 $I_n$ for 5 s<br>40 $I_n$ for 1 s | |
| **Accuracy** | ±1,5 % F.E. | |
| **Environmental conditions** | | |
| Operating temperature | +10 ºC / +30 ºC | |
| Temperatura límite | - 25 ºC / +40 ºC | |
| **Assembly features** | | |
| Dimensions | See previous table | |
| Weight | See previous table | |
| Casing type | panel | |
| Terminal protection grade | IP 00 | |
| Casing protection grade | IP 52 | |
| Insulation voltage | 2 kV for one minute between mechanism and casing | |
| **Standards** | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318, CE** | |

# Varmeters

- Casings DIN 96-144
- Class 1.5
- Built in electronic converter
- Single phase and three phase balanced and unbalanced circuits

| Type | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Single phase | | Balanced three phase | | Three phase 3 wire (ARON) | | Three phase 4 wire | |
| | YMC 96 | YMC 144 | YTC 96E | YTC 144E | YTC 96A | YTC 144A | YTC 96AN | YTC 144AN |
| Class | 1,5 | | | | | | | |
| Scale | 90 º P1 | | | | | | | |
| a<br>b<br>c | 96<br>96<br>49,2 | 144<br>144<br>71,8 | 96<br>96<br>49,2 | 144<br>144<br>71,8 | 96<br>96<br>62,9 | 144<br>144<br>71,8 | 96<br>96<br>62,9 | 144<br>144<br>71,8 |
| Weight (g) | 290 | 490 | 290 | 490 | 430 | 640 | 430 | 640 |
| V phase-phase | 400 V | | 400 | | 110 | | 400 | |
| | M13231 | M13241 | M13232 | M13242 | M13234 | M13244 | M13233 | M13243 |

| (*) Interchangeable scales | | | | | |
|---|---|---|---|---|---|
| | single phase | | Three phase | | |
| Type | SYM 96 | | | SYT 96E | SYT 96AN |
| Equipment | YMC 96 | | | YTC 96E | YTC 96AN |
| A | Base scale | Code | Base Scale | Code | Code |
| 50/5 | 20 kvar | M132J9 | 30 kvar | M132K9 | M132L9 |
| 75/5 | - | - | 45 Kvar | M132KB | M132LB |
| 100/5 | 40 kvar | M132JC | 60 Kvar | M132KC | M132LC |
| 150/5 | 60 kvar | M132JE | 90 Kvar | M132KE | M132LE |
| 200/5 | 80 kvar | M132JF | 120 Kvar | M132KF | M132LF |
| 300/5 | 120 kvar | M132JH | 150 Kvar | M132KH | M132LH |
| 400/5 | 160 kvar | M132JJ | 240 Kvar | M132KJ | M132LJ |
| 500/5 | 200 kvar | M132JK | 300 Kvar | M132KK | M132LK |
| 600/5 | 240 kvar | M132JL | 360 Kvar | M132KL | M132LL |
| 1 000/5 | 400 kvar | M132JP | 600 Kvar | M132KP | M132LP |
| 1 500/5 | 600 kvar | M132JR | 900 Kvar | M132KR | M132LR |
| 2 000/5 | 800 kvar | M132JS | 1,2 Mvar | M132KS | M132LS |
| 3 000/5 | 1,2 Mvar | M132JU | 1,8 Mvar | M132KU | M132LU |
| 4 000/5 | 1,6 Mvar | M132JV | 2,4 Mvar | M132KV | M132LV |
| 5 000/5 | 2,0 Mvar | M132JW | 3,0 Mvar | M132KW | M132LW |

(*2) On request, others values

(*3) Reference frequency 50 Hz

## Features

| Type | YMC | YTC |
|---|---|---|
| **Voltage circuit** | | |
| Voltage | 400 V (*2) | |
| Consumption | 1 ... 4 V·A | |
| Frequency | 50 Hz (*2) | 20 ... 100 Hz |
| Overload | 1,25 $U_n$ permanent<br>2 $U_n$ for 5 s | |
| **Current circuit** | | |
| Nominal current | .../ 5 A (*2) | |
| Consumption | 0,3 ... 1,5 V·A | |
| Frequency | 50 Hz (*2) | 20 ... 100 Hz |
| Overloads | 1,2 $I_n$ permanent<br>5 $I_n$ for 30 s<br>10 $I_n$ for 5 s<br>40 $I_n$ for 1 s | |
| **Accuracy** | ±1,5 % F.E. | |
| **Environmental conditions** | | |
| Operating temperature | +10 ºC / +30 ºC | |
| Temperatura límite | - 25 ºC / +40 ºC | |
| **Assembly features** | | |
| Dimensions | See previous table | |
| Weight | See previous table | |
| Cashing type | panel | |
| Terminal protection grade | IP 00 | |
| Casing protection grade | IP 52 | |
| Insulation voltage | 2 kV for one minute between mechanism and casing | |
| **Standards** | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318, CE** | |

# Electronic Phase Meters

- Casings DIN 96-144
- Class 1.5
- Electronic system converter
- Single phase and three phase balanced circuits

| Type | Electronic phase meters, 90º | | | | Electronic phase meters, 240º | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | Single phase | | Balanced three phase | | Single phase | | Balanced three phase | |
| | FEMC 96 | FEMC 144 | FETC 96 | FETC 144 | FMZ 96 | FMZ 144 | FTZ 96 | FTZ 144 |
| Class | 1,5 | | | | | | | |
| Scale | 90 º P1 | | | | 240º P1 | | | |
| a<br>b<br>c | 96<br>96<br>62,9 | 144<br>144<br>71,8 | 96<br>96<br>62,9 | 144<br>144<br>71,8 | 96<br>96<br>101,2 | 144<br>144<br>71,8 | 96<br>96<br>101,2 | 144<br>144<br>71,8 |
| Weight (g) | 480 | 690 | 480 | 690 | 500 | 710 | 500 | 710 |
| V | cos $\varphi$ 0,5-1-0,5 | | | | | | | |
| 100/√3 | M13431 | M13441 | - | - | M13531 | M13541 | - | - |
| 110/√3 | M13432 | M13442 | - | - | M13532 | M13542 | - | - |
| 100 | M13433 | M13443 | M1343C | M1344C | M13533 | M13543 | M1353C | M1354C |
| 110 | M13434 | M13444 | M1343D | M1344D | M13535 | M13545 | M1353D | M1354D |
| 230 | M13435 | M13445 | M1343E | M1344E | M13535 | M13545 | M1353E | M1354E |
| 400 | M13436 | M13446 | M1343F | M1344F | M13536 | M13546 | M1353F | M1354F |
| 440 | M13437 | M13447 | M1343G | M1344G | M13537 | M13547 | M1353G | M1354G |
| 500 | M13438 | M13448 | M1343H | M1344H | M13538 | M13548 | M1353H | M1354H |

## Features

| | FEMC / FETC | FMZ / FTZ |
|---|---|---|
| **Voltage circuit** | | |
| Consumption | 1 V·A | 4 V·A |
| Frequency | 47,5...52,5 (*3) | |
| Overloads | 1,2 $U_n$ permanent<br>2 $U_n$ for 5 s | |
| **Current circuit** | | |
| Nominal current | .../ 5 A (*) | |
| Consumption | 1,5 V·A | 0,75 V·A |
| Frequency | 20 ... 100 Hz | |
| Overloads | 1,2 $I_n$ permanent<br>5 $I_n$ for 30 s<br>10 $I_n$ for 5 s<br>40 $I_n$ for 1 s | |
| **Accuracy** | ±1,5 % F.E. | |

| | FEMC / FETC | FMZ / FTZ |
|---|---|---|
| **Environmental conditions** | | |
| Operating temperature | +10 ºC / +30 ºC | |
| Limit temperature | - 25 ºC / +40 ºC | |
| **Assembly features** | | |
| Dimensions | See previous table | |
| Weight | See previous table | |
| Casing type | panel | |
| Terminal protection grade | IP 00 | |
| Casing protection grade | IP 52 | |
| Insulation voltage | 2 kV for one minute between mecha-nism and casing | |
| **Standards** | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318, CE** | |

(*) On request, others values

(*3) Reference frequency 50 Hz

# Induction Phase Meters

- Casings DIN 96-144
- Class 1.5
- Single phase and three phase balanced and unbalanced circuits

| Type | Induction phase meters 360º | | | | | |
|---|---|---|---|---|---|---|
| | Single phase | | Balanced three phase | | Unbalanced three phase | |
| | PIC 96 A | PIC 144 A | PIC 96 B | PIC 144 B | PIC 96 E | PIC 144 E |
| **Class** | 1,5 | | | | | |
| **Scale** | 360 º , 1 P | | | | | |
| a<br>b<br>c | 96<br>96<br>101,2 | 144<br>144<br>102 | 96<br>96<br>101,2 | 144<br>144<br>102 | 96<br>96<br>101,2 | 144<br>144<br>102 |
| **Weight (g)** | 1 910 | 1 960 | 1 410 | 1 460 | 1 410 | 1 460 |
| **V** | cos $\varphi$ 0-1-0 | | | | | |
| **110** | M13631 | M13641 | M13634 | M13644 | M13637 | M13647 |
| **230** | M13632 | M13642 | M13635 | M13645 | M13638 | M13648 |
| **400** | M13633 | M13643 | M13636 | M13646 | M13639 | M13649 |

## Features

| | PIC A / PIC B | PIC E |
|---|---|---|
| **Voltage circuit** | | |
| Consumption | 5 V·A / 20 mA | 15 mA |
| Frequency | 49,5...50,5 Hz (*3)<br>59,4... 60,6 Hz (*2) | 4T-5T (*3)<br>54 ... 66 Hz(*2) |
| Overloads | 1,2 $U_n$ permanent<br>2 $U_n$ for 5 s | |
| **Current circuit** | | |
| Nominal current | .../ 5 A (*) | |
| Consumption | 4 V·A | 2,5 V·A |
| Frequency | 50 Hz | |
| Overloads | 1,2 $I_n$ permanent<br>5 $I_n$ for 30 s<br>10 $I_n$ for 5 s<br>40 $I_n$ for 1 s | |
| **Accuracy** | ±1,5 % F.E. | |

| | PIC A / PIC B | PIC E |
|---|---|---|
| **Environmental conditions** | | |
| Operating temperature | +10 ºC / +30 ºC | |
| Limit temperature | - 25 ºC / +40 ºC | |
| **Assembly features** | | |
| Dimensions | See previous table | |
| Weight | See previous table | |
| Casing type | panel | |
| Terminal protection grade | IP 00 | |
| Casing protection grade | IP 52 | |
| Insulation voltage | 2 kV for one minute between mechanism and casing | |
| **Standards** | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318, CE** | |

(*) On request, others values
(*2) Reference frequency 60 Hz
(*3) Reference frequency 50 Hz

# Protection Ammeters for Overload and Short Circuit

- Casing DIN 96
- Class 1.5
- 2 output relays
- Easy and programmable alarm system

An electronic panel instrument which protects against overcurrent and short circuit in three phase systems, being especially designed for generator protection. The equipment continually measures the current in each of the three phases and gives a signal when the current in any of the three phases exceeds the preset trip values. The alarm is indicated by activating the output relays. The status of the output relays can be known by using the two LEDs on the front.
The scale is interchangeable and as default is supplied as twice lengthened(2p).

Measurements are made using the three external current transformers... / 5 A . The equipment simultaneously measures the three currents, although the pointer only indicates the current in one phase (the phase to be shown may be selected using an external switch).

The instrument has two independent relays: one for short circuit and the other for overload.

- Protection by overload:

- Adjustable trip point from 0 to 150 % of In
- Adjustable delay from 0 to 60 s
- Relay sealing* (latch): once the alarm condition is given, the relay remains activated until the instrument's auxiliary power supply is removed (even though the alarm conditions have gone)

- Protection against short circuiting:

- Adjustable trip point from 150 to 300 % of In
- Adjustable delay from 0 to 1.2 s

| Ammeters | |
|---|---|
| | Three phase |
| **Type** | CG 96 |
| **a**<br>**b**<br>**c** | 96<br>96<br>85,3 |
| **A** | 3 inputs |
| **.../5** | M14713 |

## Features

| **Input circuit** | |
|---|---|
| Consumption | 5 V·A |
| Frequency | 20 ... 100 Hz |
| Overloads | 2 $I_n$ permanent<br>5 $I_n$ for 30 s<br>10 $I_n$ for 5 s<br>40 $I_n$ for 1 s |
| **Accuracy** | 1,5 % F.E. |
| **Environmental conditions** | |
| Operating temperature | +5 ºC / +55 ºC |
| Limit temperature | - 25 ºC / +70 ºC |

| **Assembly features** | |
|---|---|
| Dimensions (mm) | 96 x 96 x 85,3 |
| Weight (g) | 435 |
| Casing type | panel |
| Terminal protection grade | IP 20 |
| Casing protection grade | IP 52 |
| Insulation voltage | 2 kV for one minute between mechanism and casing |
| **Standards** | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318, CE** |

# Protective Dual Directional Wattmeters

- Casing DIN 96
- Class 1.5
- Dual directional power indicator
- Inverse power protection
- Two measurement controls
- Totally easy and programmable alarm system

Application

The **PGR 96** is designed to operate with process signals from the supplied converter. It has two completely configurable alarms using some microswitches located on a side window on the equipment. The measurement and alarm control system is based on a micro-processor, which operates by sampling the input signal. The configuration of each alarm is independent, using 8 microswitches.
Each alarm allows the configuration of:

- Maximum or minimum tripping
- Closure (on/off)
- Fail safe (on/off)
- Delay in connecting and disconnecting:

The alarm trip point, -20 ... 100% of the measurement, and timer time, 0 ... 30s, are selected using four power meters, two for each alarm, located at the rear of the instrument.
It has two relays with switched contact and two LEDs indicating the alarm status. When there is an alarm condition and the instrument is on a timer, the corresponding LED flashes; at the end of the timed period, the relay switches and the LED remains permanently on.

| | single phase | Balanced three phase | Three phase 3 wire (ARON) | Three phase 4 wire |
|---|---|---|---|---|
| | **PGR 96 M** | **PGR 96E** | **PGR 96A** | **PGR 96AN** |
| **Transducer (See catalogue M2)** | CW-M | CW-TE | CW-TA | CW-TAN |
| **Class** | 1,5 | | | |
| **Scale** | 90 ° , P2 | | | |
| **V / A** | 100...500 V | | | |
| **100...500 V .../5 A (*)** | M14721 | M14722 | M14724 | M14723 |
| Equipment comprising converter + analogue instrument<br>(*) Voltage and primary current indicator for the two measurement transformers as well as the end of range power. | | | | |

## Features

| Type | PGR |
|---|---|
| **Input circuit** | |
| Nominal current In | 0 ... 20 m A d.c. |
| Current range | 0 ...130 % $I_n$ |
| Current overload | 5 $I_n$ permanent |
| Impedance | 3 Ω |
| External power supply | |
| A.c. Nominal value | 115 / 230 / 400 V |
| Frequency | 40...80 Hz |
| Consumption | 2,5 V·A |
| C.c. Nominal value | 9-18 / 18-36 / 36-72 / 90-140 V |
| Consumption | 2,5 V·A |

| Type | PGR |
|---|---|
| **Environmental conditions** | |
| Operating temperature | +5 °C ... +55 °C |
| Limit temperature | -25 °C ... +70 °C |
| **Assembly features** | |
| Dimensions (mm) | 96 x 96 x 77,2 |
| Weight (g) | 435 |
| Casing type | DIN rail |
| Terminal prptection grade | IP 20 |
| Casing protection grade | IP 52 |
| **Standards** | **IEC 51, IEC 1010, IEC 529, IEC 255, IEC 278, IEC 414, IEC 144** |

# Synchronisation and Naval Applications Equipment

- Casing DIN 96-144
- Two scales

CE

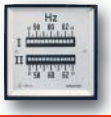
- Class 1,5

- Class 0,5
- Built in electronic converter

- Class 0,5
- Independent measurement of the wave form

| Double voltmeters | | |
|---|---|---|
| **Type** | | |
| | **2 EC 96** | **2 EC 144** |
| **Class** | 1,5 | |
| **Scale** | 90 ° | |
| **a**<br>**b**<br>**c** | 96<br>96<br>49,2 | 144<br>144<br>71,8 |
| **Weight (g)** | 220 | 430 |
| **V** | | |
| **2 x .../100** | M13831 | M13841 |
| **2 x .../110** | M13832 | M13842 |
| **2 x 220** | M13833 | M13843 |
| **2 x 380** | M13834 | M13844 |
| **2 x 440** | M13835 | M13845 |

| Double pointer frequency meters | | |
|---|---|---|
| **Type** | | |
| | **2 HC 96** | **2 HC 144** |
| **Class** | 0,5 | |
| **Scale** | 90º | |
| **a**<br>**b**<br>**c** | 96<br>96<br>62,9 | 144<br>144<br>71,8 |
| **Weight (g)** | 400 | 450 |
| **Hz** | | |
| **45...55** | M12732 | M12742 |
| **57...63** | M12732001 | M12742001 |
| **55...65** | M12732003 | M12742003 |
| **45...65** | M12732004 | M12742004 |
| **47...63** | M12732005 | M12742005 |

| Double reed frequency meters | | |
|---|---|---|
| **Type** |  | |
| | **2 HLC 96** | **2 HLC 144** |
| **Class** | 0,5 | |
| **Scale** | - | |
| **a**<br>**b**<br>**c** | 96<br>96<br>62,9 | 144<br>144<br>71,8 |
| **Weight (g)** | 400 | 450 |
| **Hz** | | |
| **47...53, 13 reeds** | M12932 | M12942 |
| **57...63, 13 reeds** | M12932001 | M12942001 |
| **45...55, 11 reeds** | M12932002 | M12942002 |
| **55...65, 11 reeds** | M12932003 | M12942003 |
| **57...63, 7 reeds** | M12932004 | M12942004 |
| **47...53, 7 reeds** | M12932005 | M12942005 |

## Features

| Type | 2 EC | 2 HC | 2 HLC |
|---|---|---|---|
| **Input circuit** | | | |
| Consumption | 1 ... 4 V·A | 2 ... 3 V·A | 1 ... 3,6 V·A |
| Frequency | 20 ... 100 Hz | According to type | |
| Overloads | 1,2 $U_n$ permanent<br>2 $U_n$ for 5 s | | |
| **Accuracy** | 1,5 % F.E. | 0,5 % F.E. | |
| **Environmental conditions** | | | |
| Operating temperature | +10 ºC / +30 ºC | | |
| Limit temperature | - 25 ºC / +40 ºC | | |

| Type | 2 EC | 2 HC | 2 HLC |
|---|---|---|---|
| **Assembly features** | | | |
| Dimensions | See previous table | | |
| Weight | See previous table | | |
| Casing type | panel | | |
| Terminal protection grade | IP 00 | | |
| Casing protection grade | IP 52 | | |
| Insulation voltage | 2 kV for one minute between mechanism and casing | | |
| **Standards** | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318, CE** | | |

## Synchronoscopes

- Casing DIN 96-144
- Class 1.5
- 50 and 60 Hz
- For single phase and three phase circuits

For indicating the frequency and phase angle difference between two generators or system and generator, when the are connected in parallel. If the difference is zero, the instrument's pointer remains on the synchronisation mark located in the middle of the scale.
The scale of the instrument is divided into two areas marked with the signs ( + ) and ( - ). These signs indicate if the machine to be connected has a higher or lower frequency than the other respectively.
The setting is carried out until the pointer is on the ( - ) side, but slowly turning in the ( + ) direction.
If the pointer stops outside the synchronisation mark, both machines are at the same frequency but the voltages are not in phase.
The instrument's pointer begins to turn in the right direction when the frequency difference is 1.5 Hz for three phase or 0.5 Hz for single phase.

## Sequence Meter

- Casing DIN 72-96
- • Class 1.5
- • 50 or 60 Hz
- • Includes voltage relay Un ±15%. Low consumption

The UC 72 and UC 96 indicate the phase order in three phase systems.
The CUC 96, as well as indicating phase sequence, includes a relay with switched contact and free of voltage. The relay is deactivated when there is no voltage or when the phase order is wrong.

Measurement system.
A completely electronic circuit with no moving parts, allows the neon indicators to be easily activated.

Scales.
Two visors, one GREEN and the other RED, indicate if the phase sequence is CORRECT or INCORRECT, respectively.

| Synchronoscope | | | | |
|---|---|---|---|---|
| | Single phase | | Three phase | |
| | | | | |
| **Type** | **SMC 96** | **SMC 144** | **STC 96** | **STC 144** |
| **Class** | 1,5 | | | |
| **a**<br>**b**<br>**c** | 96<br>96<br>101,2 | 144<br>144<br>102 | 96<br>96<br>101,2 | 144<br>144<br>102 |
| **Weight (g)** | 1700 | 2250 | 1410 | 1960 |
| **V** | | | | |
| **110** | M14431 | M14441 | M14435 | M14445 |
| **230** | M14432 | M14442 | M14436 | M14446 |
| **400** | M14433 | M14443 | M14437 | M14447 |
| **500** | M14434 | M14444 | M14438 | M14448 |

| Sequence meter | | | |
|---|---|---|---|
| | | | |
| **Type** | **UC 72** | **UC 96** | **CUC 96** |
| **Control relay** | No | | Yes |
| **a**<br>**b**<br>**c** | 72<br>72<br>62,9 | 96<br>96<br>62,9 | 96<br>96<br>62,9 |
| **Weight (g)** | 200 | 275 | 375 |
| **V** | | | |
| **100...500** | M13721 | M13731 | - |
| **230** | - | - | M13734 |
| **400** | - | - | M13735 |

## Features

| Type | SMC | STC | UC | CUC |
|---|---|---|---|---|
| **Input circuit** | | | | |
| Consumption | System: 5 V·A<br>Generator: 15 mA | System: 20 mA for circuit<br>Generator: 15 mA for circuit | 3 mA | 4 V·A |
| Frequency | 20 ... 100 Hz | | 50 Hz | |
| Overloads | 1,2 $U_n$ permanent<br>2 $U_n$ for 5 s | | | |
| **Accuracy** | 1,5 % F.E. | | | |
| **Environmental conditions** | | | | |
| Operating temperature | +10 ºC / +30 ºC | | 0 / +70ºC | |
| Limit temperature | - 25 ºC / +40 ºC | | -40ºC / +70ºC | |

| Type | SMC / STC | UC / CUC |
|---|---|---|
| **Assembly features** | | |
| | See previous table | |
| Weight | See previous table | |
| Casing type | panel | |
| Terminal protection grade | IP 00 | |
| Casing protection grade | IP 52 | |
| Insulation voltage | 2 kV for one minute between mecha-nism and casing | |
| **Standards** | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318, CE** | |

# Synchro Max / Synchro Max PID

SYNCHRO MAX

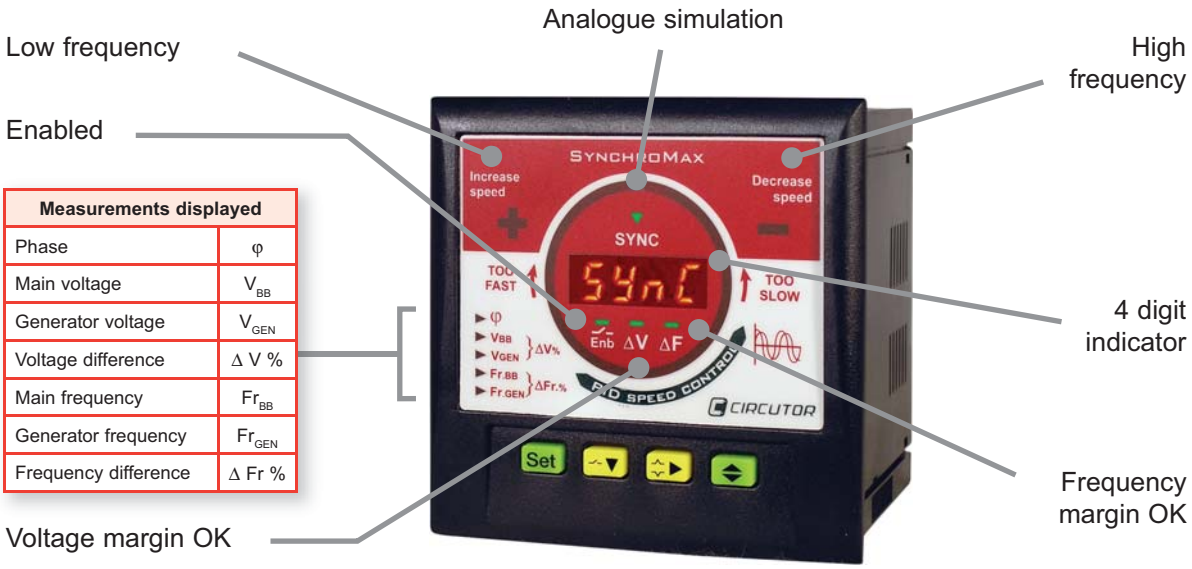
SYNCHRO MAX PID

- All parameters are programmable via the front keypad
- Digital equipment with 4 digit display and 30 auxiliary LED
- Measurement and display of the voltage and frequency of the generator and the mains and the phase angle between them (TRMS)
- Automatic synchronisation with programming of the contactor connection delay (*)
- Wide frequency range (35...80 Hz)
- Standard power supplies: 110, 230 and 400 V AC.
- 3 operating modes: manual, automatic and assisted
- Digital setting (without potentiometers)
- BUILT IN PI / PID CONTROL (according to type) OF GENERATOR SPEED USING PULSE OUTPUT
- Protection using password

## Purpose of the equipment

The SynchroMax is a synchronisation relay which synchronises a generator with the network or with another generator taken as a reference. This allows both to be connected in parallel in emergency or support applications when it is needed to provide more power.

## Front of the equipment




| Measurements displayed | |
|---|---|
| Phase | φ |
| Main voltage | $V_{BB}$ |
| Generator voltage | $V_{GEN}$ |
| Voltage difference | Δ V % |
| Main frequency | $Fr_{BB}$ |
| Generator frequency | $Fr_{GEN}$ |
| Frequency difference | Δ Fr % |

## Types

**CIRCUTOR** has two type of synchronisation relay: the **SYNCHRO MAX** and the **SYNCRO MAX PID.**

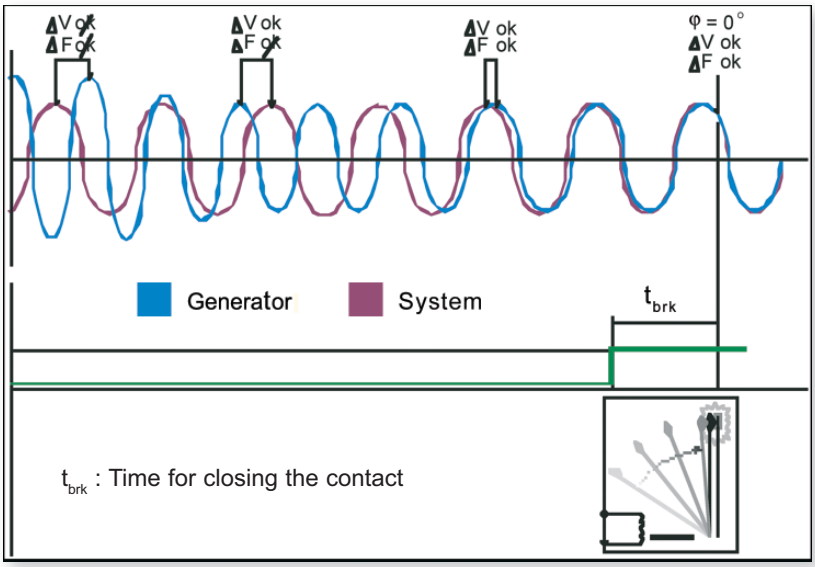
### Synchro Max

The **Synchro Max** can adapt the generator frequency using a built in PI control algorithm, to be able to connect it in parallel with the mains. It also measures and displays the voltage, phase and frequency parameters both for the generator and the mains and the differences between them.

### Synchro Max PID

The **Synchro Max PID** has all the excellent features of measurement, display and programming of the standard **Synchro Max**, and additiondly a powerful PID algorithm to control the generator frequency. This type of control makes the **Synchro Max PID** an extremely quick device for synchronising and therefore makes it suitable for reducing synchronisation costs because it minimises times invested in carrying this out. This type of control is suitable for mini hydraulic power plants among many other applications.

(*) On the right it can be seen how the **SYNCHRO MAX** gives the decission in advances Tbrk seconds before (previously set by the user) to take into account the generator's contactor connection delay.




## Features

| **Auxiliary power supply** | Alternating voltage |
|---|---|
| Standard values | 110, 230, 400 V a.c. (+15 / -10 %) |
| Frequency margin | 35 ... 450 Hz |
| Maximum consumption | 10 V·A |
| **Measuring circuit** | |
| Measuring range | 30...150 V , 110...600 V |
| Frequency | 35...80 Hz |
| Permanent overload | 800 V |
| Consumption | < 500 uA |
| **Accuracy** | |
| Voltage | Cl 1 +/- 2 dig. |
| Frequency | +/- 0,01 Hz |
| Phase angle | +/- 0,5° |

| **Display** | 4 digits |
|---|---|
| Colour | Red, high efficiency |
| Cycle of presentation | 2 / s |
| Auxiliary LED | 30 |
| **Environmental conditions** | |
| Storage temperature | - 40 ºC / +70 ºC |
| Working temperature | -10 ºC / +65 ºC |
| **Assembly features** | |
| Casing colour | Anthracite grey |
| Casing material | Self extinguishing ABS |
| Protection degree | Front: IP 54 (optional, IP 65) |
| Weight | 0,35 kg |
| **Standards** | **IEC 1010, IEC 348, IEC 664, IEC 801, EN 50081-1, EN 50082-2** |

## Code

| M | 1 | 4 | 6 | X | X | 0 | 0 | X |
|---|---|---|---|---|---|---|---|---|

| Type | |
|---|---|
| Synchro Max | 2 |
| Synchro Max PID | 3 |

| Measurement range | |
|---|---|
| 30 ... 150 V | 4 |
| 110 ... 600 V | 5 |

| Voltage | |
|---|---|
| 400 V a.c. | - |
| 110 V a.c. | 1 |
| 230 V a.c. | 2 |
| 9 ... 18 V d.c. | 8 |
| 18 ... 36 V d.c. | 7 |
| 36 ... 72 V d.c. | 9 |

# Insulation meter

- Casing DIN 96
- Class 1.5
- Insulated or impedance neutral system (IT system)

The **MEG-1000** is equipment which measures and checks, using a relay, the isolating resistance between a phase and earth in a neutral isolated or impeded line ( IT ). The amount of isolating resistance may be displayed on a galvanometric indicator on the front of the equipment.

To carry out the measurement, the equipment applies a direct, 24V current between the phase and earth and measures the leakage current flowing through the isolating resistances in the system.. This current determines the isolation resistance.

The equipment has two timed output relays, one which operates on the maximum (trips when the resistance exceeds a preset value) and another which operates on the minimum (trips when the isolation resistance is below another preset value). Both relays have a trip point and a connection delay time which may be set by using the potentiometers located at the back of the equipment.

In the event that the isolation resistance is between the maximum and minimum values defined by the potentiometers, the NORMAL LED on the front lights up. When the resistance is outside the defined margin, either above or below, the ALARM LED lights up on the front.

| **Type** | **MEG-1000** |
|---|---|
| **Class** | 1,5 |
| **Scale** | 90 ° |
| **Frequency** | 50...60 Hz |
| **a**<br>**b**<br>**c** | 96<br>96<br>73,8 |
| **Weight (g)** | 0,708 |
| **Ω (two scales)** | 0...500 kΩ<br>0.5...5 MΩ |
| **Code** | M15051 |

## Features

| Type | **MEG-1000** |
|---|---|
| **Input circuit** | |
| comsumption | 5 V·A |
| Frequency | 20 ... 100 Hz |
| Overloads | 1,2 $U_n$ permanent<br>2 $U_n$ for 5 s |
| **Accuracy** | 1,5 % F.E. |
| **Environmental conditions** | |
| Operating temperature | +10 ºC / +30 ºC |
| Limit temperature | - 25 ºC / +40 ºC |

| Type | **MEG-1000** |
|---|---|
| **Assembly features** | |
| Dimensions | See previous table |
| Weight | See previous table |
| Casing type | panel |
| Terminal protection grade | IP 00 |
| Casing protection grade | IP 52 |
| Insulation voltage | 2 kV for one minute between mecha-nism and casing |
| **Standards** | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318, CE** |

# Hours run meter

- Casing DIN 48-72-96
- Class 1.5
- 50 or 60 Hz

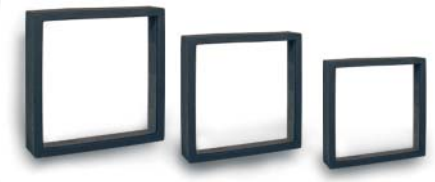
| Hour counter | | | |
|---|---|---|---|
| **Type** | **CH 48** | **CH 72** | **CH 96** |
| **Class** | 1,5 | | |
| **Display** | 5+2 | | |
| **a**<br>**b**<br>**c** | 48<br>48<br>48 | 72<br>72<br>62,9 | 96<br>96<br>62,9 |
| **Weight (g)** | 50 | 125 | 180 |
| | M14911 | M14921 | M14931 |

## Features

| **Input circuit** | |
|---|---|
| Current | 10 mA |
| Frequency | 50 ó 60 Hz |
| **Display** | Mechanical |
| Digits | 1,5 x 3,5 mm with magnifier. |
| Maximum value | 99 999,99 |
| **Environmental conditions** | |
| Operating temperature | +10 ºC / +30 ºC |
| Limit temperature | - 25 ºC / +40 ºC |

| **Assembly features** | |
|---|---|
| Dimensions | See previous table |
| Weight | See previous table |
| Casing type | panel |
| Terminal protection grade | IP 00 |
| Casing protection grade | IP 52 |
| Insulation voltage | 2 kV for one minute between mechanism and casing |
| **Standards** | **BS 89, EN 60051, IEC 144, UL 94, DIN 43780, IEC 51, UNE 21318, CE** |

## ACCESSORIES / OPTIONS



### IP Protection

| | **48 x 48** | **72 x 72** | **96 x 96** | **144 x 144** |
|---|---|---|---|---|
| **IP 54** | M19931 | M19932 | M19933 | M19934 |
| **IP 65** | M19941 | M19942 | M19943 | M19944 |

### Terminals cover (IP 20)

| 72 x 72 | 96 x 96 | 144 x 144 |
|---|---|---|
| M19922 | M19923 | M19924 |

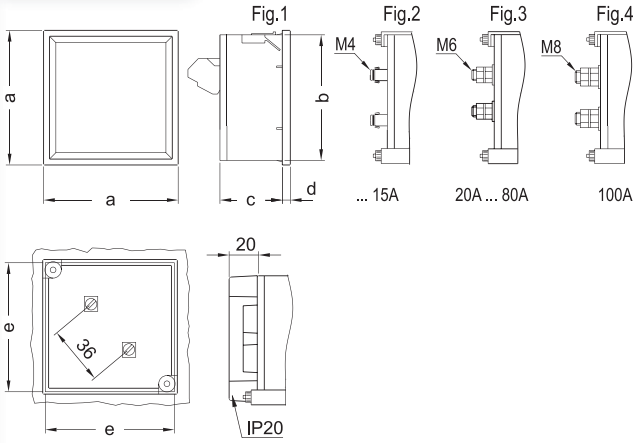
### Options

See price list for its code

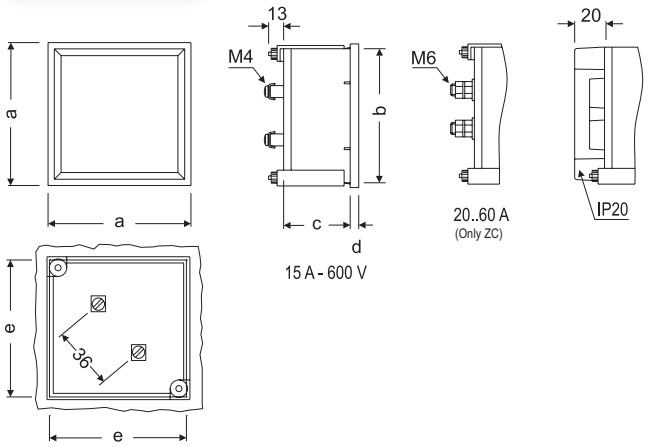
| |
|---|
| Only panel tropical weather resistant |
| Adjustable pointer |
| Anti-reflection glass |
| Makrolon glass |
| Inner lighting (6-12-48 V DC.) panel only |
| Scale adjustments 1,1.2,3,4,5,6. |
| Central cero |
| Moved cero |

# Dimensions / Connection

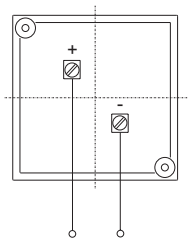
## EC / BC



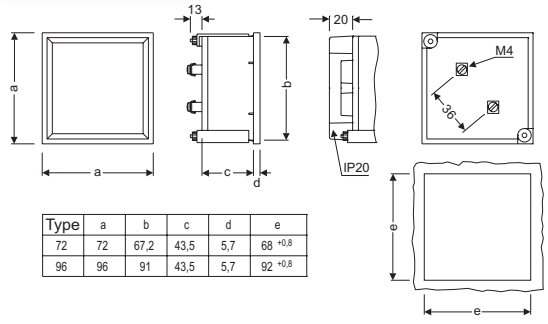

## EZC / ZC



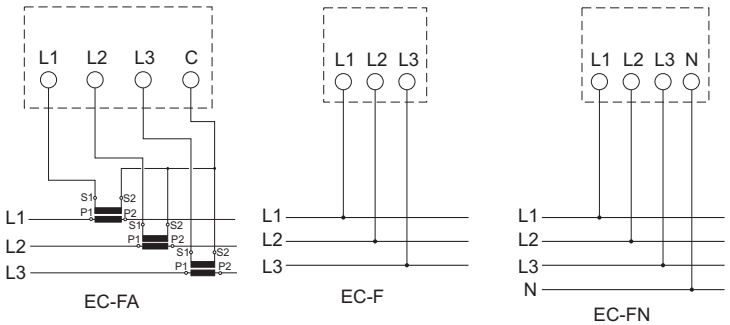

| Type | Fig. EC | Fig. BM | Fig. ZC | Fig. EZC | a | b | c | d | e |
|---|---|---|---|---|---|---|---|---|---|
| **48** | 1-3 | 1-3 | 1 | - | 48 | 44,7 | 61 | 5,2 | 45 |
| **72** | 1-3-4 | 2-3-4 | 1 | 1 | 72 | 67,2 | 43,5 | 5,7 | 68 |
| **96** | 1-3-4 | 2-3-4 | 1 | 1 | 96 | 91 | 43,5 | 5,7 | 92 |
| **144** | 2-3-4 | 2-3-4 | 1 | - | 144 | 137 | 64,5 | 7,3 | 138 |



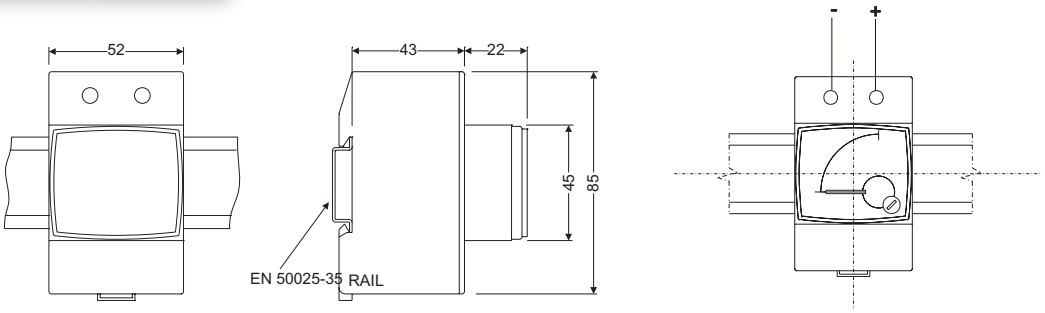

## EC-FA, EC-F, EC-FN



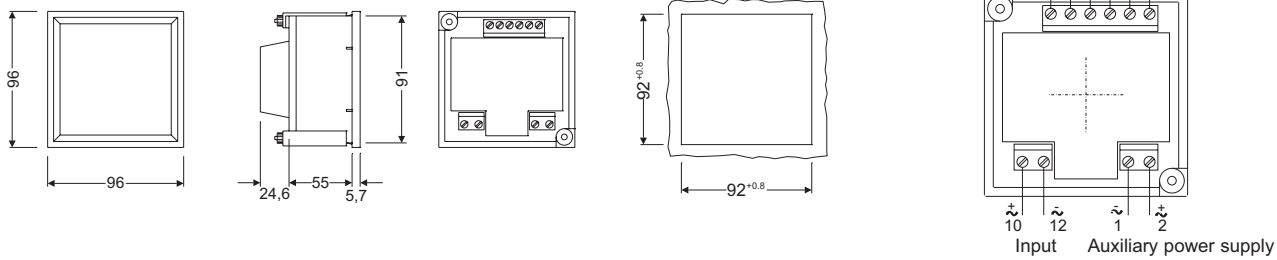

| Type | a | b | c | d | e |
|---|---|---|---|---|---|
| 72 | 72 | 67,2 | 43,5 | 5,7 | 68 +0,8 |
| 96 | 96 | 91 | 43,5 | 5,7 | 92 +0,8 |



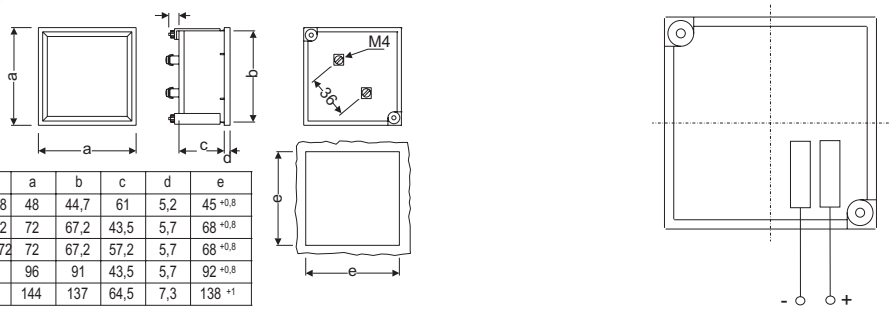

## EM 45 / BM 45 / MMC 45 / HM 45



## CEC/ CBC / PGR

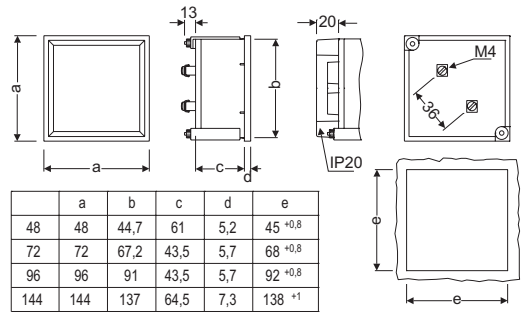



## EMC / MC



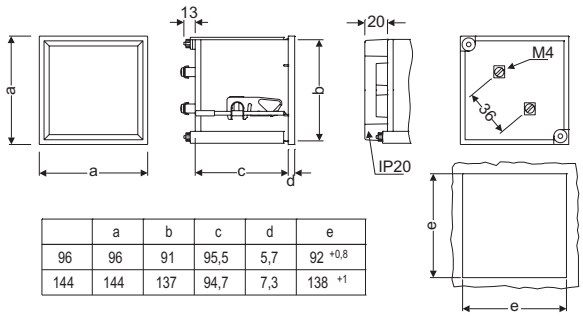

| | a | b | c | d | e |
|---|---|---|---|---|---|
| MC48 | 48 | 44,7 | 61 | 5,2 | 45 +0,8 |
| MC72 | 72 | 67,2 | 43,5 | 5,7 | 68 +0,8 |
| EMC72 | 72 | 67,2 | 57,2 | 5,7 | 68 +0,8 |
| 96 | 96 | 91 | 43,5 | 5,7 | 92 +0,8 |
| 144 | 144 | 137 | 64,5 | 7,3 | 138 +1 |

## HC



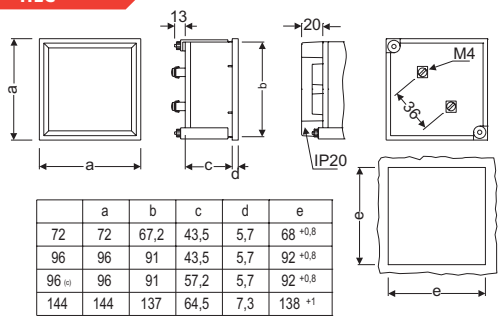

| | a | b | c | d | e |
|---|---|---|---|---|---|
| 48 | 48 | 44,7 | 61 | 5,2 | 45 +0,8 |
| 72 | 72 | 67,2 | 43,5 | 5,7 | 68 +0,8 |
| 96 | 96 | 91 | 43,5 | 5,7 | 92 +0,8 |
| 144 | 144 | 137 | 64,5 | 7,3 | 138 +1 |

## HZC

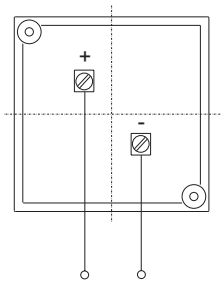



| | a | b | c | d | e |
|---|---|---|---|---|---|
| 96 | 96 | 91 | 95,5 | 5,7 | 92 +0,8 |
| 144 | 144 | 137 | 94,7 | 7,3 | 138 +1 |

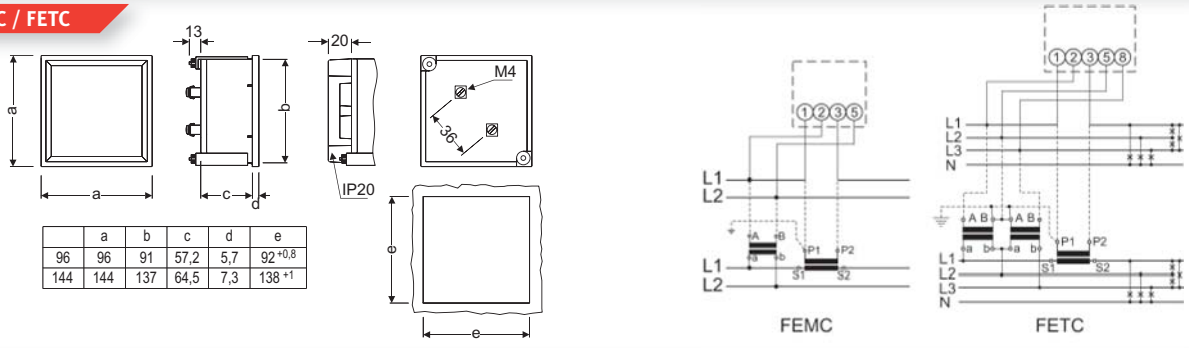
## HLC




| | a | b | c | d | e |
|---|---|---|---|---|---|
| 72 | 72 | 67,2 | 43,5 | 5,7 | 68 +0,8 |
| 96 | 96 | 91 | 43,5 | 5,7 | 92 +0,8 |
| 96 (a) | 96 | 91 | 57,2 | 5,7 | 92 +0,8 |
| 144 | 144 | 137 | 64,5 | 7,3 | 138 +1 |

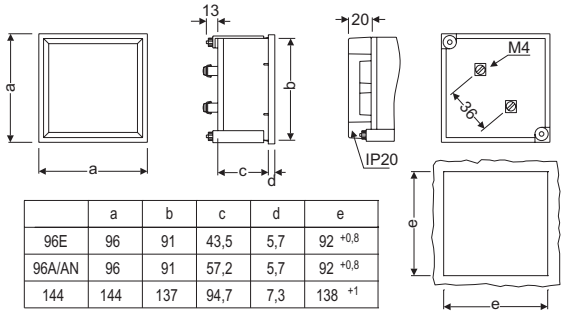



## FEMC / FETC

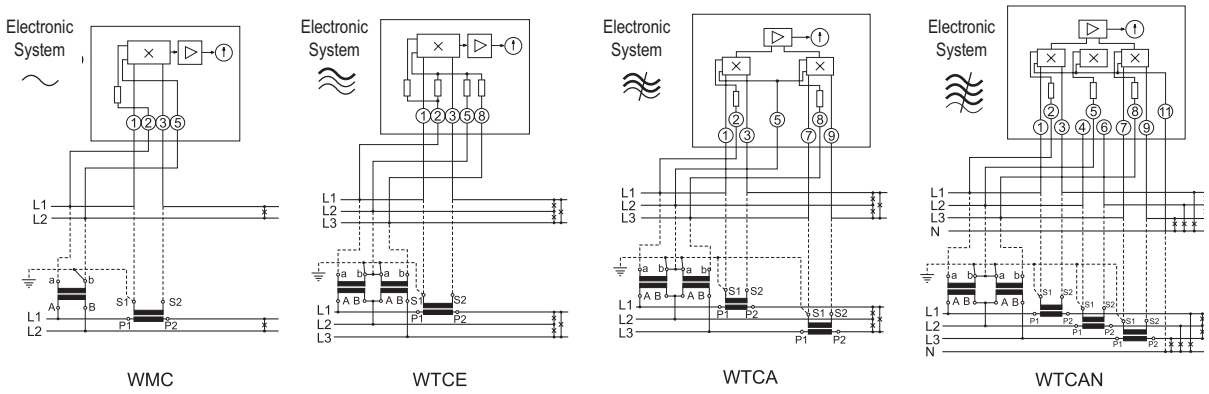



| | a | b | c | d | e |
|---|---|---|---|---|---|
| 96 | 96 | 91 | 57,2 | 5,7 | 92 +0,8 |
| 144 | 144 | 137 | 64,5 | 7,3 | 138 +1 |

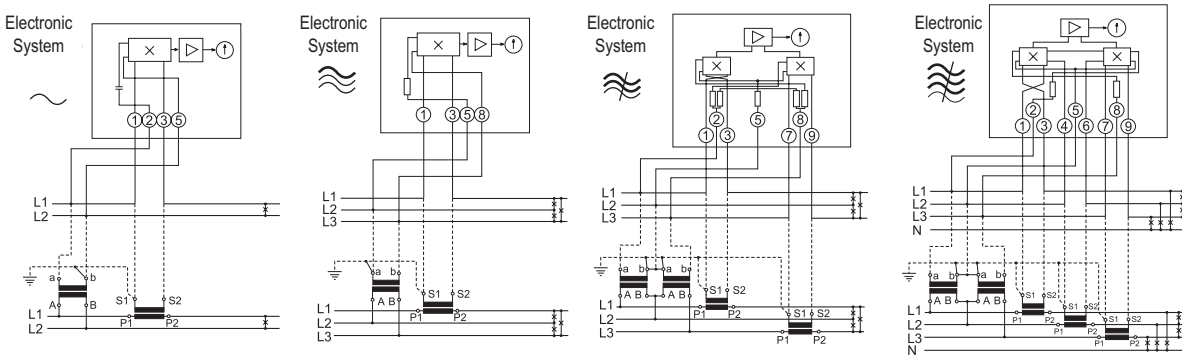
## WMC / YTC




| | a | b | c | d | e |
|---|---|---|---|---|---|
| 96E | 96 | 91 | 43,5 | 5,7 | 92 +0,8 |
| 96A/AN | 96 | 91 | 57,2 | 5,7 | 92 +0,8 |
| 144 | 144 | 137 | 94,7 | 7,3 | 138 +1 |

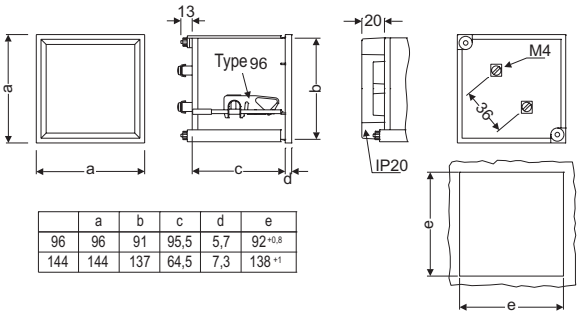



WMC WTCE WTCA WTCAN

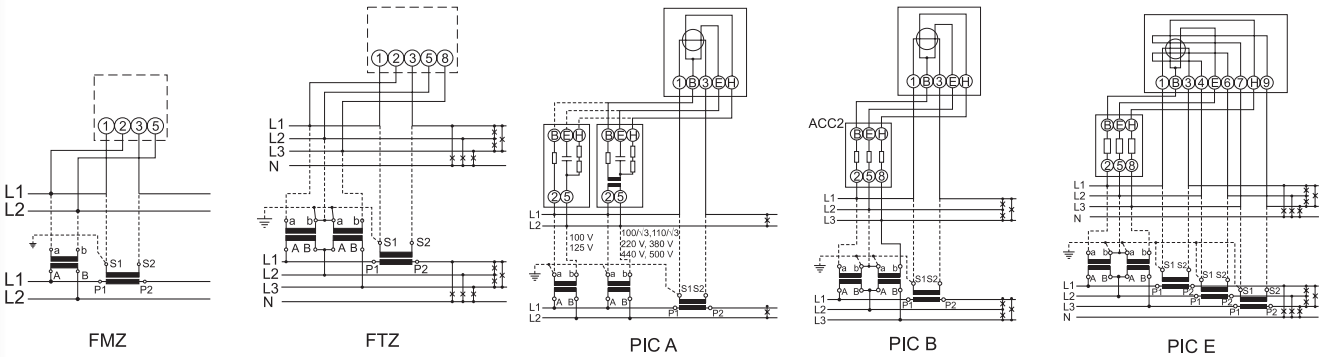



YMC YTCE YTCA YTCAN

## FMZ / FTZ / PIC

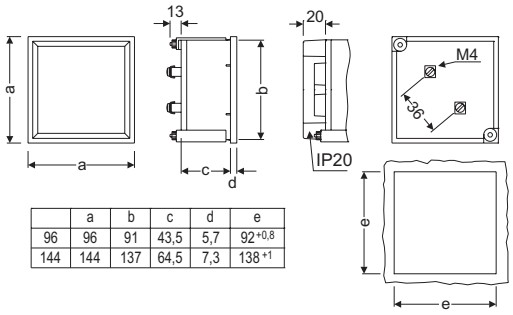



| | a | b | c | d | e |
|---|---|---|---|---|---|
| 96 | 96 | 91 | 95,5 | 5,7 | 92 +0,8 |
| 144 | 144 | 137 | 64,5 | 7,3 | 138 +1 |



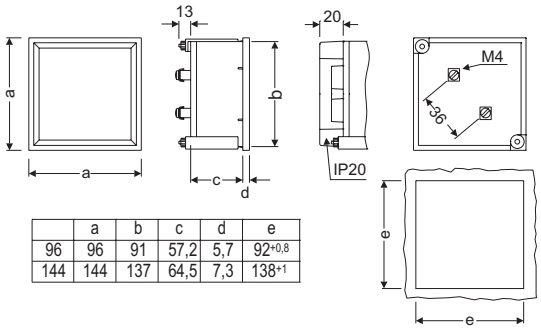

FMZ FTZ PIC A PIC B PIC E

## 2 EC

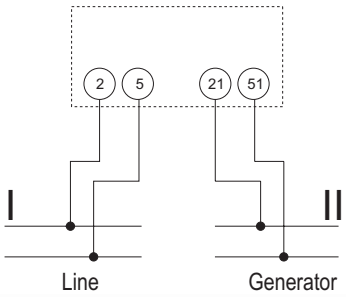



| | a | b | c | d | e |
|---|---|---|---|---|---|
| 96 | 96 | 91 | 43,5 | 5,7 | $92^{+0,8}$ |
| 144 | 144 | 137 | 64,5 | 7,3 | $138^{+1}$ |

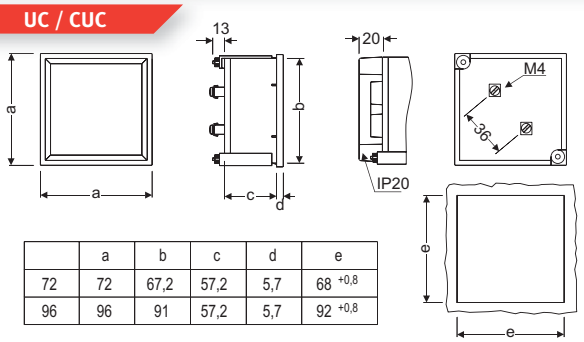
## 2 HC / 2 HLC



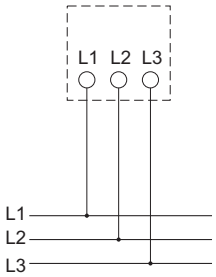

| | a | b | c | d | e |
|---|---|---|---|---|---|
| 96 | 96 | 91 | 57,2 | 5,7 | $92^{+0,8}$ |
| 144 | 144 | 137 | 64,5 | 7,3 | $138^{+1}$ |

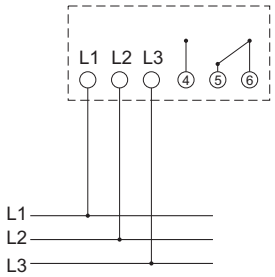



## UC / CUC

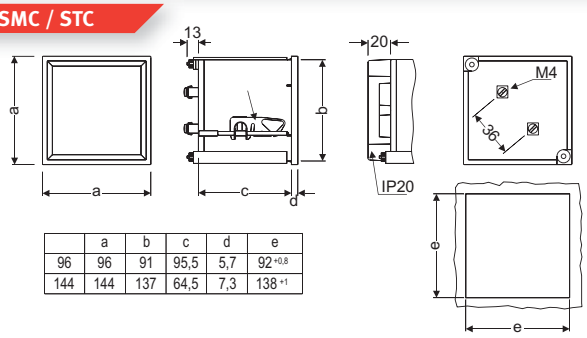



| | a | b | c | d | e |
|---|---|---|---|---|---|
| 72 | 72 | 67,2 | 57,2 | 5,7 | 68 $^{+0,8}$ |
| 96 | 96 | 91 | 57,2 | 5,7 | 92 $^{+0,8}$ |

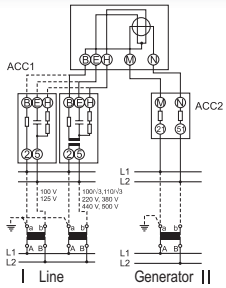


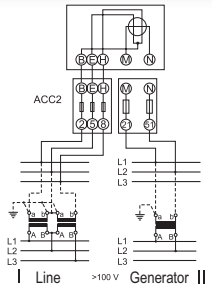

## SMC / STC




| | a | b | c | d | e |
|---|---|---|---|---|---|
| 96 | 96 | 91 | 95,5 | 5,7 | $92^{+0,8}$ |
| 144 | 144 | 137 | 64,5 | 7,3 | $138^{+1}$ |

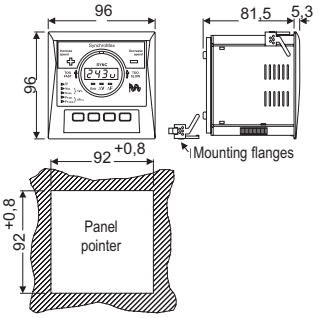


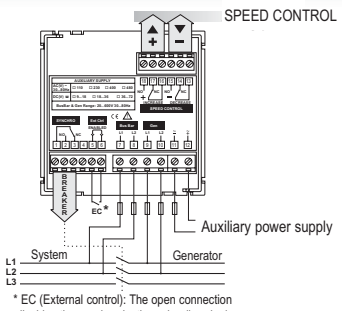

SMC




STC

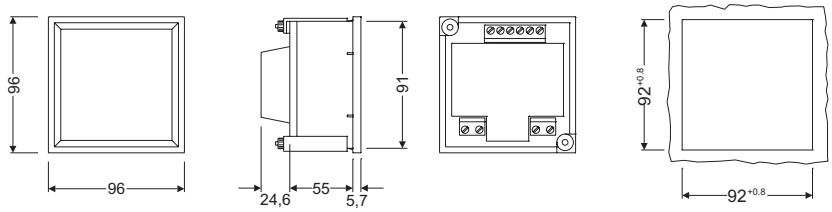
## SYNCROMAX

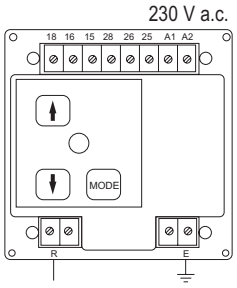


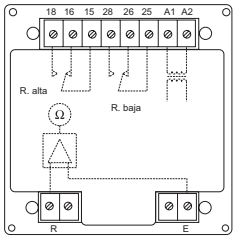




* EC (External control): The open connection disables the synchronization relay (breaker)

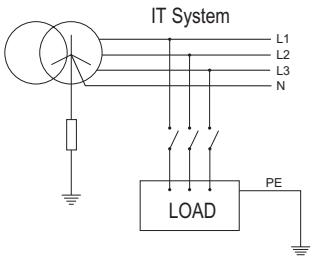
## MEG-1000



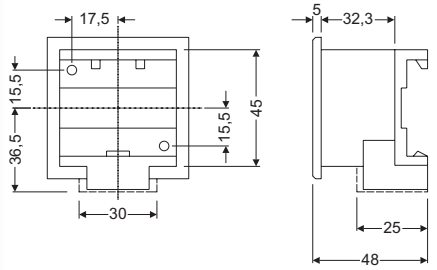



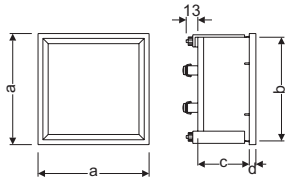




**18, 16, 15:** Normal relay
**28, 26, 25:** ALARM relay

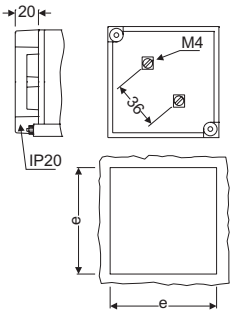


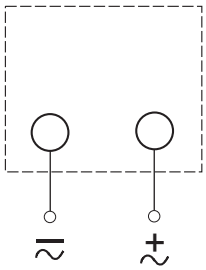

## CH




| a | b | c | d | e |
|---|---|---|---|---|
| 72 | 67,2 | 57,2 | 5,7 | 68 +0,8 |
| 96 | 91 | 57,2 | 5,7 | 92 +0,8 |



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