

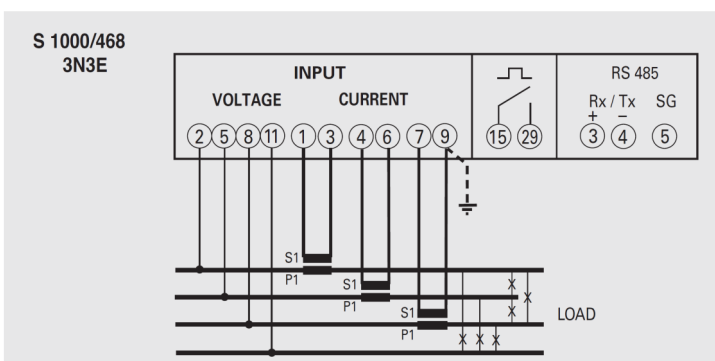
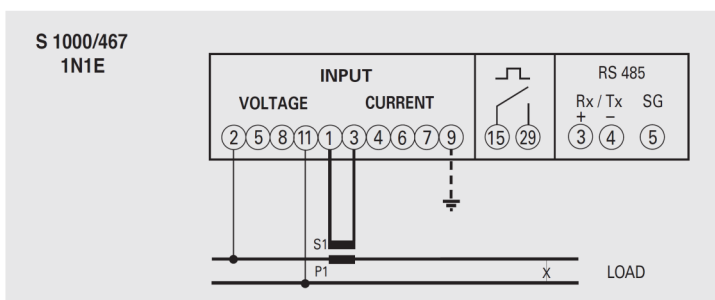
Manual: Power analyzer MF9, 96x96mm, with RS 485— interface



SCHRACK-INFO

- Three-phase system 80...500V (phase-phase)
- Power Converter connection
- Transformer ratios programmable
- Active energy class 1
- pulse output
- RS 485 - interface with ModBus RTU/TCP
- Phase sequence—fault detection

Wiring diagrams



Installation guide

This product must be installed in conformity with the installation rules and preferably by a qualified electrician. Incorrect installation and/or incorrect use of this product could lead to risks of electrical shock or fire. Before installing, read the instructions carefully and according to the product identify a suitable place of assembly.

Do not open, disassemble, alter or modify the equipment unless specially indicated in the manual. Any unauthorised opening or repair involves the exclusion of any responsibilities, rights to replacement and guarantees.

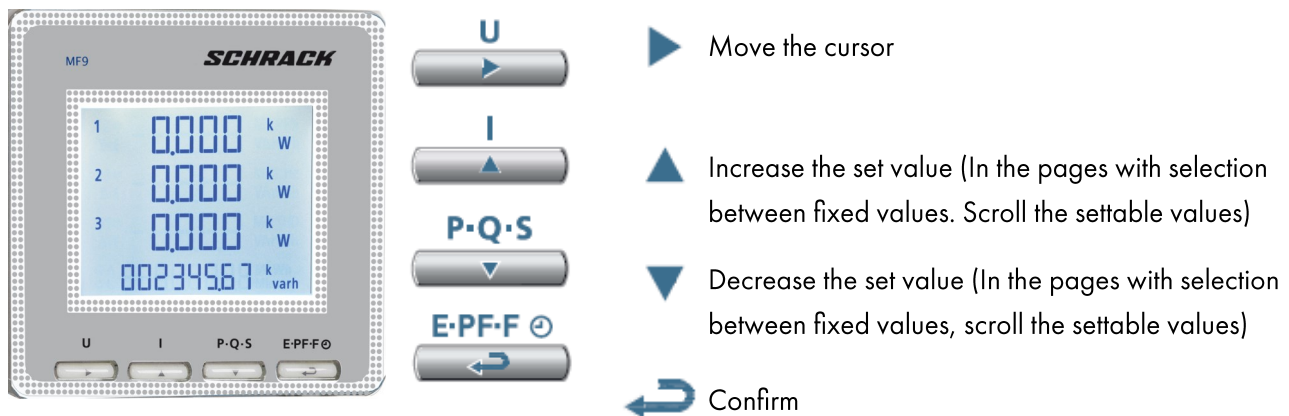
Check that the device rating plate data (Measurement voltage, measurement current and frequency) correspond to the effective data of the network to which the instrument is connected.

In the wirings scupulously respect the connection diagram; inexactness in the connections is inevitably a cause of false measurements or damage to the instrument.

When the instrument is connected complete the installation by configuring the device.

Programming

The programming is divided on two levels protected by two different numerical passwords and takes place by means of the front keypad with 4 keys



During installation keep simultaneously pressed 2 keys for:

One page backward **P-Q-S** + **E-PF-F**

Input and output without save **I** + **P-Q-S**

▀ Programmable parameters

▀ Level 1

Password = 1000

1.1 Customized display page

It is possible to set a customised display page where to select which values should appear in the three display lines. If the user sets a customised page, this will become the standard display when the device is switched on (As an alternative to the display giving the line voltages). The values which can be selected for the customised page are given in the tables on page 7.

1.2 Connection

The instrument can be used for single-phase or three-phase 4-wire line.

The connections that can be selected are:

Symbol	Wire	Current load	Number of external converters
1N1E	Single-phase	-	1
3N3E	3 phase 4 wire	Unbalanced	3

1.3 Average power and current integration time

Selectable integration time: 5, 8, 10, 15, 20, 30, 60 minutes

The selected time is valid for both the current and the average power.

1.4 Hour-meter counting start

Select the value which starts the hour-meter counting: voltage or power.

Voltage: counting starts with phase voltage >10 V

Power: 3-phase active and rared power programmable value 0...50% P_n

$P_n = 3\text{-phase active rated power} = 3\text{-phase rated voltage } U_n \times \text{rated current } I_n \times \sqrt{3}$

$U_n = 400V$

$I_n = 1A \text{ or } 5A$

$P_n = 400V \times 5A \times \sqrt{3} = 3464W$ or $400V \times 1A \times \sqrt{3} = 692,8W$

1.5 RS485 communicated (where provided)

Depending on the model, the instrument may not have communication or may have RS485 ModBus RTU/TCP communication

No. Of address: 1...255

Parity bit: none—even—odd

Waiting time before answer: 3...100ms

Transmission speed: 4800—9600—19200 bit/s

1.6 Energy pulses (max. 27V 50mA)

Associable Measurement: active or reactive energy

Pulse weight: 1pulse/10Wh(varh) - 100Wh(varh) - 1kWh(kvarh) - 10kWh(kvarh) - 100kWh(kvarh) - 1MWh(Mvarh) - 10MWh(Mvarh)

Pulse duration: 50 — 100 — 200 — 300 — 400 — 500ms

 Level 2

Password = 2001

2.1 External CT ratio

Ct = primary/secondary ratio (e.g. CT 800/5A Ct = 160)

External CT ratio (Ct): 1...9999 (maximum primary current 50000/5A — 10000/1A)

On modifying the ratios the power counters are automatically reset

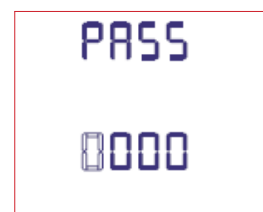
Phase sequence diagnostic

In the software there is a diagnostic and correction algorithm of the voltmetric and amperometric connection sequence. The function can be activated on request and is password protected: it can display and edit the wiring sequence with the following limitations.

- 1) The neutral conductor /in the 4-wire wirings) must be correctly positioned (terminal 11)
- 2) There must not be any crossings between the currents
- 3) The power factor must be between 0.9cap and 0.7ind for each phase

1.0 Password 1000

Keep pressed  +  keys until you display page:



Set password 1000 and confirm



Move the cursor

Increase/decrease the set value to confirm



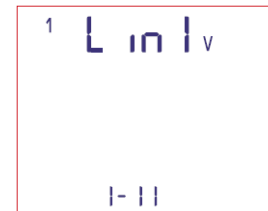
1.1 Customised display page

It is possible to select which values will appear in the three display lines. To customise the page, select the desired value for line 1:



Select the measurement

Confirm

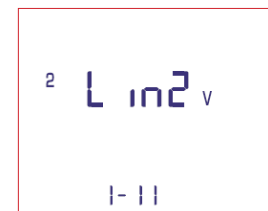


Select the desired measurement for the line 2 (among those indicated in Table 2)



Select the measurement

Confirm

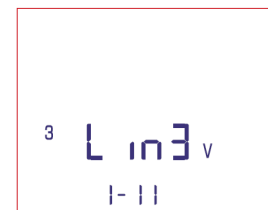


Select the desired measurement for the line 3 (among those indicated in Table 3)



Select the measurement

Confirm

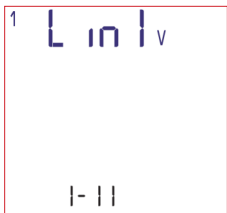


The customised page will become the standard display when the instrument is switched on.

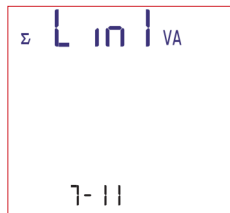
Note: If you do not want to configure the customised page go directly to point 1.2 Connection pressing the key several times.



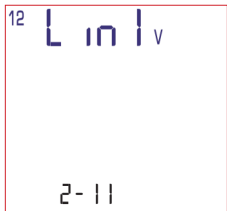
Table 1 (Line 1)



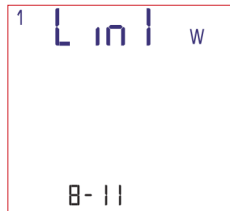
L1 Voltage



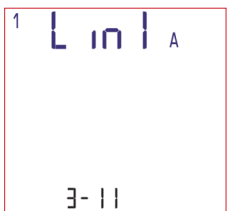
Three phase apparent power



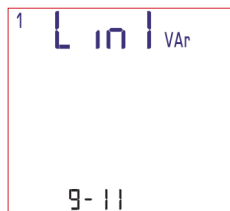
L1- L2 Voltage



L1 active power



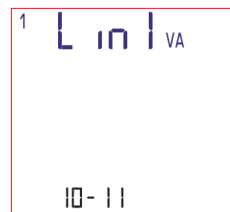
L1 Current



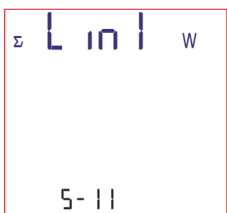
L1 reactive power



Sum of th currents
$$\frac{I1 + I2 + I3}{3}$$



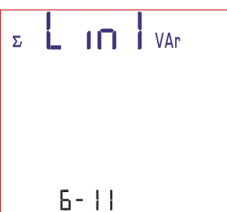
L1 apparent power



Three phase active power

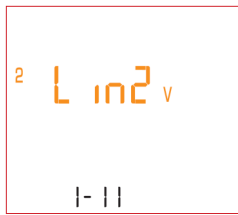


Three phase power factor

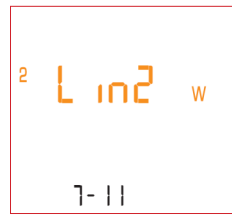


Three phase reactive power

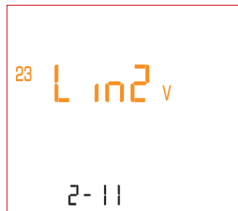
Table 2 (Line 2)



L2 Voltage



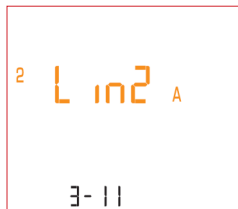
L2 active power



Voltage L2 - L3



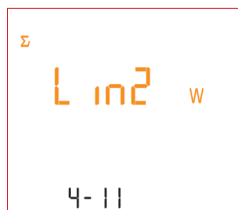
L2 reactive power



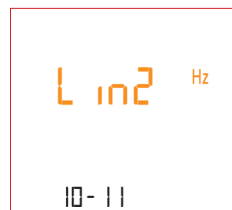
L2 current



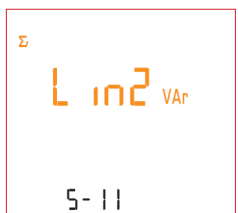
L2 apparent power



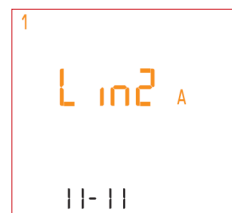
Three phase active power



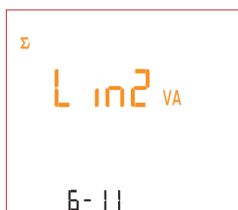
Frequency



Three phase reactive power

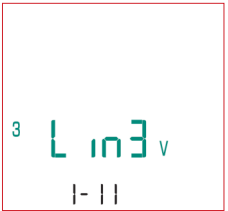
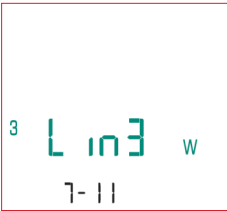
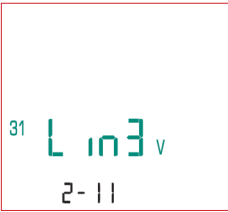
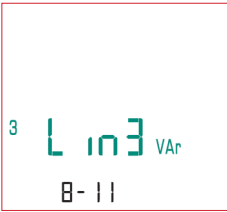
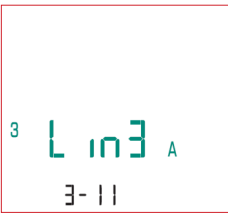
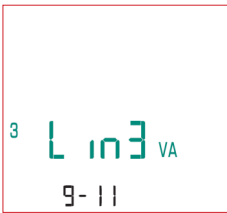
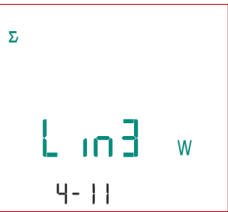
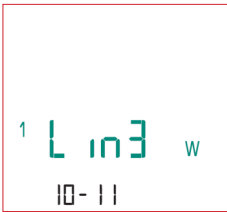
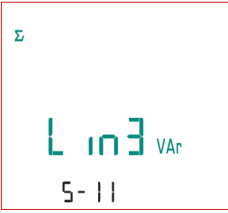

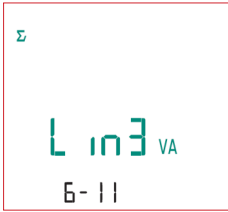


L1 current



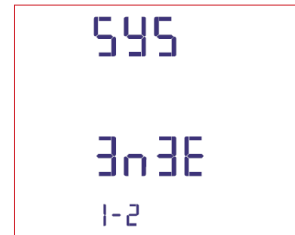
Three phase apparent power

Table 3 (Line 3)

	L3 Voltage		L3 active power
	L3—L1 Voltage		L3 reactive power
	L3 Current		L3 apparent power
	Three phase active power		L1 active power
	Three phase reactive power		L1 Current
	Three phase apparent power		

1.2 Connection

- ▲ ▼ Select the connection
- ↩ Confirm



Select the type of connection required, scrupulously respecting the connected wiring diagram

The connections that can be selected are

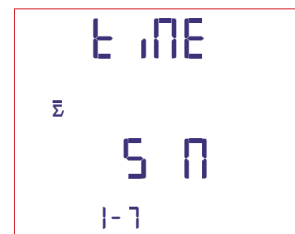
Symbol	Wire	Currentlast	Number of external converters
1N1E	Single phase	-	1
3N3E	3 phase 4 wire	Unbalanced	3

1.3 Average power and current integration time

Selectable integration time: 5, 8, 10, 15, 20, 30, 60 Minutes

The selected time is valid for both the current and the average power

- ▲ ▼ Select the time value
- ↩ Confirm



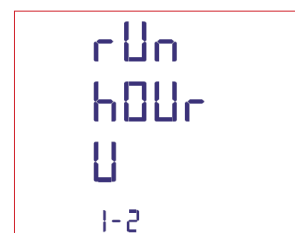
1.4 Hour meter counting start

Select the value which starts the hour-meter counting: Voltage or power

1.4a Voltage counting start

Voltage: counting start with > 10V phase voltage

- ▲ ▼ Select voltage or power
- ↩ Confirm



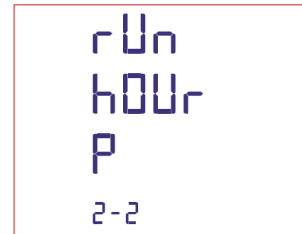
1.4b Power counting start

Power: counting start with 3-phase programmable active power

▲ ▼ Select voltage or power

↵ Confirm

0...50%Pn



▶ Move the cursor

▲ ▼ Increase/decrease the set value

↵ Confirm



1.5 RS485 ModBus RTU/TCP communication

Depending on the model, the instrument may not have communication or may have RS485 ModBus RTU/TCP communication

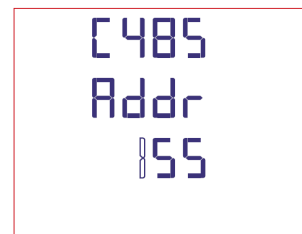
No. Of address: 1...255

▶ Move the cursor

▲ ▼ Increase/decrease the set value

↵ Confirm

Transmission Speed: 4800—9600—19200 bit/s



▲ ▼ Select speed

↵ Confirm

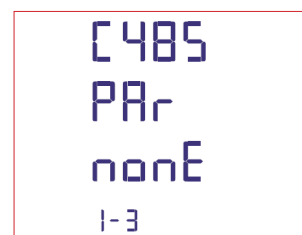
Parity bit: none—even—odd






▲ ▼ Parity selection

↵ Confirm

Waiting time before the answer: 3...99ms





-  Move the Cursor
-  Increase/Decrease the set value
-  Confirm

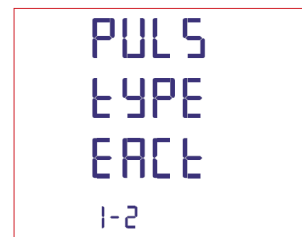




1.6 Energy pulses

Associable Measurements: active or reactive energy

-  Select active/reactive
-  Confirm



Pulseweight: 1 pulse/10Wh(varh) - 100Wh(varh) - 1kWh(kvarh) -
10kWh(kvarh) - 100kWh(kvarh) - 1MWh(Mvarh) -
10MWh(Mvarh)

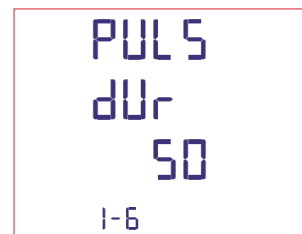


-  Select pulse weight
-  Confirm

Pulse duration: 50—100—200—300—400—500ms

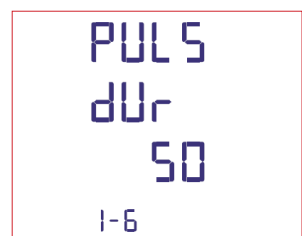


-  Select pulse duration
-  Confirm



Confirm programmed data

-  Confirm



-  Confirm



2.0 Password 2001

Press key  until site is displayed:

Set password 2001 and confirm



- ▶ Move the cursor
- ▲ ▼ Increase/decrease the set value
- ↵ Confirm



2.1 External CT ratio

CT = External CT primary/secondary ratio (e.g. CT800/5A Ct = 160)
External CT ratio (Ct): 1...9999 (maximum primary current 50000/5A—10000/1A)

- ▶ Move the Cursor
- ▲ ▼ Increase/decrease the set value
- ↵ Confirm



Display

The display is divided into four menus which can be accessed with the function keys: the display values and modes vary according to the connection selected (3 phase 4 wire line, single phase, etc.)

All the measurements displayed are indicated in the following pages according to the connection selected.

U



Phase voltage
Interlinked voltage
Minimum voltage value
Maximum voltage value
Voltage harmonic distortion
Configuration data *

I



Phase current
Neutral current
Average current
Average current peak
Average 3 currents
Current harmonic distortion
Configuration data *

P·Q·S



Active Power
Reactive Power
Apparent Power
Distortion Power
Average Power
Average Power Peak
Configuration data *

E·PF·F Ⓢ

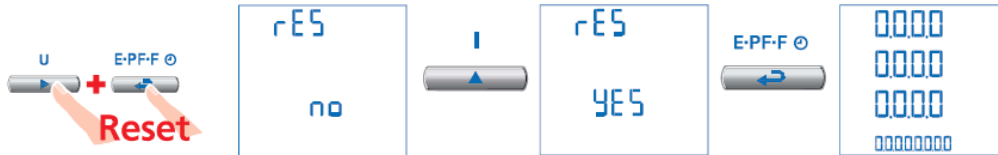


Active energy
Reactive energy
Apparent energy
Frequency
Hour meter
Configuration data *

*See Configuration data display, page 16

Reset

It is possible to reset the display pages, when the following function keys are pressed simultaneously:



Measured values

U



1	XXXX V	Phase voltage L1—N
2	XXXX V	Phase voltage L2—N
3	XXXX V	Phase voltage L3—N
	XXXXXXXXX kWh	Positive active energy

1	XXXX V	Phase voltage L1—N
2	XXXX V	Phase voltage L2—N
3	XXXX V	Phase voltage L3—N
	0.85	Max. value

12	XXXX V	Interlinked voltage L1—L2
23	XXXX V	Interlinked voltage L2—L3
31	XXXX V	Interlinked voltage L3—L1
	XXXXXXXXX kvarh	Positive reactive energy

1	XXXX %	Harmonic content
2	XXXX	Phase voltage
3	XXXX V THD	Phase voltage
	XXXXXXXXX kWh	Positive active energy

1	XXXX V	Phase voltage L1—N
2	XXXX V	Phase voltage L2—N
3	XXXX V	Phase voltage L3—N
	0.00	Min. value

	3n3E	Network type
	XXXX	Version



1 XXXX A
2 XXXX A
3 XXXX A
XXXXXXXX kWh

Phase current L1
Phase current L2
Phase current L3
Positive active energy

Σ XXXX A
Σ XXXX A
XXXXXXXX kWh

Neutral current
Sum of currents I1+I2+I3
Positive reactive

1 XXXX A
2Σ XXXX A
3 XXXX A
XXXXXXXX kWh

Average current of phase L1
Average current of phase L2
Average current of phase L3
Positive reactive energy

1 XXXX %
2 XXXX
3 XXXX A THD
XXXXXXXX kWh

Harmonic content
Phase current
Positive active energy

1 XXXX A
2 XXXX A
3^ XXXX A
XXXXXXXX kWh

Max. average current L1
Max. average current L2
Max. average current L3
Positive active energy

En Ee
XXXX

Network type
Version



P·Q·S



Σ XXXX ^kW
 XXXX ^kVAr
 XXXX ^kVA
 XXXX ^kVAh

Active power — 3-phase
 Reactive power — 3-phase
 Apparent power — 3-phase
Unbalanced power-3-phase

XXXX ^kW
 XXXX ^kVAr
 XXXX ^kVA
 XXXXXXXX ^{kvarh}

Max. average active power — 3-ph.
 Max. average reactive power — 3-ph.
 Max. average apparent power — 3-ph.
Positive reactive energy



1 XXXX ^kW
 2 XXXX ^kW
 3 XXXX ^kW
 XXXXXXXX ^{kvarh}

Active energy of phase L1
 Active power of phase L2
 Active power of phase L3
Positive reactive energy

3n3E
 XXXX

Network type
 Version

1 XXXX ^kVAr
 2 XXXX ^kVAr
 3 XXXX ^kVAr
 XXXXXXXX ^{kWh}

Reactive power of phase L1
 Reactive power of phase L2
 Reactive power of phase L3
Positive active energy

1 XXXX ^kVA
 2 XXXX ^kVA
 3 XXXX ^kVA
 XXXXXXXX ^{kvarh}

Apparent power of phase L1
 Apparent power of phase L2
 Apparent power of phase L3
Positive reactive energy

XXXX ^kW
 XXXX ^kVAr
 XXXX ^kVA
 XXXXXXXX ^{kWh}

Average power (P, Q, S)
Positive active energy

E-T



Σ XXXX PF
XXXX Hz
XXXXXXXX h

Power factor

Frequency

Operating hours



EACt
nE9
Ur00
XXXXXXXX kWh

Number of counter resets

Positive active energy

1 XXXX PF
2 XXXX
3 XXXX
XXXXXXXX kWh

Power factor of phase L1

Power factor of phase L2

Power factor of phase L3

Positive reactive energy

ErEA
nE9
Ur00
XXXXXXXX kWh

Number of counter resets

Positive reactive energy

EACt
POS
Ur00
XXXXXXXX kWh

Number of counter resets

Positive active energy

?
?
?
?

Customised page

ErEA
POS
Ur00
XXXXXXXX kWh

Number of counter resets

Positive reactive energy

EnE
XXXX

Network type

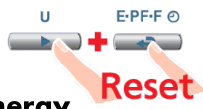
Version

U



1 XXXX V
XXXX V
^ XXXX V
XXXXXXXXX kWh

Voltage
Min. voltage
Max. voltage



Positive active energy

I



1 Σ XXXX A
XXXX A
^ XXXX A
XXXXXXXXX kWh

Current
Average Current
Average Current peak
Positive active ener-



1 XXXX %
THD
V
XXXXXXXXX kWh

Harmonic content, Voltage
Positive active energy

1 XXXX %
THD
A
XXXXXXXXX kWh

Harmonic content,
Current

In IE
XXXX

Network type
Version

In IE
XXXX

Network type
Version

P-Q-S



E-T



Σ XXXX k W
XXXX k VAr
XXXX k VA
XXXX d kva

Active energy
Reactive energy
Apparent power
Unbalanced Power

Σ XXXX PF
XXXX Hz
XXXXXXXX h

Power factor
Frequency
Operating hours



XXXX k W
Σ XXXX k VAr
XXXX k VA
XXXXXXXXXX kWh

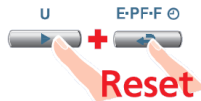
Average active energy
Average reactive energy
Average apparent power
Positive active energy

EACt
POS
Ur00
XXXXXXXXXX kWh

Number of counter resets
Positive active energy

XXXX k W
XXXX k VAr
Λ XXXX k VA
XXXXXXXXXX kWh

Max. average active energy
Max. average reactive energy
Max. average apparent power
Reactive energy



EACt
nE9
Ur00
XXXXXXXXXX kWh

Number of counter resets
Positive reactive energy

In IE
XXXX

Network type
Version

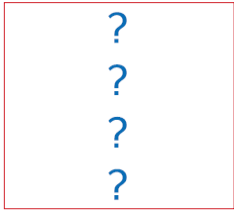
EACt
nE9
Ur00
XXXXXXXXXX kWh

Number of counter resets
Positive active energy

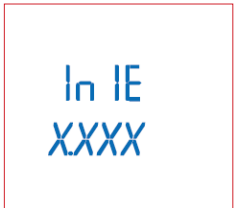
ErEA
nE9
Ur00
XXXXXXXXXX kWh

Number of counter resets
Positive reactive energy

E-T



Customised Page



Network type
Version

 Factory Settings

Password 1000

Customised page

¹Lin1v Voltage L1

²Lin2v Voltage L2

³Lin3v Voltage L3

Connection: **3n3E** 3 line 4 wires system

Average time: **5m** 5 Minutes

Hour meter counting: **U** Voltage Start

RS485

Adress: 255

Speed: 9.600

Parity bit: keine

Data transfer delay: 20ms

Pulse output

Energy: active

Pulse weight: 0,01kWh

Pulse duration: 50ms

Password 2001

CT ratio: 0001 direct connection