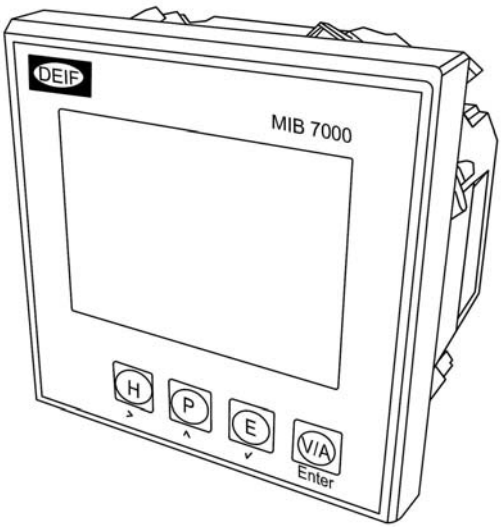
DEIF A/S

Installation Instructions and Reference Handbook

Multi-instrument MIB 7000/7020

4189320016A (UK)



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

CE

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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 MIB. 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.

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.

Product information

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

Installation instructions

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

Basic operation

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

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 instrument. If there is any doubt about how to install or operate the instrument, the company responsible for the installation or the operation of the instrument must be contacted.

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

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 MIB 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 multi-instrument MIB 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.

Measures true RMS values on all 1- or 3-phase network topologies with or without neutral and with both balanced and unbalanced load.

The MIB can replace a large number of standard analogue instruments in all electrical measuring applications.

It 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.

MIB 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 product family includes two versions:

- MIB 7000: basic version
- MIB 7020: basic + 2 digital outputs

Measured and calculated values

Voltage

Actual voltage of each phase-phase and phase-neutral.

Current

Actual current of each phase and neutral current.

Active power (P)

Active power of each phase.

Reactive power (Q)

Reactive power of each phase.

Apparent power (S)

Total apparent power.

Demand

Demand of each phase current, Active power and Reactive power.

Power factor (PF)

Power factor of each phase and total Power factor.

Frequency

Actual frequency of L1.

Digital outputs DO (Only MIB 7020)

For alarm output or energy pulse output

Min/Max

Min/max of Demand, Voltage, Current and Active/Reactive power.

Energy Pulse output (Only MIB 7020)

Energy pulse output (assign to import/export of real and reactive energy)

THD (up to 15. th. harmonics):

Voltage/Current THD of each phase.

Energy

Import and Export of energy, Inductive and capacitive of reactive Energy.

Alarm
Alarm can be related to any metering parameters (see “Setting of digital output” on page 29).

Running hour
Meters the duration of the operation.

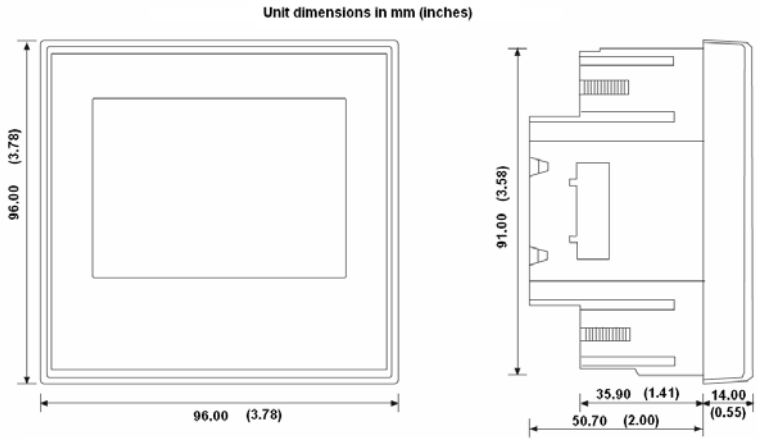
Unbalance factor
Voltage and Current.

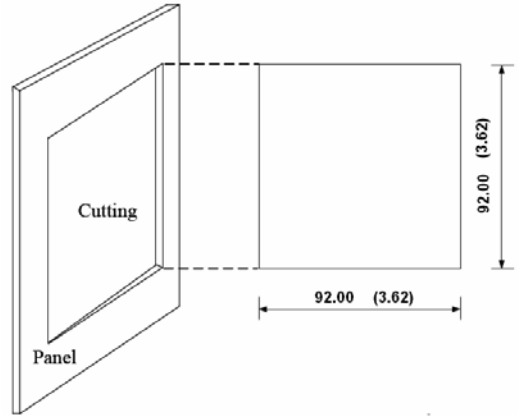
4. Installation instructions

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

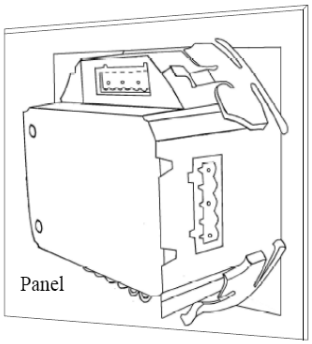
Installation of the MIB will involve working with dangerous currents and voltages. Professionals must handle these areas. If there is any doubt concerning the installation, the person responsible for the power installation should be contacted.

Mounting





Cutout



Use clips to fix the meter

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 in front view to other components in the switchboard.

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 MIB has the following rows of terminals on the rear side:

Current, voltage input and Aux. power terminals

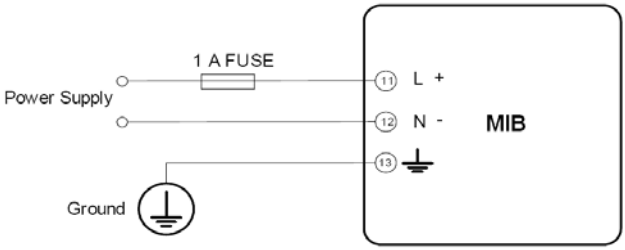
Terminal number	Description
1	I11 Current phase 1 in
2	I12 Current phase 1 out
3	I21 Current phase 2 in
4	I22 Current phase 2 out
5	I31 Current phase 3 in
6	I32 Current phase 3 out
7	V1 Voltage phase 1
8	V2 Voltage phase 2
9	V3 Voltage phase 3
10	Vn Voltage neutral
11	Auxiliary power supply L (+)
12	Auxiliary power supply N (-)
13	Safety Earth

Digital output terminals (MIB 7020 only)

MIB 7020

Terminal number	Description
14	DO1 Digital output
15	DO2 Digital output
16	DOC Digital output common

Auxiliary power supply



100~415V AC, 50-60Hz (100~300V DC) or 24~48V DC.
The wire of power supply could be AWG22-16 or 0.6-1.3mm2. A fuse (typically 1A/250V AC) should be used in auxiliary power supply loop.
For safety reasons we recommends to connect Terminal no.13 to the safety earth systems of switchgear.

Measuring connections

The MIB 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 MIB is 400 LN and 690V 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. Voltage range of PT1 is from 50-1.000.000V.

Voltage inputs:

- 3LN: 3-phase 4-line Y
- 2LN: 3-phase 4-line Y with 2 voltage transformers.
- 1LN. 1-phase 2-line
- 3LL: 3-phase 3-line direct connection.
- 2LL: 3-line open delta.

The MIB is designed to be used together with current transformers with secondary output 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.
Max. transformer ratio: 50000/5 or 10000/1

Current inputs:

- 3CT
- 2CT
- 1CT

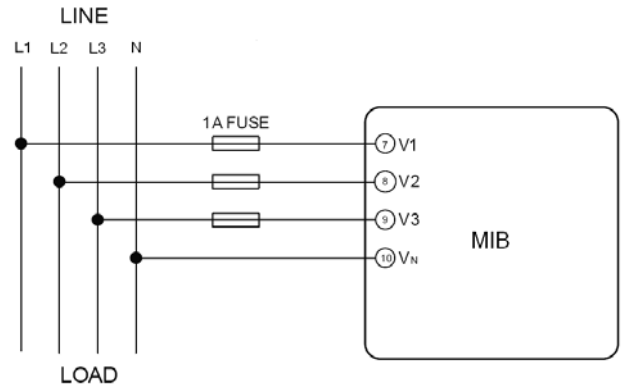
Any voltage mode can be grouped with any of the current modes.

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).

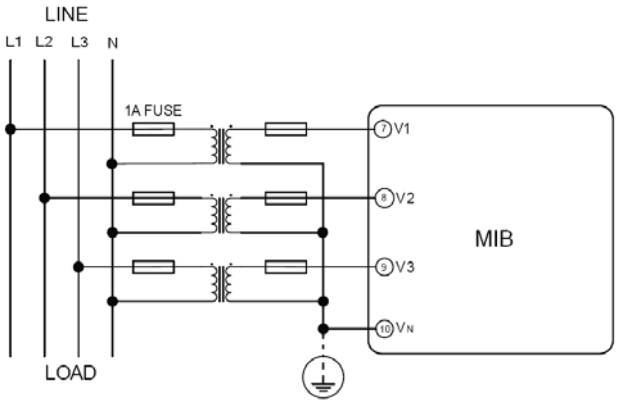
Voltage input wiring:

3LN. 3-phase 4-line Y

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



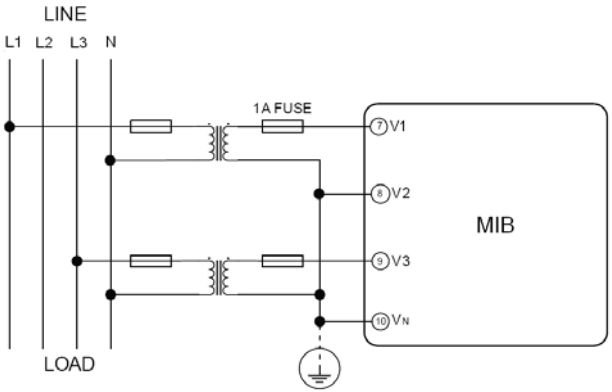
3LN direct connection



3LN connection with 3VTs

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

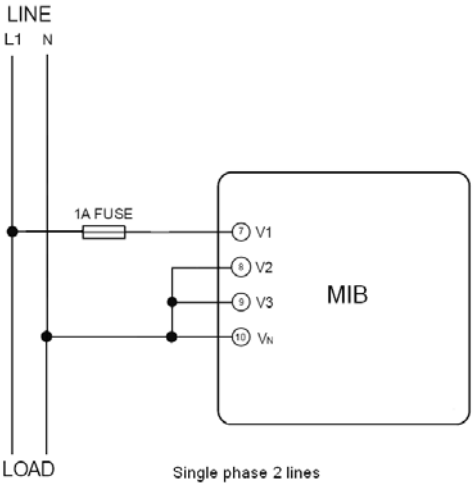
In some high voltage 3-phase 4-line Wye systems this mode is used. It is supposed that the 3 phases of the power system are in balance. The V2 voltage is calculated from the measured values of V1 and V3.



2LN connection with 2VTs

1LN. 1-phase 2-line

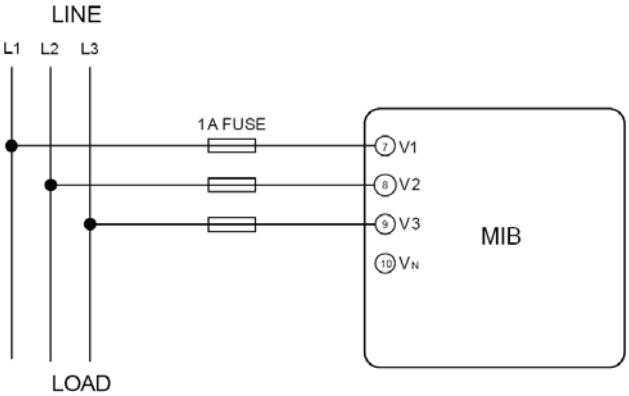
This connection is used for measurement on single phase systems



Single phase 2 lines

3LL. 3-phase 3-line direct connection

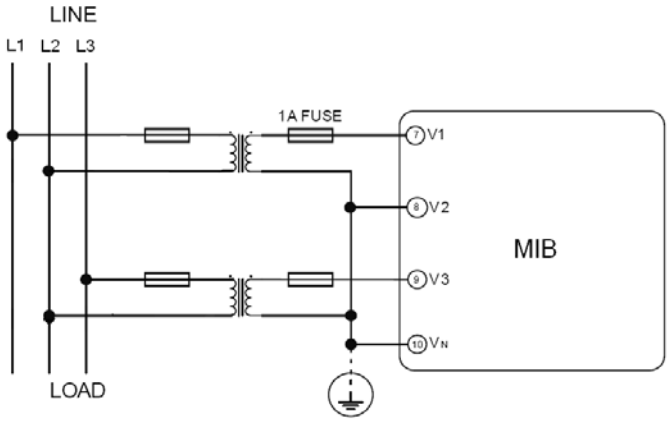
In a 3-Phase 3-Line system, power line L1, L2 and L3 are connected to V1, V2 and V3 directly. Vn is floated. The voltage input mode should be set to 3LL.



3LL 3-phase 3-line direct connection

2LL. 3-phase 3-line open delta

Open delta wiring mode is used in some applications.

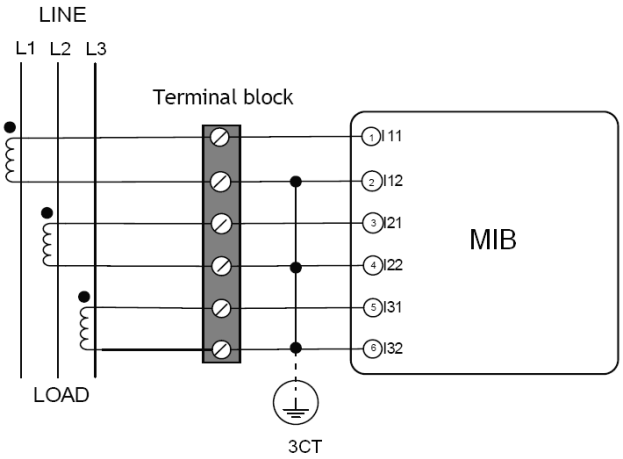


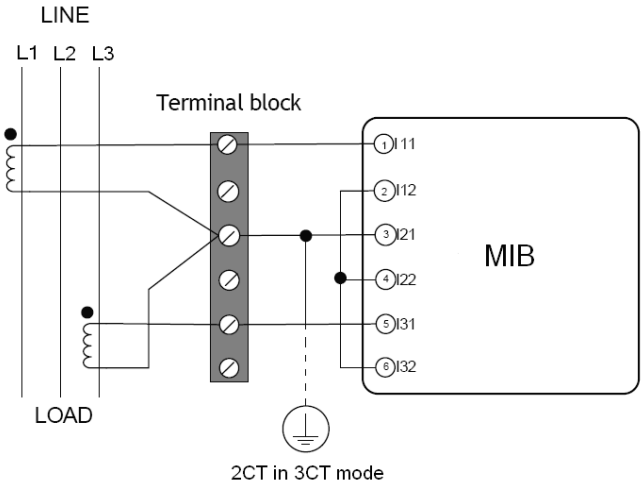
2LL with 2VTs

Current input wiring:

3CT

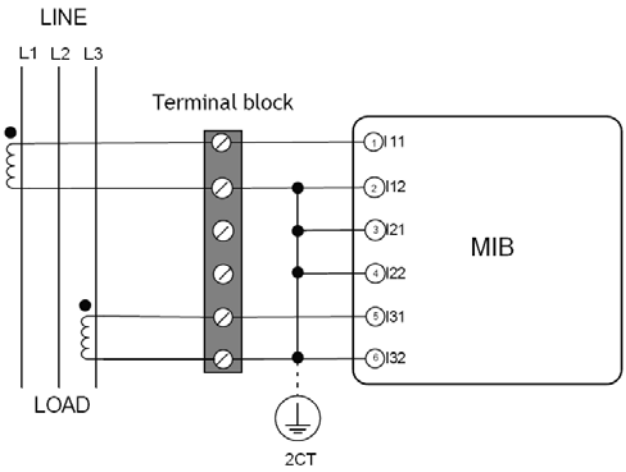
All the current inputs of the 3-phase system can be seen as 3CT one, whether there are 2 CTs or 3CTs on the input side. The current input mode of MIB should be set to 3CT for both couplings below.





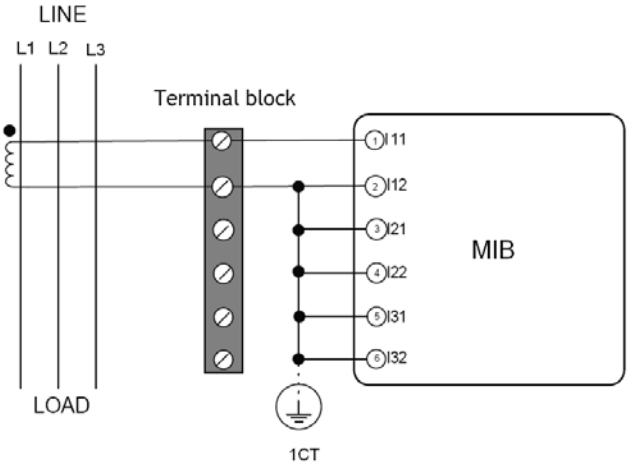
2CT

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 I1+I2+I3=0. The current in an N-wire cannot be calculated in this mode. The current input mode in MIB should be set to 2CT.



1CT

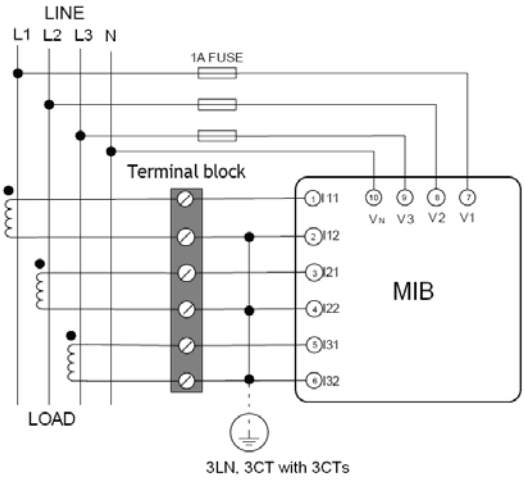
This connection with only one current transformer can be used, if the 3-phase system is in full balance. The other two phase currents are calculated according to the balance supposing. The current in an N-wire cannot be calculated in this mode.



Most used wiring method

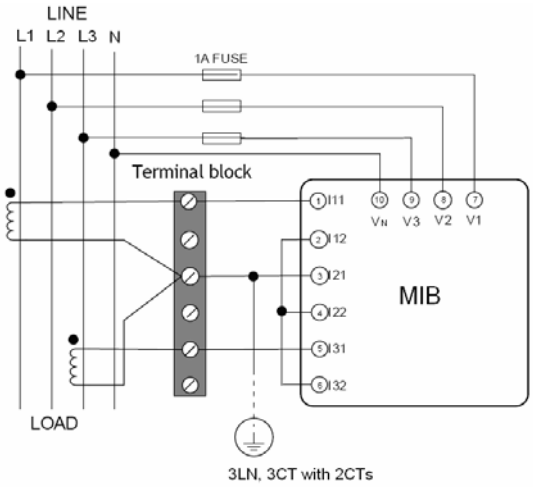
The voltage and current wiring method are put together in one drawing.
The MIB meter will only give correct readings if the settings of the meter and the wiring are correct.

3LN, 3CT with 3 CTs: Selected wire mode 3LN, 3CT



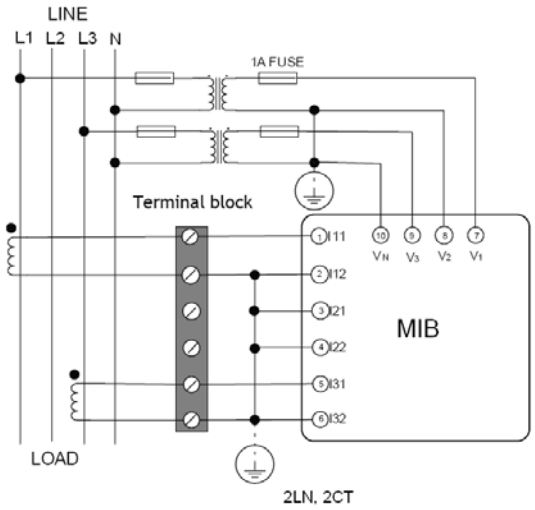
3LN, 3CT with 3CTs

3LN, 3CT with 2 CTs: Selected wire mode 3LN, 3CT

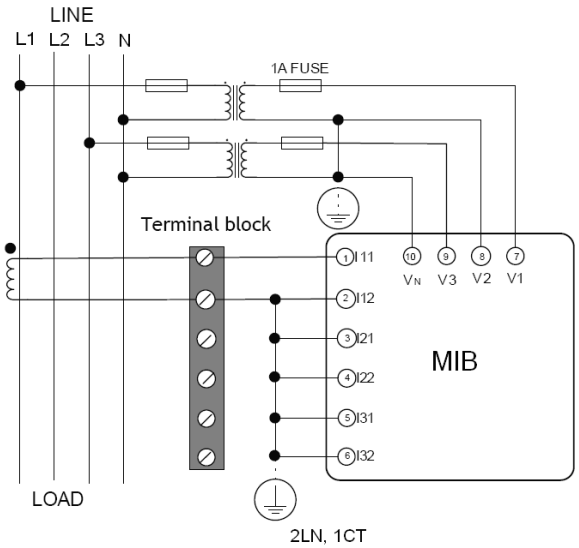


3LN, 3CT with 2CTs

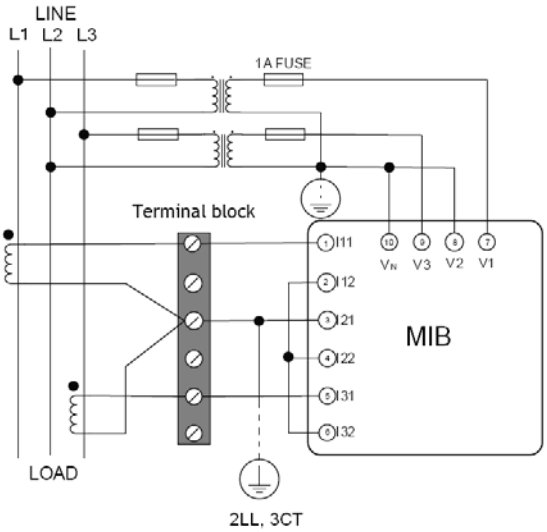
2LN, 2CT: Selected wire mode 2LN, 2CT



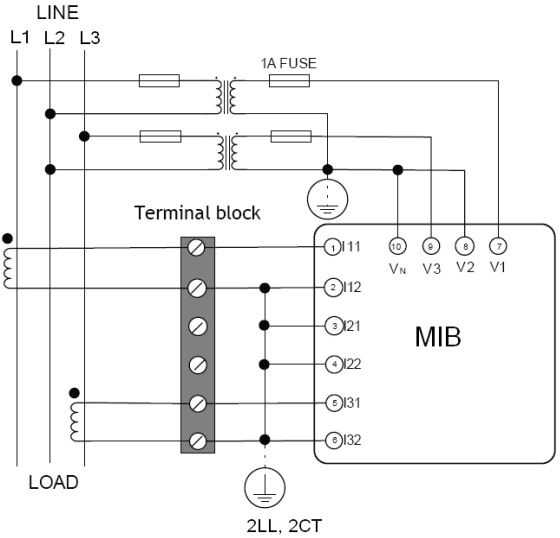
2LN, 1CT: Selected wire mode 2LN, 1CT



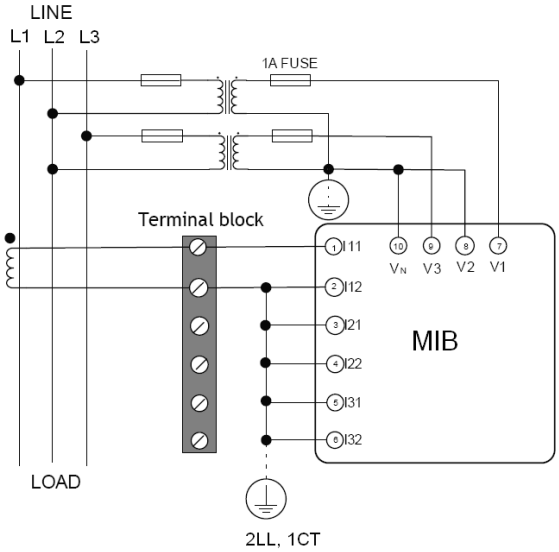
2LL, 2CT: Selected wire mode 2LL, 3CT



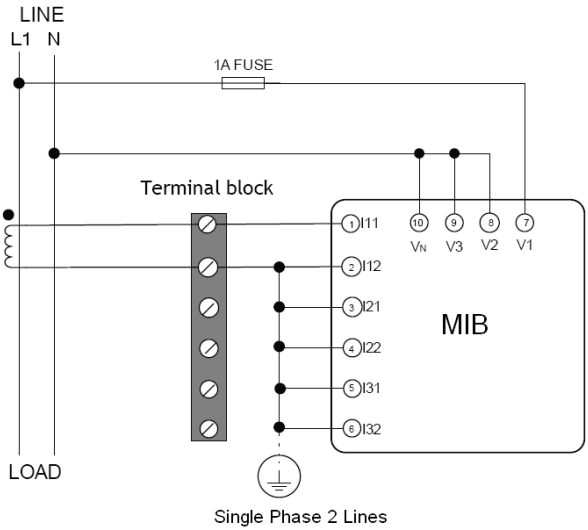
2LL, 2CT: Selected wire mode 2LL, 2CT



2LL, 1CT: Selected wire mode 2LL, 1CT



1LN, 1CT: Selected wire mode 1LN, 1CT



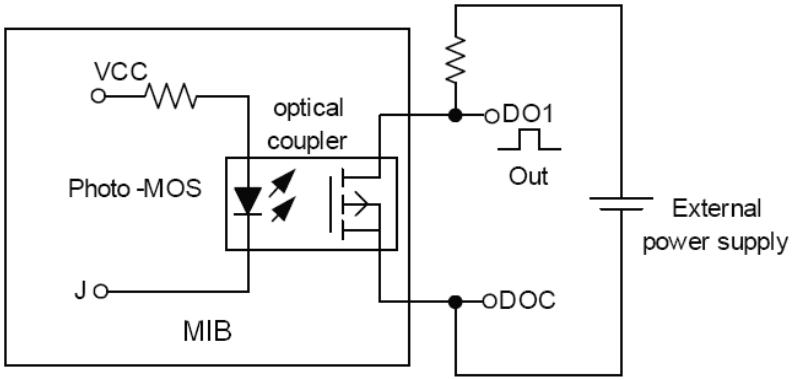
Digital output (only MIB 7020)

Digital output (DO)

There are two digital outputs in MIB 7020. The terminals of the digital outputs DO1, DO2 and DOC are 14, 15 and common 16. These two digital outputs can be used as energy pulse output or limit alarming outputs.

Digital output NE (normally energized) NC (normally closed) circuit form is Photo-MOS. The simplified circuit is as below:

Notice when no alarm is present the contact is closed (NC).



The Max output voltage and current are 250Vac/300Vdc and 50mA.

When the digital output is used as over/under limit alarm output High/low limit and alarm time can be set in System parameter settings.

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

System parameter setting

The System parameter setting mode is entered by pressing the > and Enter keys simultaneously in the normal display mode. The setup of the MIB via the front keys can be protected by an access code. The access code is a 4 digit number.

The factory default code: 0000.

Functionality of the four push-buttons in the System mode:
> to move the cursor one digit at a time
^ to increase the digit
v to decrease the digit
Enter to accept changes and move to next screen
> + Enter simultaneously to exit the System mode

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

Key in the correct access code: default = 0000, press **V/A** in order to go to the first parameter setting screen.

Screen no. 1

Voltage input wiring:
Voltage input wiring can be one of five modes:
3LN (normal), 1LN, 2LN, 2LL and 3LL
^ or v to select from 3LN, 2LN, 1LN, 2LL and 3LL
Enter to accept changes and move to next screen
Example: 3LN
Screen no. 2

Current input wiring:
Current input wiring can be one of three modes:
3CT, 2CT and 1CT
⋀ or ⋁ to select from 3CT, 2CT and 1CT
Enter to accept changes and move to next screen
Example: 3CT

Screen no. 3

Primary value of voltage transformer:
PT1 value is an integer from 50 to 1000000. Unit is Volt

> to move the cursor one digit at a time
⋀ to increase the digit
⋁ to decrease the digit
Enter to accept changes and move to next screen
Example: 380V

Screen no. 4

Secondary value of voltage transformer:
PT2 value is an integer from 50 to 400. Unit is Volt.
> to move the cursor one digit at a time
⋀ to increase the digit
⋁ to decrease the digit
Enter to accept changes and move to next screen
Example: 380V

Screen no. 5

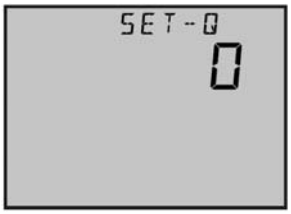
Primary value of current transformer:
CT1 value is an integer from 5 to 50000. Unit is Amp.
> to move the cursor one digit at a time
⋀ to increase the digit
⋁ to decrease the digit
Enter to accept changes and move to next screen
Example: 5A

Screen no. 6

Secondary value of current transformer:
CT2 is constant 5A. Unit is Amp.
Enter to accept changes and move to next screen
Example: 5A

Screen no. 7

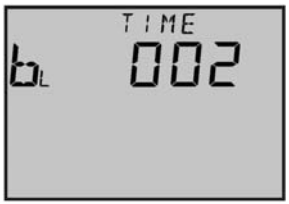
Definition of reactive power (see page 39):



Definition setting of reactive power:
0: Sinusoidal reactive power.
1: Budeanu's reactive power.
^ to increase the digit
v to decrease the digit
Enter to accept changes and move to next screen
Example: Sinusoidal reactive power

Screen no. 8

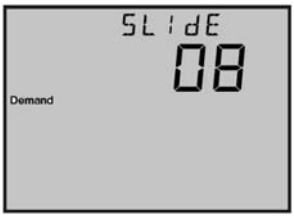
Backlight on-time:



The on-time can be set from 0 to 120 minutes
0 minutes = always "on"
After the preset on-time has expired and
none of the keys have been touched, the back light
will turn off automatically.
> to move the cursor one digit at a time
^ to increase the digit
v to decrease the digit
Enter to accept changes and move to next screen
Example: 2 minutes "on".

Screen no. 9

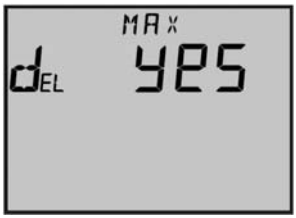
Total sliding windows time of demand:



Total sliding windows time of demand is from: 1-30 minutes
The window slides constant once per minute.
> to move the cursor one digit at a time
^ to increase the digit
v to decrease the digit
Enter to accept changes and move to next screen
Example: Total sliding windows time: 8 minutes

Screen no. 10

Reset of Max and Min:



^ and v to change between Yes and No.
Enter to accept changes and move to next screen
Example: YES to reset both Max and Min.

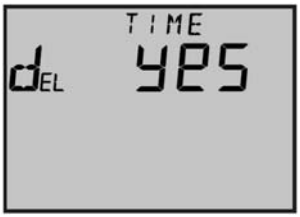
Screen no. 11

Lock/unlock reset function of saved energy:
Enable to reset energy data saved in MIB.
1 = enable (possible to reset counters)
0 = disable (impossible to reset counters)
⋀ and ⋁ to change between 1 and 0.
Enter to accept changes and move to next screen
Example: enable

Screen no. 12

Reset saved energy data:
"Yes" = reset energy data
"No" = do not reset energy data
⋀ and ⋁ to change between Yes and No.
Enter to accept changes and move to next screen
Example: do not reset energy data

Screen no. 13



Reset of running hours:
"Yes" = reset running hours
"No" = do not reset running hours
⋀ and ⋁ to change between Yes and No.
Enter to accept changes and move to next screen
Example: reset of running hours

Screen no. 14

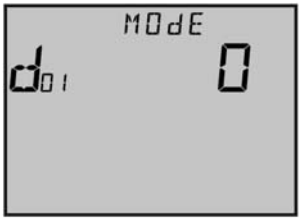
New access code:
The access code can be changed in here. It's important to remember the new access code.
> to move the cursor one digit at a time
⋀ to increase the digit
⋁ to decrease the digit
Enter to accept changes and move to next screen
Example: 0001

Setting of Digital output: DO1+2 (MIB 7020 only)

MIB 7020 has two digital outputs. Each can operate as energy pulse or alarm output.
Accessing Parameter settings for the 2 digital outputs:
> and Enter simultaneity: System parameter setting mode
Enter **:** 1 step down.
^ and v simultaneity: DO parameter setting mode
^ and v simultaneity: Exit from DO to System parameter setting mode
> and Enter simultaneity: Exit from System parameter setting mode to display mode.
The following screens show how to setup the DO:

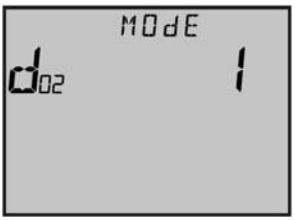
Screen no. 1

DO1 output mode:
0 = pulse output
1 = alarm output
^ to increase the digit
v to decrease the digit
Enter to accept changes and move to next screen
Example: DO1 setup to pulse output



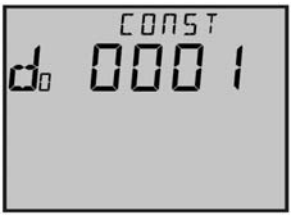
Screen no. 2

DO2 output mode:
0 = pulse output
1 = alarm output*
^ to increase the digit
v to decrease the digit
Enter to accept changes and move to next screen
Example: DO2 set to alarm output
*Jump to screen no. 7



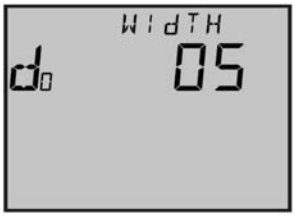
Screen no. 3

Pulse rate:
Pulse rate means the amount of energy per pulse.
Integer from 1 to 6000.
1 digit is 0.1KWh or 0.1KVarh
> to move the cursor one digit at a time
^ to increase the digit
v to decrease the digit
Enter to accept changes and move to next screen
Example: Pulse rate is 1 x 0.1KWh (1 pulse/0.1KWh)



Screen no. 4

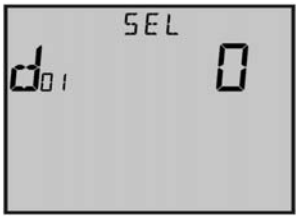
DO pulse width:



Integer from 1 to 50
1 digit is 20ms
> to move the cursor one digit at a time
^ to increase the digit
v to decrease the digit
Enter to accept changes and move to next screen
Example: Pulse width = 5, equal to 100ms (5 x 20ms)

Screen no. 5

DO1 output energy parameter:

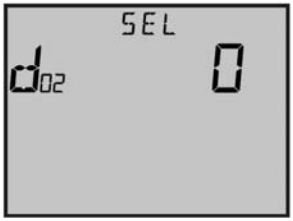


DO1 output can be one of the energy items shown below
^ to increase the digit
v to decrease the digit
Enter to accept changes and move to next screen
Example: DO1 output energy = no output

Item value	0	1	2	3	4
Energy select	No output	Ep_imp	Ep_exp	Eq_imp	Eq_exp

Screen no. 6

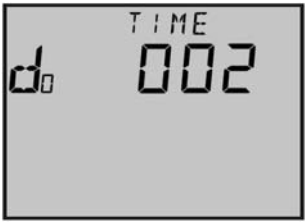
DO2 output energy parameter:



DO2 output can be one of the energy items shown below
^ to increase the digit
v to decrease the digit
Enter to accept changes and move to next screen
Example: DO2 output: no output

Item value	0	1	2	3	4
Energy select	No output	Ep_imp	Ep_exp	Eq_imp	Eq_exp

Screen no. 7



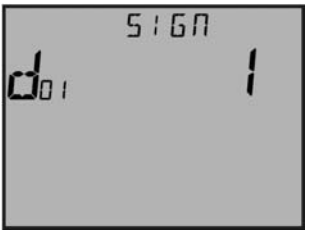
DO alarm time:
This is the time the alarm has to be present before DO alarm will be activated.
Time is also “delay” before DO alarm will deactivate after the alarm is no longer present.
Integer from 0 to 255
1 digit is 300ms.
> to move the cursor one digit at a time
^ to increase the digit
V to decrease the digit
Enter to accept changes and move to next screen
Example: DO = 2 equal to 600ms (2x300ms)

Screen no. 8

DO1 alarm output items:
DO1 alarm output can be one of the items shown below.
> to move the cursor one digit at a time
^ to increase the digit
V to decrease the digit
Enter to accept changes and move to next screen
Example: DO1 alarm output = V31 line voltage

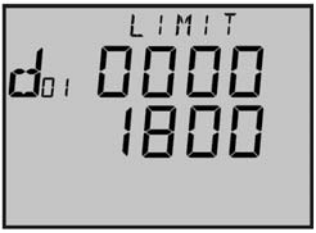
Var	0	1	2	3	4	5	6	7
item	Hz	V1	V2	V3	V12	V23	V31	I1
Var	8	9	10	11	12	13	14	15
item	I2	I3	In	P1	P2	P3	Psum	Q1
Var	16	17	18	19	20	21	22	23
item	Q2	Q3	Qsum	Ssum	PF1	PF2	PF3	PFsum
Var	24	25	26	27	28	29	30	
item	U_unbl	I_unbl	Dmd_P	Dmd_Q	Dmd_I1	Dmd_I2	Dmd_I3	

Screen no. 9



DO1 alarm function:
1 = high alarm
0 = low alarm
High alarm: Alarm if the input exceeds the alarm setpoint.
Low alarm: Alarm if input is under alarm setpoint.
^ to increase the digit
V to decrease the digit
Enter to accept changes and move to next screen
Example: DO1 = high alarm

Screen no. 10



DO1 alarm limit:
> to move the cursor one digit at a time
^ to increase the digit
v to decrease the digit
Enter to accept changes and move to next screen
Example: DO1 limit = 1800

Screen no. 11

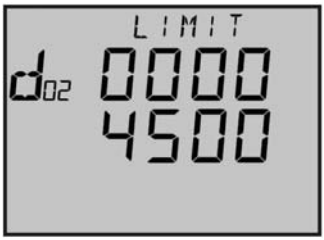
DO2 alarm output items:
DO2 alarm output can be one of the items shown below.
> to move the cursor one digit at a time
^ to increase the digit
v to decrease the digit
Enter to accept changes and move to next screen
Example: DO2 alarm output = I2 current

Var	0	1	2	3	4	5	6	7
item	Hz	V1	V2	V3	V12	V23	V31	I1
Var	8	9	10	11	12	13	14	15
item	I2	I3	In	P1	P2	P3	Psum	Q1
Var	16	17	18	19	20	21	22	23
item	Q2	Q3	Qsum	Ssum	PF1	PF2	PF3	PFsum
Var	24	25	26	27	28	29	30	
item	U_unbl	I_unbl	Dmd_P	Dmd_Q	Dmd_I1	Dmd_I2	Dmd_I3	

Screen no. 12

DO2 alarm function:
1 = high alarm
0 = low alarm
High alarm: alarm over the alarm limit
Low alarm: alarm under the alarm limit.
^ to increase the digit
v to decrease the digit
Enter to accept changes and move to next screen
Example: DO2 = high alarm

Screen no. 13



DO2 alarm limit:
> to move the cursor one digit at a time
^ to increase the digit
v to decrease the digit
Enter to accept changes and move to screen no. 1
Example: DO2 limit = 4500

Description of measurement and functions of the MIB

Almost all the electric parameters in power systems can be measured by MIB. Some of the parameters which are special will be described in this part.

Reactive power (Q): MIB adopts two definitions of reactive power.

1. Sinusoidal reactive power. The formula is as follows:

$$Q^2 + D^2 = S^2 - P^2$$

2. Nonsinusoidal reactive power. The formula is as follows:

$$Q' = \sqrt{Q^2 + D^2}$$

Where Q_D: Budeanu's distortion power.
Q: Budeanu's reactive power.

Apparent power (S): System total apparent power is measured and Displayed.

Power factor (PF): Three phase power factor and system total power factor are measured and displayed.

Frequency (F): The frequency of L1 phase voltage input is measured as system frequency.

Energy (kWh): Energy is time integral of power. The unit is kWh.

Import energy (imp): "-"
Export energy (exp): "+" is not shown in display
Reactive energy (kVArh): reactive energy is time integral of reactive power. The unit is kVArh.
Import energy (imp): capacitive energy
Export energy (exp): inductive energy.

Energy terms are based on the generator method.

Harmonic parameter:

Total harmonic distortion: this factor is often used to express the power quality of the power system. The formula is as follows:

$$THD = \sqrt{\sum_{h=2}^{\theta}\left(\frac{U_h}{U_1}\right)^2} \times 100$$

In the formula, U1 is RMS value of the voltage fundamental and Uh is RMS value of the voltage harmonic with order n.

Each harmonic rate: the percentage of each harmonic divided by fundamental.

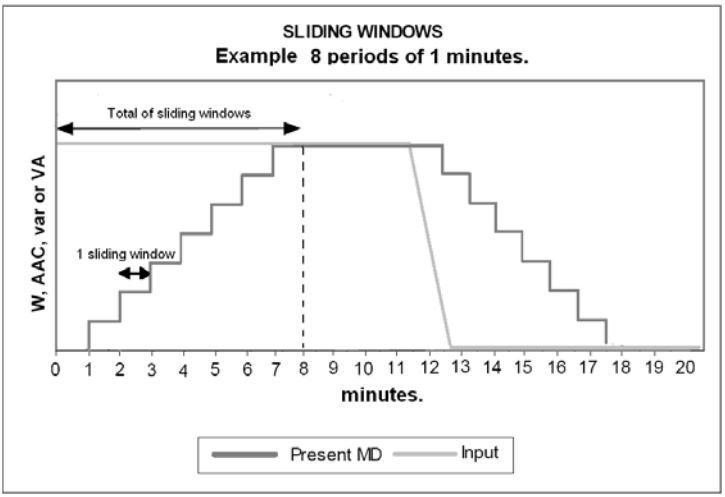
$$HRU_h = \frac{U_h}{U_1} \times 100 \qquad HRI_h = \frac{I_h}{I_1} \times 100$$

Demand: demand of total power and reactive power of system, demand of three-phase current. The demand statistics method in MIB is sliding windows. The total sliding windows time can be chosen from 1 to 30 minutes. Each window slides once per minute.

Example: the sliding window time is supposed to be three minutes. If average power of the 1st minute is 12, 14 of the 2nd minute and 3rd minute is 10.

Result of the total power demand the last three minutes is:

(12+14+10)/3 = 12 at the end of the 3rd minute. If another minute passed, the average power of the minute is then 9, then the total power demand of the last three minutes is (14+10+9)/3 = 11 at the end of the 4th minute.



Unbalance factor: MIB can measure the unbalance factor of three-phase voltage and current, using the method of sequence vector.
Max/Min: MIB can measure the max value of a system's total power, reactive power and apparent power and the max/min of the three-phase voltage and current. The value of the measured data is stored in NV-RAM.

Alarm function
When the measured data value has reached the pre-set alarm limit and pre-set alarm time has expired, an alarm will be generated.

Digital output (only MIB 7020)

The digital output (DO) can be used as trigger to light or sound alarming. An example is given below to describe how the over-limit alarming works.

Example DO1+2 Alarm output:
Alarm when current I1 goes over 1A and duration is over 15 seconds, a high-limit alarm will be generated:

1. Set the mode of DO1 as alarming output, namely the value of DO1 mode is set to 1;

2. Alarm time set to 15 seconds, 1 digit is 300ms

The setting value of Alarm time is then: 15÷0.3 = 50.

3. Alarm output item is I1, and then value must be set to 7.

4. I1 must be higher than 1A, so the alarm function must be set to 1
High alarm = 1.

5. Setting of alarm limit = 1A (use direct primary values)

Energy pulse output:
The two digital outputs can be used as energy pulse outputs. The output energy can be selected among all kinds of active and reactive energy terms. Pulse rate and pulse width can be set to meet the requirements.
Pulse constant is the amount of kWh for each pulse.
Pulse width is the time that a pulse lasts.
When the accumulated energy reaches the pulse rate value, there will be a pulse on DO.

Related parameters: pulse energy output ranges from 0 to 4 corresponding to none, Ep_imp, Ep_exp, Eq_imp, Eq_exp.
Pulse rate ranges from 1 to 6000 (integer) with a unit of 0.1kWh (kVArh), apparently that is the resolving power of energy output.
Pulse width ranges from 1 to 50 (integer) with a unit of 20ms. The narrowest interval between two pulses is 20ms.
In practice the pulse width and the pulse ratio are selected according to system power. The relation of the two parameters should satisfy the following expression:

$$\text{Pulse rate} > [(\text{pulse width} + 1) \times \text{Pmax}] \div 18000$$

In the expression, the Pmax is the maximum power or reactive power.
The unit is kW or kVAr. Recommended pulse rate is 3 to 5 times the right side value of the above expression.

5. Basic operation

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

Display

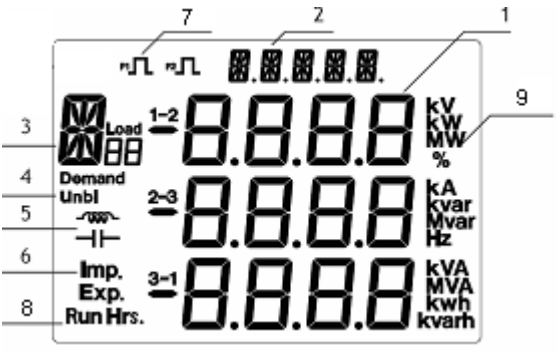
The display panel with white backlight is used for presentation of all measured values and for displaying of the selected function during the setup process.

There are four push-buttons in the front panel used for navigation in the 3 modes:

Display mode: Press Keys, **H** = Power quality, **P** = Power, **E** = Energy and **V/A** = Volt/Ampere.

System mode: Press > and Enter keys simultaneously
> to move the cursor one digit at a time
^ to increase the digit
v to decrease the digit
Enter to accept changes and move to next screen

Statistic mode: Press ▶ and ▼ keys simultaneously



SN	display	Description
1	Three lines of "8 "letter in the metering area	Display metering data Voltage, current, power, power factor, THD, frequency, demand, unbalance factor, max, min etc.
2	Status display area One line "MAX" letter at the top of display panel	Display currant status Meter: metering status; Max: maximum value; Min: minimum value; THD: display THD: Harmo: display data is harmonic.
3	Item label	Item label U: voltage, I: Current, P: active power; q: reactive power; PF: power factor; when display harmonic rate, the little 8 letter displays harmonic number.
4	3-phase unbalance Unbl	Unbalance label
5	Load nature	Capacitor label: capacitive load; Inductor label: inductive load.
6	Energy label Imp. Exp.	Imp: consumption energy; exp: generating energy
7	Energy pulse output indicator P1 P2.	No label: no pulse output With label: pulse output
8	Time label Run Hrs.	With label: display running time
9	Unit	Indicate data unit Voltage: V, kV, Current: kA, A, Power: kW and MW, Reactive Power: kvar and Mvar, Apparent Power: kVA and MVA, Frequency: Hz, Energy: kWh, Reactive Power: kvarh, Percentage: %

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 to navigate between the measured and calculated values of your power system.

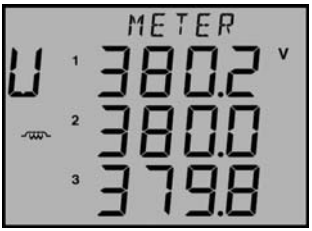
Voltage and current data

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
Load nature inductive

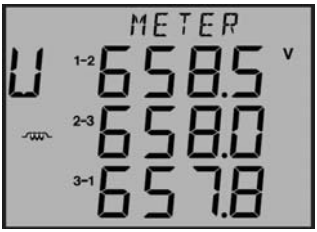
►V/A



Screen no. 2

Phase-phase voltage U12
Phase-phase voltage U23
Phase-phase voltage U31
Load nature inductive

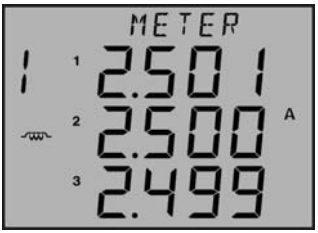
►V/A



Screen no. 3

Current I1
Current I2
Current I3
Load nature inductive

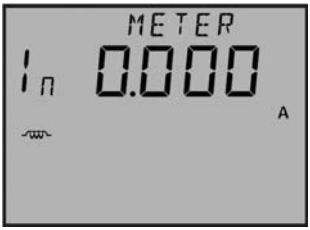
►V/A



Screen no. 4

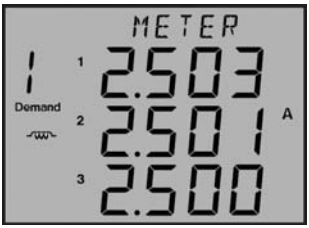
Neutral current (In)

►V/A



Screen no. 5

Demand of current on each phase: (Sliding window)
Dmd_I1
Dmd_I2
Dmd_I3



Note: when the voltage wiring of the meter is set to 2LL, there is no phase voltage and natural current screen shown in display

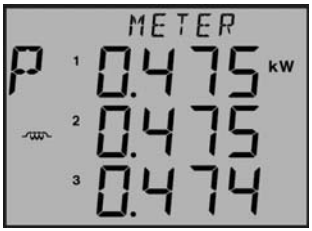
Power related data

Press the "P" key to read power related data.

Screen no. 1

Phase power P1
Phase power P2
Phase power P3
Load nature inductive

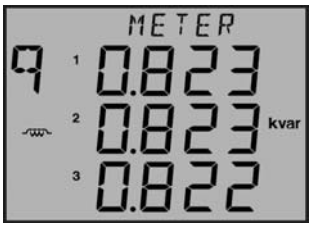
► P



Screen no. 2

Phase reactive power Q1
Phase reactive power Q2
Phase reactive power Q3
Load nature inductive

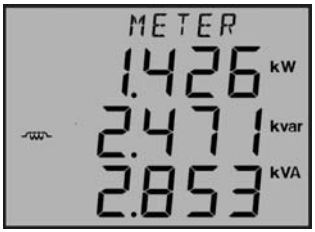
► P



Screen no. 3

System total power
Reactive power
Apparent power
Load nature inductive

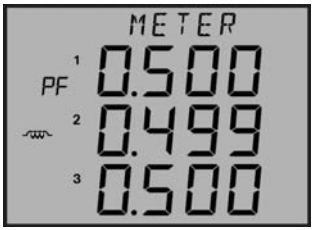
► P



Screen no. 4

Phase power factor PF1
Phase power factor PF2
Phase power factor PF3
Load nature inductive

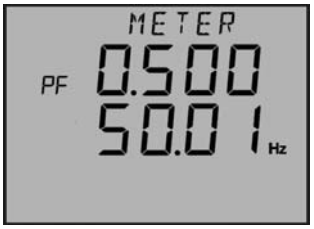
► P



Screen no. 5

System average power factor
System frequency F.

► P



Screen no. 6

Active power:
demand Dmd_P

Reactive power:
Demand Dmd_Q

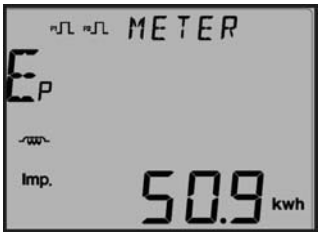
Note: when the voltage wiring of the meter is set to 2LL or 3LL, there is no phase power, phase reactive power and phase power factor shown in display.

Energy and running hour counters

Press the “E” key to read energy run time data.

Screen no. 1

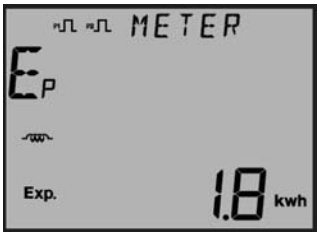
Import energy counter: Ep_imp



► E

Screen no. 2

Export energy counter: Ep_exp



► E

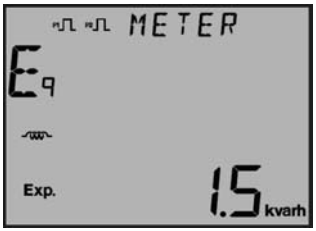
Screen no. 5

Import reactive energy: Eq_imp

► E

Screen no. 6

Export reactive energy counter: Eq_exp



► E

Screen no. 7

Run time: Run_Hour

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

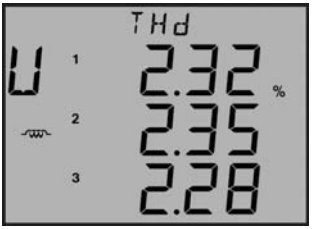
Power quality data

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

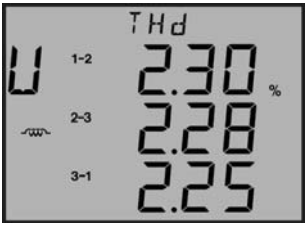
or



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

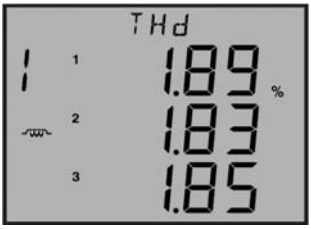
THD of phase-phase voltage THD_U12
THD of phase-phase voltage THD_U23
THD of phase-phase voltage THD_U31

► **H**



Screen no. 2

THD of phase current THD_I1
THD of phase current THD_I2
THD of phase current THD_I3

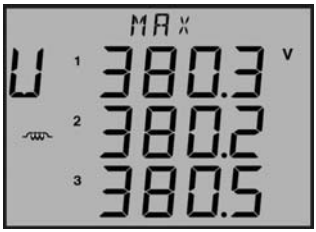


► H to get back to the first screen

Statistics data

Press the **H** and **E** keys simultaneously to go from the regular display mode to the statistic mode.
Max/Min values can be reset in system mode.

Screen no. 1



Max. value of phase-neutral voltage U1_max
Max. value of phase-neutral voltage U2_max
Max. value of phase-neutral voltage U3_max

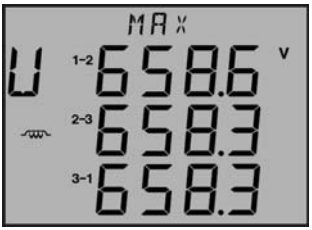
►V/A

Screen no. 2

Min. value of phase-neutral voltage U1_min
Min. value of phase-neutral voltage U2_min
Min. value of phase-neutral voltage U3_min

►V/A

Screen no. 3



Max. value of phase-phase voltage U12_max
Max. value of phase-phase voltage U23_max
Max. value of phase-phase voltage U31_max

►V/A
Screen no. 4 change from max. to min.

►V/A

Screen no. 5

Max. value of the current I1_max
Max. value of the current I2_max
Max. value of the current I3_max

►V/A
Screen no. 6 change from max. to min.

►V/A

Screen no. 7

Max value of demand
Current:
I1_Demand_Max
I2_Demand_Max
I3_Demand_Max

►V/A

Display the Max Demand of Active/Reactive power demand.

►P

Screen no. 1

Max Demand
power and reactive power

P_Demand_Max = 1.435kW

Q_Demand_Max = 2.478kvar

Display power quality parameter

►H

Screen no. 1

Unbalance factor of three-phase
Voltage and current in %
Unbl Voltage: 0.3%
Unbl Current: 0.5%

►H

Screen no. 2 (phase - neutral voltage selected)

The screen will roll from 2nd harmonic rate of voltage and current to 15th harmonic rate press “H” each time.

2nd Harmonic of U1
2nd Harmonic of U2
2nd Harmonic of U3
Load nature inductive

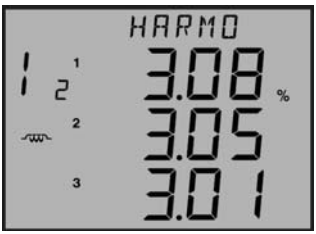
Screen no. 2 (Phase - Phase voltage selected)

2nd Harmonic of U12
2nd Harmonic of U23
2nd Harmonic of U31
Load nature inductive

Press “H” key in turn, to display up to 15th voltage harmonic.

►H

Screen no. 16



2nd harmonic rate of Current:
2nd Harmonic of I1
2nd Harmonic of I2
2nd Harmonic of I3
Load nature inductive

Press “H” key in turn, to display up to 15th current harmonic.