MIC-2 MKII, Multi-instrument
DATA SHEET

Measurements
- All 3-phase AC measurements
- True RMS
- 4-Quadrant energy
- Power Quality Analysis
- Replaces analogue meters

Communication
- RS-485 Modbus RTU protocol
- TCP/IP Modbus (optional)
- Profibus DP (optional)

I/O modules optional
- Analogue Input/Output
- Digital Input/Output
- Relay

Accuracy Multi-instrument only
- U, I and f class 0.2
- Harmonic Class 5
- Other values class 0.5
- Harmonic accuracy 1 % when MIC-2 MKII FCT and MIC-2 MKII FCT DIN is including flexible current transformer

Variants
- MIC-2 MKII front-mounted
- MIC-2 MKII DIN-mounted
- MIC-2 MKII FCT, flexible current transformer input, front-mounted
- MIC-2 MKII FCT DIN, flexible current transformer input, DIN-mounted

Intelligent
- Suitable for 2 and 3-phase network topologies

Installation
- Compact dimensions
- Simple wiring

Utility software
- Data logging
- Remote reading
- Easy setting up

Alarms
- Up to 16 configurable alarms
**Application**

The MIC-2 MKII multi-instrument is a microprocessor-based measuring unit providing measurement of most electrical quantities on a 2- or 3-phase electric energy distribution network. The measurements are shown on the built-in display.\(^*1\)

MIC-2 MKII can be used as a data logging device for an intelligent Power Distribution System or Plant Automation System. All measurements are monitored and data is available via the RS-485 Modbus port. Other communication types as Ethernet (Modbus TCP/IP, HTTP, FTP, SMTP, SNTP) and Profinet DP are available options.

True RMS values are measured with/without neutral and with both balanced and unbalanced load.

A large number of standard analogue instruments can be replaced by the MIC-2 MKII in all electrical measuring applications. 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 duration is selectable.\(^*1\)

Operating the MIC-2 MKII is very easy. It is a flexible and logical measuring unit that enables the user to easily adapt the instrument to individual applications. Password protection of KWh counter reset and change of settings is possible.

**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, total power.
- **Reactive power (Q)**
  - Each phase, total power.
- **Apparent power (S)**
  - Each phase total power.
- **Power factor**
  - Each phase and total power factor.
- **Frequency**
  - Actual frequency
- **Load nature**
  - Inductive/Capacitive/Resistive.
- **THD (up to 63\(^{rd}\) harmonics)**
  - Voltage THD of each phase, current THD of each phase.
- **Maximum Demand**
  - Demand of Active (P), Reactive (Q) and Apparent (S) power.

\(^*1\) Only MIC-2 MKII and MIC-2 MKII FCT

**Energy counter**

Import and export of energy, inductive and capacitive of reactive energy. Apparent energy.

**Energy pulse output (optional)**

Two ports of pulse output (assign to any energy (P, Q and S) counter).

**Statistics**

- Max/min of voltage, current, Power (P, Q, S) total, PF total, Frequency, Unbalance factor and THD values with time stamps.

**Running hour indication**

- Unbalance factor
- Voltage and current.

Based on the positive and the negative sequence

**Connection**

The MIC-2 MKII can be used in 2- and 3-phase network topologies with/without neutral and with both balanced and unbalanced load, including the US split phase system. The voltage and current input wiring modes are set separately in the parameter setting process. Please refer to the wiring diagram section in the MIC-2 MKII Installation Instructions for more details.

**Options**

- **Communication**
  - Ethernet - Modbus TCP/IP, HTTP, FTP, SMTP, SNTP
  - Profinet DP/VO

- **Input/Output**
  - Analogue input (AI)
  - Analogue output (AO)
  - Digital input/output (DI/DO)
  - Relay output (RO)

<table>
<thead>
<tr>
<th>I/O Module</th>
<th>DI</th>
<th>DO</th>
<th>RO</th>
<th>AI</th>
<th>AO</th>
</tr>
</thead>
<tbody>
<tr>
<td>AXM-IO1</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
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<tr>
<td>AXM-IO2</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>AXM-IO3</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

AXM-IO1 has a 24 V DC power supply for DI. A maximum of 1 communication and 2 input/output modules can be used for each MIC-2 MKII.

**Communication via RS-485 com port and AXM-WEB-PUSH module.**

Normal refresh time Modbus 1 sec.

Refresh time harmonic values 4 sec.

The 100 ms. refresh time Modbus parameter address list is only supported by the RS-485 communication port. Please see the Installations Instructions.
**Technical specifications, MIC-2 MKII and MIC-2 MKII DIN**

<table>
<thead>
<tr>
<th><strong>Voltage inputs</strong></th>
<th><strong>Data rate</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage $U_N$</td>
<td>1200 (9600) to 38400 bits/s</td>
</tr>
<tr>
<td>Measuring range</td>
<td><strong>Environmental conditions</strong></td>
</tr>
<tr>
<td>Overload capacity</td>
<td>Operation temperature: -25 to 70°C</td>
</tr>
<tr>
<td>VT primary</td>
<td>Storage temperature: -40 to 85°C</td>
</tr>
<tr>
<td>VT secondary</td>
<td>Standard: IEC 60068-2-2</td>
</tr>
<tr>
<td>Fuse</td>
<td>IEC 60068-2-1</td>
</tr>
<tr>
<td><strong>Current inputs</strong></td>
<td><strong>Humidity, relative</strong></td>
</tr>
<tr>
<td>Nominal current $I_N$</td>
<td>5-97 % RH condensing</td>
</tr>
<tr>
<td>Measuring range</td>
<td>Standard: IEC 60068-2-6 Db</td>
</tr>
<tr>
<td>Overload capacity</td>
<td><strong>Connections</strong></td>
</tr>
<tr>
<td>CT primary</td>
<td>Measuring inputs: Current input fixed</td>
</tr>
<tr>
<td>CT secondary</td>
<td>block, wire max. 5 mm²</td>
</tr>
<tr>
<td>Load</td>
<td>Screw torque: 0.5 Nm/5.5 lb-inch</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>Other: Pluggable block</td>
</tr>
<tr>
<td>Nominal frequency $f_N$</td>
<td>Wire max.: 1.5 mm²</td>
</tr>
<tr>
<td>Measuring range</td>
<td>Screw torque: 0.25 Nm/2.5 lb-inch</td>
</tr>
<tr>
<td>Measuring point</td>
<td><strong>Mounting</strong></td>
</tr>
<tr>
<td><strong>Accuracy Multi-instrument only</strong></td>
<td>Panel mounted: Max. 6 mm thick</td>
</tr>
<tr>
<td>Voltage</td>
<td>Panel cutout: 92 x 92 mm (+0.8 mm</td>
</tr>
<tr>
<td>Current</td>
<td>(3.62” x 3.62¨) or 4” round</td>
</tr>
<tr>
<td>Power</td>
<td><strong>Protection</strong></td>
</tr>
<tr>
<td>Power factor</td>
<td>Front: IP52 (EN 60529)</td>
</tr>
<tr>
<td>Frequency</td>
<td>Rear: IP30 (EN 60529)</td>
</tr>
<tr>
<td>Energy</td>
<td><strong>Safety</strong></td>
</tr>
<tr>
<td>Harmonic</td>
<td>IEC/EN 61010-1, UL 61010-1</td>
</tr>
<tr>
<td><strong>Standard</strong></td>
<td>300 V installation cat.</td>
</tr>
<tr>
<td>IEC 60051</td>
<td>III, pollution degree 2</td>
</tr>
<tr>
<td><strong>Auxiliary power supply</strong></td>
<td>600 V installation cat.</td>
</tr>
<tr>
<td>Universal AC/DC power supply</td>
<td>II, pollution degree 2</td>
</tr>
<tr>
<td>Supply voltage</td>
<td><strong>Weight</strong></td>
</tr>
<tr>
<td>100 to 240 L-N / +/-10 %</td>
<td>MIC-2 MKII: 320 g (0.8 lbs.)</td>
</tr>
<tr>
<td>100 to 415 L-L V AC +/-10 %</td>
<td>MIC-2 MKII DIN: 280 g (0.7 lbs.)</td>
</tr>
<tr>
<td>50/60 Hz</td>
<td><strong>EMC</strong></td>
</tr>
<tr>
<td>100...300 V DC</td>
<td>IEC/EN 61000-6-2</td>
</tr>
<tr>
<td><strong>Consumption</strong></td>
<td>IEC/EN 61000-6-4</td>
</tr>
<tr>
<td>Consumption</td>
<td><strong>Vibration</strong></td>
</tr>
<tr>
<td>≤ 5 VA</td>
<td>3 to 13.2 Hz: 2 mmpp</td>
</tr>
<tr>
<td>Fuse</td>
<td>13.2 to 100 Hz: 0.7 g</td>
</tr>
<tr>
<td>1 A slow blow</td>
<td>To IEC 60068-2-6</td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td>To IEC/EN 60529</td>
</tr>
<tr>
<td>RS-485 Modbus RTU</td>
<td><strong>Connections</strong></td>
</tr>
<tr>
<td>Number of devices</td>
<td><strong>Mounting</strong></td>
</tr>
<tr>
<td>Max. 32 units</td>
<td>Panel mounted: Max. 6 mm thick</td>
</tr>
<tr>
<td>Cable type</td>
<td>Panel cutout: 92 x 92 mm (+0.8 mm</td>
</tr>
<tr>
<td>Belden 3105 A or equivalent (twisted pair and shielded)</td>
<td>(3.62” x 3.62¨) or 4” round</td>
</tr>
<tr>
<td>Maximum cable length</td>
<td><strong>Protection</strong></td>
</tr>
<tr>
<td>up to 1000 m</td>
<td>Front: IP52 (EN 60529)</td>
</tr>
<tr>
<td></td>
<td>Rear: IP30 (EN 60529)</td>
</tr>
<tr>
<td><strong>Standard</strong></td>
<td><strong>Safety</strong></td>
</tr>
<tr>
<td>IEC/EN 61010-1, UL 61010-1</td>
<td>IEC/EN 61010-1, UL 61010-1</td>
</tr>
<tr>
<td>300 V installation cat.</td>
<td>300 V installation cat.</td>
</tr>
<tr>
<td>III, pollution degree 2</td>
<td>III, pollution degree 2</td>
</tr>
<tr>
<td>600 V installation cat.</td>
<td>600 V installation cat.</td>
</tr>
<tr>
<td>II, pollution degree 2</td>
<td>II, pollution degree 2</td>
</tr>
</tbody>
</table>

**DEIF A/S**

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Technical specifications, MIC-2 MKII FCT and MIC-2 MKII FCT DIN

Voltage inputs
Nominal voltage $U_N$  L-L 480 V AC (cat III) L-L 690 V AC (cat II)
Measuring range  0 to 1.2 x $U_N$
Overload capacity  1500 V continuous 3250 V for 1min
VT primary  220 V to 500 kV
VT secondary  100 V to 400 V
Fuse  1 A slow blow

FCT, Flexible Current Transformer input 100 mV
Only to be used with DEIF accessory flexible current transformer.
See Technical Specification, Flexible Current Transformer

Frequency
Nominal frequency $f_N$  50/60 Hz
Measuring range  45 Hz to 65 Hz
Measuring point  V1 phase voltage

Accuracy Multi-instrument only
Voltage  0.2 %
Current  0.2 %
Power  0.5 %
Power factor  0.5 %
Frequency  0.2 %
Energy  0.5 %
Harmonic  1.0 % *3

*3 Harmonic accuracy 1 % when MIC-2 MKII FCT and MIC-2 MKII FCT DIN is including flexible current transformer.

Standard  IEC 60051

Auxiliary power supply
Universal AC/DC power supply
Supply voltage  100 to 240 L-N / +/-10 %
100 to 415 L-L V AC +/-10 %
50/60 Hz
100 to 300 V DC

Consumption  ≤ 5 VA
Fuse  1 A slow blow

Environmental conditions
Operation temperature  -25 to 70°C
Storage temperature  -40 to 85°C
Standard  IEC 60068-2-2
IEC 60068-2-1

Humidity, relative  5-95 % RH condensing
Standard  IEC 60068-2-30 Db

Connections
Measuring inputs  Current input fixed block, wire max. 5 mm²
Screw torque  0.5 Nm/5.5 lb-inch
Other  Pluggable block
Wire max.  1.5 mm²
Screw torque  0.25 Nm/2.5 lb-inch

Mounting
Panel mounted  Max. 6 mm thick
Panel cut out  92 x 92 mm +0.8 mm (3.62” x 3.62“)
or 4” round

Protection
Front  IP52 (EN 60529)
Rear  IP30 (EN 60529)

Safety  IEC/EN 61010-1,
UL 61010-1
300 V installation cat. III, pollution degree 2
600 V installation cat. II, pollution degree 2

Weight
MIC-2 MKII FCT  320 g (0.8 lbs.)
MIC-2 MKII FCT DIN  280 g (0.7 lbs.)

EMC  IEC/EN 61000-6-2
IEC/EN 61000-6-4

Vibration
3 to 13.2 Hz: 2 mmpp
13.2 to 100 Hz: 0.7 g
To IEC 60068-2-6
To IACS UR E10

DEIF A/S
Flexible Current Transformer

<table>
<thead>
<tr>
<th>Variant</th>
<th>FCT1200</th>
<th>FCT3000</th>
<th>FCT6000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>5 A – 1200 A</td>
<td>12.5 A – 3000 A</td>
<td>25 A – 6000 A</td>
</tr>
<tr>
<td>Window size</td>
<td>106 mm</td>
<td>178 mm</td>
<td>271 mm</td>
</tr>
<tr>
<td>Coil length</td>
<td>400 mm</td>
<td>600 mm</td>
<td>900 mm</td>
</tr>
<tr>
<td>External diameter</td>
<td>143 mm</td>
<td>207 mm</td>
<td>302 mm</td>
</tr>
</tbody>
</table>

Frequency Range: 20 Hz – 5 kHz (Coil only)

Maximum measurements error: ≤ 1 % (of final range value). MIC-2 MKII FCT and MIC-2 MKII FCT DIN including Flexible Current Transformer.

Conductor Position sensitivity: +/- 2 % max

Influence of external fields: +/- 2 % max

Lead: White-positive, brown-negative, bare-shield must be connected to functional earth; 24AWG

Mounting: Coil to be fastened to the busbar or cable with tie wrap. Wire lead must also be fastened securely.

Insulation category: CAT III 1000 V/CAT IV 600 V

Polarity: Arrow towards load (current flow direction).

Measuring principle: Rogowski 100 mV

Operating temperatures: -20°C - 70°C

Storage temperature: -40°C - 70°C

Temperature drift: +/- 0.07 % within operating temperature range

Material: Orange thermoplastic rubber, flame retardant UL 94 V-0 rated

Testing voltage: 7400 V AC @ 50/60 Hz for 1 minute

Coil diameter: 15.5 mm

Wire lead length: 2 meters. Extension of wire lead is not approved
Unit dimensions in mm (inches)

Panel cutout:
H x W = 92 x 92 mm (3.622” x 3.622”)

MIC-2 MKII DIN

Panel dimensions:
- Height: 96.00 mm (3.78”)
- Width: 96.00 mm (3.78”)
- Panel cutout: 92.00 mm x 92.00 mm (3.622” x 3.622”)

Cutting dimensions:
- Height: 92.00 mm ±0.5 mm (3.622” ±0.5”)
- Width: 92.00 mm ±0.5 mm (3.622” ±0.5”)
- Column: 35.90 mm (1.413”)
- Row: 35.90 mm (1.413”)
- Column spacing: 101.6 mm ±0.5 mm (4.000” ±0.5”)

Panel cutout dimensions:
- Height: 96.00 mm (3.78”)
- Width: 96.00 mm (3.78”)

MIC-2 MKII DIN dimensions:
- Height: 91.00 mm (3.583”)
- Width: 91.00 mm (3.583”)
- Cutout height: 35.90 mm (1.413”)
- Cutout width: 50.70 mm (2.0”)
## Technical specifications – optional modules

### Communication modules

**Ethernet TCP/IP module – AXM-WEB-PUSH**
- 10M/100M Auto
- Interface: RJ45
- Modbus TCP/IP protocol
- HTTP Web page browse
- FTP compatible
- SMTP E-mail transfer protocol
- SNTP for time synchronization

### Profibus module – AXM-PROFI
- Profibus-DP/V0
- Input Byte (typical): 32 bytes
- Output Byte (typical): 32 bytes
- EN50170 vol.2 compliance
- Profibus slave mode, baud rate self-adaptable up to 12M

### I/O modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AXM-IO1</td>
<td>6 digital inputs (DI), 2 relay output (RO), 24 V DC isolated voltage output</td>
</tr>
<tr>
<td>AXM-IO2</td>
<td>4 digital inputs (DI), 2 digital outputs (DO), 2 analogue output (AO)</td>
</tr>
<tr>
<td>AXM-IO3</td>
<td>4 digital inputs (DI), 2 relay output (RO), 2 analogue input (AI)</td>
</tr>
</tbody>
</table>

#### Digital Input (DI)
- Input voltage range 20~160 V AC/DC
- Input current (max) 2 mA
- “1” voltage level 15 V
- “0” voltage level 5 V
- Switch response time <1 ms
- Pulse frequency (max) 100 Hz, 50 % duty ratio (5 ms ON and 5 ms OFF)
- Power supply for digital input (DI)
- Output voltage 24 V DC
- Output current 42 mA
- Load (max) 21 DI

#### Digital Output (DO) (Photo-MOS)
- Voltage range 0~250 V AC/DC
- Load current 100 mA (Max)
- Output frequency 25 Hz, 50 % Duty Ratio (20 ms ON, 20 ms OFF)
- Isolation voltage 2500 V

#### Relay Output (RO)
- Switching voltage (max) 250 V AC, 30 V DC
- Load current 3 A
- Set time 10 ms (Max)
- Contact resistance 100 mΩ (Max)
- Isolation voltage 2500 V
- Mechanical life 1.5 x 10^7

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

### Analogue Output (AO)
- Output range, 0~20 mA/4~20 mA
- Accuracy 0.5 %
- Response time 300 ms
- The max load resistance is 500 Ω
- Temperature drift 50 ppm/°C typical
- Isolation voltage 500 V

**Note**: Predefined output, see "Option I-O module 4189320032 UK", for more information.

### Consumption

<table>
<thead>
<tr>
<th>Module</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>AXM-WEB-PUSH</td>
<td>1 W</td>
</tr>
<tr>
<td>AXM-PROFI</td>
<td>1 W</td>
</tr>
<tr>
<td>AXM-IO1</td>
<td>1 W</td>
</tr>
<tr>
<td>AXM-IO2</td>
<td>1.3 W</td>
</tr>
<tr>
<td>AXM-IO3</td>
<td>0.8 W</td>
</tr>
</tbody>
</table>

### Environmental conditions

- Operation temperature: -25 to 70°C
- Storage temperature: -40 to 85°C
- Humidity, relative: 5-97 % RH condensing
- Standard: IEC 60068-2-2
- IEC 60068-2-1

### Safety

- IEC/EN 61010-1, UL 61010-1
- 300 V installation cat. III, pollution degree 2
- 600 V installation cat. II, pollution degree 2

### Weight

<table>
<thead>
<tr>
<th>Module</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>AXM-WEB-PUSH</td>
<td>65 g</td>
</tr>
<tr>
<td>AXM-PROFI</td>
<td>65 g</td>
</tr>
<tr>
<td>AXM-IO1</td>
<td>90 g</td>
</tr>
<tr>
<td>AXM-IO2</td>
<td>80 g</td>
</tr>
<tr>
<td>AXM-IO3</td>
<td>85 g</td>
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</table>

### EMC

<table>
<thead>
<tr>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC/EN 61000-6-2</td>
</tr>
<tr>
<td>IEC/EN 61000-6-4</td>
</tr>
</tbody>
</table>
## Available accessories

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Item no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessory for MIC-2 MKII</td>
<td>Bracket for DIN rail mounting</td>
<td>2232700011</td>
</tr>
<tr>
<td>Accessory for MIC-2 MKII FCT &amp; DIN</td>
<td>FCT1200 Flexible current transformer</td>
<td>1211029016</td>
</tr>
<tr>
<td>Accessory for MIC-2 MKII FCT &amp; DIN</td>
<td>FCT3000 Flexible current transformer</td>
<td>1211029017</td>
</tr>
<tr>
<td>Accessory for MIC-2 MKII FCT &amp; DIN</td>
<td>FCT6000 Flexible current transformer</td>
<td>1211029018</td>
</tr>
</tbody>
</table>

## Order specifications

### Communication module

- **MIC-2 MKII**
  - DEIF no. 1211020021
  - EAN no. 5703727116133
- **AXM-IO1**
  - DEIF no. 1211020013
  - EAN no. 5703727109760
- **AXM-IO2**
  - DEIF no. 1211020014
  - EAN no. 5703727109777
- **AXM-IO3**
  - DEIF no. 1211020015
  - EAN no. 5703727109784
- **AXM-IO1 (2)**
  - DEIF no. 1211020018
  - EAN no. 5703727110001
- **AXM-IO2 (2)**
  - DEIF no. 1211020019
  - EAN no. 5703727110018
- **AXM-IO3 (2)**
  - DEIF no. 1211020020
  - EAN no. 5703727110025

### I/O module 1

- **MIC-2 MKII FCT**
  - DEIF no. 1211020023
  - EAN no. 5703727113019
- **AXM-PROFI**
  - DEIF no. 1211020017
  - EAN no. 5703727109753
- **AXM-I01**
  - DEIF no. 1211020013
  - EAN no. 5703727109760
- **AXM-I02**
  - DEIF no. 1211020014
  - EAN no. 5703727109777
- **AXM-I03**
  - DEIF no. 1211020015
  - EAN no. 5703727109784

### I/O module 2

- **MIC-2 MKII FCT DIN**
  - DEIF no. 1211020024
  - EAN no. 5703727113026
- **AXM-I01 (2)**
  - DEIF no. 1211020018
  - EAN no. 5703727110001
- **AXM-I02 (2)**
  - DEIF no. 1211020019
  - EAN no. 5703727110018
- **AXM-I03 (2)**
  - DEIF no. 1211020020
  - EAN no. 5703727110025

A maximum of 1 communication and 2 input/output modules can be used for each MIC-2 MKII.