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**User manual**

Branch Circuit Power Monitoring System — Current Measurement Module

# EMI 12

| Document revision | Release date | Valid for versions | | | |
|---|---|---|---|---|---|
| | | Hardware | Bootloader | Firmware | Software ENVIS |
| 1.7 | 12.4.2021 | 2.0 | 4.1 | 3.7 | 1.9 |



Figure 1: EMI 12 S X/333mV

You can find the current revision of this document on the manufacturer's website at http://www.kmb.cz/.

# Contents

```
                                              EMI 12 S X/333mV
Instrument model
      EMI 12 = Energy management current measurement module,
              12 × I, local bus
Auxiliary power supply
      S = 10 ÷ 30 V_DC, provided from local bus
Current inputs
      X/333mV = CT with 333 mV_AC output
      X/100mA = CT with 100 mA_AC output
```

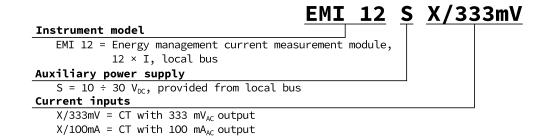Figure 2: Ordering codes and schemas.

Table 1: Standard and optional accessories

| Ordering code | Accessory | | Description |
|---|---|---|---|
| | Standard | Number of pcs. | |
| Cable 3CT, 0,3m (RJ12 - RJ12) | ⊠ | | 30 cm cable for three-phase CT |
| Cable 3CT, 0,5m (RJ12 - RJ12) | ⊠ | | 50 cm cable for three-phase CT |
| Cable 3CT, 1m (RJ12 - RJ12) | ⊠ | | 100 cm cable for three-phase CT |
| Cable 3CT, 3m (RJ12 - RJ12) | ⊠ | | 300 cm cable for three-phase CT |
| Cable JC, 0,3m (RJ12 - 0,5/6) | ⊠ | | 30 cm cable for 3 × single-phase CTs |
| Cable JC, 0,5m (RJ12 - 0,5/6) | ⊠ | | 50 cm cable for 3 × single-phase CTs |
| Cable JC, 1m (RJ12 - 0,5/6) | ⊠ | | 100 cm cable for 3 × single-phase CTs |
| Cable JC, 3m (RJ12 - 0,5/6) | ⊠ | | 300 cm cable for 3 × single-phase CTs |
| Cable LocalBus RJ-RJ, 0,1m | ⊠ | | Local bus cable 0,1 m |
| Cable LocalBus RJ-RJ, 0,15m | ⊠ | | Local bus cable 0,15 m |
| Cable LocalBus RJ-RJ, 0,5m | ⊠ | | Local bus cable 0,5 m |
| Cable LocalBus RJ-RJ, 1m | ⊠ | | Local bus cable 1 m |
| Cable LocalBus RJ-RJ, 3m | ⊠ | | Local bus cable 3 m |
| Cable LocalBus RJ-RJ, 5m | ⊠ | | Local bus cable 5 m |

# 1 Basic description

The EMI 12 is designed for remote monitoring of energy consumption. It is designed for installation on a DIN rail or mounting panel and does not have a local display. This concept is suitable for a wide range of applications in power engineering and smart networks, in building automation and individual production processes, for remote infrastructure supervision and also for automatic load management. The device is not equipped with local controls and therefore cannot easily interfere with the functions it performs — in simple terms, it should not attract the special attention of lay people in easily accessible places. The module measures twelve currents using single-phase or three-phase current transformers. It allows measurement of basic electrical parameters of up to 4 three-phase branches. It is connected via local bus to EMU 3 or BCPM 233.012, which is used for voltage measurement, concentration of measured data and their access to superior system. Up to five EMI 12 modules can be run on a single bus to allow for compact measurements of up to 20 three-phase branches, 60 currents respectively.

## 1.1 Types and options

The EMI 12 is available in various configurations according to the customer's specifications[1]. On figure 2 marking schema of all available options is drawn.

## 1.2 Accessories

In table 1 is a list of accessories that are automatically delivered to each EMI 12 and accessories that can be specified when ordering or additionally purchased.

The figure 3 shows the wiring diagrams for *Cable 3CT* and *Cable JC* used for current probes connection.

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[1]A complete and up-to-date list of optional accessories can be obtained from your dealer upon request.
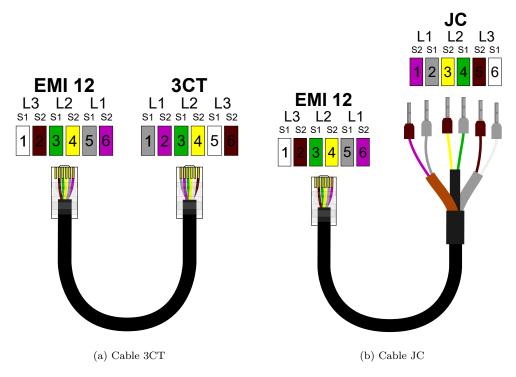
(a) Cable 3CT

(b) Cable JC

Figure 3: Construction of current sensor cables.

## 1.3   Measuring principles and signal processing

**Connection and measurement**

- DC supply voltage $10 \div 30\,\text{V}$ from local bus

- four RJ12 (6P6C) connectors for three-phase indirect star or delta current measurement, single-phase or Aron

- sampling rate of $6.4\,\text{kHz}$, continuous measurement

- in combination with EMU 3 or BCPM 233.012, it is possible to evaluate all commonly measured one- and three-phase quantities such as powers (active, reactive, apparent, deformation and fundamental active and reactive), power factor, voltage harmonics, THD of currents and voltages

**Measured data recording**

- built-in precise real time circuit with backup battery in superior device

- EMI 12 modules only back up the electricity meter counters in the event of a power failure

**Data transmission and evaluation**

- ENVIS 1.9 or higher is available for free download

- system service ENVIS.Online for downloading and processing of archived measurement data

- tools for downloading, exporting and processing data using custom scripts or via command line

- data library for developing custom applications in C#/.NET or for Linux (C/C++, .NET Core)

- data transfer, module setup and firmware update is done over local bus via EMU 3 or BCPM 233.012

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# 2 Operating the measuring instrument

## 2.1 Safety requirements for use of the EMI 12

**When working with the device, all necessary precautions must be taken to protect persons and property against injury and electric shock.**

- The device must be operated by a person with the required qualifications for such operation and this person must be familiar with the principles of working with the device described in this description!

- If the module is connected to parts that are under dangerous voltage, all necessary precautions should be taken to protect users and equipment from electric shock.

- The operator performing installation or maintenance of the equipment must be equipped with personal protective equipment and other safety equipment at work.

- If the device is used in a manner not specified by the manufacturer, the protection provided by the analyzer may be reduced.

- If the device or its accessories appear to be damaged or not working properly, do not use it and send it for repair.
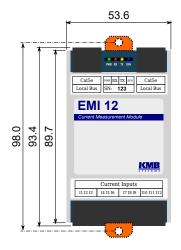
### 2.1.1 The meaning of the symbols used on the device

Table 2: Symbols

| Symbol | Description |
|---|---|
| ⚠ | Warning |
| ∿ | Alternating current |
| ⎓ | Direct current |
| CE | CE mark declaring conformity with European regulations and regulations |
| ♲ | The device must not be disposed of with household waste |
| ▣ | Equipment with double or reinforced insulation |

## 2.2 Installing the device in a switchboard

The EMI 12 is designed for mounting on a DIN rail. In the figure 4, the dimensions of the device are drawn. The hole positions for the wall mounting are dimensioned by a dashed line, which is screwed with two screws.

Natural air circulation should be allowed inside the switchgear at the installation site and its immediate surroundings. Do not install other equipment that could be a significant source of heat near to the instrument.
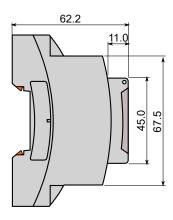
Figure 4: Dimensions of EMI 12.

### 2.2.1 Measured currents

Current inputs are galvanically isolated from the local bus for up to 150 V/CAT IV. Individual current inputs are not galvanically isolated from each other. It is necessary to use CT with the appropriate measurement category/insulation voltage or to install the CT on an insulated primary conductor with adequate insulation voltage.

CT secondary circuits are connected using one of the cables, see table 1 for RJ12 (6P6C) connectors marked F1 through F4. When viewed from the front, the pins of the current connectors are connected in the following order:

| F1 | | | | | | F2 | | | | | | F3 | | | | | | F4 | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| I1 | | I2 | | I3 | | I1 | | I2 | | I3 | | I1 | | I2 | | I3 | | I1 | | I2 | | I3 | |
| S2 | S1 | S2 | S1 | S2 | S1 | S2 | S1 | S2 | S1 | S2 | S1 | S2 | S1 | S2 | S1 | S2 | S1 | S2 | S1 | S2 | S1 | S2 | S1 |

All pins "S1" are galvanically connected to a common potential inside the module. Therefore, if the secondary side of the MTP is required to be grounded (usually in HV and VHV networks), the "S1" terminals must be grounded. If the "S2" terminals were connected during CT installation, all secondary circuits would be connected in parallel and all current inputs would measure the same current.

EMI 12 is produced in two variants of current inputs for connection of standard CTs with nominal output of 100 mA or 333 mV. Advantages of X/333 mV sensors are the possibility of using wires with small cross-section and disconnection without the need to short circuit the CT's secondary.

| | |
|---|---|
| Recommended type of conductor | LiYY 6×0,14 mm$^2$ |
| Crimp connector type: | 6P6C (RJ12) |
| Pin wiring: | Depends on the CT used |

Figure 6 is an example of monitoring twenty three-phase terminals measured using five EMI 12 modules. In addition to individual X/333 mV sensors (Figure 5a), sensors integrating triple current transformers, shunts, and especially 6P6C connector in single housing (Figure 5b) are also available which greatly simplifies and accelerates instalation.

### 2.2.2 Local bus

The local bus uses the 8P8C connector to connect the EMI 12 modules to EMU 3 or BCPM 233.012 instrument. It is a proprietary bus combining signals for communication, synchronization and powering of external modules[2].

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[2]Other compatible modules may arise in the future. It is recommended to consult the manufacturer and upgrade the firmware before connecting them to the existing installation

(a) Split core X/333 mV current sensors with different nominal currents.



(b) Combined X/333 mV three-phase current sensor with 6P6C connector.

Figure 5: Examples of X/333 mV current sensors.

⚠️ The physical layer of the local bus is not Ethernet compatible! Only EMU 3, BCMP 233.012 or another EMI 12 modules can be connected to the device. Never connect the port labeled Local Bus to any Ethernet device, hub, etc. — they may be damaged!

The EMI 12 modules are equipped with two local bus connectors, allowing creation of a bus. An example of a connection is illustrated in the figure 6. A maximum of five modules can be connected to a single local bus.

EMU 3 or BCPM 233.012 automatically detects module connections and performs their subsequent configuration. Measured variables are available in the current data immediately after connection and user configurations of newly detected modules can be done in the settings. To uniquely identify the modules in the settings, their serial numbers are used, which are printed on the label near the local bus connectors for ease of installation.

| | |
|---|---|
| Recommended type of conductor | UTP CAT5e 8×AWG24 |
| Crimp connector type: | 8P8C (RJ45) |
| Pin wiring standard: | TIA/EIA-568-B |
| Cable variants: | Straight or crossed (T568A ↔ T568B) |
| Maximum total bus length: | 15 m |

## 2.3   Description of LED indicators

**PWR green** illuminates when supply voltage is present.

**SYN blue** flashes synchronously with the synchronization pulse every ten periods of the network frequency.

**TX green** flashes when sending data to the local bus.

**RX red** blinks when receiving data from the local bus.

## 2.4   Module settings on the PC

It is advisable to set the EMI 12 instrument before starting the measurement. The settings can be made from the computer via EMU 3 or BCPM 233.012 instrument in the ENVIS.Daq[3] application. For the procedure of connecting to a superior device, refer to the corresponding user manual of the device used.

### 2.4.1   Local bus (fig. 7)

The window consists of five blocks:

- AVG

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[3]Daq application. ENVIS.Daq is also part of the ENVIS installation package. A detailed description can be found in the ENVIS user manual.

(a) EMU 3 with quintuplet of EMI 12.



(b) BCPM 233.012 with four EMI 12 expansion modules.

Figure 6: An example of typical use of EMI 12 modules when measuring many three-phase branches connected via a local bus.

Figure 7: ENVIS.Daq — Local bus tab for EMI 12 modules configuration for branch circuit measurement.
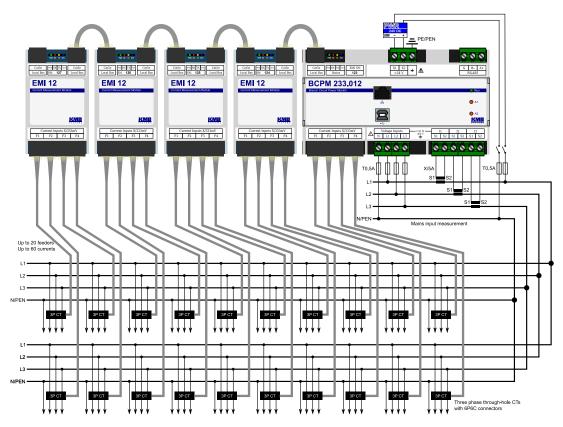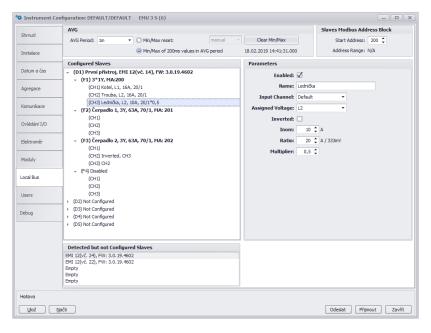
- – AVG Period — allows you to set the averaging interval, the way to evaluate minima and maxima and to manually reset them.

- Slaves Modbus Address Block

  - – Start Address — sets the Modbus address at which data from the first measured terminal will be available. Additional branches are available on consecutive addresses.

- Configured Slaves — Tree structure of set modules.

  - – At the highest level, there are 5 positions for up to 5 EMI 12 modules with information displayed: *Device Name*, *Device Type*, *Serial Number*, *Firmware Version*.

  - – Under each module there are 4 positions for each three-phase branch with information displayed: Branch *Name*, *Connection* Type, *Inom*, CT *Ratio*, Current *Multiplier*, Modbus Address (*MA*).

  - – Under each branch there are 3 positions for each measurement channel with information displayed: *Inverted*, *Input Channel*, *Assigned Voltage*, *Inom*, CT *Ratio* and *Multiplier* (for 3*1Y connection).

- Detected but not Configured Slaves — List of detected modules that are not yet set for measurement.

  - – Each module here reports its type, serial number and firmware version.

  - – Empty — This slot is empty.

- Parameters — Used to set individual tree items. The adjustable parameters vary according to the selected item (module/branch/channel) and also depend on the selected connection type.

  - – Enabled — Enables/disables the selected branch or channel. It is not possible to display measured data from deactivated branches/channels. Deactivate when the branch/channel is not used for measurement.

  - – Name — Sets the module, branch or channel name. It serves mainly for easier orientation in measured data.

  - – Serial Number — Used to pair the module in the tree with the detected EMI 12 module.

  - – Clear — Button to remove the pairing of the selected item with the set module.

  - – Connection — Selects the connection type of the selected branch. Three-phase connection types are available: star (3Y), triangle (3D) and Aron (3A). It is also possible to use the 3*1Y mode, which allows the measurement of three independent single-phase powers.

  - – Inom — Nominal current of selected branch (3Y, 3D or 3A) or channel (3*1Y).
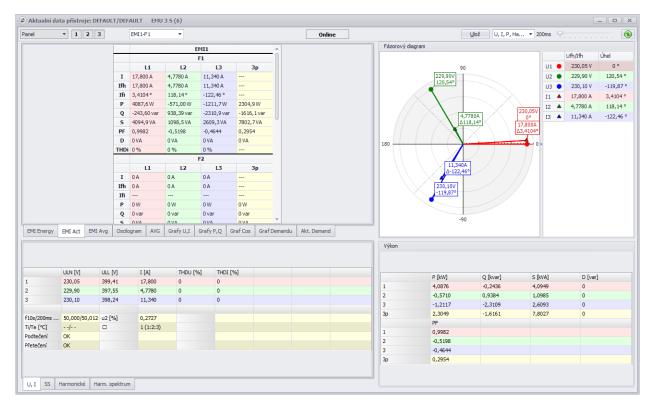
Figure 8: ENVIS.Daq — Actual data window.

- Ratio — The conversion ratio of current transformers on selected branch (3Y, 3D, or 3A) or channel (3*1Y).

- Multiplier — Current multiplier of the selected branch or channel serving, for example, to correct the measured value in case of sensitivity increase by passing multiple turns through the CT. Default value is *1* and has no effect.

- Input Channel — Allows software to correct wiring by assigning physical measurement channel CH1 through CH3 to logical channel CH1 through CH3. It is not set by default and the *Default* option is left.

- Assigned Voltage — With a 3*1Y connection, it allows you to select the reference voltage channel L1 through L3 for the selected channel CH1 through CH3, against which powers, phase shift, etc. is calculated. The *Default* option assigns CH1-L1, CH2-L2, and CH3-L3.

- Inverted — It allows software to correct the wrong connection of the selected channel. If the check box is checked, the polarity of the corresponding channel is inverted. The inversion is not performed by default and the field is not checked.

## 2.5  Transfer of measured data to PC

The EMI 12 module itself does not allow archives to be recorded (only in collaboration with BCPM 233.012). The ENVIS.Online application or any application reading data via Modbus from the superior EMU 3 or BCPM 233.012 must be used to transfer data to the PC. When connecting to a superior device, it is possible to use the *Actual data* button to display all measured quantities from all branches of the connected EMI 12 devices, which can be switched by selection at the top of the window. For the procedure of connecting to a superior device, refer to the corresponding user manual of the device used.

## 2.6  Display of electricity meter reading

EMI 12 has a built-in three-phase, four-quadrant electricity meter for all branches. The instrument separately registers the active imported EP+ and exported EP- energy. For reactive energy, it registers character — capacitive EQC and inductive EQL resp. capacitive EQC+, EQC- and inductive EQL+, EQL- especially in

case of active energy import or export. Primarily it offers the sum values of all phases. For star-connection and single-phase connection, it also registers the values of all energy types in each individual phase.

Values can be read automatically via EMU 3 or BCPM 233.012 using ENVIS.Online software and then processed in ENVIS or using ModBus communication protocol in any other program.

# 3 Technical parameters

## 3.1 Basic parameters

| Auxiliary Voltage | |
| --- | --- |
| rated auxiliary voltage range | 12 ÷ 26 V$_{DC}$ |
| DC auxiliary voltage range | 10 ÷ 29 V$_{DC}$ |
| power supply | 1.5 W |
| pollution degree | 2 |
| maximum operating altitude | 2000 m |
| connection | internal circuits galvanicaly isolated from local bus |

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| Other Specifications | |
| --- | --- |
| operational temperature | - 25 to 60°C |
| storage temperature | - 40 to 80°C |
| operational and storage humidity | < 95% - non-condensable environment |
| EMC – generic standards | EN 61326-1 ed. 2<br>EN 61000-6-2 ed. 3 |
| EMC – immunity | EN 61000-4-2 ed. 2: level 3 (6/8 kV)<br>EN 61000-4-3 ed. 3: level 3 (10 V/m, 80 – 3000 MHz)<br>EN 61000-4-4 ed. 3: level 4 (4 kV)<br>EN 61000-4-5 ed. 3: level 4 (4/2 kV) measuring inputs<br>EN 61000-4-5 ed. 3: level 3 (2 kV) communication<br>EN 61000-4-6 ed. 4: level 3 (10 V, 0.15 – 80 MHz) |
| EMC – emissions | EN 55011 ed. 4, class A<br>EN 61000-6-4 ed. 2<br>EN 61000-3-2 ed. 4<br>EN 61000-3-3 ed. 3 |
| communication ports | local bus |
| communication protocols | KMB, Modbus RTU (through superior device) |
| sampling frequency 50 Hz (60 Hz) | 6,4 kHz (5,76 kHz) |
| ingress protection<br>  front panel<br>  whole instrument | IP 40<br>IP 20 |
| protection class | II |
| dimensions<br>  front panel<br>  whole instrument | 54 x 45 mm<br>54 x 94 x 61 mm |
| weight | max. 0.1 kg |

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## 3.2 Measured quantities (with EMU 3)

| Measured Quantities – Current | | | |
|---|---|---|---|
| **General** | | | |
| number of embedded feeders | 4 | | |
| number of currents per feeder | 3 | | |
| feeder CT connection | connector 6P6C | | |
| extendability (local bus) | total up to 5 × EMI 12 (connector 8P8C) | | |
| maximum number of feeders | 20 | | |
| maximum number of currents | 60 | | |
| **Current** | | | |
| current input option | **„X/333mV"** | **„X/100mA"** | **„RCM"** |
| $I_{NOM}$ ($I_B$) – rated (basic) current | xxx $A_{AC}$ => 333 mV | xxx $A_{AC}$ => 0.1 $A_{AC}$ | 20 m$A_{AC}$ |
| crest factor at $I_{NOM}$ ($I_B$) | 1.9 | 1.8 | 2.2 |
| measuring range | 0.0025 ÷ 1.2 xxx $A_{AC}$ | 0.0025 ÷ 1.2 xxx $A_{AC}$ | 0.08 ÷ 31 m$A_{AC}$ |
| intrinsic uncertainty ($t_A$=23 ±2 ºC) | +/- 0.1% of rdg ± +/- 0.05% of rng | | |
| temperature drift | +/- 0.03% of rdg ± +/- 0.01% of rng / 10 ºC | | |
| measurement category | Depends on CT | Depends on CT | Depends on CT |
| permanent overload | 2 x $I_{NOM}$, 666 m$V_{AC}$ | 2 x $I_{NOM}$, 0.2 $A_{AC}$ | 100 m$A_{AC}$ |
| peak overload 1 second, maximum repetition frequency > 5 minutes | 10 × $I_{NOM}$ | 10 × $I_{NOM}$ | 1 $A_{AC}$ |
| burden power (impedance) | < 5 μVA (Ri = 39 kΩ) | < 0.05 VA (Ri = 2.7 Ω) | < 0.01 VA (Ri = 10 Ω) |
| **Current Unbalance** | | | |
| measuring range | 0 ÷ 100% | | N/A |
| measuring uncertainty | ± 1% of rdg or ± 0.5 | | |
| **THDI** | | | |
| measuring range | 0 ÷ 200% | | N/A |
| measuring uncertainty (for harmonics up to 15th order) | THDI <= 100%: ± 1 | | |
| | THDI > 100%: ± 1% of rdg | | |

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| Measured Quantities – Power, Power Factor, Energy | |
|---|---|
| **Active / Reactive Power, Power Factor (PF), cos φ ($P_{NOM}$ = $U_{NOM}$ x $I_{NOM}$)** | |
| reference conditions "A": <br> ambient temperature ($t_A$) <br> U, I <br> for active power, PF, cos φ <br> for reactive power | 23 ± 2 ºC <br> U = 80 ÷ 120% $U_{NOM}$, I = 1 ÷ 120% $I_{NOM}$ <br> PF = 1.00 <br> PF = 0.00 |
| act. / react. power uncertainty | ± 0.5% of rdg ± 0.01% $P_{NOM}$ |
| PF & cos φ uncertainty | ± 0.01 |
| reference conditions "B": <br> ambient temperature ($t_A$) <br> U, I <br> for active power, PF, cos φ <br> for reactive power | 23 ± 2 ºC <br> U = 80 ÷ 120% $U_{NOM}$, I = 2 ÷ 120% $I_{NOM}$ <br> PF >= 0.5 <br> PF <= 0.87 |
| act. / react. power uncertainty | ± 1% of rdg ± 0.01% $P_{NOM}$ |
| PF & cos φ uncertainty | ± 0.01 |
| temperature drift of powers | ± 0.05% od rdg ± 0.02% $P_{NOM}$ / 10 ºC |
| **Energy** | |
| measuring range | corresponds to U & I measuring ranges <br> 4 quadrant energy counters for both active and reactive energies |
| active energy uncertainty | class 1 acc. to EN 62053 – 21 |
| reactive energy uncertainty | class 2 acc. to EN 62053 – 23 |

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Table 3: IEC 61557-12: Equipment for measuring and monitoring electrical parameters

| Instrument characteristics according to IEC 61557-12 | |
|---|---|
| power quality assessment function | |
| classification according to par. 4.3 <br> direct voltage connection <br> voltage connection via VT | SD <br> SS |
| temperature according to par. 4.5.2.2 | K55 |
| humidity + altitude according to par. 4.5.2.3 | < 95% - noncondensation conditions <br> < 2000 m |
| active power/energy function performance class | 1 |

spec-EMx-61557-12-spec-en

**Function characteristics according to IEC 61557-12**
Model „**X/333mV**" with „**xxx/333mV**" CTs, $I_{NOM}$ = xxx A, $U_{NOM}$ = 230 V

| Symbol | Function | Class | Measuring range | Notes |
|---|---|---|---|---|
| $P$ | total effective power | 1 | $0 \div (993.6 * I_{NOM})$ W | |
| $Q_A, Q_V$ | total reactive power | 2 | $0 \div (993.6 * I_{NOM})$ var | |
| $S_A, S_V$ | total apparent power | 1 | $0 \div (993.6 * I_{NOM})$ VA | |
| $E_a$ | total active energy | 1 | $0 \div (993.6 * I_{NOM})$ Wh | |
| $E_{rA}, E_{rV}$ | total reactive energy | 2 | $0 \div (993.6 * I_{NOM})$ varh | |
| $E_{apA}, E_{apV}$ | total apparent energy | 1 | $0 \div (993.6 * I_{NOM})$ Vah | |
| $f$ | frequency | 0.02 | $40 \div 70$ Hz | |
| $I$ | phase current | 0.5 | $0.1 \div 1.2 * I_{NOM}$ $A_{AC}$ | |
| $I_N$ | neutral current measured | – | – | |
| $I_{Nc}$ | neutral current calculated | 0.5 | $0.1 \div 1.2 * I_{NOM}$ $A_{AC}$ | |
| $U_{LN}$ | line-to-neutral voltage | 0.05 | $40 \div 280$ $V_{AC}$ | |
| $U_{LL}$ | line-to-line voltage | 0.05 | $70 \div 480$ $V_{AC}$ | |
| $PF_A, PF_V$ | power factor | 0.5 | $0 \div 1$ | |
| $P_{st}, P_{lt}$ | flicker | – | – | |
| $U_{dip}$ | voltage dips | – | – | |
| $U_{swl}$ | voltage swells | – | – | |
| $U_{tr}$ | transients overvoltage | – | – | |
| $U_{int}$ | voltage interruption | – | – | |
| $U_{nba}$ | voltage unbalance (amp.) | 0.5 | $0 \div 10\%$ | |
| $U_{nb}$ | voltage unbalance (ph. & amp.) | 0.5 | $0 \div 10\%$ | |
| $U_h$ | voltage harmonics | 1 | up to 25th order | 1) |
| $THD_u$ | voltage total harmonic distortion (rel. to fund.) | 1 | $0 \div 20\%$ | 1) |
| $THD\text{-}R_u$ | voltage total harmonic distortion (rel. to RMS) | 1 | $0 \div 20\%$ | 1) |
| $I_h$ | current harmonics | – | – | 1) |
| $THD_i$ | current total harmonic distortion (rel. to fund.) | 5 | $0 \div 200\%$ | 1) |
| $THD\text{-}R_i$ | voltage total harmonic distortion (rel. to RMS) | 5 | $0 \div 200\%$ | 1) |
| $M_{sv}$ | mains signalling voltage | TBD | TBD | 1, 2) |

1) … according to IEC 61000-4-7

2) … with optional firmware module „RCS"

# 4   Maintenance, service and warranty

**Maintenance**   The module EMI 12 does not require any special maintenance. For reliable operation, it is only necessary to adhere to the specified operating conditions and not to expose it to rough handling and exposure to water or various chemicals that could cause damage.

Service

In case of product failure, a warranty must be claimed with the manufacturer at:

K M B systems, s.r.o.
Dr. Milady Horakove 559
Liberec VII-Horni Ruzodol
460 07 Liberec
Czech republic
Tel.: +420 485 130 314
E-mail: kmb@kmb.cz
Web: www.kmbsystems.com

The product must be properly packed to avoid shipping damage. A description of the fault must be provided with the product.

If warranty repair is claimed, the warranty card must also be sent. If an out-of-warranty repair is required, an order for this repair must be attached.

**Warranty card:**   The module is warranted for a period of 24 months from the date of purchase, but no longer than 30 months from the manufacturer's delivery date. Defects that arise within these time limits demonstrably due to defective design, faulty construction or unsuitable material will be repaired free of charge by the manufacturer or authorized service organization.

The warranty also expires during the warranty period if the user performs unauthorized modifications or changes on the module, if the module connects to incorrectly selected values, if the module has been violated by unauthorized falls or improper handling, or if it has been operated in contrary to the specified technical parameters.

Product type:          . . . . . . . . . . . . . . . . . . . . . . . . .          Serial number:          . . . . . . . . . . . . . . . . . . . . . . . . .

Delivery date:          . . . . . . . . . . . . . . . . . . . . . . . . .          Checkout control:          . . . . . . . . . . . . . . . . . . . . . . . . .

                                                                                 Manufacturer's stamp:          . . . . . . . . . . . . . . . . . . . . . . . . .

Date of sale:          . . . . . . . . . . . . . . . . . . . . . . . . .          Seller's stamp:          . . . . . . . . . . . . . . . . . . . . . . . . .