

## Features

### **Measurements**

- All 3-phase AC measurements
- True RMS
- Replaces analogue meters

### **Intelligent**

- Suitable for all 3-phase network topologies
- Replaces transducers

### **Communication**

- Suitable for SCADA systems
- RS485 serial output
- Modbus RTU protocol

### **Accuracy**

- U, I and F class 0.2
- Other values class 0.5

### **Installation**

- Compact dimensions
- Simple wiring

### **Display**

- 5 display rows
- 58 x 66 mm
- Blue backlight

## Application

The MIC multi-instrument is a microprocessor-based measuring unit providing measurement of all electrical quantities on a 3-phase electric energy distribution network. The measurements are shown on the built-in display. The MIC also has an RS485 interface that supports data exchange with a control system via Modbus RTU.

The MIC product family includes two versions:

- MIC 4002 (basic)
- MIC 4224 (additional functionality)

The MIC measures true RMS values on all 3-phase network topologies with/without neutral and with both balanced and unbalanced load.

The MIC can replace a large number of standard analogue instruments in all electrical measuring applications. It can be applied both as a regular instrument and as a remote value-reading and control unit, where all measured values are transmitted to the remote control system via the serial interface. The MIC contains all necessary measuring circuits and presents all values on a display with blue backlight. The display has 4 digits resolution for all measurements with the exception of the energy counter values (9 digits). The backlight "on"-time is selectable.

The MIC is a flexible measuring unit that enables the user to easily adapt the instrument to the individual application. Counter reset and change of the instrument settings can be password protected.

## Measured and calculated values

### Voltage (phase-neutral)

Actual voltage of each phase and average voltage.

### Voltage (phase to phase)

Actual voltage of each line and average voltage.

### Current

Actual current of each phase, average current and neutral current.

### Active power

Actual active power of each phase and total power.

### Reactive power

Actual reactive power of each phase and total reactive power.

### Apparent power

Actual apparent power of each phase and total apparent power.

### Power factor

Actual power factor of each phase and system average power factor.

### Frequency

Actual frequency of L1.

## Power quality

Voltage/current unbalance factor, total harmonics distortion of voltage/current of each phase and total harmonics distortion of average voltage/current.

## Energy counter

The MIC has 8 counters: Export/import kWh, export/import kvarh, absolute sum of export/import kWh, algebraic sum of export/import kWh, absolute sum of export/import kvarh, algebraic sum of export/import kvarh.

## Statistics data

Max./min. values of voltage, current, total power, total reactive power, total apparent power, power demand, power factor and frequency.

## Running hour

Meters the duration of the operation.

## Real time clock

Date and time.

## Connection

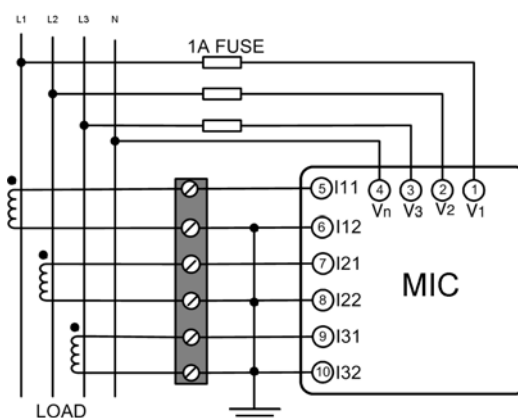
The multi-instrument MIC can be used in almost all 3-phase network topologies with/without neutral and with both balanced and unbalanced load. The voltage and current input wiring modes are set separately in the parameter setting process. The voltage wiring mode can be:

3LN	3-phase 4-line Y
2LN	3-phase 4-line Y with 2 PT
2LL	3-phase 3-line open delta

The current input wiring mode can be:

3CT	Unbalance system
2CT	Unbalance system without N
1CT	Balance system

Any voltage mode can be grouped with any of the current modes. The MIC is supplied configured in 3-phase 4-wire unbalanced mode, i.e. voltage wiring mode 3LN and current input mode 3CT (3W4).



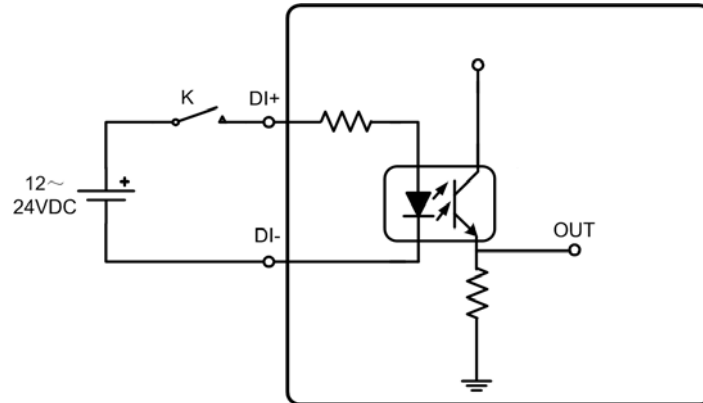
Principle diagram for 3LN, 3CT  
Connection (3W4)

## I/O

## MIC 4002

Digital input

MIC 4002 has two digital inputs that can be used to show the status of the switches in the power system:



Digital input circuit

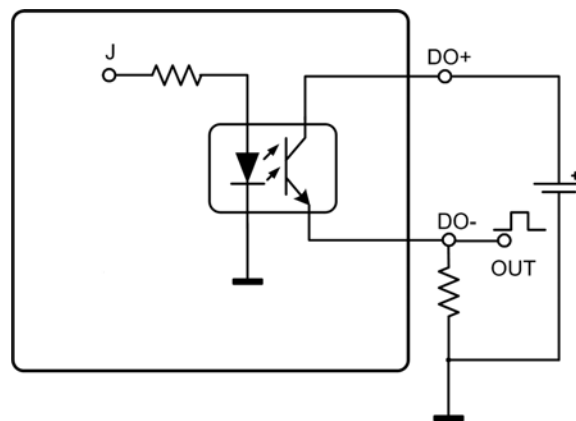
## MIC 4224

Relay output

The two relay outputs are used to control electric switches in the power system via the Modbus RTU communication.

Digital output

MIC 4224 has two digital outputs that can be used either as pulse outputs for actual and reactive energy or as over/under the limit alarm signals. The digital outputs are suitable for driving tariff devices or 24V DC relays:



Digital output circuit (pulse)

Digital input

MIC 4224 has four digital inputs that can be used for status of switches in the power system.

## Technical specifications

**Voltage inputs**

Nominal voltage $U_N$	Ph-N 230V AC Ph-Ph 400V AC
Measuring range	10...480V AC
Overload capacity	2 x $U_N$ continuously 2500V for 1s
PT primary	100V...500kV
PT secondary	100V...400V
Consumption	≤ 0.2VA/phase
Fuse	1A/230V

**Current inputs**

Nominal current $I_N$	5A AC
Measuring range	0 to 1.2 x $I_N$
Overload capacity	10A continuously 100A for 1s
CT primary	5A...10kA
Max. current	9999A
Consumption	≤ 0.5VA/phase

**Frequency**

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

**Accuracy**

Ph-N voltage	0.2% of range
Ph-Ph voltage	0.2% of range
Ph current	0.2% of range
Frequency	0.2% of reading
Neutral current	0.5% of range
Active power	0.5% of range
Reactive power	0.5% of range
Apparent power	0.5% of range
Power factor	0.5% of range
Active energy	EN 61036 class 1
Reactive energy	EN 61268 class 2
Demand power	1.0% of range
THD	1.0% of reading

**Response time**

Metering data	300ms
Power quality	3s

**Auxiliary power supply**

Universal AC/DC power supply	
Supply voltage	24...48, 100...280V DC 85...264V AC 50/60Hz
Consumption	≤ 2VA
Fuse	1A/250V AC

**Digital input**

Optical isolation	4000V AC rms
Input resistance	2kΩ
Input voltage	5...30V DC
Input current	Max. 20mA

**Digital output**

Output form	Open collector, NO
Optical isolation	4kV AC rms
Voltage	+40V DC to -6V DC
Current	Max. 30mA
Pulse rate	0.1...600kWh/pulse 0.1...600kvarh/pulse
Pulse duration	20ms...1s

**Relay output**

Type	Normally open contact
AC rating (resistive load)	250V-3A-750VA
DC rating (resistive load)	30V-3A-90W
Mechanical life	5x10 <sup>6</sup> operations
Electrical life at rated load AC	1x10 <sup>5</sup> operations
Electrical life at rated load DC	2x10 <sup>5</sup> operations
Dielectric strength	750V AC for 1min.
Isolation contact/coil	4kV AC rms

**Communication**

Signal levels	RS485
Connection type	Multi-drop
Devices per link	Max. 32 units
Cable type	Screened twisted pair
Maximum cable length	1200m
Transmission mode	Asynchronous
Message format	Modbus RTU
Data rate	1 200 to 38 400 bits/s

**Environmental conditions**

Working temperature, display	-5...55°C
Working temperature, RS485	-25...55°C
Storage temperature	-25...70°C
Humidity, relative	0-95% non condensing
Temperature drifts	100ppm/°C
Standard	EN 60068-2-1, EN 60068-2-2, EN 60068-2-3

**Connections**

Measuring inputs	Firm terminal block
Wire max.	5mm <sup>2</sup> / AWG10
Screw torque	0.5Nm / 5.5 lb-inch
Other	Pluggable block
Wire max.	1.5mm <sup>2</sup> / AWG16
Screw torque	0.25Nm / 2.5 lb-inch

**Mounting**

Panel mounted	Max. 6mm thick
Panel cutout	92 x 92mm +0.8mm (3.62" x 3.62")

**Protection**

Front	IP40 (EN 60529)
Rear	IP20 (EN 60529)

**Weight**

350 g (0.8 lbs.)

**Material**

Plastic housing	According to UL94 (V0)
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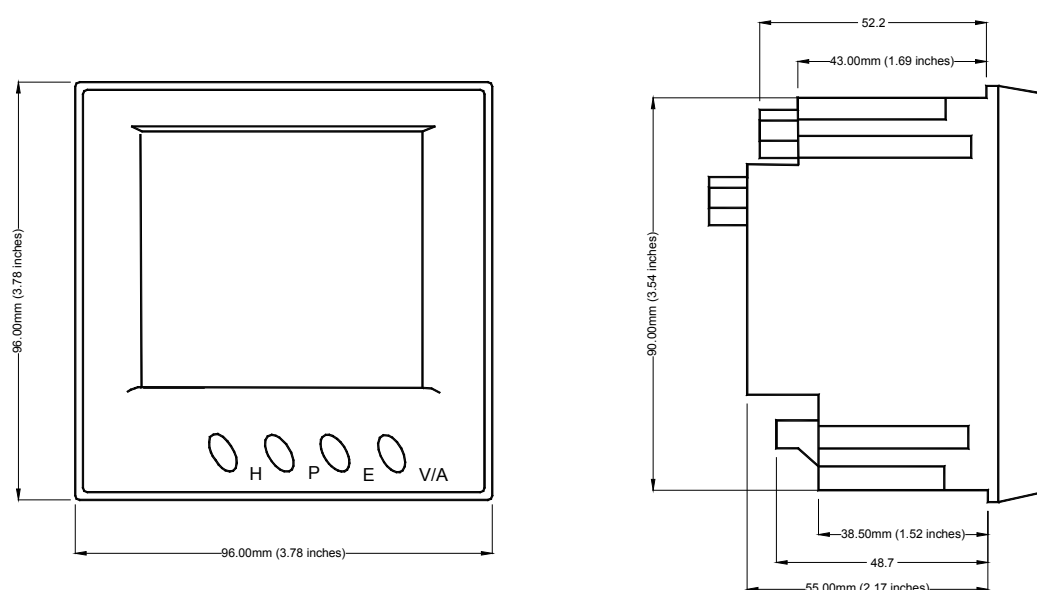
**EMC**

EN 61000-6/1-2-3-4

**Safety**EN 61010-1  
Cat. III, pollution degree 2**Test voltage**

2.2kV according to EN 61010-1

Unit dimensions in mm (inches)



Panel cutout:

H x W = 92 x 92mm (3.62" x 3.62")

Order specifications

MIC 4002

400V Ph-Ph, 5A, no relay output, no digital output,  
2 digital inputs

**Aux. supply: 100-280V DC/85-264V AC**

DEIF no. 1211020002

EAN no. 5703727105960

**Aux. supply: 24-48V DC**

DEIF no. 1211020005

EAN no. 5703727106868

MIC 4224

400V Ph-Ph, 5A, 2 relay outputs, 2 digital outputs,  
4 digital inputs

**Aux. supply: 100-280V DC/85-264V AC**

DEIF no. 1211020004

EAN no. 5703727105953

**Aux. supply: 24-48V DC**

DEIF no. 1211020006

EAN no. 5703727106875



DEIF A/S



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