# MIC-2 MKII

4921210156-I

Multi-instrument

**Data sheet**

DEIF Improve Tomorrow

# 1. About the MIC-2 MKII

## 1.1 Application

The MIC-2 MKII multi-instrument is a microprocessor-based measuring unit. It provides measurement of most electrical quantities on a 2-phase or 3-phase distribution system for electricity. The measurements are shown on the built-in display*.

Use the MIC-2 MKII as a data logging device for a power distribution system or a plant automation system. All measurements are monitored and data is available from the RS-485 Modbus port. Other communication options are also available, for example, Ethernet and Profibus DP.

The MIC-2 MKII is available in five versions:

- MIC-2 MKII (front mounted, display)
- MIC-2 MKII DIN (rail mounted)
- MIC-2 MKII FCT (front mounted, display)
- MIC-2 MKII FCT DIN (rail mounted)
- MIC-2 MKII LV (front mounted, display, low voltage DC supply)

True RMS values are measured with/without neutral and with both balanced and unbalanced load. The MIC-2 MKII contains all necessary measuring circuits and presents all values on a display with white backlight. The display has 4 digits resolution for all measurements. The backlight on-time is selectable*. The MIC-2 MKII is simple to use and easy to configure for individual applications. Counter reset and change of settings can be password protected.

The optional I/O extension modules extend the number of I/O possibilities. Digital input, digital output, pulse output, relay output, analogue input, and analogue output I/O modules are available.

**NOTE** * Only MIC-2 MKII, MIC-2 MKII FCT, and MIC-2 MKII LV.

## 1.2 Features

| **Measured and calculated values** | |
|---|---|
| Voltage | True RMS – each phase, line-to-line voltage, and average. |
| Current | Each phase, average and neutral. |
| Active power (P) | Each phase and total active power. |
| Reactive power (Q) | Each phase and total reactive power. |
| Apparent power (S) | Each phase and total apparent power. |
| Power factor | Each phase and total power factor. |
| Frequency | Actual frequency. |
| Load nature | Inductive/Capacitive/Resistive. |
| THD (up to 63rd harmonics) | Voltage THD of each phase and current THD of each phase. |
| Maximum demand | Demand of active power (P), reactive power (Q), and apparent power (S). |
| Energy counter | Import and export of energy, inductive and capacitive of reactive energy. Apparent energy. |
| Energy pulse output (optional) | Two energy pulse outputs. Select P, Q, or S as the output. |
| Statistics | Maximum and minimum voltage, current, power (P, Q, S) total, power factor (PF) total, frequency, unbalance factor, and THD values with time stamps. |
| Running hour | Meters the duration of the operation. |
| Unbalance factor | Voltage and current. Based on positive and negative sequence. |

## 1.3 Connection

Use the MIC-2 MKII in 2-phase and 3-phase network applications with or without neutral, and with both balanced and unbalanced load. This includes the US split phase system. The voltage and current input wiring modes are configured separately.

**More information**
See the **MIC-2 MK II Installation instructions and reference handbook** for how to wire the different systems.

## 1.4 Communication

Suitable for Modbus RTU protocol using RS-485.

## 1.5 Optional modules

### 1.5.1 Optional I/O modules

| I/O module → | AXM-IO1 | AXM-IO2 | AXM-IO3 |
|---|---|---|---|
| Digital inputs | 6 | 4 | 4 |
| Digital outputs | - | 2 | - |
| Relay outputs | 2 | - | 2 |
| Analogue inputs | - | - | 2 |
| Analogue outputs | - | 2 | - |

AXM-IO1 has a 24 V DC power supply for DI. You can use a maximum of two I/O modules for each MIC-2 MKII.

### 1.5.2 Optional communication modules

These optional communication modules are available for MIC-2 MKII:

- Ethernet: Modbus TCP/IP, HTTP, FTP, SMTP, SNTP
- Profibus DP/V0

You can use a maximum of one communication module for each MIC-2 MKII.

# 2. Technical specifications

## 2.1 Electrical specifications

| Auxiliary power supply | |
|---|---|
| Supply voltage AC/DC | 100 to 415 V AC +/-10%, 50/60Hz, 100 to 300 V DC |
| Supply voltage LV module | 20 to 60 V DC |
| Consumption | ≤ 5 VA |
| Fuse | 1A slow-blow fuse |
| Real-time clock (RTC) | Time and date |

| Voltage measurement | |
|---|---|
| Nominal voltage $U_n$ | L-N 400 V AC (cat III)<br>L-L 690 V AC (cat II) |
| Measuring range | 0 to 1.2 x $U_n$ |
| Overload capacity | 1500 V AC continuous<br>2500 V, 50/60 Hz for 60 s |
| VT primary | 50 V to 1000 kV |
| VT secondary | 50 V to 400 V |
| Fuse | 1 A slow-blow fuse |

| Current measurement | |
|---|---|
| CT input | 5 A AC, 1 A AC |
| CT primary | 5 A to 50 kA |
| Measuring range | 0 to 10 A |
| Pickup current | For 5 A CT secondary: 5 mA<br><br>For 1 A CT secondary: 1 mA |
| Overload capacity | 20 A continuous<br>100 A for 1s |
| FCT input | 100 mV |
| FCT measuring range | 5 A to 6000 A |
| Load | 0.5 VA |

| Frequency measurement | |
|---|---|
| Nominal frequency $f_n$ | 50 Hz to 60 Hz |
| Measuring range | 45 Hz to 65 Hz |
| Measuring point | V1 phase voltage |

| Accuracy | |
|---|---|
| Voltage | 0.1 % of range |
| Current | 0.1 % of range |
| Power | 0.1 % of reading |

| Accuracy | |
|---|---|
| Power factor | 0.1 % of range |
| Frequency | 0.001 % of range |
| Energy | 0.1 % of range |
| Harmonic | 1.0 % of range |

## 2.2 Communication

| Communication | |
|---|---|
| Communication system | RS-485 Modbus RTU |
| Devices per link | Maximum 32 units |
| Cable type | Belden 3105A or equivalent (twisted pair and shielded) |
| Maximum cable length | Up to 1000 m |
| Data rate | 1200 to 115200 bits/s |

## 2.3 Environmental specifications

| Operation conditions | |
|---|---|
| Operating temperature | -25 to +70 °C (-13 to +158 °F) |
| Storage temperature | -40 to +85 °C (-40 to +185 °F) |
| Relative humidity | 5 to 95 % non-condensing |
| Environmental standard | IEC 60068-2-1, IEC 60068-2-2 |
| Measurement standard | IEC 62053-22, ANSI C12.20, IEC 61557-12 |
| EMC | EN/IEC 61000-6-2<br>(IEC 61000-4/-2-3-4)<br>(IEC 61000-4/-5-6-7-8-11)<br>IEC 61000-3-2<br>EN/IEC 61000-6-4 (CRISPR 22) |
| Vibration | 3 to 13.2 Hz, 2 mmpp<br>13.2 Hz to 100 Hz, 0.7 g<br>To IEC 60068-2-6<br>To IACS UR E10 |
| Safety | IEC/EN 61010-1<br>UL 61010-1<br>300 V installation cat. III, pollution degree 2<br>600 V installation cat. II, pollution degree 2 |
| Protection- Front | IP54 (EN 60529) |
| Protection- Rear | IP30 (EN 60529) |

## 2.4 Connections

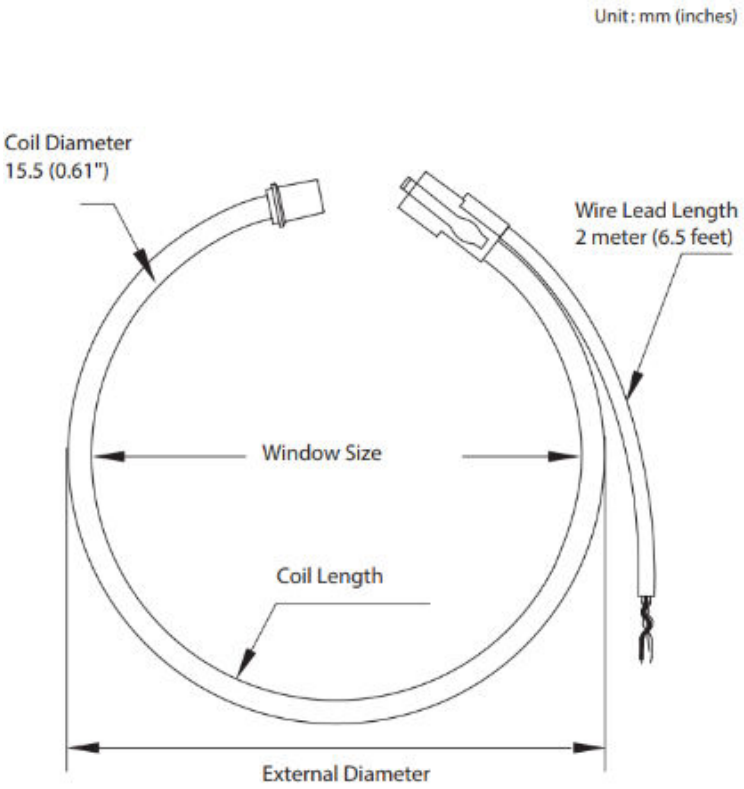
**Current input, fixed block**

| Connections | |
|---|---|
| Measuring inputs | Fixed block |
| Maximum wire | 5 mm² |
| Screw torque | 0.5 Nm / 5.5 lb-inch |

### Pluggable block

| Connections | |
|---|---|
| Measuring inputs | Pluggable block |
| Maximum wire | 1.5 mm² |
| Screw torque | 0.25 Nm / 2.5 lb-inch |

## 2.5 Flexible current transformer (FCT)




### Variants

| Variant → | FCT1200 | FCT3000 | FCT6000 |
|---|---|---|---|
| Measuring range | 5 A to 1200 A | 12.5 A to 3000 A | 25 A to 6000 A |
| Window size | 106 mm (4.17 in) | 178 mm (7.00 in) | 271 mm (10.7 in) |
| Coil length | 400 mm (15.7 in) | 600 mm (23.6 in) | 900 mm (35.4 in) |
| External diameter | 143 mm (5.63 in) | 207 mm (8.15 in) | 302 mm (11.9 in) |

### Electrical specifications

| Specifications | |
|---|---|
| Frequency range | 20 Hz to 5 kHz (coil only) |
| Maximum measurement error | ≤ 1 % of final range value) |
| Conductor position sensitivity | ± 2 % max |
| Influence of external fields | ± 2 % max |
| Lead | White is positive and brown is negative.<br>The shield must be connected to functional earth.<br>24AWG |

| Specifications | |
|---|---|
| Mounting | Coil must be fastened to the busbar or a cable with a tie wrap. The wire lead must also be securely fastened. |
| Insulation category | CAT III 1000 V/CAT IV 600 V |
| Polarity | Arrow towards load (current flow direction) |
| Measuring principle | Rogowski 100 mV |

### Environmental specifications

| Specifications | |
|---|---|
| Operating temperature | -20 to +70 °C (- 4 to +158 °F) |
| Storage temperature | - 40 to +70 °C (-40 to +158 °F) |
| Temperature drift | ± 0.07 % within operating temperature range |
| Material | Orange thermoplastic rubber.<br>Flame retardant UL 94 V-0 rated |
| Test voltage | 7400 V AC @ 50/60 Hz for 60 s |
| Coil diameter | 15.5 mm |
| Wire lead length | 2 m *. Extension of wire lead is not permitted. |

**NOTE** * A 5 m wire is also available upon request. Contact DEIF for more information.

## 2.6 Optional modules

### 2.6.1 I/O modules

| Modules | |
|---|---|
| AXM-IO1 | 6 x digital inputs (DI)<br>2 x relay outputs (RO)<br>24 V DC isolated voltage output |
| AXM-IO2 | 4 x digital inputs (DI)<br>2 x digital outputs (DO)<br>2 x analogue outputs (AO) |
| AXM-IO3 | 4 x digital inputs (DI)<br>2 x relay outputs (RO)<br>2 x analogue inputs (AI) |

### Electrical specifications

| Digital input (DI) | |
|---|---|
| Input voltage range | 20 to 160 V AC/DC |
| Input current (max) | 2 mA |
| Start voltage | 15 V |
| Stop voltage | 5 V |
| Switch response time | < 1 ms |
| Pulse frequency (max | 10 Hz, 50 % duty ratio ( 5ms ON and 5 ms OFF) |
| Power supply for digital input | **Output voltage**<br>24 V DC<br>**Output current**<br>42 mA |

| Digital input (DI) | |
|---|---|
| | **Load (max)**<br>21 DI |

| Digital output (DO) (Photo-MOS) | |
|---|---|
| Voltage range | 0 to 250 V AC/DC |
| Load current (max) | 100 mA |
| Output frequency | 25 Hz, 50 % duty ratio (20 ms ON and 20 ms OFF) |
| Isolation voltage | 2500 V |

| Relay output (RO) | |
|---|---|
| Switching voltage (max) | 250 V AC, 30 V DC |
| Load current | 5 A (R), 2 A (L) |
| Set time (max) | 10 ms |
| Contact resistance (max) | 30 mΩ |
| Isolation voltage | 2500 V |
| Mechanical life | $1.5 \times 10^7$ |

| Analogue input (AI) | |
|---|---|
| Input range | 0 to 20 mA/4 to 20 mA |
| Accuracy | 0.2 % |
| Temperature drift | 50 ppm/°C typical |
| Isolation voltage | 500 V |
| Impedance | 100 Ω |

| Analogue output (AO) | |
|---|---|
| Output range | 0 to 20 mA/4 to 20 mA |
| Accuracy | 0.5 % |
| Response time | 300 ms |
| Load resistance (max) | 500 Ω |
| Temperature drift | 50 ppm/°C typical |
| Isolation voltage | 500 V |

| Consumption | |
|---|---|
| AXM-WEB2 | 1 W |
| AXM-Profibus | 1 W |
| AXM-IO1 | 1 W |
| AXM-IO2 | 1.3 W |
| AXM-IO3 | 0.8 W |

**More information**
See **Option I-O module** for more information about predefined outputs.

### Environmental specifications

| Operation conditions | |
|---|---|
| Operating temperature | -25 to +70 °C (-13 to +158 °F) |
| Storage temperature | -40 to +85 °C (-40 to +185 °F) |
| Relative humidity | 5 to 95 % non-condensing |
| Environmental standard | IEC 60068-2-1, IEC 60068-2-2 |
| EMC | EN/IEC 61000-6-2<br>(IEC 61000-4/-2-3-4)<br>(IEC 61000-4/-5-6-7-8-11)<br>IEC 61000-3-2<br>EN/IEC 61000-6-4 (CRISPR 22) |
| Safety | IEC/EN 61010-1<br>UL 61010-1<br>300 V installation cat. III, pollution degree 2<br>600 V installation cat. II, pollution degree 2 |

## 2.6.2 Communication modules

### Ethernet TCP/IP - AMX-WEB2

| Specifications |
|---|
| 10M/100M Auto |
| Modbus TCP/IP protocol |
| HTTP webserver |
| FTP compatible |
| SMTP email transfer protocol |
| SNTP for time synchronisation |

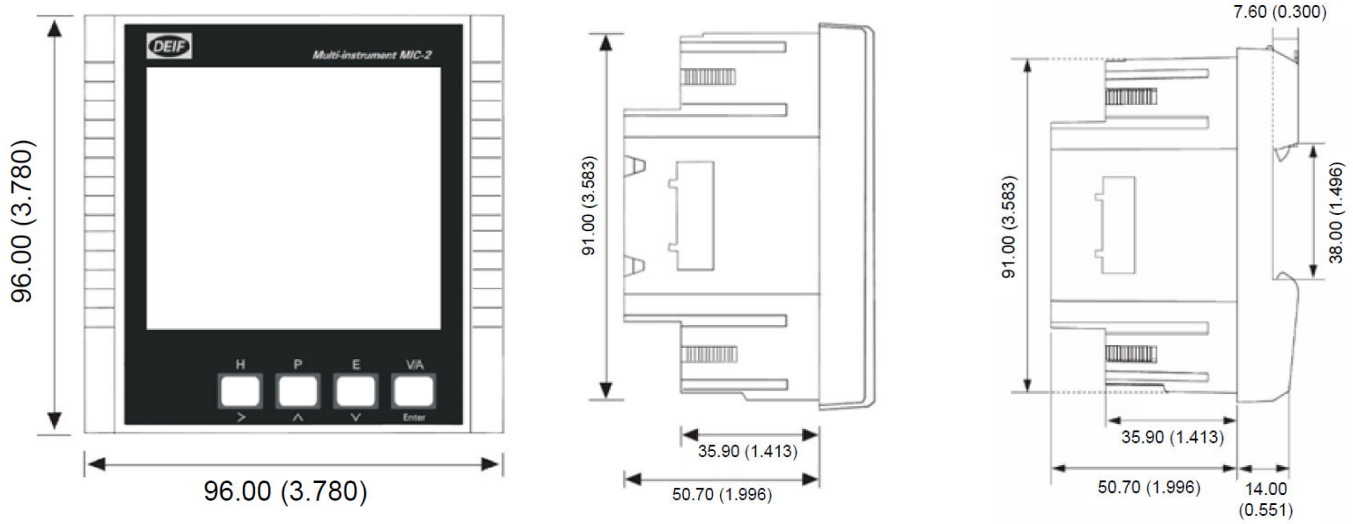
### Profibus - AXM-PROFI

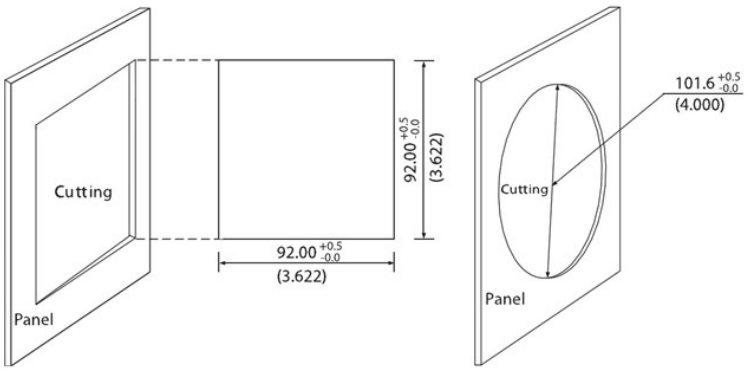
| Specifications |
|---|
| Profibus DP/V0 protocol |
| Input byte: 32 bytes |
| Output byte: 32 bytes |
| EN 50170 vol. 2 compliance |
| Profibus slave mode.<br>Baud rate self-adaptable up to 12M |

**More information**
See **Description of Options** for how to install and configure the communication modules.

## 2.7 Dimensions and weight

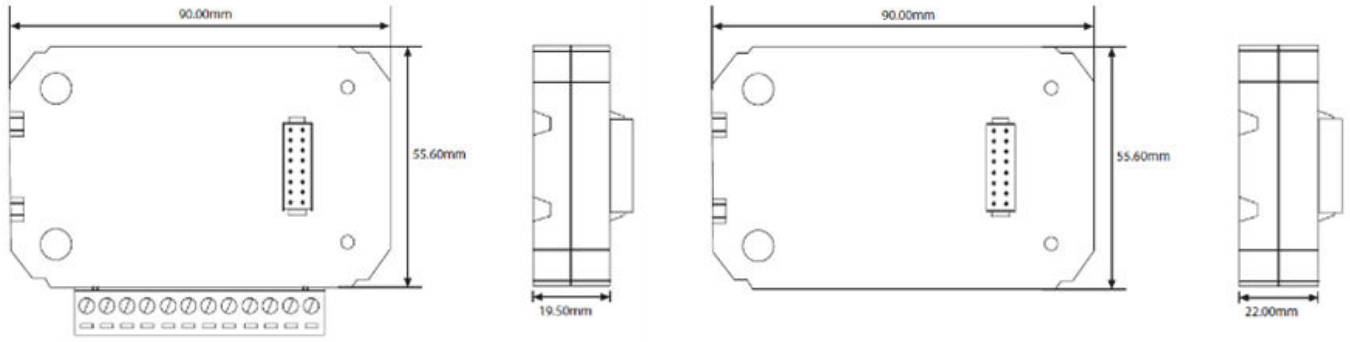
### 2.7.1 MIC-2 MKII




| Dimensions | |
|---|---|
| Dimensions | Length: 96 mm (3.78 in)<br>Height: 96 mm (3.78 in)<br>Depth: 50.7 mm (1.996 in) |
| Panel cutout | **Square**<br>Length: 92 mm + 0.5 (3.62 in)<br>Height: 92 mm + 0.5 (3.62 in)<br><br>**Round**<br>Diameter: 101.6 mm + 0.5 (4 in) |
| Maximum panel thickness | 6 mm (0.24 in) |
| Weight | **MIC-2 MKII**<br>320 g (0.8 lbs)<br><br>**MIC-2 MKII DIN**<br>280 g (0.7 lbs) |

## 2.7.2 Optional modules




| Dimensions | |
|---|---|
| Dimensions | Length: 90 mm (3.54 in)<br>Height: 55.6 mm (2.19 in)<br><br>**Depth**<br>I/O module: 19.5 mm (0.77 in)<br>Communication module: 22 mm (0.87 in) |
| Weight | **Communication modules**<br>AXM-WEB2: 65 g (0.14 lbs)<br>AXM-PROFI: 65 G (0.14 lbs)<br><br>**I/O modules**<br>AXM-IO1: 90 g (0.20 lbs)<br>AXM-IO2: 80 g (0.18 lbs)<br>AXM-IO3: 85 g (0.19 lbs) |

# 3. Ordering

## 3.1 MIC-2 MKII Multi-instrument

| Multi-instrument | Item no. | Variant no. |
|---|---|---|
| MIC-2 MKII | 2961021910 | 17 |
| MIC-2 MKII FCT | 2961021910 | 18 |
| MIC-2 MKII DIN | 2961021910 | 16 |
| MIC-2 MKII FCT DIN | 2961021910 | 19 |
| MIC-2 MKII LV | 2961021910 | 23 |

**Optional communication modules for MIC-2 MKII**

| Module | Item no. | Variant no. |
|---|---|---|
| AXM-WEB2 TCP/IP | 2961021911 | 19 |
| AXM-PROFI PROFIBUS | 2961021911 | 06 |

**Optional I/O modules for MIC-2 MKII**

| Module | Item no. | Variant no. |
|---|---|---|
| AXM-IO1 | 2961021911 | 16 |
| AXM-IO2 | 2961021911 | 17 |
| AXM-IO3 | 2961021911 | 18 |

**Available accessories**

| Variant | Description | Item no. | Variant no. |
|---|---|---|---|
| MIC-2 MKII | Bracket for DIN rail mounting | 2961021911 | 10 |
| MIC-2 MKII FCT | FCT1200 Flexible current transformer | 2961021910 | 20 |
| MIC-2 MKII FCT | FCT3000 Flexible current transformer | 2961021910 | 21 |
| MIC-2 MKII FCT | FCT6000 Flexible current transformer | 2961021910 | 22 |

# 4. Legal information

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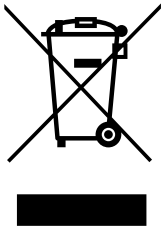
# 5. End-of-life

## Disposal of waste electrical and electronic equipment

WEEE symbol



All products that are marked with the crossed-out wheeled bin (the WEEE symbol) are electrical and electronic equipment (EEE). EEE contains materials, components and substances that can be dangerous and harmful to people's health and to the environment. Waste electrical and electronic equipment (WEEE) must therefore be disposed of properly. In the EU, the disposal of WEEE is governed by the WEEE directive issued by the European Parliament. DEIF complies with this directive.

You must not dispose of WEEE as unsorted municipal waste. Instead, WEEE must be collected separately, to minimise the load on the environment, and to improve the opportunities to recycle, reuse and/or recover the WEEE. In the EU, local governments are responsible for facilities to receive WEEE. If you need more information on how to dispose of DEIF WEEE, please contact DEIF.