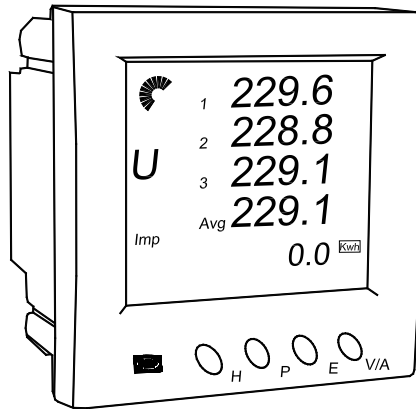


Installation Instructions and Reference Handbook



Multi-instrument MIC 4189320009H



- *Product information*
- *Installation instructions*
- *Basic operation*



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1. About this document

This chapter includes general user information about this handbook concerning the general purpose, the intended users and the overall contents and structure.

General purpose

This document is the Installation Instructions and Reference Handbook for DEIF's multi-instrument, the MIC. The document mainly includes installation instructions, general product information and information about basic, daily operation. The general purpose of the Installation Instructions and Reference Handbook is to provide the information needed to install the unit correctly and to provide information about the basic functionality of the instrument.



Please make sure to read this handbook before working with the instrument. Failure to do this could result in human injury or damage to the equipment.

Intended users

The handbook is mainly intended for the person responsible for the installation and setup of the instrument. On the basis of this document the operator will be able to use the multi-instrument for simple, daily operation (for information about advanced operation, please refer to the Serial Interface Manual).

Contents/overall structure

This handbook is divided into chapters and in order to make the structure of the document simple and easy to use, each chapter will begin from the top of a new page. The following will outline the contents of each of the chapters.

About this document

This first chapter includes general information about this handbook as a document. It deals with the general purpose and the intended users of the document. Furthermore, it outlines the overall contents and structure.

Warnings and legal information

The second chapter includes information about general legal issues and safety precautions relevant in the handling of DEIF products. Furthermore, this chapter will introduce note and warning symbols, which will be used

throughout the handbook.

Product information

The third chapter will deal with the unit in general and describe its functions.

Installation instructions

This chapter includes the information needed to perform correct installation of the instrument, e.g. mounting instructions, terminals, wiring, inputs, parameter setting etc.

Basic operation

This chapter deals with the basic operation of the MIC. Screen dumps are used in order to simplify the information.



The Serial Interface Manual, the data sheet and the free utility software can be downloaded at www.deif.com.

2. Warnings and legal information

This chapter includes important information about general legal issues relevant in the handling of DEIF products. Furthermore, some overall safety precautions will be introduced and recommended. Finally, the highlighted notes and warnings, which will be used throughout the document, are presented.

Legal information and responsibility

DEIF takes no responsibility for installation or operation of the engine set. If there is any doubt about how to install or operate the engine controlled by the unit, the company responsible for the installation or the operation of the set must be contacted.

The units are not to be opened by unauthorised personnel. If opened anyway, the warranty will be lost.

Disclaimer

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

The English version of this document always contains the most recent and up-to-date information about the product. DEIF does not take responsibility for the accuracy of translations, and translations might not be updated at the same time as the English document. If there is any discrepancy, the English version prevails.

Electrostatic discharge awareness

Sufficient care must be taken to protect the terminals against static discharges during the installation. Once the unit is installed and connected, these precautions are no longer necessary.

Safety issues

Installing the unit implies work with dangerous currents and voltages. Therefore, the installation should only be carried out by authorised personnel who understand the risks involved in working with live electrical equipment.



Be aware of the hazardous live currents and voltages. Do not touch any AC measurement inputs as this could lead to injury or death.

CE-marking

The MIC is CE-marked according to the EMC-directive for industrial environments, which normally covers the most common use of the product.

Definitions

Throughout this document a number of notes and warnings will be presented. To ensure that these are noticed, they will be highlighted in order to separate them from the general text.

Notes



The notes provide general information, which will be helpful for the reader to bear in mind.

Warnings



The warnings indicate a potentially dangerous situation, which could result in death, personal injury or damaged equipment, if certain guidelines are not followed.

3. Product information

This chapter includes overall product information about the unit.

Description of functions

The MIC multi-instrument is a microprocessor-based measuring unit providing measurement of all electrical quantities on a 1- or 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 protocol.

The MIC measures true RMS values on all 1- or 3-phase network topologies with or 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 transmitting all measured values 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 (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.

The MIC product family includes two versions:

- MIC 4002 is the basic version
- MIC 4224 has additional I/O functions

Measured and calculated values (both versions)

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 demand

System total active power demand, system total reactive power demand and system total apparent power demand (sliding window 1 to 30 minutes).

Power factor

Actual $\cos\varphi$ 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 (up to 31st harmonics).

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 operation.

Real time clock

Date and time.

Digital input, MIC 4002

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

Digital input, MIC 4224

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

Additional functions in MIC 4224**Digital output**

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

The setup of the alarm is made via the Modbus RTU communication.



Please refer to the Serial Interface Manual.

Relay output

MIC 4224 has two relay outputs that can be used to control electric switches in the power system. The relays can only be activated via the Modbus RTU communication.

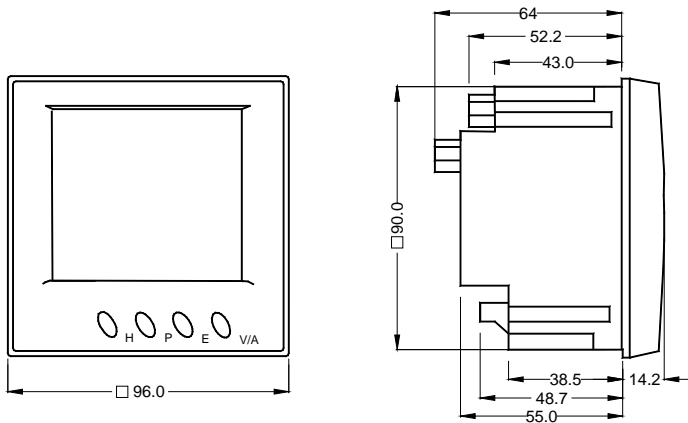
4. Installation instructions

This chapter includes the information needed to perform correct installation of the unit, e.g. mounting instructions, terminals, wiring, setup etc.



Installation of the MIC will involve working with dangerous currents and voltages. Professionals must handle these areas. If there is any doubt concerning the installation, the person responsible for the power installation should be contacted.

Mounting



Unit dimensions in mm

The unit is designed for flush mounting by means of 4 fixing clips, which are included at delivery.

In order to facilitate mounting of the meter and wire arrangement, we recommend a minimum distance of 25 mm to other components in the switchboard.

The MIC can be installed in a panel cutout with the dimension 92 x 92 mm + 0.8 mm according to IEC 61554 and DIN 43700. Max. panel thickness: 6 mm.

Electrical connection

Terminals



Only qualified personnel should do the wire connection work. Make sure the power supply is cut off. Failure to do this may result in severe injury or death.

The MIC has the following rows of terminals on the rear side:

Voltage and current input terminal

Terminal number	Description
1	V1 Voltage input phase 1 (R, A)
2	V2 Voltage input phase 2 (S, B)
3	V3 Voltage input phase 3 (T, C)
4	Vn Voltage reference point
5	I11 Current phase 1 in
6	I12 Current phase 1 out
7	I21 Current phase 2 in
8	I22 Current phase 2 out
9	I31 Current phase 3 in
10	I32 Current phase 3 out

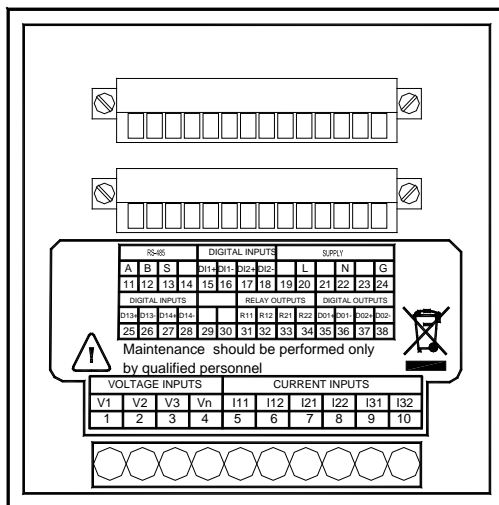
Auxiliary supply, communication and digital inputs terminal

Terminal number	Description
11	RS485 A, differential signal +
12	RS485 B, differential signal -
13	RS485 S, shield
14	Not used
15	DI1+ Digital input 1
16	DI1- Digital input 1
17	DI2+ Digital input 2
18	DI2- Digital input 2
19	Not used
20	Auxiliary power supply L (+)
21	Not used
22	Auxiliary power supply N (-)
23	Not used
24	Safety Earth

Digital inputs, digital outputs and relay output terminal (MIC 4224 only)

Terminal number	Description
25	DI3+ Digital input 3
26	DI3- Digital input 3
27	DI4+ Digital input 4
28	DI4- Digital input 4
29	Not used
30	Not used
31	R11 Relay 1
32	R12 Relay 1
33	R21 Relay 2
34	R22 Relay 2
35	DO1+ Digital output 1
36	DO1- Digital output 1
37	DO2+ Digital output 2
38	DO2- Digital output 2

Instrument rear view



Auxiliary power supply

The auxiliary power supply of the MIC meter is 85-264V AC (50/60Hz) or 24-48, 100-280V DC. For the pure DC version the auxiliary supply is 19.2-57.6V DC. The typical power consumption of the meter is less than 2W. The terminals for the auxiliary power supply are to be connected as follows:

Terminal number	20	22	24
AC	L	N	G /
DC	+	÷	

A fuse (typical 1A/250V AC) should be used in auxiliary power supply loop. Terminal no. 24 can be connected to ground on a grounded system (star point on the generator is connected to ground). On an IT system, terminal 24 must be left open, otherwise a false insulation error will occur.

The wire of the auxiliary power supply should be 0.5-1.5mm² (AWG16-22).



Current transformers must be short-circuited, before the wires are removed from the terminals on the instrument.

Measuring connections

The MIC can be used in almost all kinds of 3-phase connections.

The voltage and current input wiring modes can be set separately in the parameter setting process. The voltage wiring mode can be:



The rated measuring voltage of the MIC is 400V LL. Naturally the instrument can be used in systems with lower system voltage level, e.g. in connection with 100V voltage transformers. The measuring accuracy will in this case be slightly reduced.

- **3LN** 3-phase 4-line Y
- **2LN** 3-phase 4-line Y with 2 voltage transformers
- **2LL** 3-phase 3-line open delta

The MIC is designed to be used together with current transformers with secondary input of 5A. If the secondary current is 1A, the primary ratio has to be multiplied with 5 to give a correct reading.



Example: $500/1 = 2500/5$.

This gives a limitation of max. 2.000A on the primary when the secondary is 1A.

The current input wiring mode can be:

- **3CT**
- **2CT**
- **1CT**

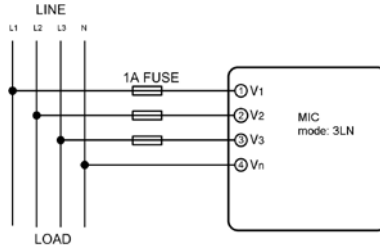
Any voltage mode can be grouped with any of the current mode.

The wire of the measuring inputs supply should be 1.5-5mm² (AWG10-16). The voltage measuring inputs should be protected by fuses (1A/250V AC).

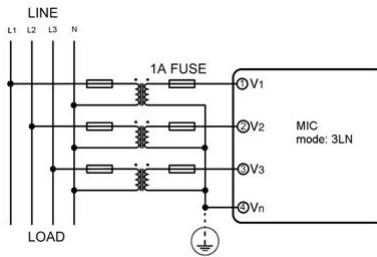
Voltage input wiring

3LN. 3-phase 4-line Y

The 3-phase 4-line Wye mode is popularly used in low voltage electric distribution power systems. The MIC can either be connected directly to the power line or it can be connected with voltage transformers.



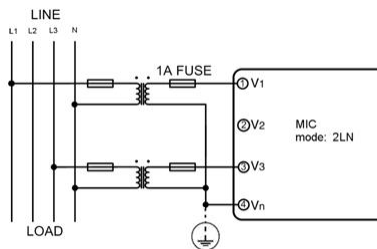
Direct connection



With 3 voltage transformers

2LN. 3-phase 4-line Y with 2 voltage transformers

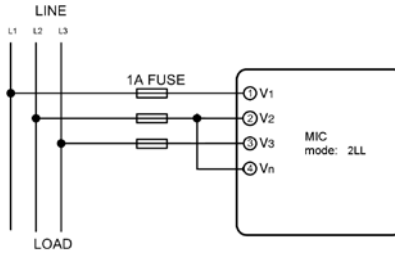
In some high voltage 3-phase 4-line Wye systems this mode is used. It is supposed that the 3 phases of the power system are in balance. The V2 voltage is calculated from the measured values of V1 and V3.



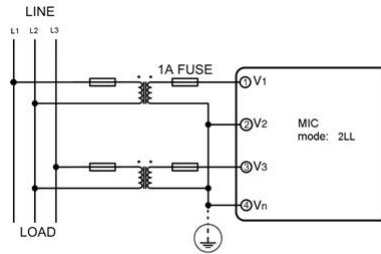
With 2 voltage transformers

2LL. 3-phase 3-line open delta

Open delta wiring mode is used in some applications.

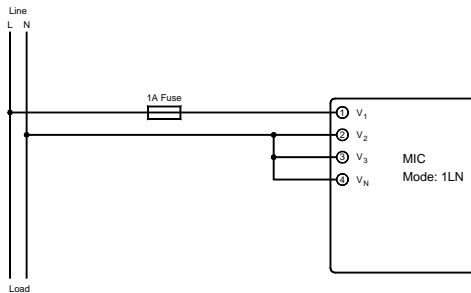


Open delta



Open delta with 2 voltage transformers, the V2 and Vn must be connected

1LN. 1-phase 2-line

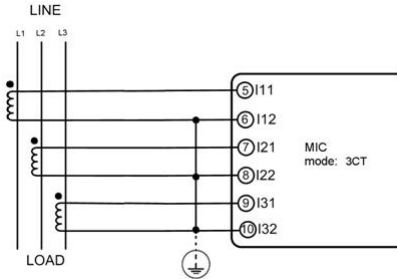


This connection is used for measurement on single phase systems

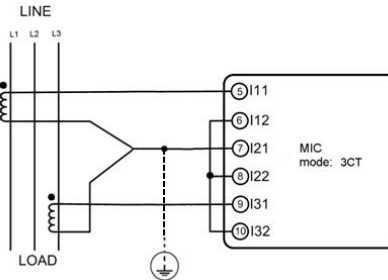
Current input wiring

3CT

All the current inputs of the 3-phase system can be seen as 3CT one, whether there are two or three CTs on the input side.



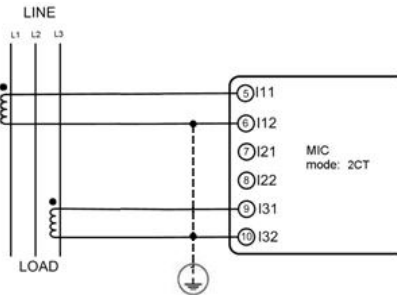
3 current transformers



2 current transformers with input on I21 and I22

2CT

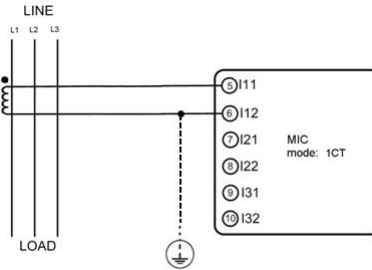
The difference of the 2CT mode compared to the 3CT mode is that there is no current input in the I21 and I22 terminals. The I2 value is calculated from the formula $i_1+i_2+i_3=0$. The current in an N-wire cannot be calculated in this mode.



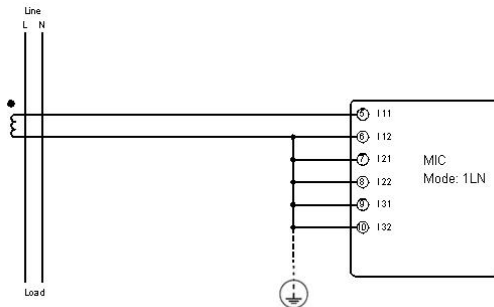
2 current transformers without input on I21 and I22

1CT

This connection with only one current transformer can be used, if the 3-phase system is in full balance. The other two phase currents are calculated according to the balance supposing. The current in an N-wire cannot be calculated in this mode.



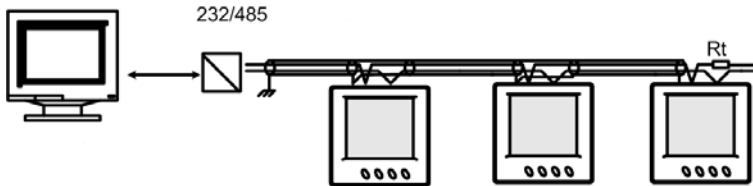
1 current transformer in a balanced network

1CT 1-phase

1 current transformer in a 2-line system

Communication

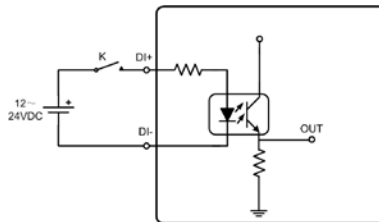
The communication terminals are A, B, and S (11, 12, 13). A is differential signal +, B is differential signal and S is connected to a shield of twisted pair cables. Up to 32 devices can be connected on an RS485 bus. The maximum connection length is 1000m. Conductors A and B should be terminated with a 120Ω terminating resistor at the end of the string.



For RS485 communications the PC requires either an internal RS485 communications port or an external RS232/RS485 converter. In both cases, the device must provide automatic RS485 data flow control.

Digital input

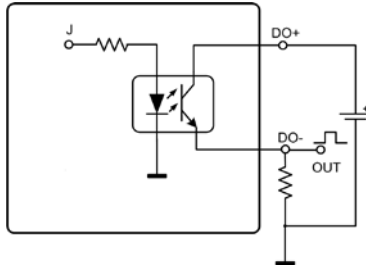
There are two digital inputs in the MIC 4002. They can be used to show the status of switches in the power system. The terminals of the two digital inputs are DI1+, DI1- (15, 16) and DI2+, DI2- (17, 18). The MIC 4224 has two additional digital inputs, they are on terminals DI3+, DI3- (25, 26) and DI4+, DI4- (27, 28).



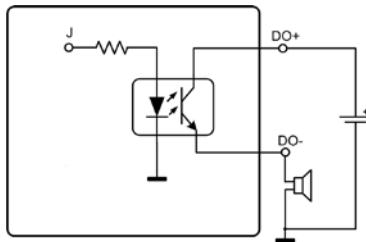
The DC power supply should be 12-24V DC. Max. input current 30mA. The wire of digital inputs should be 0.5-1.5mm² (AWG16-22).

Digital output

The MIC 4224 has two digital outputs that can be used either as pulse outputs to energy counters or as over/under the limit alarm signals. The terminals of the digital output are DO1+, DO1- (35, 36) and DO2+, DO2- (37, 38). Max. output voltage 40V DC. Max. output current 30mA. Negative voltage is not possible.



When the digital outputs are used to give pulses to energy counters, the pulse width and pulse rate can be set in the parameter setting mode via the communication.



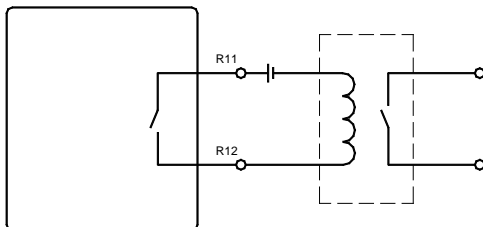
When the digital outputs are used as over or under alarm limits outputs, then the limits of the parameter, time interval and output port can be set. This setting can only be performed via the communication.



The wire of the digital output should be 0.5-1.5mm² (AWG16-22).

Relay output

The MIC 4224 has two relay outputs. The terminals are R11, R12 (31, 32) and R21, R22 (33, 34). These two relay outputs can be used to remote control electric switches in power systems.



Relay rating: 3A/30V DC. A mediate relay is recommended.

The MIC has two relay output modes, namely 'Latching' and 'Momentary'. In the latching mode the relay has two settings: On or off. In the momentary mode the relay changes from off to on for a certain period of time (Ton), and then it goes off again. Ton can be set from 50-3000ms.

The wire of the relay output should be 0.5-1.5mm² (AWG16-22).

Parameter setting

The parameter setting mode is entered by pressing the **H** and **V/A** keys simultaneously in the normal display mode. The setup of the MIC via the front keys can be protected by an access code. The access code is a 4 digit number.

The factory default code is 0000.

Functionality of the four push-buttons in the settings mode:

- ▶ **H** to move the cursor one digit at a time
- ▶ **P** to increase the digit
- ▶ **E** to decrease the digit
- ▶ **V/A** to accept changes and move to next screen
- ▶ **H + V/A** simultaneously to exit the setting mode



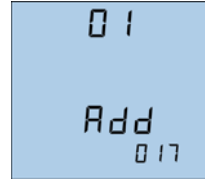
Any change has to be accepted with the V/A key before exiting the settings mode. Otherwise, the change will not be stored.

Key in the correct access code, press **V/A** in order to go to the first parameter setting screen.

Screen no. 1

Setting the Modbus communication address:

- ▶ **H** to move the cursor one digit at a time
- ▶ **P** to increase the digit
- ▶ **E** to decrease the digit
- ▶ **V/A** to accept changes and move to next screen
- ▶ **H + V/A** simultaneously to exit the setting mode



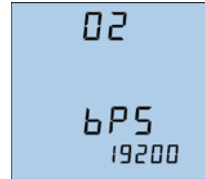
Screen no. 2

Setting the baud rate:

Baud rate can be one of the following:

600, 1200, 2400, 4800, 9600, 19200, 38400

- ▶ **P** to increase the baud rate
- ▶ **E** to decrease the baud rate
- ▶ **V/A** to accept changes and move to next screen



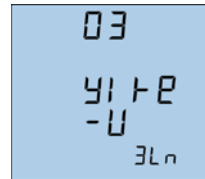
When the communication parameters are stored, the remaining parameters can also be set using the PC utility software. Setup from the communication is not protected by the access code.

Screen no. 3

Setting of the voltage input wiring:

Voltage input wiring can be one of the three modes:
3LN (normal), 2LN and 2LL

- ▶ **P** or ▶ **E** to select from 3LN, 2LN and 2LL
- ▶ **V/A** to accept changes and move to next screen

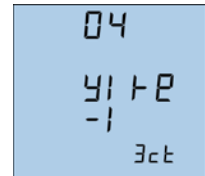


Screen no. 4

Setting of the current input wiring:

Current input wiring can be one of the three modes:
3CT, 2CT and 1CT

- ▶ **P** or ▶ **E** to select from 3CT, 2CT and 1CT
- ▶ **V/A** to accept changes and move to next screen



Screen no. 5**Setting of primary value of voltage transformer:**

PT1 value is an integer from 100 to 500000V

- ▶ **H** to move the cursor one digit at a time
- ▶ **P** to increase the digit
- ▶ **E** to decrease the digit
- ▶ **V/A** to accept changes and move to next screen

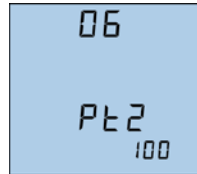


05
PT 1
00 1000

Screen no. 6**Setting of secondary value of voltage transformer:**

PT2 value is an integer from 100 to 400V

- ▶ **H** to move the cursor one digit each time
- ▶ **P** to increase the digit
- ▶ **E** to decrease the digit
- ▶ **V/A** to accept changes and move to next screen

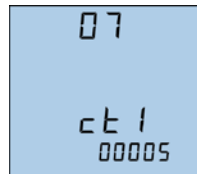


06
PT 2
100

Screen no. 7**Setting of primary value of current transformer:**

CT1 value is an integer from 5 to 10000A

- ▶ **H** to move the cursor one digit at a time
- ▶ **P** to increase the digit
- ▶ **E** to decrease the digit
- ▶ **V/A** to accept changes and move to next screen

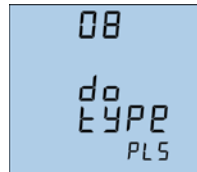


07
CT 1
00005

Screen no. 8**Setting of the digital output mode:**

The mode can be set as pulse or alarm output
The detail setting of the alarm mode is made using Modbus communication and the PC utility software

- ▶ **P** or ▶ **E** to select from PLS and AL
- ▶ **V/A** to accept changes and move to next screen



08
DO
TYPE
PLS

Screen no. 9**Setting of digital output 1:**

DO1 can be one of the following 8 energy counters:

0=No output, 1=Ep_imp, 2=Ep_exp, 3=Eq_imp,
4=Eq_exp, 5=Ep_total, 6=Ep_net, 7=Eq_total, 8=Eq_net

- ▶ **P** or ▶ **E** to select from the counter
- ▶ **V/A** to accept changes and move to next screen



09
DO 1
PULS
SLCT
0

Screen no. 10**Setting of digital output 2:**

DO2 can be one of the following 8 energy counters:

0=No output, 1=Ep_imp, 2=Ep_exp, 3=Eq_imp,
4=Eq_exp, 5=Ep_total, 6=Ep_net, 7=Eq_total, 8=Eq_net

▶**P** or ▶**E** to select from the counter

▶**V/A** to accept changes and move to next screen

**Screen no. 11****Setting of the DO pulse width:**

DO pulse width is integer from 1 to 50

One digit is 20ms

▶**H** to move the cursor one digit at a time

▶**P** to increase the digit

▶**E** to decrease the digit

▶**V/A** to accept changes and move to next screen

**Screen no. 12****Setting of the energy value per pulse:**

It can be the integer from 1 to 6000

One digit is 0.1kWh or 0.1kVArh

Minimum counting = 1 digit = 0.1kWh/pulse

Maximum counting = 6000 digits = 600kWh/pulse

Example: 1000 digits = 100kWh/pulse

▶**H** to move the cursor one digit at a time

▶**P** to increase the digit

▶**E** to decrease the digit

▶**V/A** to accept changes and move to next screen

**Screen no. 13****Setting of relay output 1 mode:**

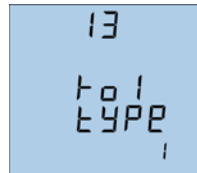
In latching mode the relay is either on or off

In momentary mode the relay output will change from off to on for a period of time, Ton, and then go off again

Ton is set in screen fourteen

▶**P** or ▶**E** to select 0=latching, 1=momentary

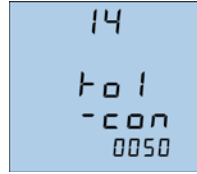
▶**V/A** to accept changes and move to next screen



Screen no. 14**Setting of relay 1 closing time Ton:**

Ton is integer from 50 to 3000ms

- ▶ **H** to move the cursor one digit at a time
- ▶ **P** to increase the digit
- ▶ **E** to decrease the digit
- ▶ **V/A** to accept changes and move to next screen

**Screen no. 15****Setting of relay output 2 mode:**

In latching mode the relay is either on or off

In momentary mode the relay output will change from off to on for a period of time, Ton, and then go off again

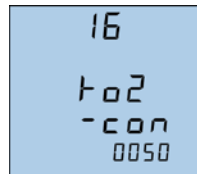
Ton is set in screen fourteen

- ▶ **P** or ▶ **E** to select 0=latching, 1=momentary
- ▶ **V/A** to accept changes and move to next screen

**Screen no. 16****Setting of relay 2 closing time Ton:**

Ton is integer from 50 to 3000ms

- ▶ **H** to move the cursor one digit at a time
- ▶ **P** to increase the digit
- ▶ **E** to decrease the digit
- ▶ **V/A** to accept changes and move to next screen

**Screen no. 17****Setting of display backlight "on"-time:**

The backlight will go to "off" a certain period of time after the last key has been touched. The time can be set from 0 to 120min. If the value is 0, then it will always be "on"

- ▶ **H** to move the cursor one digit at a time
- ▶ **P** to increase the digit
- ▶ **E** to decrease the digit
- ▶ **V/A** to accept changes and move to next screen



Screen no. 18**Setting of demand sliding window time:**

Is used for:

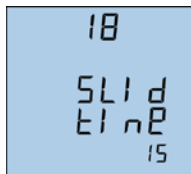
Power demand

Reactive power demand

Apparent power demand

The size of the sliding window time can be from 1 to 30min. The window slides once per minute

- ▶ **H** to move the cursor one digit each time
- ▶ **P** to increase the digit
- ▶ **E** to decrease the digit
- ▶ **V/A** to accept changes and move to next screen

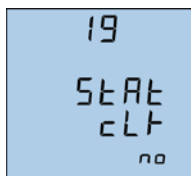
**Screen no. 19****Clear all store statistics values:**

The MIC will begin to record new max. and min. values

Yes: Clear the max. and min. statistics value

No: Do not clear the max. and min. statistics value

- ▶ **P** or ▶ **E** to select yes or no
- ▶ **V/A** to accept changes and move to next screen

**Screen no. 20****Setting of system date:**

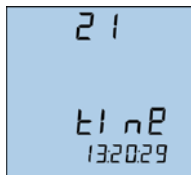
Display format is MM:DD:YYYY

- ▶ **H** to move the cursor one digit at a time
- ▶ **P** to increase the digit
- ▶ **E** to decrease the digit
- ▶ **V/A** to accept changes and move to next screen

**Screen no. 21****Setting of system time:**

The display format is hh:mm:ss

- ▶ **H** to move the cursor one digit at a time
- ▶ **P** to increase the digit
- ▶ **E** to decrease the digit
- ▶ **V/A** to accept changes and move to next screen



Screen no. 22**Setting of the access code:**

The access code can be changed in this setting page

It is important to remember the new access code!

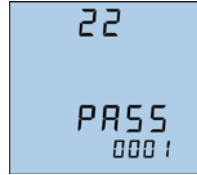
▶ **H** to move the cursor one digit at a time

▶ **P** to increase the digit

▶ **E** to decrease the digit

▶ **V/A** to accept changes and move to first screen

▶ **H + V/A** simultaneously to exit the setting mode

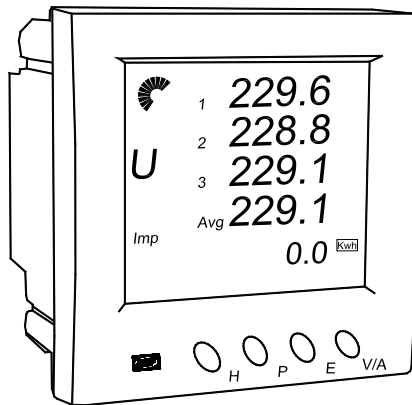


5. Basic operation

This chapter deals with the basic operation of the MIC. Screen dumps are used in order to simplify the information.

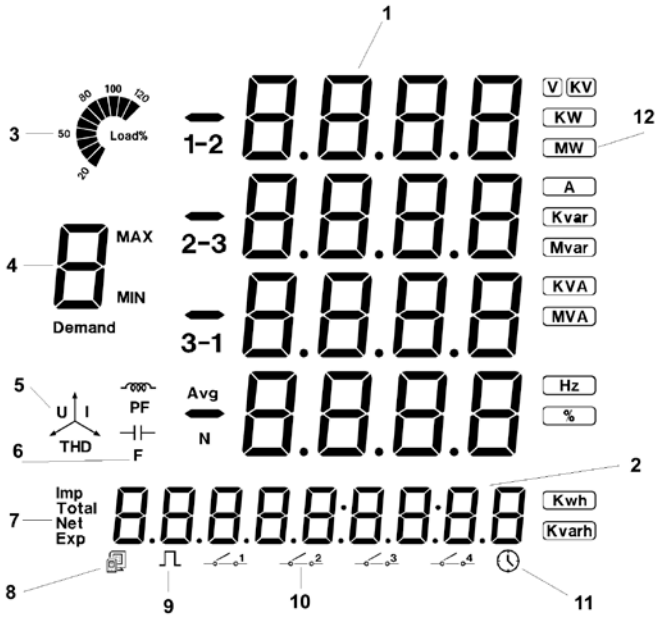
Display

The display panel with blue backlight is used for presentation of all measured values and for displaying of the selected function during the setup process.












The four push-buttons are used to change the display to the different screens showing all the measured and calculated values.

All the display segments are illustrated in the following picture.



	Display	Description
--	---------	-------------

1	Four lines of  letters in the metering area	Display metering data: Voltage, current, power, power factor, frequency, THD, demand, unbalance factor, max, min etc.
2	One line of  letters in the energy display area	Energy data display or running hour
3	Load rating 	Display load current percentage
4	Item label Letter  , MAX, MIN, Demand, PF and F	U: Voltage, I: Current, P: Power, q: Reactive power, S: Apparent power, PF: Power factor, F: Frequency MAX: Maximum value, MIN: Minimum value, Demand: Demand value, Avg: Average value, I with N: Neutral current, PF, F, Avg and N indicate the fourth line data
5	Three phase unbalance label 	With letter U: Voltage unbalance factor With letter I: Current unbalance factor
6	Load nature 	Inductor: Inductive load Capacitor label: Capacitive load
7	Energy label	Imp: Consumption energy Exp: Generating energy Total: Absolute sum of imp and exp energy Net: Algebraic sum
8	Communication indicator 	No label: No communication One label: Inquiry Two labels: Inquiry and answer
9	Energy pulse output indicator	No label: No pulse output With label: Pulse output
10	Digital input indicator	Switches 1 to 4 indicate DI1 to DI4
11	Hour label 	Running hour display in energy area
12	Unit 	Indicate data unit V, kV, A, kW, MW, kVAr, mVAr, kVA, MVA, Hz, kWh, kVArh, %

Display menus

The following displays appear at a 3W4 connection (3LN, 3CT). Displays for other connections are alike.

Using the four push-buttons marked H, P, E and V/A, the measured and calculated values of your power system can be read.

Voltage and current data

Press the **V/A** key to read voltage and current data.

Screen no. 1

Phase-neutral voltage U1
Phase-neutral voltage U2
Phase-neutral voltage U3
Phase-neutral average voltage Ulnavg

► **V/A**



Screen no. 2

Current I1
Current I2
Current I3
Neutral current In

► **V/A**



Screen no. 3

Phase-phase voltage U12
Phase-phase voltage U23
Phase-phase voltage U31
Phase-phase average voltage Ullavg

► **V/A**



Screen no. 4

Current I1
Current I2
Current I3
Average current Iavg

► **V/A to go back to the first screen**



Power related data

Press **P** to display power related data.

Screen no. 1

Phase power P1
Phase power P2
Phase power P3
System total power Psum

► P



Screen no. 2

Phase reactive power Q1
Phase reactive power Q2
Phase reactive power Q3
System total reactive power Qsum

► P



Screen no. 3

Phase apparent power S1
Phase apparent power S2
Phase apparent power S3
System total apparent power Ssum

► P



Screen no. 4

Phase power factor PF1
Phase power factor PF2
Phase power factor PF3
System average power factor PF

► P



Screen no. 5

System total power Psum
System total reactive power Qsum
System total apparent power Ssum
System average power factor

► P



Screen no. 6

System total power Psum
 System total reactive power Qsum
 System total apparent power Ssum
 System frequency F

▶ P

**Screen no. 7**

Three-phase system power demand Dmd_P
 Three-phase system reactive power demand Dmd_Q
 Three-phase system apparent power demand Dmd_S

▶ P to get back to the first screen

**Power quality data**

Press H, display power quality data.

Screen no. 1 (voltage wiring 2LN or 3LN)

THD of phase-neutral voltage THD_U1
 THD of phase-neutral voltage THD_U2
 THD of phase-neutral voltage THD_U3
 THD of average phase-neutral voltage THD_Uln

or

**Screen no. 1** (voltage wiring 2LL)

THD of phase-phase voltage THD_U12
 THD of phase-phase voltage THD_U23
 THD of phase-phase voltage THD_U31
 THD of average phase-phase voltage THD_Ull

▶ H

**Screen no. 2**

THD of phase current THD_I1
 THD of phase current THD_I2
 THD of phase current THD_I3
 THD of average current THD_lavg

▶ H



Screen no. 3

Three-phase voltage unbalance factor
 Three-phase current unbalance factor

► **H** to get back to the first screen

**Energy and running hour counters**

Press the **E** key to display the different energy and running hour counters and the real time clock.

Screen no. 1

Import energy counter Ep_imp

► **E**

**Screen no. 2**

Export energy counter Ep_exp

► **E**

**Screen no. 3**

Absolute sum of the import and export energy counters Ep_total

► **E**

**Screen no. 4**

Algebraic sum of the import and export energy counters Ep_net

► **E**



Screen no. 5

Import reactive energy counter Eq_imp

▶ E

**Screen no. 6**

Export reactive energy counter Eq_exp

▶ E

**Screen no. 7**

Absolute sum of the import and export reactive energy counters Eq_total

▶ E

**Screen no. 8**

Algebraic sum of the import and export reactive energy counters Eq_net

▶ E

**Screen no. 9**

Date

▶ E



Screen no. 10

Time

► **E****Screen no. 11**

Running hour counter

► **E** to get back to the first screen**Statistics data**

Press the **P** and **V/A** keys simultaneously to go from the regular display mode to the statistics mode.

Screen no. 1 max. values

Max. value of phase-neutral voltage U1_max

Max. value of phase-neutral voltage U2_max

Max. value of phase-neutral voltage U3_max

► **P** to display the min. values**Screen no. 1 min. values**

Min. value of phase-neutral voltage U1_min

Min. value of phase-neutral voltage U2_min

Min. value of phase-neutral voltage U3_min

► **P** to get back to max. values► **V/A** to get to the second screen

Screen no. 2

Max. value of phase-phase voltage U_{12_max}

Max. value of phase-phase voltage U_{23_max}

Max. value of phase-phase voltage U_{31_max}

► **P** to change from max. to min.

► **V/A** to get to the third screen

**Screen no. 3**

Max. value of the current I_{1_max}

Max. value of the current I_{2_max}

Max. value of the current I_{3_max}

► **P** to change from max. to min.

► **V/A** to get to the fourth screen

**Screen no. 4**

Max. value of system total power P_max

Max. value of system total reactive power Q_max

Max. value of system total apparent power S_max

Max. value of system average power factor PF_max

► **P** to change from max. to min.

► **V/A** to get to the fifth screen

**Screen no. 5**

Max. value of system total power demand Dmd_P_max

Max. value of system total reactive power demand

Dmd_Q_max

Max. value of system total apparent power demand

Dmd_S_max

Max. value of system frequency F_max

► **P** to change from max. to min.

► **V/A** to get to the first screen

► **P + V/A** simultaneously to get back to normal display mode

