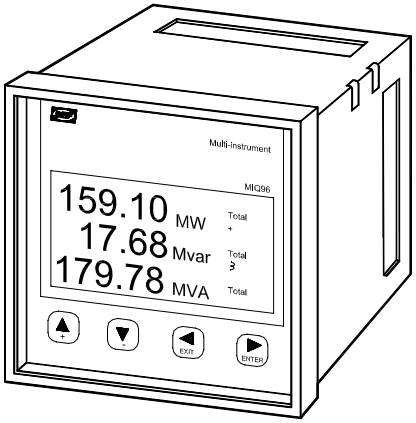
DEIF A/S

User's manual

Multi-instrument type MIQ96

4189320005D (UK)



- *All 1- or 3-phase AC measurements (RMS) in one unit:*
  - *U_{RMS}, I_{RMS}, f*
  - *P, Q, S, PF (cos φ)*
  - *kWh, kvarh, kVA*
  - *MD, THD*
- *Programmable CT and VT ratio*
- *Programmable connections 1W, 1W3, 2W3, 1W4, 3W4*
- *2 impulse outputs for kWh import, kvarh import (option)*
- *Serial output (option)*

CE

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List of contents

1. Warnings, regular information and remarks referring to CE-marking

In this manual installations and working instructions for the multi-instrument MIQ96 are to be found. Installation as well as use of the MIQ96 will involve working with dangerous currents and voltages. Professionals must handle these areas. DEIF does not take on responsibility for the use and installation. If any doubt comes up concerning the installation or use of the system, on which the MIQ96 is to be used for measurement, the person responsible for the power installation should be contacted.

The MIQ96 is CE-marked according to the EMC-directive for housing and light industry, which normally covers the most common use of the multi-instrument.

Important: CTs must be short-circuited, before the wires are moved from terminals on the multi-instrument.

The delivery contains:

- Multi-instrument MIQ96
- User's manuals

2. Application and description of function

The MIQ96 multi-instrument is a microprocessor-based unit for measurement of all electrical values in a 1- or 3-phase grid. Application of this unit is possible in all installations where these parameters are to be measured. All measured values are shown on the built-in display. Moreover the measurements can be transmitted as digital output and RS 485 (see options).

The MIQ96 can replace many analogue instruments in installations for measuring of electrical values and can be used as a conventional instrument and/or as a unit for transmitting values by the serial communication to a remote control base. Also the digital outputs can be connected to a local control system.

All kinds of grids can be connected to the multi-instrument. Both with and without neutral - as well as balanced and unbalanced load. The unit contains all necessary loops for measurements and all values are displayed on an LCD. Information is presented in clear text and shown as actual values.

Characteristic of the MIQ96 is the flexible set-up for different grid connections, CTs, VTs, languages et cetera, which ensures the user an easy adaptation of the unit to the wanted application. The set-up parameters and the reset of counters and peak values can be protected by passwords.

3. Options

Option 1: The RS 485 remote control of all values and possible changes of set-up, reset of counters and peak values.
The MIQ96 implements a subset of the AEG Modicon Modbus RTU serial communications standard.
Serial Interface Manual and free utility software can be downloaded from DEIF's homepage www.deif.com.

Option 2: Relay output for kWh import and kvarh import.

4. Valid measurements

The MIQ96 is supplied configured in 3-phase 4-wire unbalanced. This variation may be reconfigured via the front panel or remote communications as follows:

- 1b (1W) Single phase connection.
- 3b (1W3) Three-phase three-wire connection with balanced load.
- 3u (2W3) Three phase three-wire connection with unbalanced load.
- 4b (1W4) Three-phase four-wire connection with balanced load.
- 4u (3W4) Three-phase four-wire connection with unbalanced load.

Also see the external wiring diagram section 16.2 page 31.

Parameter	Connection type				
	1W	1W3	1W4	3W4	2W3
U_1	•		•	•	
U_2			•	•	
U_3			•	•	
$\overline{U}$	•		•	•	
U_{12}		•	•	•	•
U_{23}		•	•	•	•
U_{31}		•	•	•	•
$\overline{U}\Delta$		•	•	•	•
φ_{12}		•	•	•	•
φ_{23}		•	•	•	•
φ_{31}		•	•	•	•
f	•	•	•	•	•
I_1	•	•	•	•	•
I_2				•	•
I_3				•	•

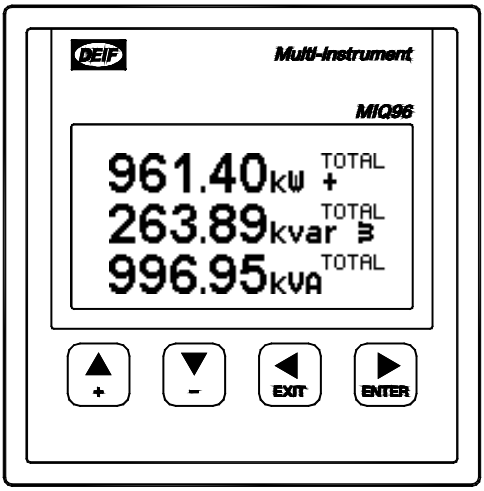
Parameter	Connection type				
	1W	1W3	1W4	3W4	2W3
I_t	•	•	•	•	•
I_n				•	
P_1	•		•	•	
P_2			•	•	
P_3			•	•	
P_t	•	•	•	•	•
$\cos\varphi_1$	•		•	•	
$\cos\varphi_2$			•	•	
$\cos\varphi_3$			•	•	
$\cos\varphi_t$	•	•	•	•	•
Q_1	•		•	•	
Q_2			•	•	
Q_3			•	•	
Q_t	•	•	•	•	•
S_1	•		•	•	
S_2			•	•	
S_3			•	•	
S_t	•	•	•	•	•
THD (U_1)	•		•	•	
THD (U_2)			•	•	
THD (U_3)			•	•	
THD (U_{12})		•	•	•	•
THD (U_{23})		•	•	•	•
THD (U_{31})		•	•	•	•
THD (I_1)	•	•	•	•	•
THD (I_2)				•	•
THD (I_3)				•	•

5. Measured parameters

Instantaneous measurements	Parameters
Phase voltages	U_1, U_2, U_3
Average phase voltage	$\overline{U}$
Line voltages	U_{12}, U_{23}, U_{31}
Average line voltage	$\overline{U\Delta}$
Angle between phases	φ_{12}, φ_{23}, φ_{31}
Current	I_1, I_2, I_3, I_t
Neutral current	I_n
Active power	P_1, P_2, P_3, P_t
Reactive power	Q_1, Q_2, Q_3, Q_t
Apparent power	S_1, S_2, S_3, S_t
Power factor	$\cos\varphi_1$, $\cos\varphi_2$, $\cos\varphi_3$, $\cos\varphi_t$
THD (Total harmonic distortion)	THD (I_1, I_2, I_3, U_1, U_2, U_3, U_{12}, U_{23}, U_{31})
Frequency	f
Integrated / maximum demands	
Maximum demand	I_t, P_t, Q_t, S_t
Energy	Wh_t, $varh_t$

6. Display and key-pads

The graphic LCD with yellow/green backlight is used for presentation of measured values and for displaying of the chosen function during set-up.



Up arrow key. Up through the main menus.
+ increases a value in the menu "Setting".

Down arrow key. Down through the main menus.
- decreases a value in the menu "Setting".

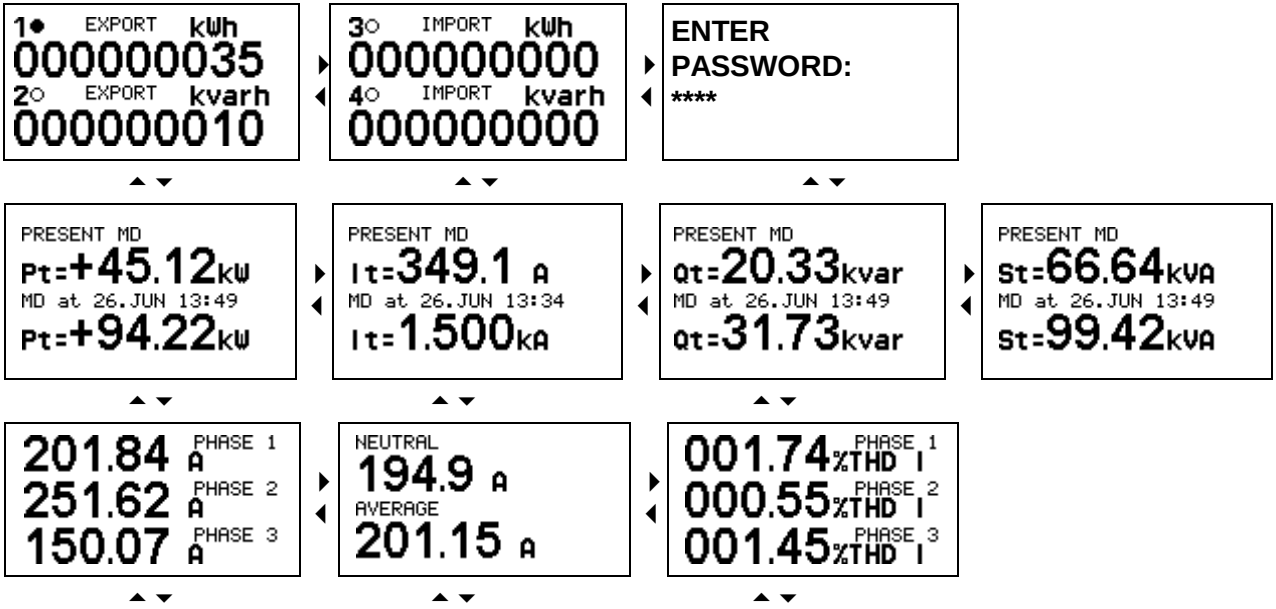
Left arrow key. Left through the sub-menus.
"Exit" - skip of action by key-in or by changing in the menu "Setting".

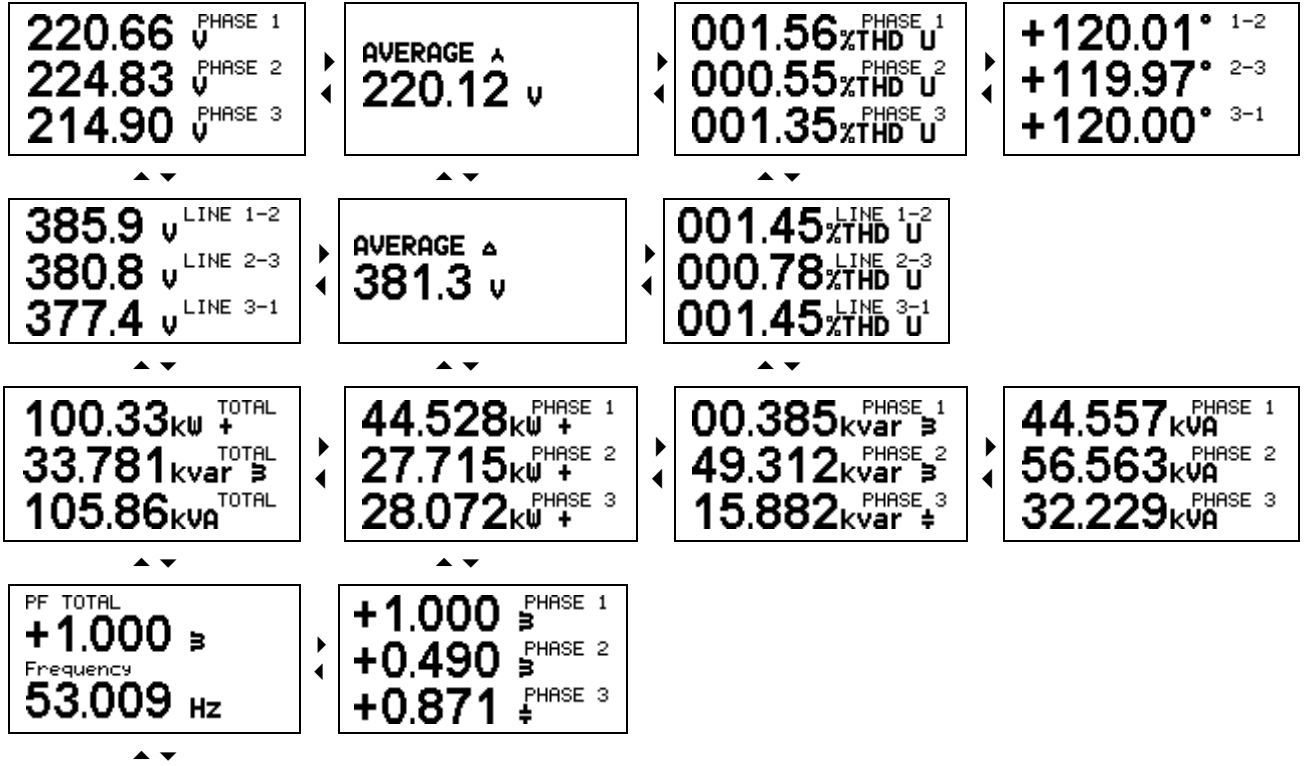
Right arrow key. Right through the sub-menus.
"Enter" - accept of changes in the menu "Setting" or reset of counters and peak values.

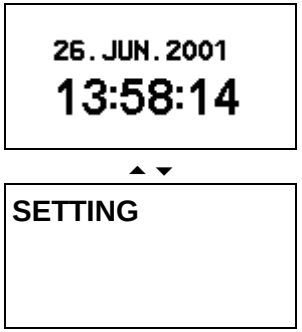
7. Menus

7.1 Display of measuring quantities for connection 3W4 (4u), 1W4 (4b), 2W3 (3u) and 1W3 (3b)

The following displays appear at 3W4 (4u) connection. Displays for other connections are alike except from 1W(1b).
Arrows between displays indicate which display occurs on the instrument when the corresponding key is pressed.
If the password function is deactivated, the display for entering of password will not appear and access will be obtained directly.

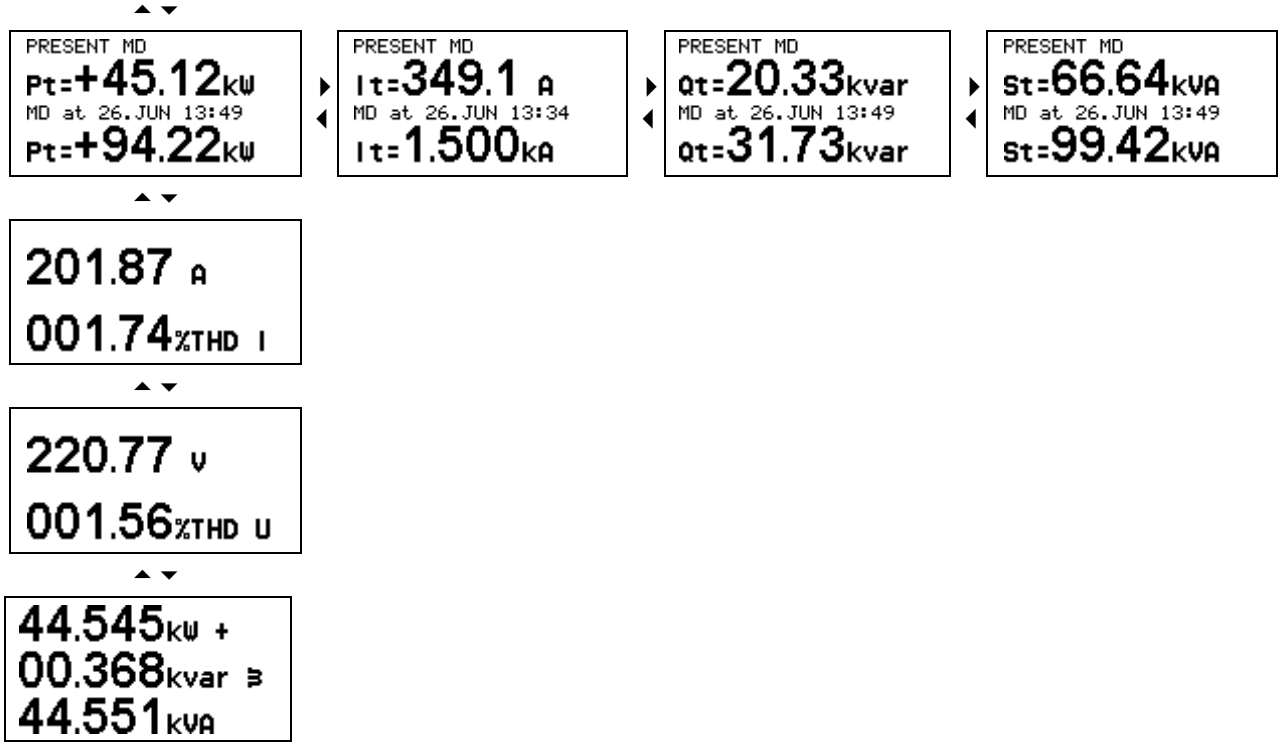


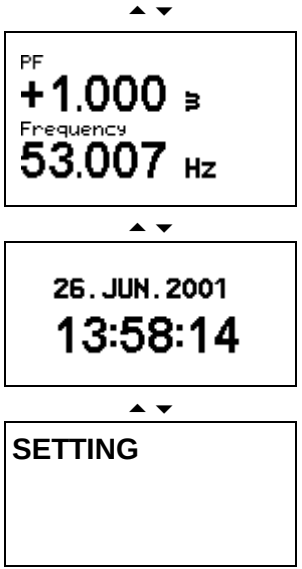

220.66 V PHASE 1
224.83 V PHASE 2
214.90 V PHASE 3
AVERAGE
220.12 V
001.56 %THD U PHASE 1
000.55 %THD U PHASE 2
001.35 %THD U PHASE 3
+120.01° 1-2
+119.97° 2-3
+120.00° 3-1
385.9 V LINE 1-2
380.8 V LINE 2-3
377.4 V LINE 3-1
AVERAGE
381.3 V
001.45 %THD U LINE 1-2
000.78 %THD U LINE 2-3
001.45 %THD U LINE 3-1
100.33 kW TOTAL
33.781 kvar TOTAL
105.86 kVA TOTAL
44.528 kW PHASE 1
27.715 kW PHASE 2
28.072 kW PHASE 3
00.385 kvar PHASE 1
49.312 kvar PHASE 2
15.882 kvar PHASE 3
44.557 kVA PHASE 1
56.563 kVA PHASE 2
32.229 kVA PHASE 3
PF TOTAL
+1.000
Frequency
53.009 Hz
+1.000 PHASE 1
+0.490 PHASE 2
+0.871 PHASE 3


26. JUN. 2001
13:58:14
SETTING

7.2 Display of measuring quantities for connection 1W (1b)

The following displays appear.

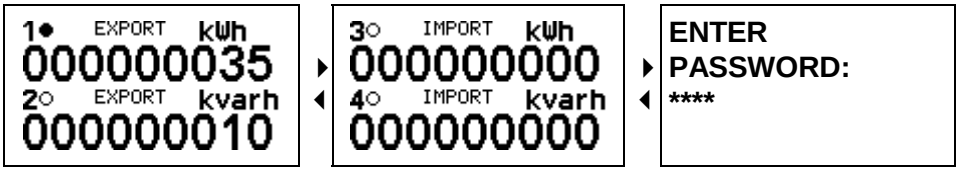



PF
+1.000 ⫐
Frequency
53.007 Hz
26. JUN. 2001
13:58:14
SETTING

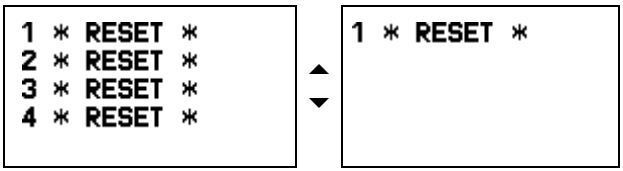
8. Watt and var meters

8.1 Displaying of measuring energy

Pictures of the measured energy are identical for all kinds of grid connections. See section 16.2 page 31. Please notice that an indicator is flashing just to the right of the counter number when the counter is active.



To reset the energy value it is necessary to enter a password of level L1 or L2. When the password is entered, the following is displayed.



With the ▲ ▼ keys the values of the energy, which will be reset, are selected. The energy value is reset when the ▶ key is pressed for five seconds. In the meantime a count-down of 5 seconds is made. After five seconds the picture of exports kWh and kvarh is displayed again, and the chosen counter is reset.

Please notice that all 4 counters can be reset simultaneously, if the ▶ key is pressed before using the ▲ ▼ keys.

If the ▶ key is released before the expiration of 5 seconds, the energy value is not reset.

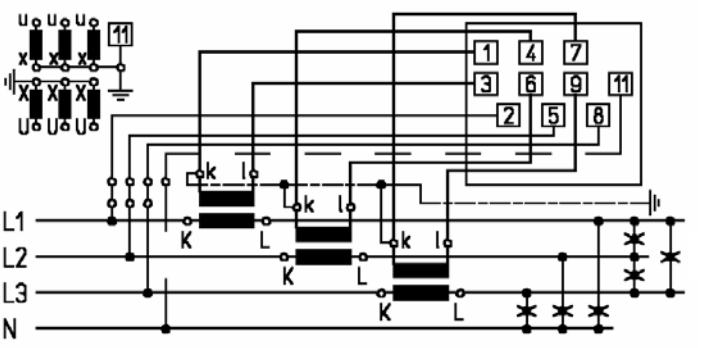
The resetting procedure is equal for all data resetting in the multi-instrument.

8.2 Measuring of energy

In the figure below a 3W4(4u) connection is shown to illustrate the direction of energy according to the 4 counters for kWh and kvarh.

The direction of energy is identical for all other connections.

The consideration of import and export of energy.



Generator **Consumer**

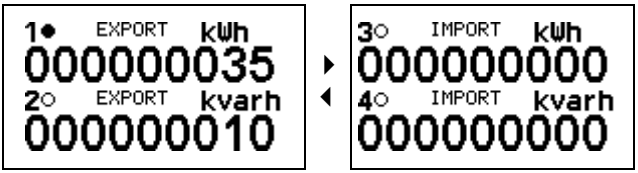
Import

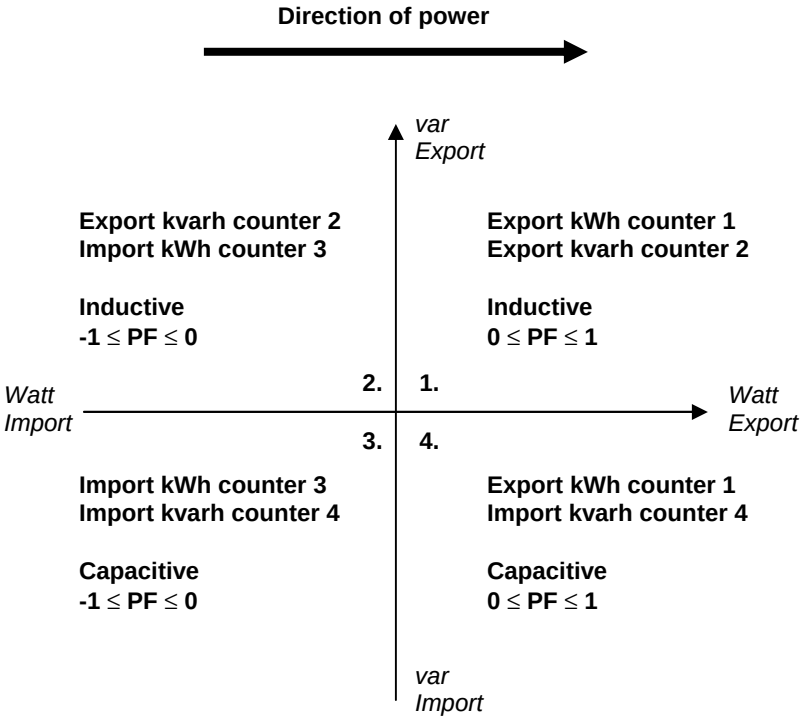
Export

The function of the 4 counters, according to the displacement between voltage and current, is illustrated in the figure below.

If the MIQ96 has relay output/outputs (see section 16.5 page 34), relay output 1 is corresponding to counter 3 (import kWh) and relay output 2 is corresponding to counter 4 (import kvarh).

Change of this set-up can only be done through communication.





9. Maximum demands (MD)

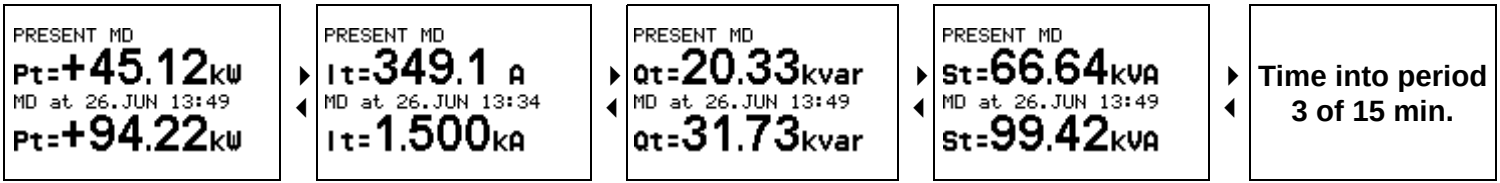
9.1 Display of maximum demands (MD)

The MIQ96 provides demand values from a variety of average demand values (**Thermal**/bimetal instrument, **Fixed window** and **Sliding window**) for the following electrical parameters:

Total active power	(P_t)
Sum of phase currents	(I_t)
Total reactive power	(Q_t)
Total apparent power	(S_t)

Maximum demands
The MIQ96 displays the present or "dynamic" maximum demand (value below "PRESENT MD"). The MIQ96 also stores the maximum demand value since last reset and its corresponding time stamp, visible either from the MIQ96 display or remote communications link (value below "MD at DD.MM HH:MM").

Only one of the following modes 1) **Thermal**, 2) **Fixed window** or 3) **Sliding window** can be active at a time. Set-up – see the menu "Settings" → "Maximum demands" section 17.5 page 41.

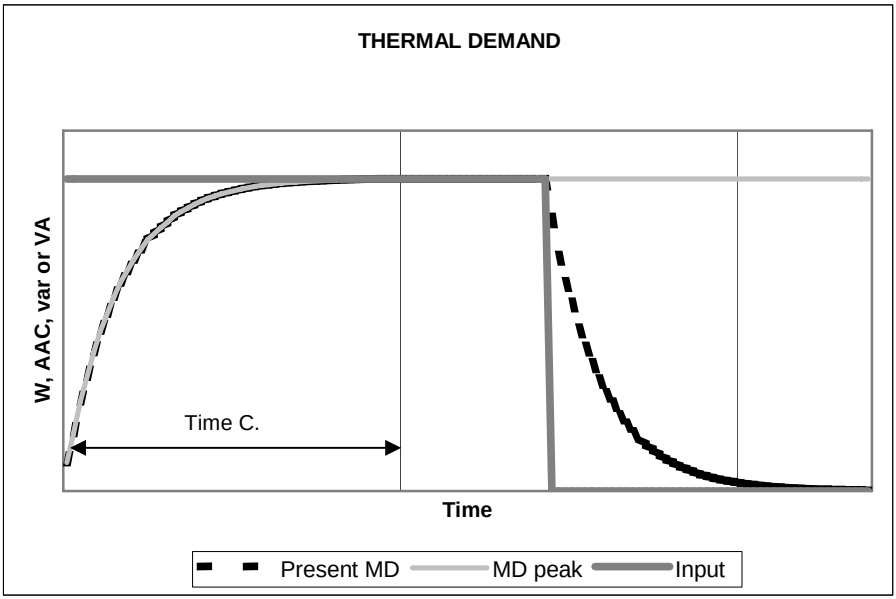


9.2 Thermal demand

The thermal demand option will provide an exponential thermal characteristic, based on the bimetal element principle.

Maximum demand and the time of its occurrence are stored in the unit. The period (Time C.) can be set in the range 1 to 255 minutes.

When "Thermal demand" mode is used, "Time into period" is not displayed.

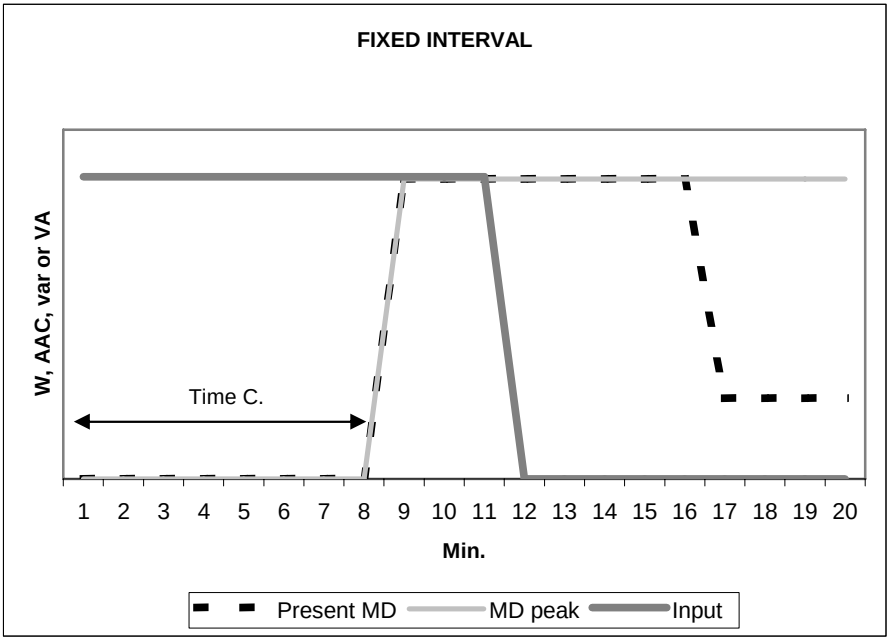


9.3 Fixed window

The fixed interval mode calculates an average demand value over a fixed time period. The period (Time C.) can be set in the range 1 to 255 minutes.

"Time into period" will be active and show the remaining time of a period until **present MD** and **MD peak** will be updated next. When P_t, I_t, Q_t, S_t displays have been updated, a new time period starts and a new average demand is measured for the next period. Display "Time into period" shows 0 of xx min.

Example:
Mode: **Fixed window**
Time C.: **8 min.**
Present MD and MD peak: **Reset at time 0 min.**

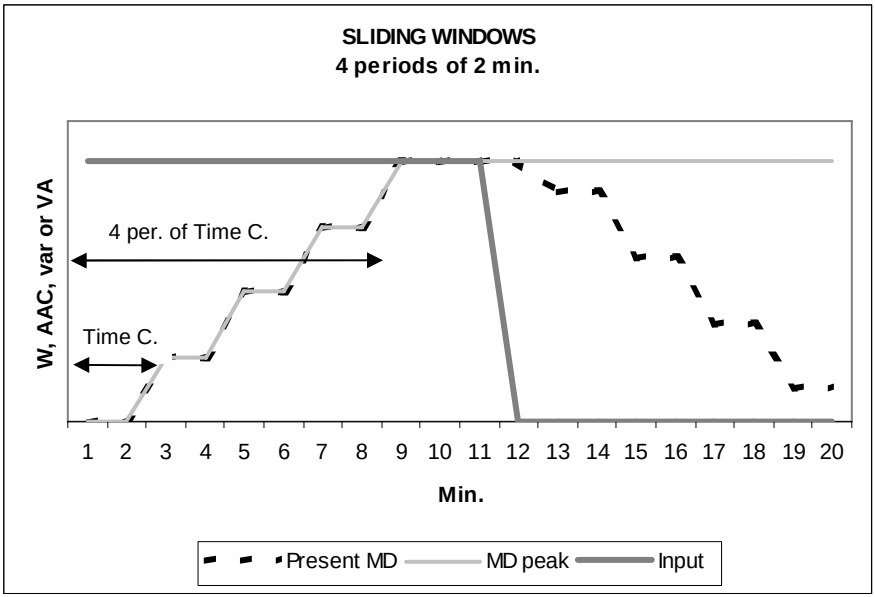


9.4 Sliding window

The sliding window technique allows the user to divide the time period into a number of sub-periods. The average demand value over the demand total period is displayed, however, after the initial demand period has expired, the demand value will be updated by the addition of a further sub-period, thus creating a "sliding window" measurement.

The number of sub-periods can be set from 2 to 15.
The sub-period (Time C.) can be set in the range 1 to 255 minutes.

Example:
A total period is 8 minutes (consisting of 4 sub-periods of 2 minutes duration). The **present MD** and **MD peak** are reset at time 0 min. "Time into period" will consist of 2 minutes and make an update of **present MD** and **MD peak** every second minute. After the first 4 sub-periods (1 total period) have expired, a new window will be added and the oldest window will be deleted, thus creating a sliding window. This will always give an average demand value for the last 4 sub-periods.



10. Display of current

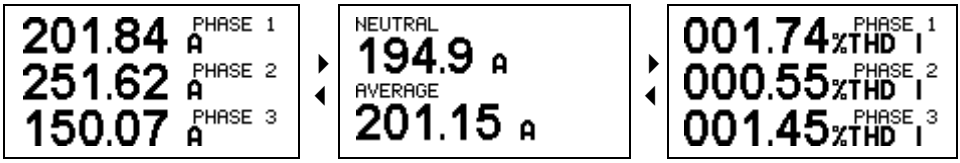
The MIQ96 measures the true RMS value of the phase currents (I_1, I_2, I_3) connected to the unit.

$$I_{RMS} = \sqrt{\frac{\sum_{n=1}^{N} i_n^2}{N}}$$

N is the number of sampled values within a period and i_n is the sampled value.
N is 64 for the MIQ96.

The neutral current (I_n), average current (I_a) and the sum of all phase currents (I_t) are calculated from the three phase currents.

The available phase currents, neutral current and average current can be viewed on the display or via the remote communications link while the sum of all phase currents is visible only via the remote communications link.



10.1 Current THD (total harmonic distortion)

The THD is calculated for phase currents. It is expressed as a percentage of harmonics due to fundamental frequency.

The multi-instrument uses a true RMS (Root Mean Square) measurement technique which provides accurate measurement with harmonics present up to the 15th harmonic.

$$\frac{\sqrt{\sum_{n=2}^{\infty} In^2}}{I_1} \bullet 100\% = THD\%$$

11. Display of voltage

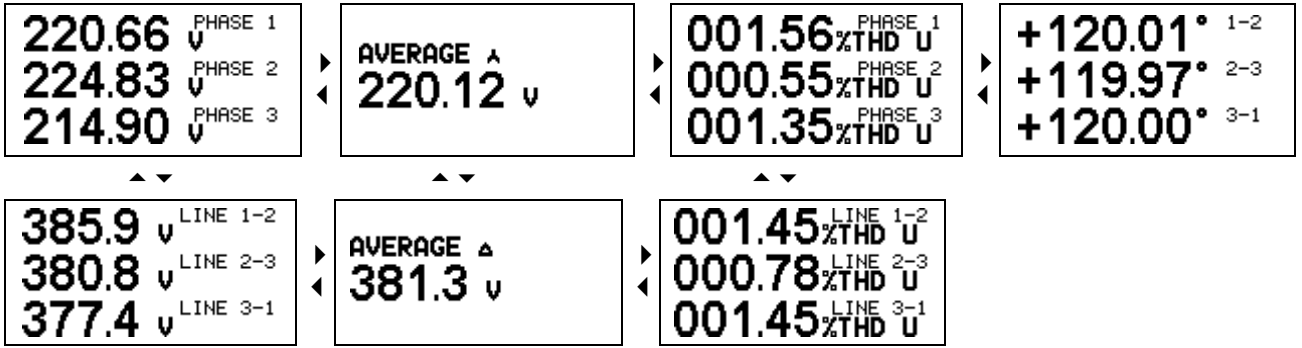
All connections of the MIQ96, except in the 3-wire mode (1W3 and 2W3), measure the true RMS value of the phase voltages (U_1, U_2, U_3) connected to the unit (only U_1 for 1W connection).

The three line voltages (U_{12}, U_{23}, U_{31}), average phase voltage ($\overline{U}\curlywedge$) and average line voltage ($\overline{U}\Delta$) are calculated from these measured parameters.

Calculation of line voltage: $U_{xy} = \sqrt{U_x^2 + U_y^2 - 2U_x U_y \cos\varphi_{xy}}$

For 3-phase 3-wire balanced systems (1W3) and 3-phase 3-wire unbalanced system (2W3), the MIQ96 creates a virtual neutral internally.
The available phase, line and average voltages can be viewed on the MIQ96 display or via the remote communications link.

Angles between phases indicate the angles between the vectors of phase voltages. A positive mark indicates correct phase sequence, while a negative mark indicates an opposite phase sequence of the measured system.



11.1 Voltage THD (total harmonic distortion)

The THD is calculated for phase voltages and line voltages. It is expressed as a percentage of harmonics due to fundamental frequency.

The MIQ96 uses a true RMS (Root Mean Square) measurement technique which provides accurate measurement with harmonics present up to the 15th harmonic.

$$\frac{\sqrt{\sum_{n=2}^{\infty} Un^2}}{U_1} \bullet 100\% = THD\%$$

12. Display of active, reactive and apparent power

The MIQ96 provides accurate measurement of active (P_1, P_2, P_3, P_t), reactive (Q_1, Q_2, Q_3, Q_t) and apparent power (S_1, S_2, S_3, S_t).

Active power:

Calculation of $P_{1, 2, 3}$: $$P = \sum_{n=1}^{N} \frac{u_n \times i_n}{N}$$

N (64) is the number of samples, and u_n and i_n are sampled values within 1 period.

Calculation of P_t: $$P_t = P_1 + P_2 + P_3$$

Reactive power:

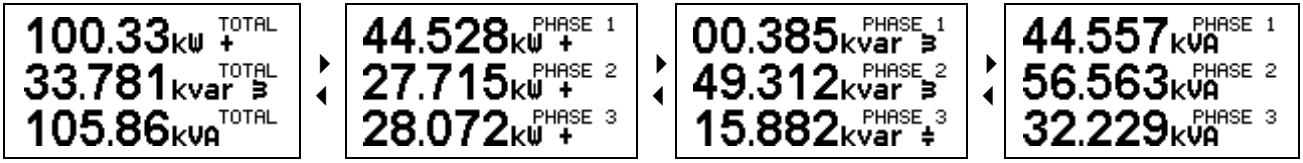
Calculation of $Q_{1, 2, 3}$: $$Q = \sqrt{(UI)^2 - P^2}$$

Calculation of Q_t: $$Q_t = Q_1 + Q_2 + Q_3$$

Apparent power:

Calculation of $S_{1, 2, 3}$: $$S_1 = \sqrt{P_1^2 + Q_1^2}$$

Calculation of S_t: $$S_t = \sqrt{Pt^2 + Qt^2}$$



For four-wire systems (1W4, 3W4) the powers are calculated both for each phase separately and as a total.

For three-wire (1W3, 2W3) and single phase systems (1W) only total power values are measured.

When displaying active power, a positive sign indicates export power while a negative sign indicates import power (see section 8.2 page 19).

When displaying reactive power, a coil symbol indicates an inductive load while a capacitor symbol indicates a capacitive load (see section 13 page 28).

All the available power parameters can be viewed using either the MIQ96 display or the remote communications link.

13. Display of power factor PF (cos φ) and frequency

The power factor is calculated as a quotient of active and apparent power for each phase separately ($\cos\varphi_1$, $\cos\varphi_2$, $\cos\varphi_3$) and as a total ($\cos\varphi_t$).

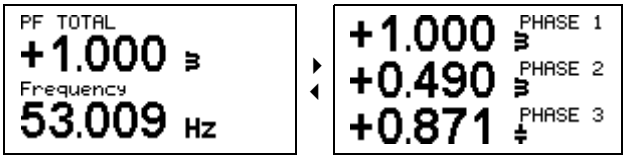
Calculation of $\cos\varphi_1$: $\cos\varphi_1 = P_1/S_1$

Calculation of $\cos\varphi_t$: $\cos\varphi_t = P_t/S_t$

$\cos\varphi_1$, $\cos\varphi_2$, $\cos\varphi_3$ for each phase are only displayed in a 3W4 connection and set-up.

A positive sign and a coil symbol indicate an inductive load while a negative sign and a capacitor symbol indicate a capacitive load (see section 8.2 page 19).

All available power factor parameters can be read from the display or via the remote communications link.

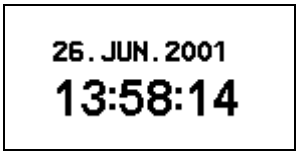


The system frequency is calculated from the time period of the measured voltage and can be viewed both from the display and the remote communications link.

14. Display of real time clock

The MIQ96 is provided with a built-in real time clock. It is intended for registration of time of the occurrence of MDs, and for synchronisation of the time interval.

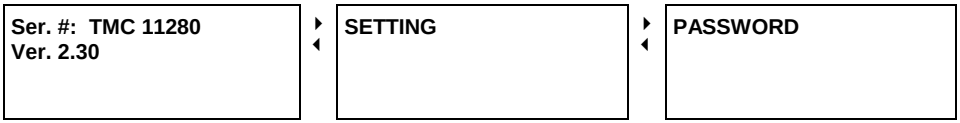
On delivery from DEIF, the MIQ96 is set up with CET time (winter time). Switching from winter time to summer time must be done manually in the menu “Setting”.



15. Display of the menu "Setting"

In the menu "Setting" the software version number is displayed when the left arrow key is pressed.

The id-number of this instrument is stated above the software version number. This number is also visible on the label behind the protection lid for terminals.



16. Installation

In this section the line of general directions for the installation of the MIQ96 are indicated. Installation as well as use of the MIQ96 will involve working with dangerous currents and voltages. Professionals must handle these areas. DEIF does not take on responsibility for the use and installation. If any doubt comes up concerning the installation or use of the system, on which the MIQ96 is to be used for measurement, the person responsible for the power installation should be contacted.

Before commissioning: Check voltage and revolving field. These must be correct.

Warning: Missing or wrong voltage and other input errors might cause malfunction and damage on the MIQ96.

16.1 Mechanical installation

Dimensions (in mm)

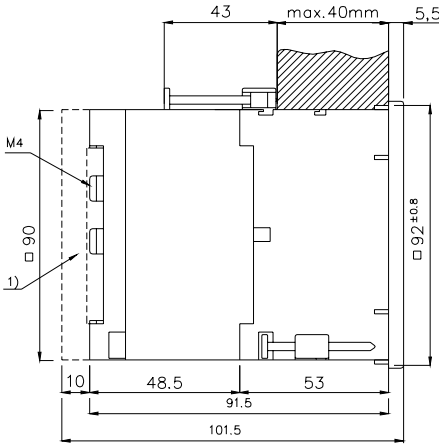
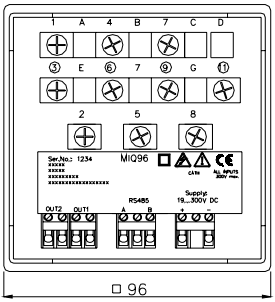


Figure 16.1



1) Protection lid for terminals

Weight: Approx. 0.65 kg

Panel cut-out: 92 x 92 mm + 0.8

1. Remove the 4 screws before inserting the instrument in the panel cut-out, and then replace and tighten the screws until the instrument is fastened in the panel.
2. Remove the folio protection from the display.

16.2 Electrical installation

Connection for measuring voltage and measuring current:

3. Choose one of the connections from the figures below and make the connection according to this for input voltage and input current. Consumption for voltage and current input - see "Technical data" section 19 page 49.

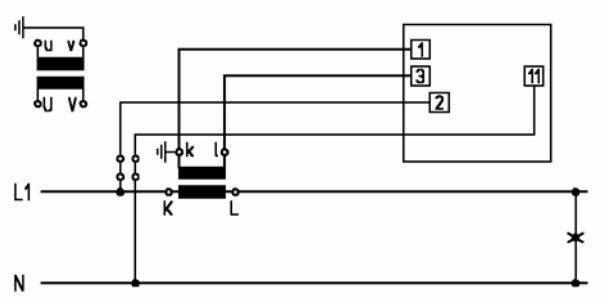


Figure 16.2.1 1W connection (1b)

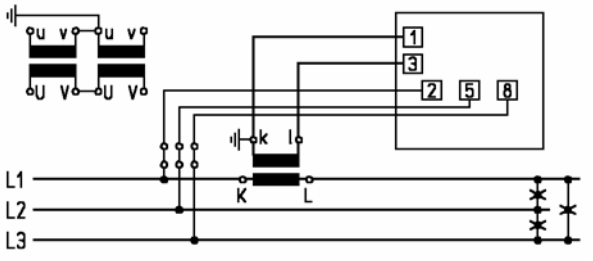


Figure 16.2.2 1W3 connection (3b)

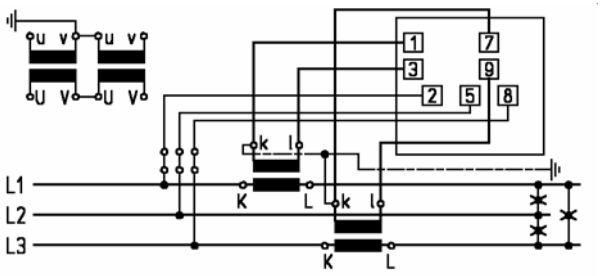


Figure 16.2.3 2W3 connection (3u)

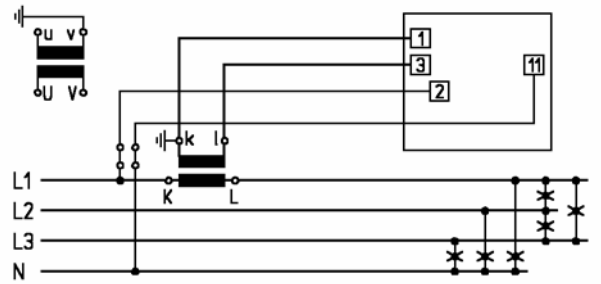


Figure 16.2.4 1W4 connection (4b)

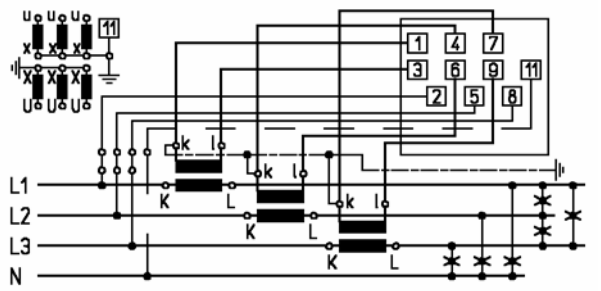


Figure 16.2.5 3W4 connection (4u)

16.3 Connection for aux. supply

4. Make the connection for aux. supply (see figure 16.5 page 34).
   a) AC: Line in the left terminal and neutral in the right.
   b) DC: + in the left terminal and – in the right.

16.4 RS 485 Modbus (option)

5. Make the connection for communication RS 485 as shown in figure 16.4 below (also see figure 16.5 page 34).

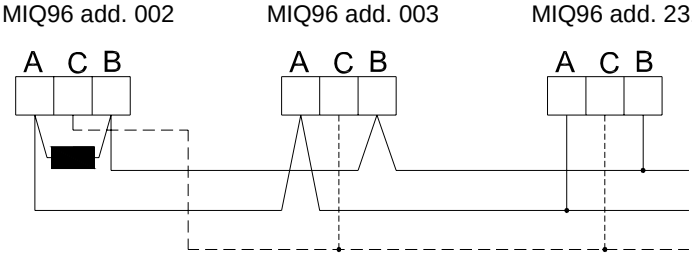


Figure 16.4

6. Screened twisted pair must be used (min. 0.5 mm^2).
7. Max. 32 multi-instruments in one string.

For RS 485 communications the PC will require either an internal RS 485 communications port or an external RS 232/RS 485 interface. In both cases the device must provide automatic RS 485 data flow control.

The maximum connection length is 1000 metres.

Conductors A and B should be terminated with a 120Ω terminating resistor at the end of a string.

RS 485 connections:

MIQ96	RS 485
A	DATA +
B	DATA –
C	GND

Note:
It is recommended only to connect terminal C (GND), if solely MIQ96s are connected. In other situations, leave the terminal C open.

16.5 Connection for relay outputs (option)

Output 1: Potential free relay for kWh import (counter 3).
Output 2: Potential free relay for kvarh import (counter 4).

Note:
The set-up for kWh import and kvarh import counters for relay 1 and 2 respectively can only be changed via communication.

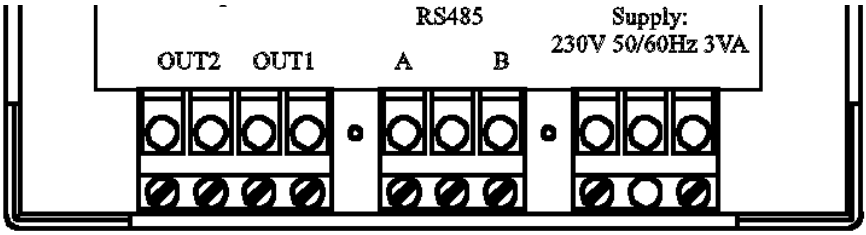


Figure 16.5

17. Setting

17.1 Setting of language

- The MIQ96 is delivered without requirement for password. (Password is disabled). See section 18 page 47 for activation of password levels.
- The MIQ96 is delivered with set-up for English language.

Please follow the guidance below for change of language:

1. Put on power for supply of the MIQ96.

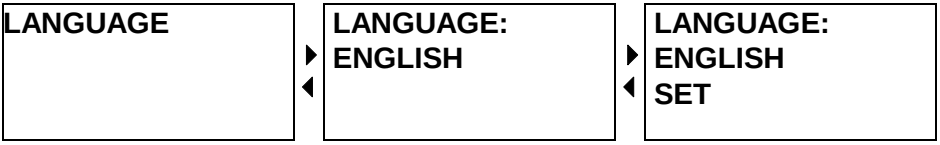
The value of the measured energy export is displayed 5 seconds after power up (see figure 17.1).

Figure 17.1

Now follow the instructions below for setting of the unit for the wanted language.

The arrows indicate which button to push.

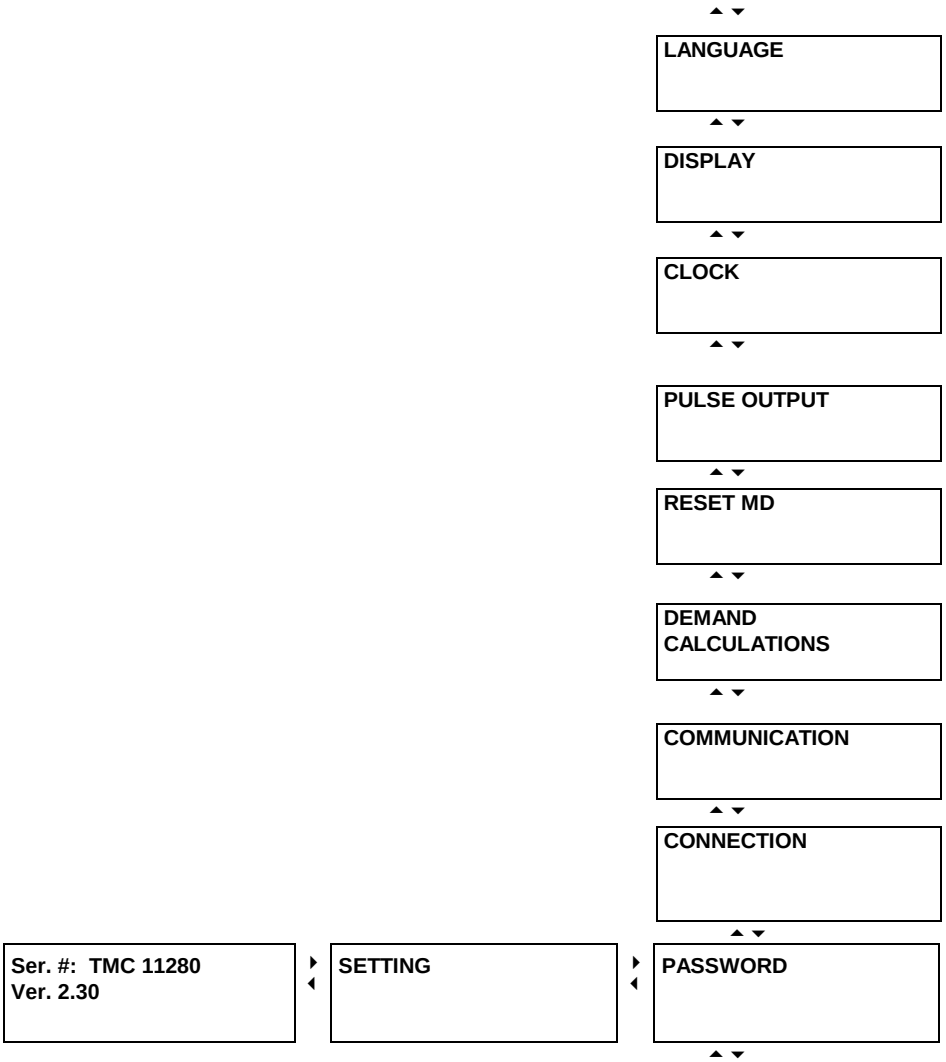
2. Push the ▼ key and "Setting" is displayed. (The display returns to the picture shown in figure 17.1 if no keys are pushed for 5 seconds).
3. Push the ▶ key and "Password" will appear. (The display returns to the picture shown in figure 17.1 if no keys are pushed for 30 seconds. This is general when operating in the menu "Setting").
4. Push the ▼ key and "Language" is displayed.
5. Push the ▶ key and "English" will appear below "Language".
6. Push the ▶ key and "Set" will appear. Now the MIQ96 is ready for change of language.
7. Push the ▲ or ▼ key until the wanted language appears, then push the "Enter" key, and the chosen language will appear.


LANGUAGE
LANGUAGE:
ENGLISH
LANGUAGE:
ENGLISH
SET

17.2 Other settings

Follow the instruction on the following pages for general set-up of the unit before commissioning.

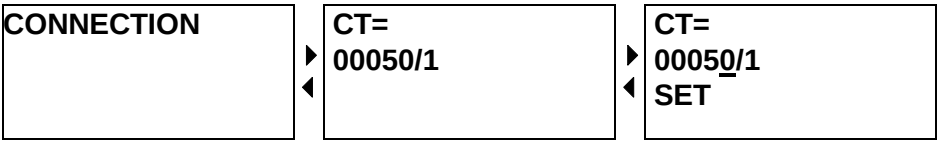
On the overview below the sub-menus for the menu "Setting" are indicated.



17.3 Connection

Setting of current/voltage transformer ratio and input requires password L2. For a survey of individual values it is not necessary to set the password.

CT-ratio
When setting the current ratio, only the primary value is set. The secondary value is defined with the version of the multi-instrument (1A).



Ratios are selected as shown in the table below.

Ratio for current transformer	/1A	Ratio step in MIQ96
1…63	1…63	1
65…315	65…315	5
320…630	320…630	10
650…3150	650…3150	50
4000	4000	

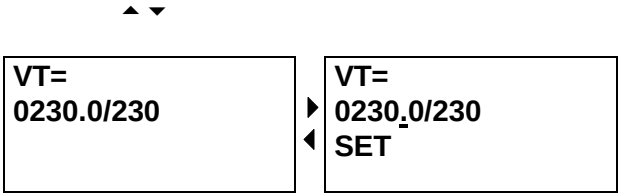
Maximum ratio for current transformers is 4000.

When **Set** is displayed, the digit is selected by means of the ▶ and ◀ keys (the selected digit is underlined). The primary value of the current transformer is selected with the ▲ or ▼ keys.

When the current ratio value is selected, the ▶ key must be pressed until **Set** disappears. In this way the multi-instrument has received a new value of the current ratio.

With the ◄ key the parameter setting range is exited, and an eventual modification is not considered.

VT-ratio
Both the primary and secondary values of the VT ratio may be set. The values are set in the same manner as described for the CT ratio. When setting the voltage transformer primary value, the decimal point is also set. The decimal point is set with the ▲ and ▼ keys when the decimal point is selected (underlined). By setting of the decimal point, the resolution of the energy display can be changed.



Ratio of the voltage transformer is set as follows:

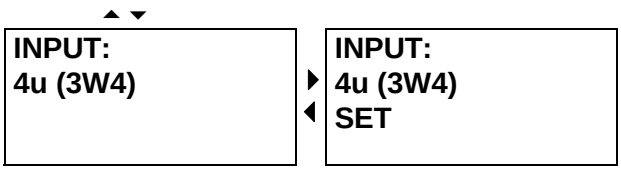
Setting of secondary voltage:

Voltage range	Voltage step
10…137 V	1 V
140…775 V	5 V

Setting of primary voltage:

Voltage range	Step
0.1…1599.9 V	0.1 V
1…15.999 kV	1 V
10…159.99 kV	10 V
100…1599.9 kV	100 V

Setting of input connection



The type of connection is selected with the ▲ or ▼ keys when **Set** is displayed. The type of connection to the power system must be set to match the physical connection implemented. See the physical connections section 16.2 pages 31 and 32.

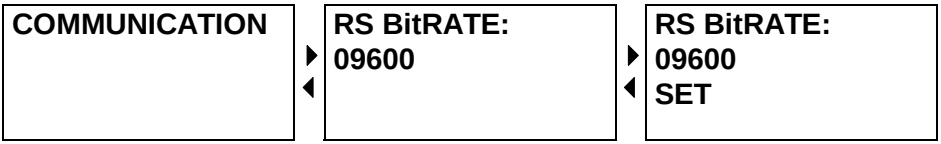
Connection types:

- 1b (1W) Single phase connection.
- 3b (1W3) Three-phase three-wire connection with balanced load.
- 3u (2W3) Three phase three-wire connection with unbalanced load.
- 4b (1W4) Three-phase four-wire connection with balanced load.
- 4u (3W4) Three-phase four-wire connection with unbalanced load.

17.4 Communication (option)

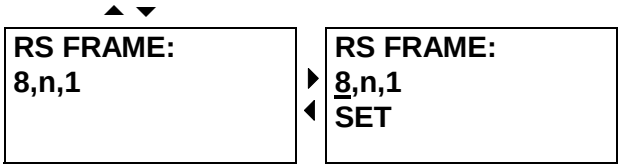
An L2 password is required to set the communications.

Setting of communication RS BitRate:



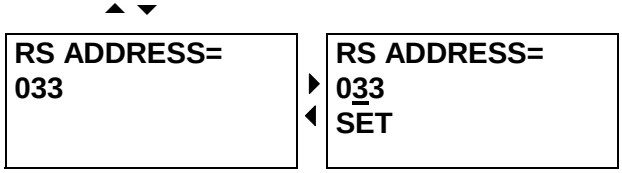
The transmission rate of communication data is set with the ▲ and ▼ keys. The rate values are: 1200, 2400, 4800, 9600, 19200, 38400, 57600 or 115200 Baud.

Setting of communication data form:



Length:	7, 8 (value 8 is always used for MODBUS RTU).
Parity:	n (NONE), o (ODD), e (EVEN).
Stop bit:	1, 2.

Setting the address:



The address can be set within the range from 1 to 247. The addresses must be different for units on the same string.

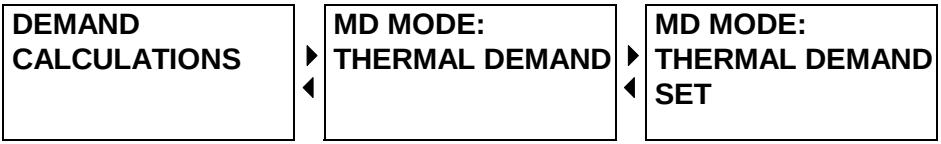
Address 0 is reserved only for simultaneous transmission of data of the master system to all slave systems. Subordinate systems do not respond with the answer to the master one.

17.5 Maximum demand (MD) calculations

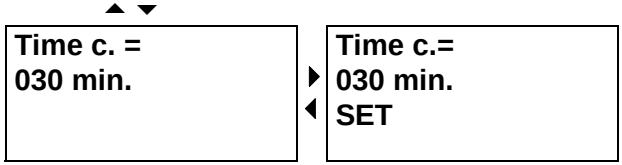
Setting of calculation mode of MDs:
A level 2 password must be entered to set maximum demand calculations. Only one of the 3 below modes can be active at a time.

- Thermal mode (Thermal) (bimetal instrument).
- Fixed window (Fixed window).
- A number of sub-windows within the range from 2 to 15 (x Sliding window).

Setting of mode is done with the ▲ and ▼ keys.



Setting of Time C.:
Setting of the time interval within the range from 1 to 255 minutes. If the interval is set at 0, measurement of MDs is switched off.

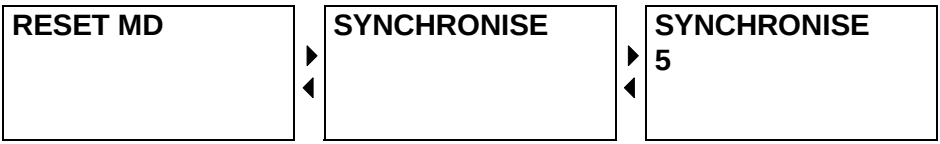


17.6 Reset MD

An L1 or L2 password is required to reset or synchronise the MD quantities.

Synchronisation of time interval:

- **Thermal mode**
  In this mode synchronisation does not have any influence.
- **Fixed window**
  At synchronisation a momentary interval is interrupted, and measurement or calculation of MDs is continued at the next full period.
- **Sliding window**
  At synchronisation a momentary interval of the sub-window is interrupted, and the measurement or calculation of maximum values is continued at the following full period of the next sub-window.

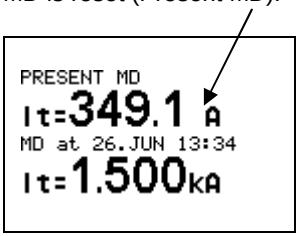


Synchronisation of the time interval is done by pressing the ▶ key for 5 seconds. A count-down of 5 seconds is done. If the ▶ key is released before 5 seconds, the synchronisation of the time interval is not performed.

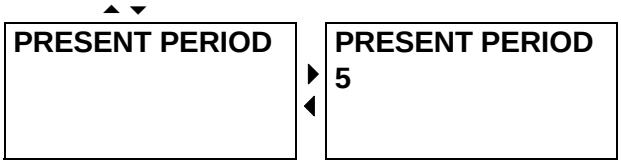
After the synchronisation the “Time into period” is shown in the display. With this the synchronisation is performed and a new measurement implemented.

Present MD (resetting of the values in a momentary time interval):

- **Thermal mode**
  MD is reset (Present MD).

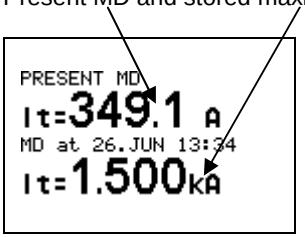


- **Fixed window**
  Value in the current time interval (Present MD) is reset. At the same time synchronisation of the time interval is also performed.
- **Sliding window**
  Momentary values in a sub-window as well as other values of sub-windows in the time interval are reset. At the same time synchronisation of the time interval is performed at the beginning of the first sub-window.

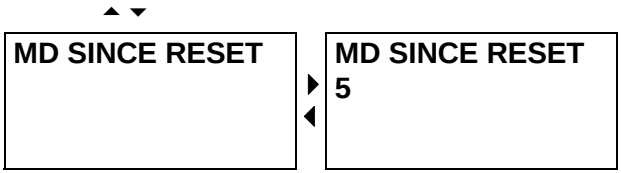


MD since reset (resetting of recorded MD):

- **Thermal mode**
  Present MD and stored maximum values are reset.



- **Fixed window**
  Value in a current time interval and stored MD are reset. At the same time synchronisation of the time interval is performed.
- **Sliding window**
  Value in the time interval and in all sub-windows as well as stored MD are reset. At the same time synchronisation of the time interval is performed at the beginning of the first sub-window.



General:
After resetting of present MD, the MD window of total active power is displayed. With this the present MD is zero and a new measurement implemented.

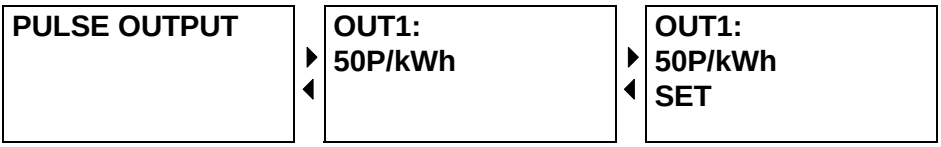
After resetting of present MD and MD peak, the total active power is displayed. With this the present MD and MD peak are zero and a new measurement implemented.

The above resetting modes are valid for all maximum demand parameters (I_t, P_t, Q_t, S_t) simultaneously.

17.7 Pulse output (setting of parameters of impulse outputs) (option)

A level 2 password must be entered to set the pulse outputs.

Setting of impulses for relay output 1:



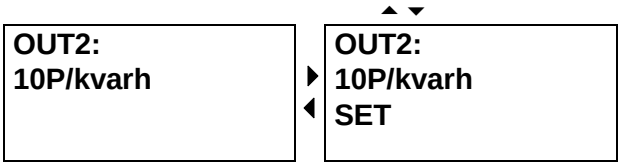
The pulse rate per Wh is set by the ▲ and ▼ keys.

Lowest value: 1P/Wh

Highest value: 20P/MWh

The upper limit of the number of impulses is 4000 impulses per hour.

Setting of impulses for relay output 2:



The pulse rate per varh is set by the ▲ and ▼ keys.

Lowest value: 1P/varh

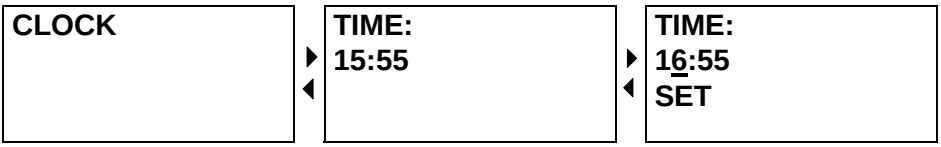
Highest value: 20P/Mvarh

The upper limit of the number of impulses is 4000 impulses per hour.

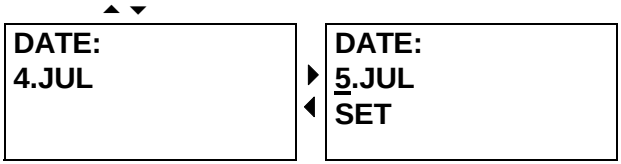
17.8 Clock (setting of real time clock)

Setting of the real time clock requires level L1 or L2 password.

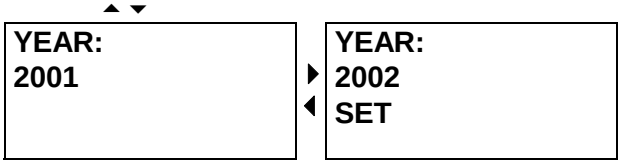
Setting of time:



Setting of date:



Setting of year:



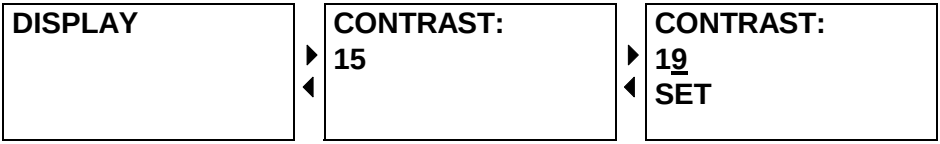
The character, which is to be changed for time and date, is chosen with the ▶ and ◀ keys, and its value is changed with the + and - keys. The ▲ and ▼ keys are used for setting of the year.

Note:
On delivery from DEIF, the MIQ96 is set up with CET time (winter time). Switching from winter time to summer time must be done in the menu "Setting" → "Clock" as shown above.

17.9 Display (setting of display parameters)

The display settings can be modified without entry of password.

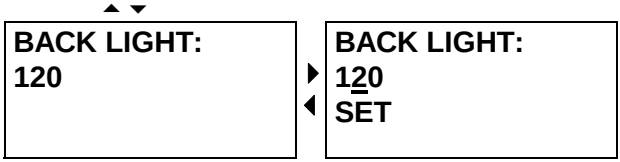
Setting of the contrast:



The display contrast is set within the range from 0 to 63.

0: High contrast.
63: Low contrast.

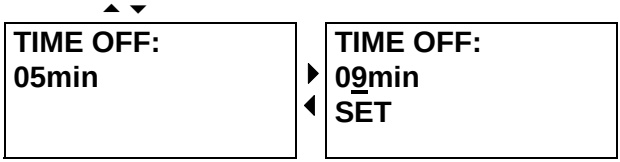
Setting of illumination intensity:



The illumination intensity is set within the range from 0 to 255.

0: Illumination is switched off.
255: High intensity of illumination.

Setting of display illumination duration:



The duration of display illumination is set within the range from 0 to 54 minutes. The display illumination is switched on when one of the 4 keys under the display is activated, and it is switched off after expiration of the set time from the last pressing of a key. If “Time off” is set at 0, the illumination is permanently switched on.

17.10 Language (setting of language)

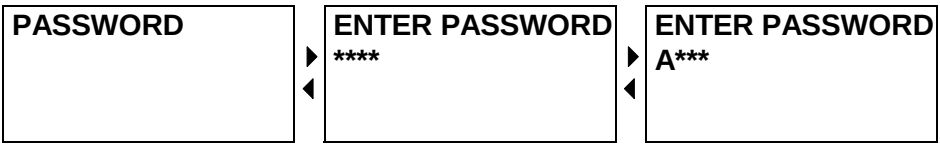
Setting of language - see section 17.1 page 35.
The following languages can be chosen for the MIQ96:
English, Danish, German, French, Russian and Spanish.

18. Password

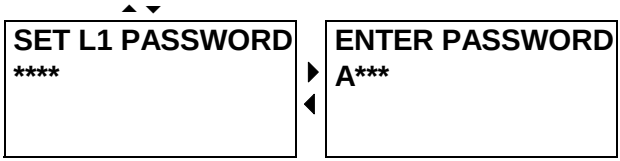
Setting of parameters in the multi-instrument is divided into four groups regarding password level:

1. At the lowest level (L0), at which a password is not required, the following display parameters can be set: The contrast of characters, the illumination intensity and the duration of illumination.
2. At the first level (L1) it is possible to change the setting of the real time clock (Clock), resetting of electricity meters and resetting of MD values (Reset MD).
3. The second level (L2) gives access to the first level (L1) and enables setting of all other parameters in the menu "Setting".
4. The backup password (BP) is used if the L1 or L2 password is forgotten and is specific for each serial number. The BP can be obtained on application to the Service and Support department at DEIF A/S and is entered instead of L1 or/and L2. Please remember to state the five-figure id-number of the unit when contacting DEIF A/S. (See section 15 page 29).

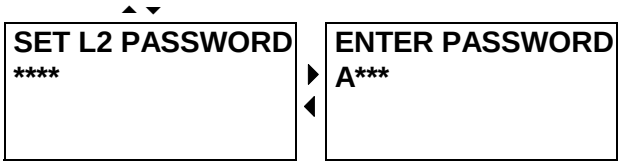
Password entry:



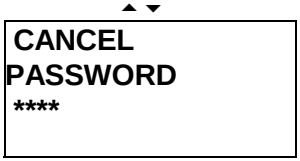
Setting of the L1 level password:



Setting of the L2 level password:



Password cancellation:



A password consists of four letters. Each letter can be chosen from A to Z. Only one character is displayed when the password is entered or set. The other three characters are indicated by *.

The character is selected with the ▶ and ◀ keys and modified with the + or – keys.

The multi-instrument detects the level of the entered password. If no key is pressed for 15 minutes, the password is automatically cancelled.

When “Cancel password” is selected, the user can cancel the present password by pressing “Enter”.

Entry of the password via communication (option) or the front panel of the MIQ96 gives access to the same rights for resetting and changing of parameters.

The factory set password is AAAA for both levels of password (L1 and L2). AAAA password does not limit the access and corresponds to the level L0.

To protect the setting, the energy counters and the MD functions it is recommended to modify the password on levels L1 and L2 immediately after the commissioning.

Only level L2 settings are protected if L1=AAAA.
L1 settings are not protected if L2=AAAA.

Procedure for changing of password:

1. Enter password (password for L1) followed by “Enter”.
2. Choose “Set L1 password” followed by “Enter”.
3. Enter the new password for L1 followed by “Enter”.
4. Choose “Set L2 password” followed by “Enter”.
5. Enter the new password for L2 followed by “Enter”.
6. Finally choose “Cancel password” followed by “Enter”.
7. Now the new passwords for L1 and L2 are valid.
8. Disable passwords: Enter “AAAA” for both L1 and L2 in points 3 and 5.

19. Technical data

Voltage input

Nominal voltage (U_n)	Ph-N 230V AC / Ph-Ph 400V AC
Measuring range	0.1…..1.5 x U_n
Consumption	<0.1 VA per phase
Overload capacity	1.5 x U_n continuously, 2 x U_n for 10 s

Current input

Nominal current (I_n)	-/1 A
Measuring range	0…..1.6 x I_n
Consumption	<0.1 VA per phase
Overload capacity	3 x I_n continuously, 25 x I_n for 3 s, 50 x I_n for 1 s

Frequency

Nominal frequency (f_n)	50/60Hz
Measuring range	45Hz to 65Hz

AC auxiliary supply

Nominal voltage (U_x)	230V
Operative range	200…276V
Overload capacity	1.2 x U_x continuously 1.5 x U_x for 10 s
Nominal frequency (f_x)	50/60Hz
Operative frequency range	45Hz to 65Hz
Consumption	<7 VA

DC auxiliary supply

Nominal voltage (U_x)	24 to 220V
Operative range	19V to 300V
Consumption	<5 W

Accuracy (measurement)

Phase voltage Ph-N		0.5% of range
Phase-phase voltage		1.0% of range
Current		0.5% of range
Neutral current		1.0% 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
MD values		1.0% of range
Active energy	EN61036	1996 class1
Reactive energy	EN61268	1995 class2
Frequency		0.05% of reading
THD		1.0%

Response time

Refresh of display	Every 100 ms	
From input to display From input to communication From input to relay	All calculations are made for every 64 periods, which gives the below response times depending on grid:	
	Frequency:	
	45Hz:	64 x 0.023 s = 1.42 sec
	50Hz:	64 x 0.020 s = 1.28 sec
	55Hz:	64 x 0.018 s = 1.16 sec
	60Hz:	64 x 0.017 s = 1.07 sec
	65Hz:	64 x 0.015 s = 0.98 sec
Real time clock	Accuracy	1 minute/month
Back up battery	Battery life	6 years

Relay outputs (option)

Contact ratings	250V-6A-1500VA (AC) (250V AC-6A resistive AC load 100.000 operations) 35V-6A-210W (DC) (30V DC-6A resistive load 500.000 operations)
Contact voltage	Max. 250V (AC) Max. 100V (DC)
Isolation	1000V (AC) between open contacts 4000V (AC) between coil and contacts
Pulse	Max. pulses per hour: 4000 Pulse duration 100 ms

RS 485 port (option)

Connection type	Multi-drop (32 connections per link)
Signal levels	RS 485
Cable type	Screened twisted pair
Maximum cable length	1000 m
Connector	Screw terminals
Isolation	4kV rms for 1 minute between all terminals and all other circuits
Transmission mode	Asynchronous
Message format	MODBUS RTU
Data rate	1200 to 115200 bits/s

Fuse	All voltage inputs should be protected by a 2A fuse
Safety	To EN 61010-1 Installation Cat. III, 300V. Pollution degree 2 Installation Cat. II, 600V. Pollution degree 2
Test voltage	3.7kV rms according to EN 61010-1
EMC	To EN 61326-1: 1997 for mentioned accuracy (To EN 50081-1/2 and EN 50082-1/2 for a general 1.0% accuracy on all measurements)
Connections	Permissible cross section of the connection leads: For input quantities: $\leq$ 5mm^2 single wire For communication, auxiliary power supply and relay outputs: $\leq$ 2.5 mm^2 single wire
Protection	IP21. Front: IP52. According to EN 60529
Climate	According to EN 61036: 1996 According to EN 61268: 1995 Operating temp., AC supply: -20 to +70°C Operating temp., DC supply: 0 to +50°C Storage temperature: -40 to +70°C Annual mean relative humidity: $\leq$ 75% r.h.
Housing	Plastic, in compliance with UL 94 V0
Weight	Approx. 0.65kg