AEG

MULTIMETER

EXM
User manual

EXM User manual 9AKK108469A9868

Table of Contents

1. General information

1.1.Use and storage of manuals

Carefully read this manual and adhere to the indications described prior to using the device.

This manual contains all of the safety information, the technical aspects and the operations necessary to ensure the correct use of the device and maintain it in safe conditions.

1.2.Copyright

1.3.Liability disclaimer

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1.4.General safety warnings

Non-adherence to the following points can lead to serious injury or death.

Use the suitable personal protection devices and adhere to the current regulations governing electrical safety.

- This device must be installed exclusively by qualified personnel who have read all of the information relative to the installation.
- Check that the voltage supply and measurement are compatible with the range permitted by the device.
- Ensure that all current and voltage supplies are disconnected prior to carrying out any controls, visual inspections and tests on the device.
- Always assume that all circuits are under voltage until they are completely disconnected, subjected to tests and labelled.
- Disconnect all of the power supply prior to working on the device.
- Always use a suitable voltage detection device to check that the supply is interrupted.
- Pay attention to any dangers and carefully check the work area ensuring that no instruments or foreign objects have been left inside the compartment in which the device is housed.
- The correct use of this device depends on a correct manipulation, installation and use.hdfh.
- Failure to adhere to the basic installation information can lead to injuries as well as damage to the electric instruments or to any other product.
- **NEVER** connect an external fuse in by-pass.
- Disconnect all of the input and output wires before carrying out a dielectric rigidity test or an insulation test on an instrument in which the device is installed.
- The tests carried out at a high voltage can damage the device’s electronic components.
- The device has to be installed on a standard 35mm DIN rail.
- Installation of EXM shall include a switch or circuit breaker for the connection of auxiliary supply and voltage measurement. The switch or circuit breaker must be suitably located and easily reachable and must be marked as the disconnecting device for EXM.
- Before connecting the auxiliary power supply and voltage measurement, or disconnecting the auxiliary power supply or voltage measurement, you must turn off the circuit breaker or switch.

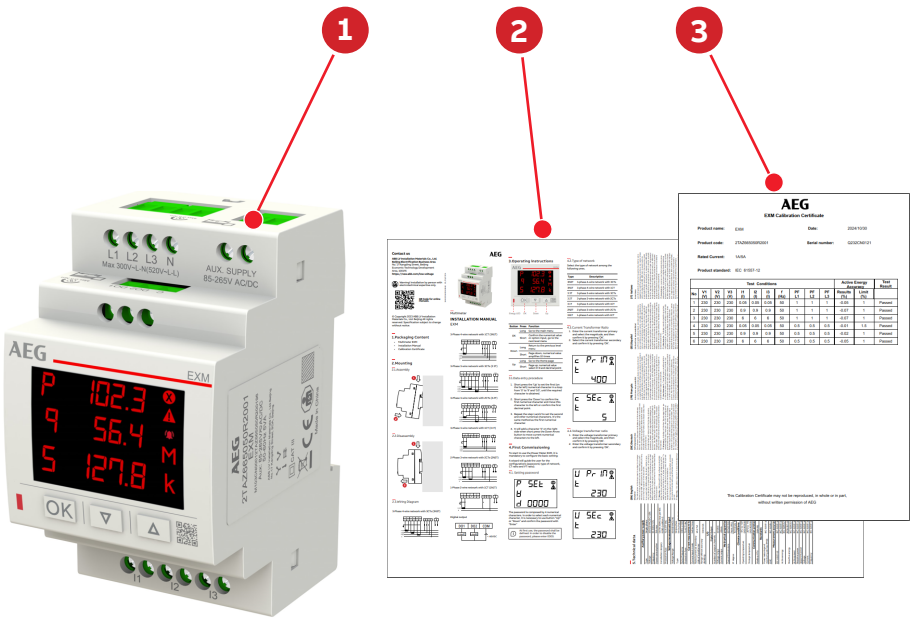
1.5.Cyber Security Disclaimer

EXM multimeter is designed to be connected and to communicate information and data via a network interface, which should be connected to a secure network. It is your sole responsibility to provide and continuously ensure a secure connection between the product and your network or any other network (as the case may be) and to establish and maintain appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of antivirus programs, etc.) to protect the EXM multimeter product, the network, its system and interfaces against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. **ABB LV Installation Materials Co. Ltd. Beijing** and its affiliates are not liable for damages and/ or losses related to such security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

EXM products can only work on a Local Area Network, it uses Modbus communication which is unsafe protocol, so you should establish a safe hardware environment for meter operation to against security threats or attacks. We recommend that you change your security password in time, keep the meter is not accessible to irrelevant personnel, and deploy security measures such as installing firewall and anti-virus software.

Although **ABB LV Installation Materials Co. Ltd. Beijing** provides functionality testing on the products and updates that we release, you should institute your own testing program for any product updates or other major system updates (to include but not limited to code changes, configuration file changes, third party software updates or patches, hardware change out, etc.) to ensure that the security measures that you have implemented have not been compromised and system functionality in your environment is as expected.

2. Packaging contents



Packaging contents	
1	Multimeter EXM
2	Installation manual
3	Calibration certificate

3. Technical characteristics

3.1.Description of the device

EXM series can help users accurately monitor energy efficiency while meeting their cost control requirement.

Conforming to the international electric energy metering and monitoring accuracy standards, all EXM series products are perfectly suitable for ABB electrical systems and solutions.

3.2.Main functionalities

Real-time Measurement	
TRMS Current	●
TRMS Voltage	●
Frequency	●
Active, Reactive and Apparent Power	●
Power Factor	●

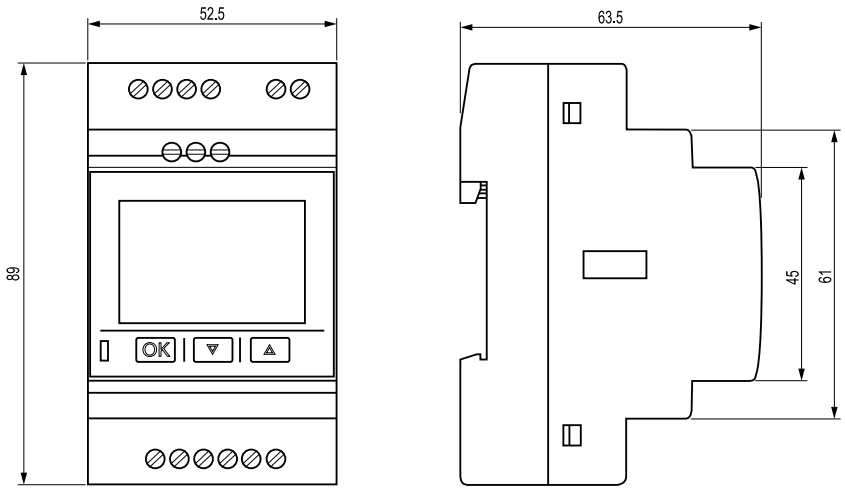
Energy	
Active, Reactive and Apparent Energy	●
Four-quadrant (Import/Export/Net)	●

Data recording and logs	
Alarms	15
Warnings logs	●
Alarms logs	●
Errors log	●
Audit logs	● (Only counter)

3.3.Versions

Product Name	I/O	Display	Communication protocol
EXM	2 DO	LED	/
EXM-RS	2 DO	LED	Modbus-RTU

3.4.Overall dimensions



Unit: mm

3.5.Technical data

Auxiliary power supply	
Voltage range	100-230 V AC/DC ±15%
Frequency	50 - 60Hz ±5%
Power Consumption	5VA max
Installation category	CAT III 300V class per IEC 61010-1 edition 3
Protection fuse	T1 A-277 VAC

Measurement accuracy	
IEC 61557-12	IEC 61557-12 PMD/S/K55/1
Active energy	IEC61557-12 Class 1
	IEC 62053-21 Class 1
Reactive energy	IEC 61557-12 Class 2
	IEC 62053-24 Class 2
Active power	IEC 61557-12 Class 1
Reactive power	IEC 61557-12 Class 2
Apparent power	IEC 61557-12 Class 2
Voltage	IEC 61557-12 Class 0.5
Current	IEC 61557-12 Class 0.5
Frequency	IEC 61557-12 Class 0.1

Voltage measurement inputs	
Voltage input mode	Direct or Indirect insertion with VT
Voltage Range	80-300 VAC(L-N)
Wiring Type	Single-phase, three-phase (3P, 3P+N)
Rated frequency	50Hz or 60Hz
Protection fuse	T1 A-277 VAC
VT primary range	50~750000V
VT secondary range	50~510V

Current measurement inputs	
Current input mode	Indirect insertion with CT
Rated current at secondary side of CT	1A or 5A
Rated frequency	50Hz or 60Hz
Range without accuracy derating	50mA-5A AC 120%
CT primary range	1-50000A
Wiring Type	Single-phase, three-phase (3P, 3P+N)

I/O	
Digital Output	
Number of channels	2
Voltage	40V DC
Current	≤60mA DC
Width	10 ~ 990ms

Mechanical properties	
Overall dimensions	89.0mm x 52.5mm x 63.5mm
IP degree of protection (IEC 60529)	Front: IP51 @ IEC 60529
	Enclosure: IP20 @ IEC 60529
Weight	252g
Fireproof and Heatproof	Terminal 960°C, cover 650°C @IEC 60695-2-1-UL V0

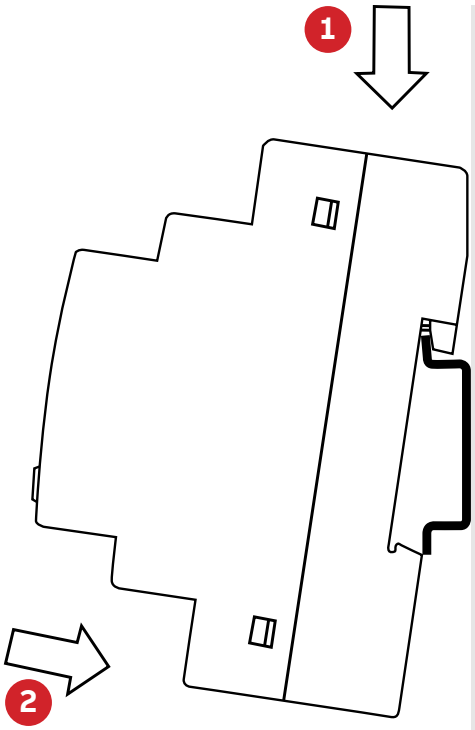
Climatic conditions	
Operating temperature	-5 to 55°C (K55 IEC61557-12)
Storage temperature	-25 to70°C (K55 IEC61557-12)
Relative humidity	≤75% yearly average, ≤95% on 30 days/year
Altitude	≤2km
Pollution degree	2
Environment	It is prohibited to use in the environment containing H2S, Cl2, NH3 and other harmful gases

Communication protocol	
Modbus RTU	**EXM-RS**
Communication interface	RS485 with optical isolation
Baud rate	9.6, 19.2, 38.4, 57.6, 115.2 kbps
Parity number	Odd (1 stop bit), Even (1 stop bit), None (1 stop bits)
Address	1-247
Connector	3 pole terminal

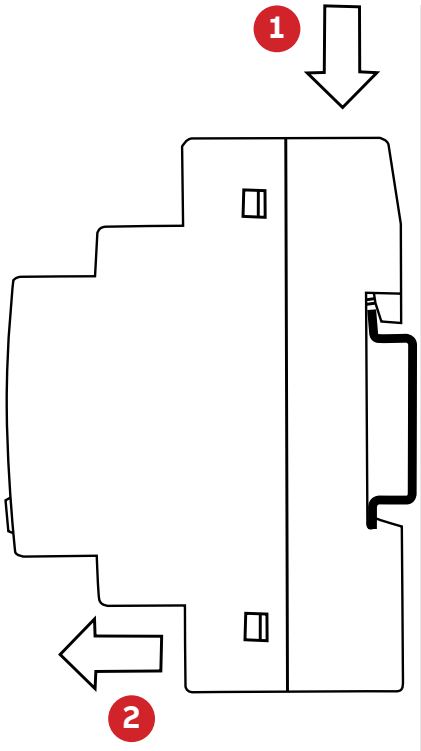
Standards	
Power metering and monitoring devices (PMD)	IEC 61557-12
Static meters for AC active energy	IEC 62053-21
Static meters for fundamental component reactive energy	IEC 62053-24
EMC	IEC 61326-1
Electrical safety	IEC 61010-1
IP degree of protection	IEC 60529

4. Installation

4.1.Assembly



4.2.Disassembly



4.3.Wiring diagrams

The operations to carry out for the correct connection of the device, based on the type of electric line available, are described in this section.

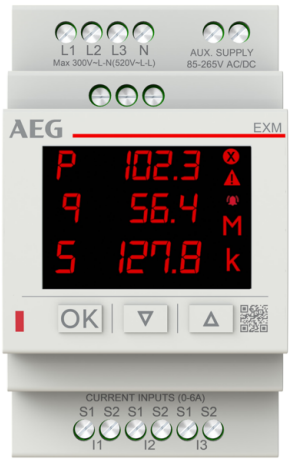
The installation and the cabling of the device must be carried out by qualified personnel.

Danger of electrocution, burning and electric arc.

Use the personal protection devices suitable to adhere to the current regulations governing electrical safety.

Prior to carrying out any connections check the sectioning of the electric supply with the voltage detection device.

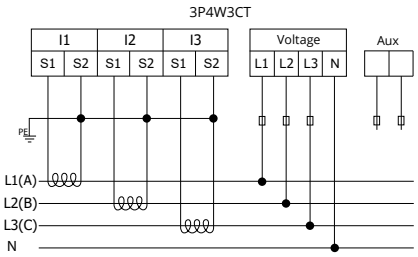
EX**M**

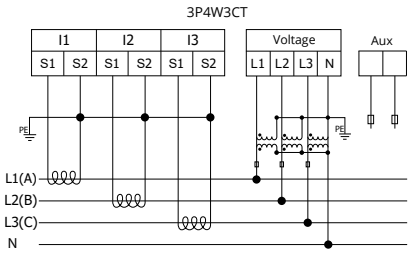


EX**M**-RS

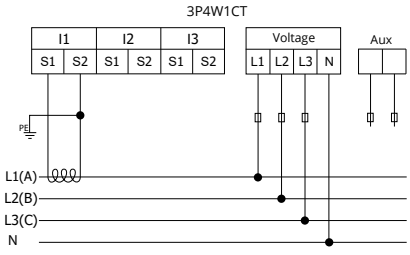
Type of network EXM can be used on different type of network (please refer to chapter "7. Configuration (CFG)" for the configuration on the device). According to the type of network that has been chosen, the parameters visualized on the device HMI change. Below the wiring diagrams are shown:

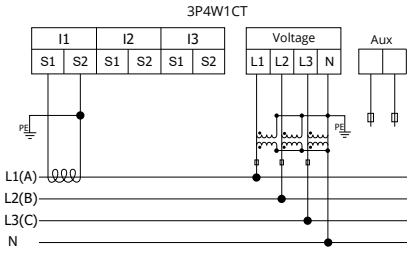
- **3-phase 4-wire network with 3CTs (3N3T)**



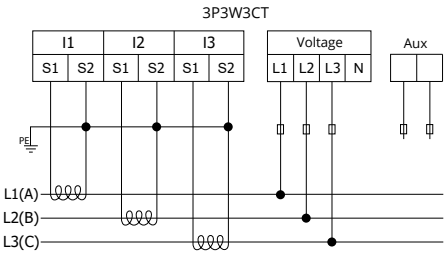


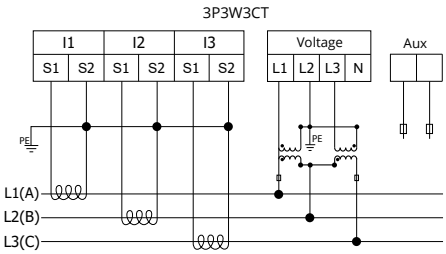
- **3-phase 4-wire network with 1CT (3 1T)**



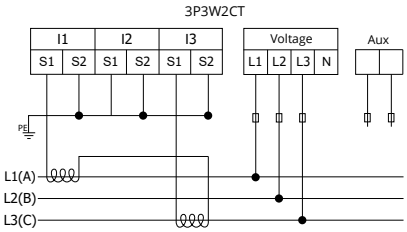


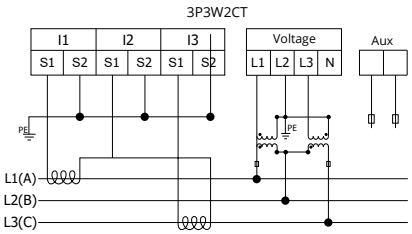
- **3-phase 3-wire network with 3CTs (3 3T)**



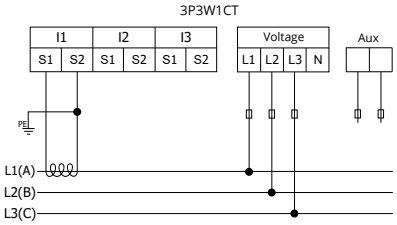


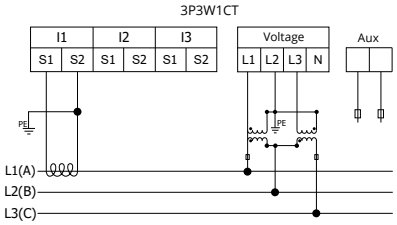
- **3-phase 3-wire network with 2CTs (3 2T)**



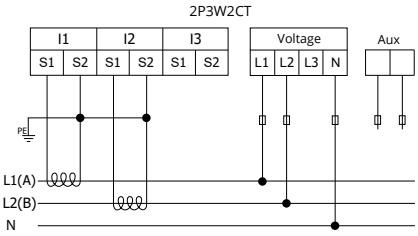


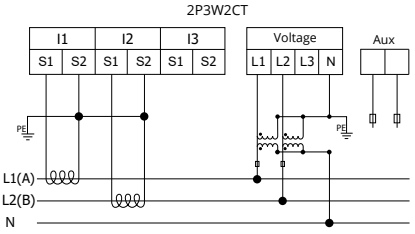
- **3-phase 3-wire network with 1CT (3 1T)**



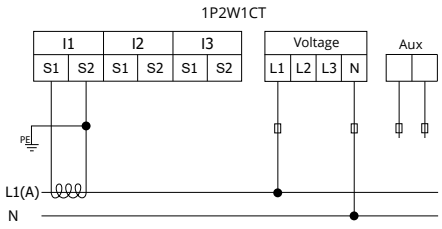


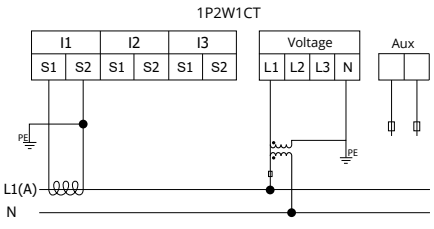
- **2-phase 3-wire network with 2CTs (2N2T)**



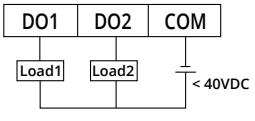


- **1-phase 2-wire network with 1CT (1N1T)**





- **Digital outputs**



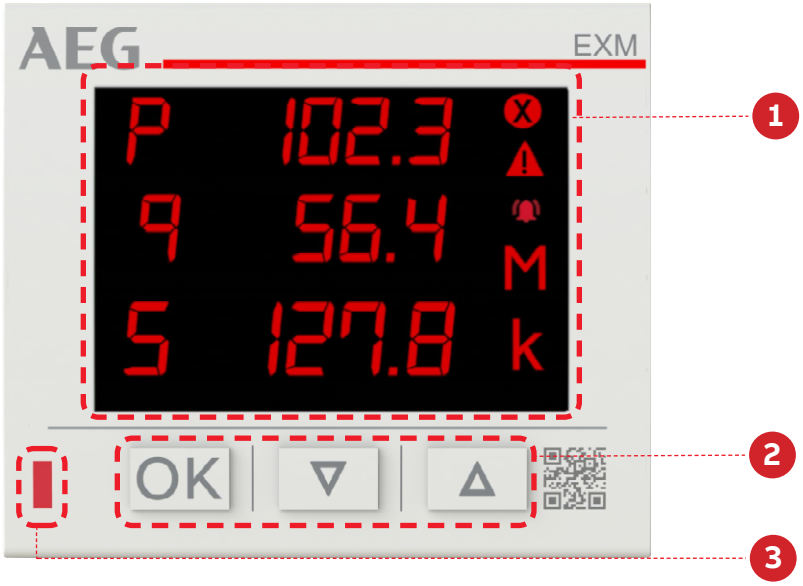
5. Access to device

This chapter gives a detailed introduction of the device's HMI, including how to read data and configure related parameters.

5.1.Display

Front panel.

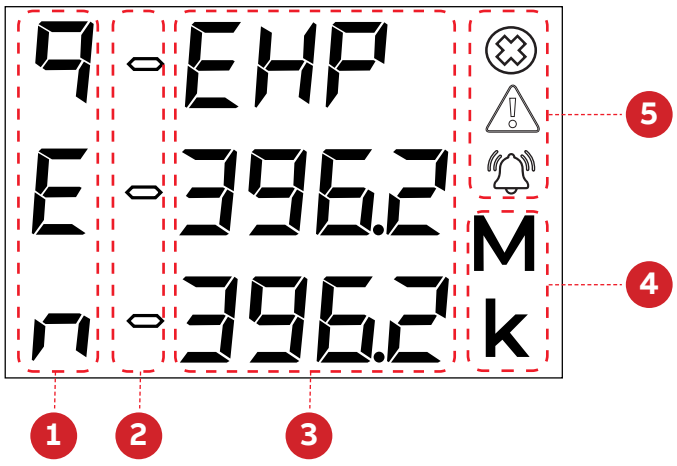
EXM products use LED displayer, the front panel of EXM is shown below:



Operator panel	
1	Display area
2	Function buttons
3	Energy pulse LED

Display content

Display is divided into 5 different areas, as shown in the figure below:

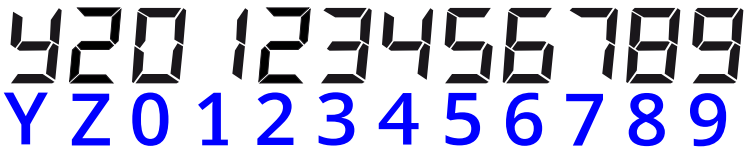


N	Area	Description
1	Title	Title of the content displayed on each screen, including MENU, Read and CONF…
2	Load type	Inductive load and capacitive load, or the negative sign
3	Measurements	Specific measured value, or other contents
4	Magnitude	Magnitude includes K, M and G
5	Icons	Indicating various types of state, and for further details, see the table below

Icon description:

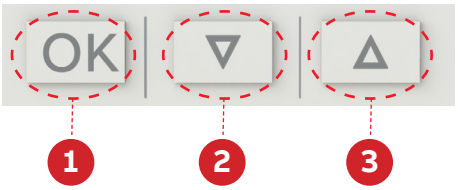
	Icon	Description
		Notification of alarm
		Notification of error
		Notification of warning

Character display type:

Icon	Description
Title	
	
Measurements	

5.2.Buttons

Each D1M 15 is provided with 3 push buttons as per below picture:



Functions of each button might change according to the displayed page on the meter. See below for a complete description:

#	Button	Short press functions	Long press functions
1	OK	Confirm the numerical value or option input, go to the next class menu	Go to the main menu
2	Down	Page down, numerical value amplifies 10 times	Return to the previous menu
3	Up	Page up, numerical value select 0~9 and decimal point	Go to the Home page

There are some functions need to use combination of pushbuttons, see below for a complete description:

Combination buttons	Screen	Function
Down + Up	During entering password	Short press together to escape password check configuration read-only.

5.3.Data entry

Some of the pages require the entry of numerical characters (0-9) in the Configuration mode. In these cases, the display will show an active field identified by a flashing number.

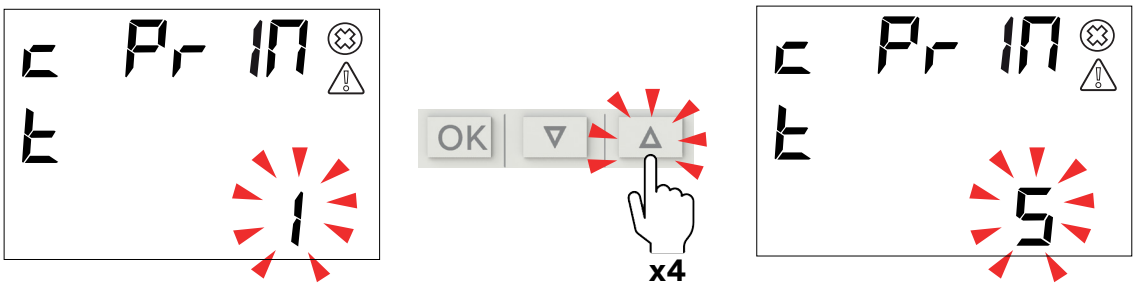
Data entry procedure
Press the “**OK**” button to start setting on the specified parameter page, and the parameter starts to blink display.

The data entry procedure is as follows:

Short press the “**Up**” Arrow button to set the first(on the far left) numerical character in a loop from ‘0’ to ‘9’ and ‘0.0’, until the required character is obtained.

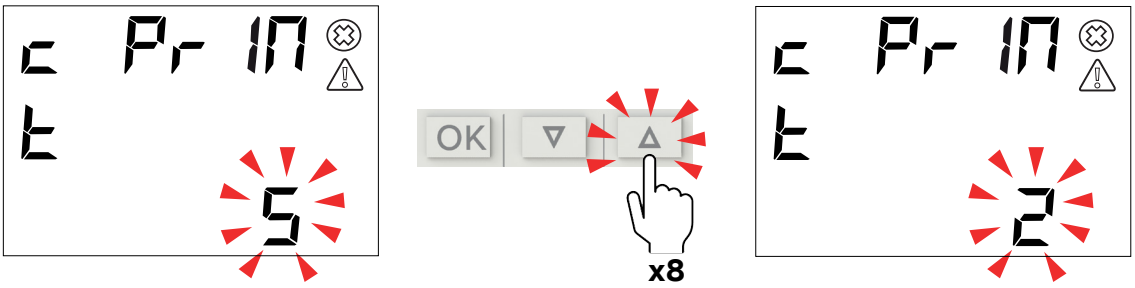
- Short press the “**Down**” Arrow button to confirm the first numerical character and move this character to the left, or confirm the first decimal point.
- Repeat the step 1 and 2 to set the second and other numerical characters, it’s the same method as the first numerical character.
- It will add a character ‘0’ on the right side when short press the “**Down**” Arrow button to move current numerical characters to the left.

The following will be combined with the display to describe how to complete the data entry.



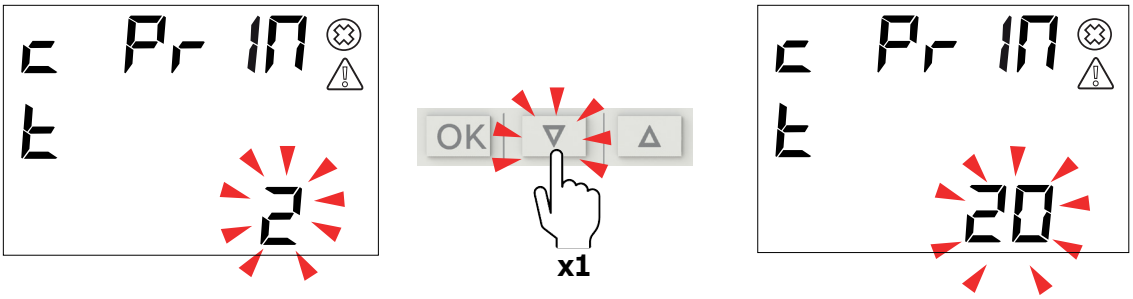
1. Press “**Up**” to increase the numerical characters from 0 to 9, until the required character is obtained.

- **How to Go back to a previous number**



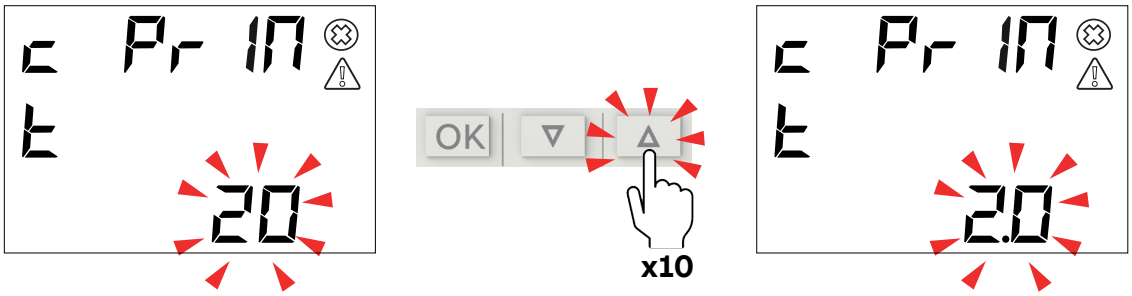
If during the data entry the desired number is exceeded by mistake, it is needed to increase the displayed number until data entry starts again from 0.

- **Add a second digit**



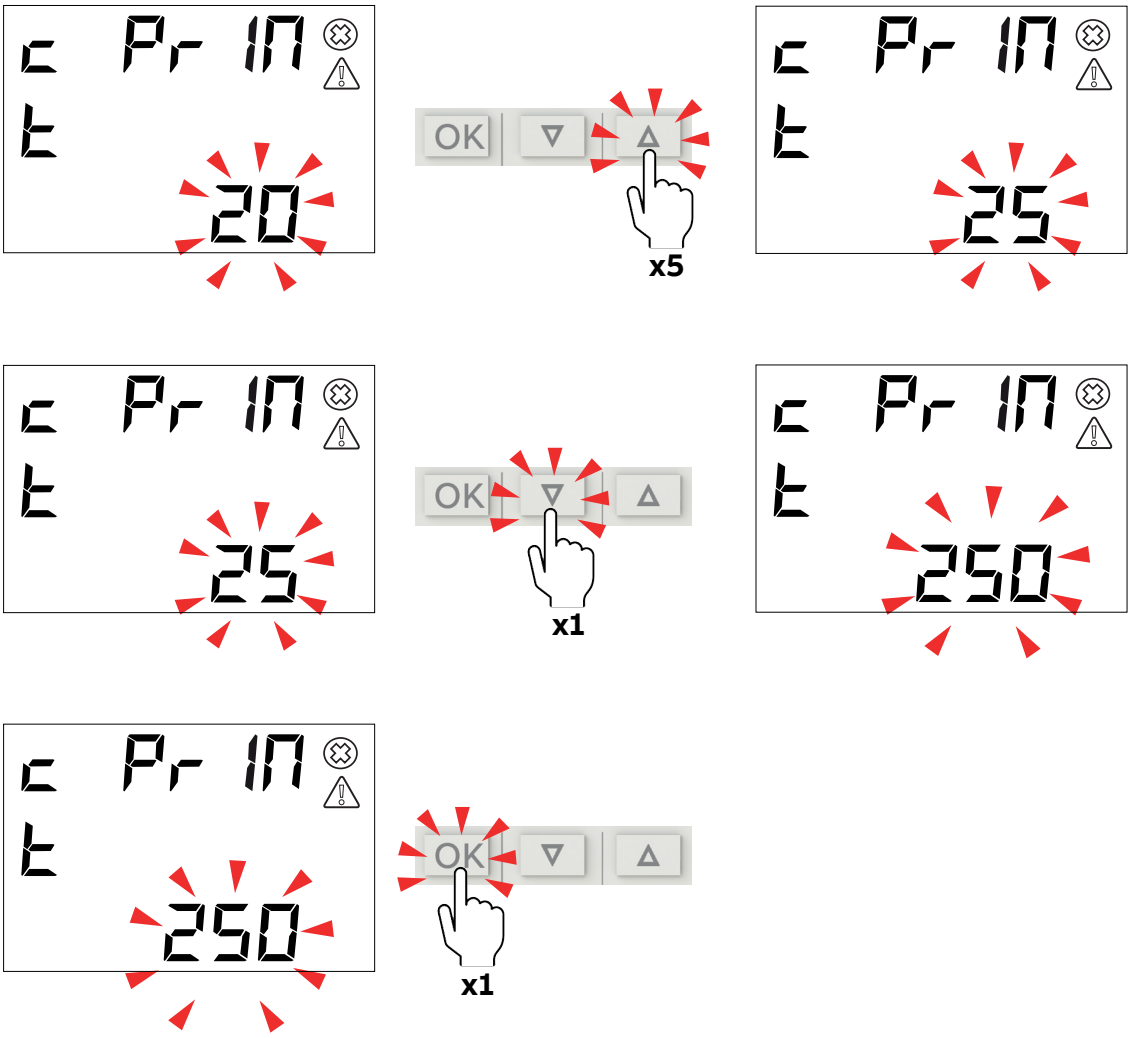
2. Press “**Down**” to move the cursor in order to add a second digit to the number.

- **How to: Enable the comma**



Some device configurations allow entering the comma. Comma can be displayed by increasing the number with “**Up**” , after character 9 and before data entry starts again from character 0.

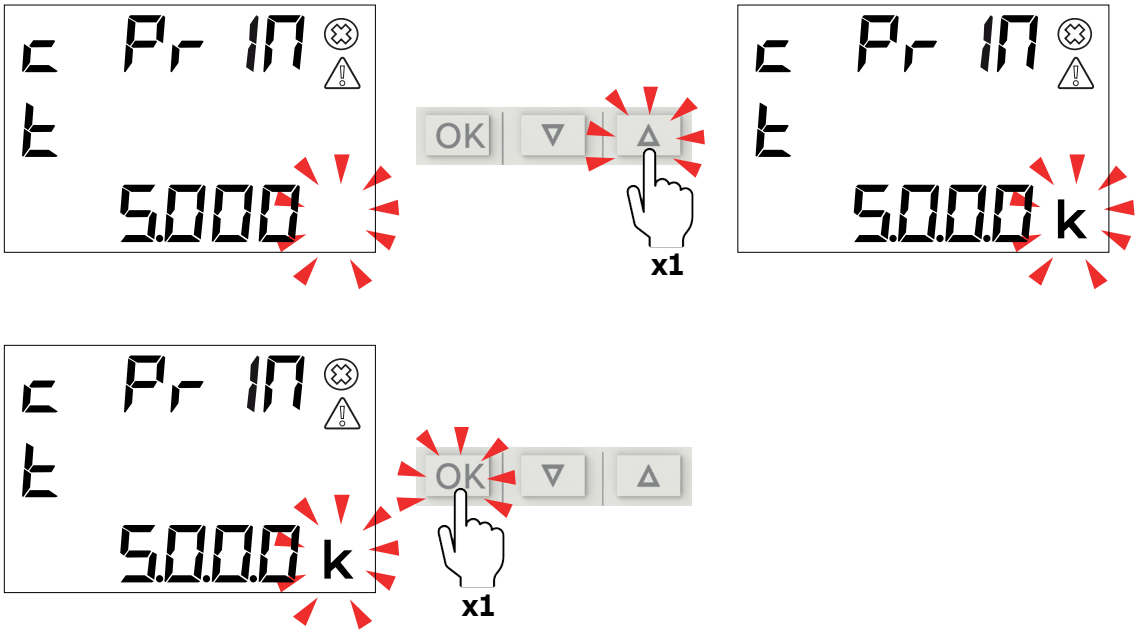
- **Confirm number**



3. Repeat the operations described in steps 1 and 2 until the desired number is obtained, press “**OK**” to confirm the number.

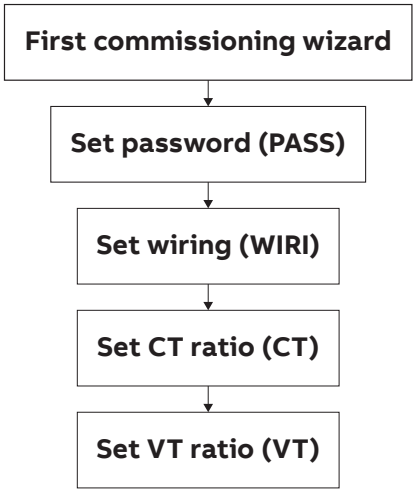
- **How to Enter the magnitude**

Some device configurations allow entering the magnitude (k, M). Once the number has been entered as after step 3, keys “**Up**” and “**Down**” allow enabling the magnitude “K” (kilo) or not. Press “**OK**” to confirm the magnitude. Follow the steps below when the buttons are used to enter numbers:



6. First commissioning

When the device is started up for the first time, the basic parameters need to be set, and the wizard program will guide the user to configure the device by following the steps below:



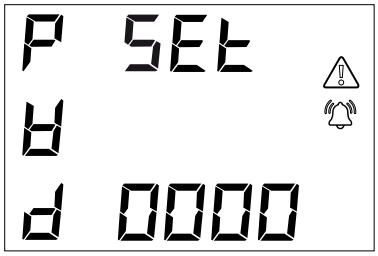
6.1.Password for the first use (PWD)

A password can be set by the user to protect the Configuration menu and avoid any unwanted modification to the device settings.

At the first use it is mandatory to define a password.

The password comprises 4 digits, and Button “**Up**” and Button “**Down**” can be used to enter numbers, and Button “**OK**” can be used to confirm the user’s settings and Button “Menu” used to drop the user’s settings.

In order to disable the password, please set the new password as **0000**.



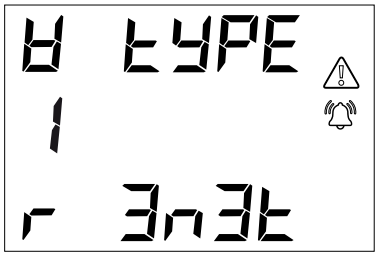
The password can be changed this way:

1. Go to **CFG>UNT>PWD**
2. Press “**OK**” to start changing password.

6.2.Wiring (WIR)

In order to configure the type of network it is needed to choose one of the available options according to the installation conditions.

CFG>ISTL>WIR



1. Scroll the list of fields “**Up**” or “**Down**”
2. Select one option by pressing “**OK**”

Type	Description
3N3T	Three-phase, four-wire and 3 CTs
3N1T	Three-phase, four-wire and 1 CT
3 3T	Three-phase, three-wire and 3 CTs
3 2T	Three-phase, three-wire and 2 CTs
3 1T	Three-phase, three-wire and 1 CT
2N2T	Two-phase, three-wire and 1 CT
1N1T	Single-phase, two-wire and 1 CT

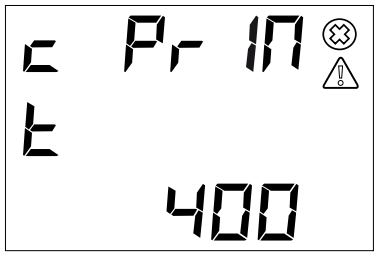
6.3.CT ratio (Ct P, Ct S)

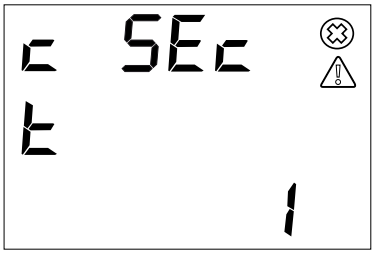
EXM is capable to measure current only via indirect connection by means of current transformers CTs.../5A or .../1A.

It is needed to set the transformation ratio of the installed current transformers.

In order to configure the current transformers ratio, it is possible to set the primary (CT P) and secondary (CT S) of the current transformer.

CFG>ISTL>CT





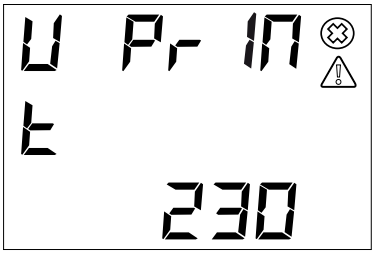
1. When the number of the primary CT is set, press Button “**OK**”
2. Use Button “**Up**” and Button “**Down**” to select the magnitude
3. Press button “**OK**” to confirm the setting of the primary CT
4. Press button “**Down**” to go to the setting of the secondary CT
5. Select the secondary CT among 1 and 5A
6. Press button “**OK**” to confirm the setting of the secondary CT

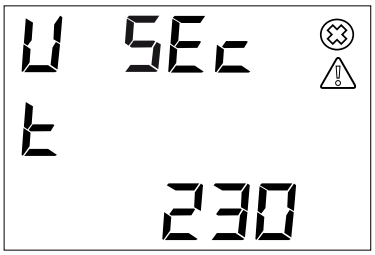
6.4.VT ratio (Vt P, Vt S)

EXM is capable to measure voltage via direct connection up to 300 V (L-N), or via indirect connection by means of voltage transformers.

In order to configure the voltage transformer ratio, it is needed to enter manually the values of both primary (Vt P) and secondary (Vt S).

CFG>ISTL>VT





1. When the number of the primary VT is set, press Button “**OK**”
2. Use Button “**Up**” and Button “**Down**” to select the magnitude
3. Press button “**OK**” to confirm the setting of the primary VT
4. Press button “**Down**” to go to the setting of the secondary VT
5. When the number of the secondary VT is set, press Button “**OK**”
6. Press button “**OK**” to confirm the setting of the secondary VT

In case of direct insertion without voltage transformers, please set VT ratio as 230/230 (default).

7. Configuration (CFG)

When entering the **CFG** section, in order to change any configuration of the device, it is mandatory to enter the password. It is needed to enter the password again when customer needs to re-operate after inactivity time.

In case of wrong entering of the password for three times in a row, user will have to wait for 5 minutes until he can enter the password once again.

In order to read only the configurations, it is possible to simultaneously press "**Down**" and "**Up**" buttons.

CFG includes the following menus:

Menu	Description
UNT(UNIT)	Settings related to the device itself
ISTL(Installation)	Settings related to the installation conditions
I/O(Input/Output)	Settings related to DO
ALM(Alarm)	Definition of alarm conditions
COM(Communication)	Settings related to the embedded communication protocols of the EXM version

7.1.Unit (UNT)

UNIT includes the following sub-menus:

Menu	Description
PWD(Password)	Change the existing password
RST(Reset)	Full or partial reset of the meter
INF(Information)	Device information
ENS (EnergySaving)	Set inactivity time of HMI for energy saving
LOG(AuditLog)	Count the times of CT,VT, Wiring type, FW update configuration
HOMPAGE	Set to return to which page and when to return
LED	Set to indicate the speed of energy consumption

Modify password (PWD)

PWD shares the same interface and setting way with password setting. For details, see "6.1.Password for the first use (PWD)".

CFG>UNT>PWD

Reset (RST)

If the user selects “**YES**” and presses Button “**OK**”, all parameters will be reset, i.e. restoring all parameters to their factory default.

CFG>UNT>RST

RST sub-menu includes the following pages:

Menu	Description
RESET FACTORY	Reset factory settings
Reset Energy	Clear register of all energy
Reset NOTF	Clear the logs of warning, error and alarm
Reset Global	Complete reset of the device

• RESET FACTORY

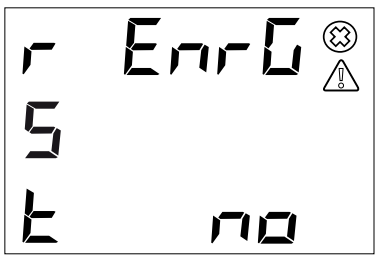
Reset Factory settings restores parameters to default values, including communication parameters, energy, alarms, CT/VT configuration, etc. Restore the device to the factory state except for the Audit Log.

CFG>UNT>RST>FACTORY

• RESET ENERGY

Reset energy will clear the energy to 0.

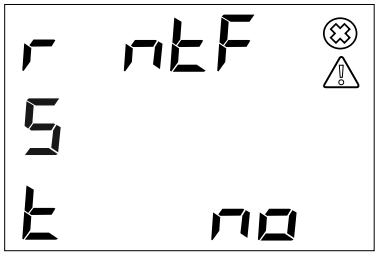
CFG>UNT>RST>ENRG



- **RESET NOTF**

All notification will be cleared after the reset notification, including alarms, warnings, and errors.

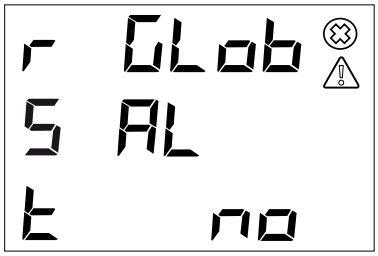
CFG>UNT>RST>NTF



- **RESET Global**

Complete reset of the device except for the settings and the audit log, include notifications, energy.

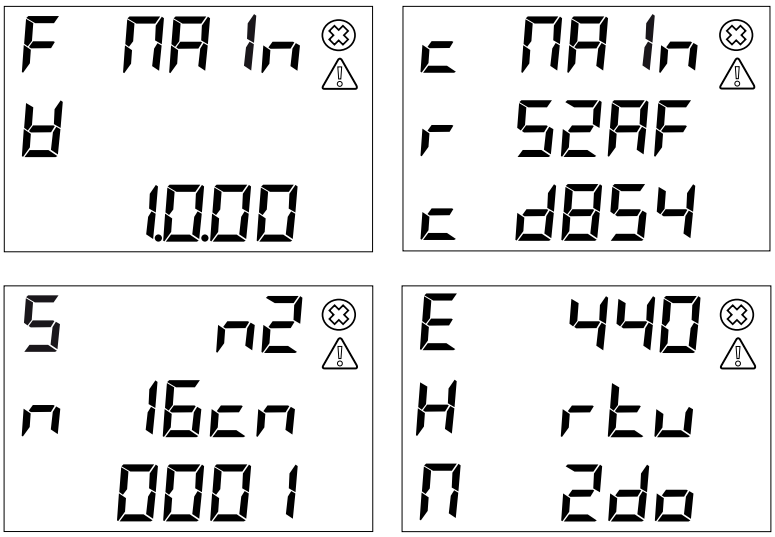
CFG>UNT>RST>GLOBAL



Device information (INF)

INF includes firmware version, product model and peripheral functions, etc.

CFG>UNT>INF

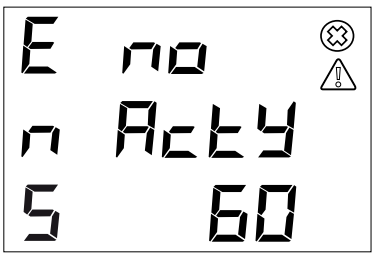


Menu	Description
FW	Firmware version
CRC	A method for Error-Detection and Correction
SN	Serial Number
EXM	EXM Device Type

Energy Saving (ENS)

In this menu it is possible to define the inactivity time in order to limit the device power consumption in no operation conditions. The range is from 1 ~ 60 minutes. After the inactivity time, it will display the homepage.

CFG>UNT>ENS

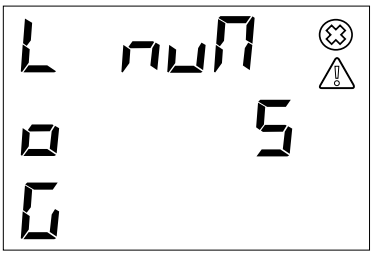


Audit log (LOG)

LOG items that are counted contain the activities as below. User could read the times through HMI and communication.

	Description
1	CT Primary setting
2	CT Secondary setting
3	VT Primary setting
4	VT Secondary setting
5	Wiring Type setting
6	FW Update successful
7	Reset Factory

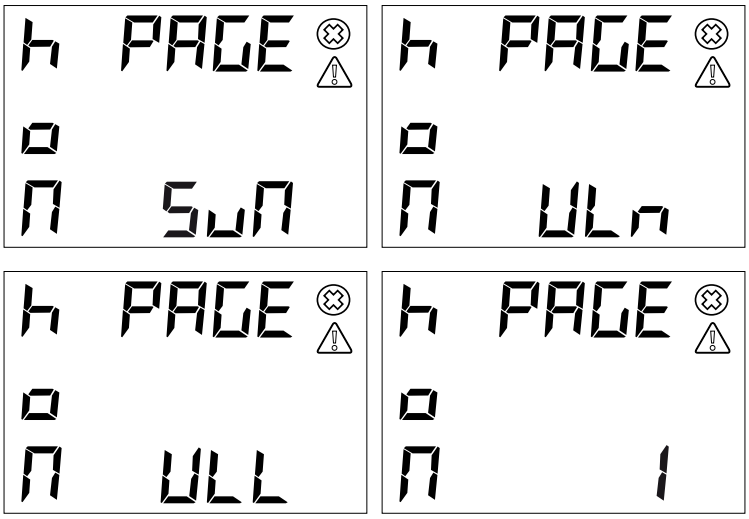
CFG>UNT>LOG



Homepage

Homepage can be set as the one of Summary, Phase Voltage, Line Voltage and Current page. It will turn to the home page which was set by users if no activities after inactivity time.

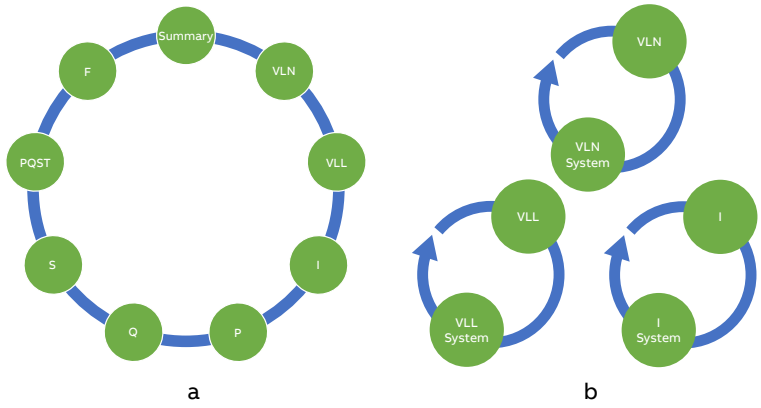
CFG>UNT>HOMEPAGE



- **Auto Scroll pages:**

Auto Scroll pages can be set for an auto scroll time loop scrolling as below two modes:

a) All Real Time measurement pages
b) Phase measurements to three-phase-system measurements pages except for Summary.

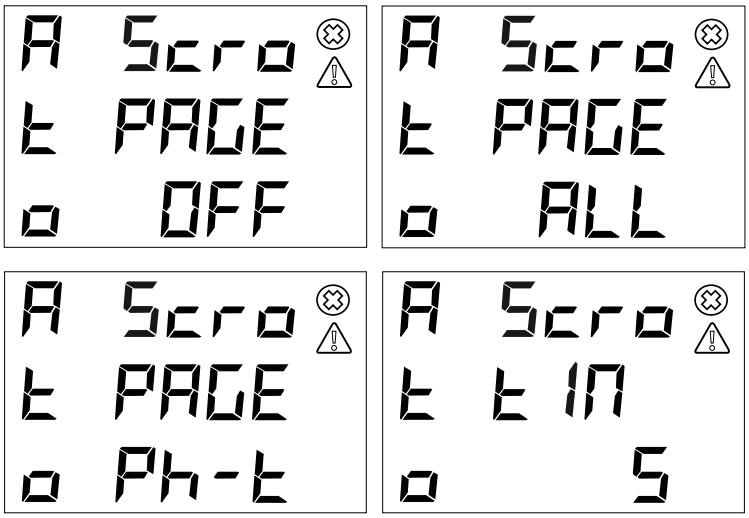


a b

It will return a Homepage after timeout and display every few seconds.

If VLN/VLL is configured as the auto scroll page but the connection mode does not support the display of VLN/VLL, the display is not cyclic, the homepage is displayed on the Summary page.

CFG>UNT>HOMEPAGE



LED

LED is used to indicate the speed of energy consumption. It can be configured to output Total Active Import Energy(IPEN), Total Active Export Energy(EPEN), Total Reactive Import Energy(IQEN), Total Reactive Export Energy(EQEN), Total Apparent Import Energy(ISEN) and Total Apparent Export Energy(ESEN).

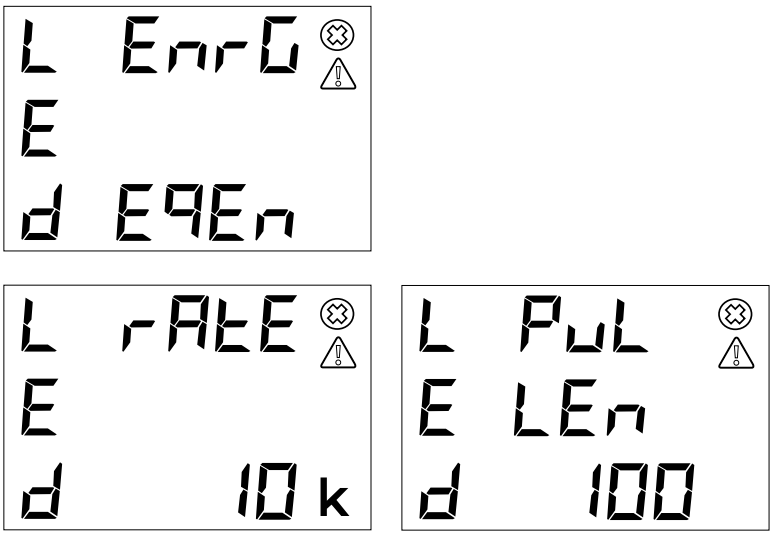
The pulse width can be configured between 10ms and 990ms, and it can be set via the HMI and communication.

The pulse width should satisfy the following formula:

Pulse width≤1000/(Energy∗Factor)ms

The pulse factor range between energy and pulses is 1 to 99999999 pulse per energy, the energy type can be set as Active Energy, Reactive Energy or Apparent Energy, magnitude and unit can be MWh/MVarh/MVAh.

CFG>UNT>LED



7.2.Installation (ISTL)

ISTL includes the following sub-menus:

Menu	Description
CT Primary	Set the primary ratio of current transformers for current measurement
CT Secondary	Set the secondary ratio of current transformers for current measurement
VT Primary	Set the primary ratio of voltage transformers for voltage measurement, if any
VT Secondary	Set the secondary ratio of voltage transformers for voltage measurement, if any
Wiring TYPE	Set the type of network and number of wires on which the device is installed

The three items above must be set during the first startup. For details, see “6.2.Wiring (WIR)”, “6.3.CT ratio (Ct P, Ct S)” and “6.4.VT ratio (Vt P, Vt S)”.

7.3.Input/output (I/O)

In this section it is possible to configure I/O slots of the meter. EXM series Multimeter meter have two ports of DO.

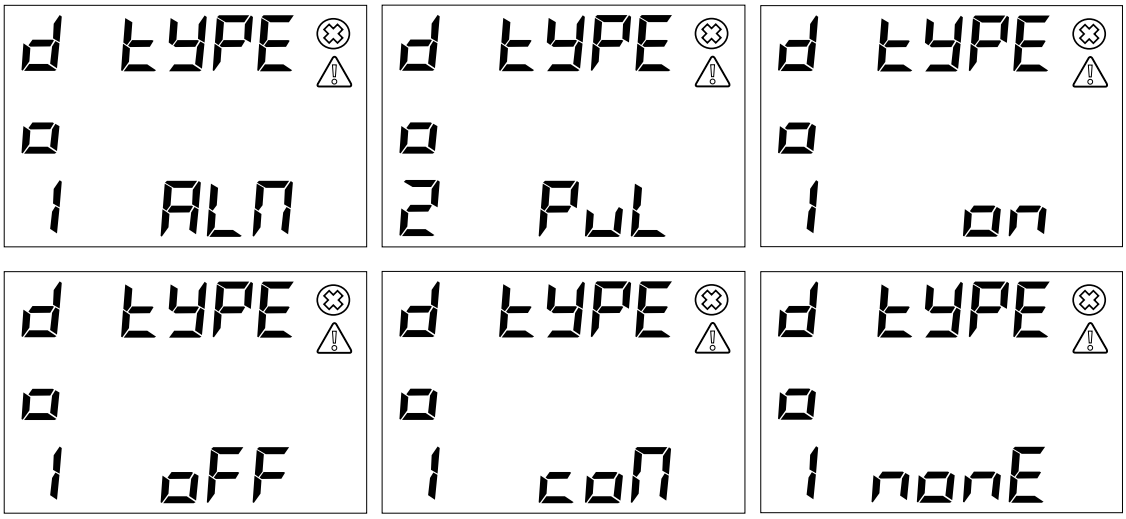
I/O includes the following sub-menus:

Menu	Description
DO	Digital Output

Digital Output (DO)

Each DO can be configured as **Alarm output**, **Communication output**, **Pulse output**, **Output ON** or **Output OFF**.

CFG>I/O>DO



Pulse settings (PUL)

Selecting **Pulse output**, the output is set as a pulse generator associated with a measured parameter. It is needed to consecutively set a measured parameter associated to the pulse output, the pulse ratio, and the pulse length.

Electricity Variable	Description
IPEN	Import active energy
EPEN	Export active energy
IQEN	Import Reactive energy
EQEN	Export Reactive energy
ISEN	Import Apparent energy
ESEN	Export Apparent energy
NONE	Nothing

- The pulse ratio could be set manually or selected from default values. The formula guiding this parameter setting is:

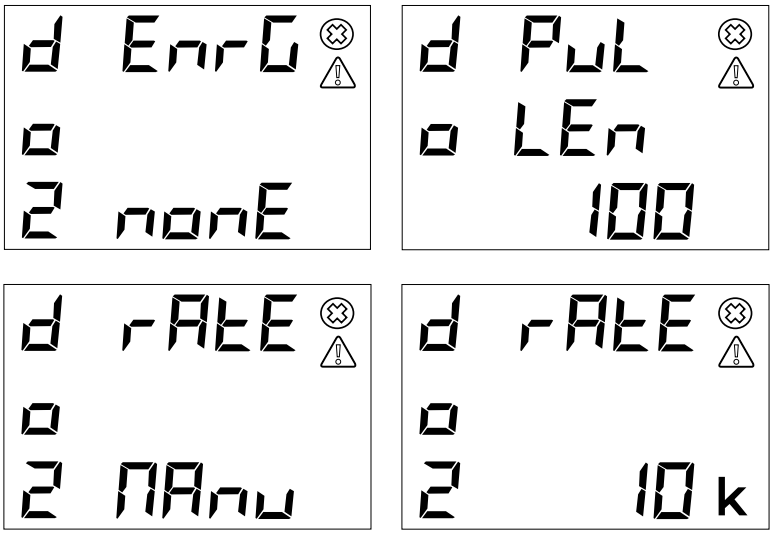
  Outing pulse = X * Energy (Wh/arh/VAh)

  X is the set value of pulse ratio

  Default values: 10/100/1000/5000 pulses for each kWh/kvarh/kVAh or 10/50/100 pulses for each Wh/varh/VAh.

  Manual setting: 1 and 999999 pulses for each each MWh/Mvarh/MVAh.

- The pulse width could be configured once DOs were configured as pulse output, and the two DOs follow the same setting of pulse length when they are all configured as pulse output.
  Manual setting: 10 to 990ms.



Alarm output

Selecting **Alarm output**, it is mandatory to set up an alarm prior to setting an output as Alarm output. For alarm settings, please refer to chapter “7.4.Alarms (ALM)”.

Always ON/OFF

Selecting Output ON / Output OFF, the output acts as a contact close / contact open.

Selecting Output ON the circuit is closed, selecting Output OFF the circuit is open.

For output connections, please refer to chapter “4.3.Wiring diagrams”.

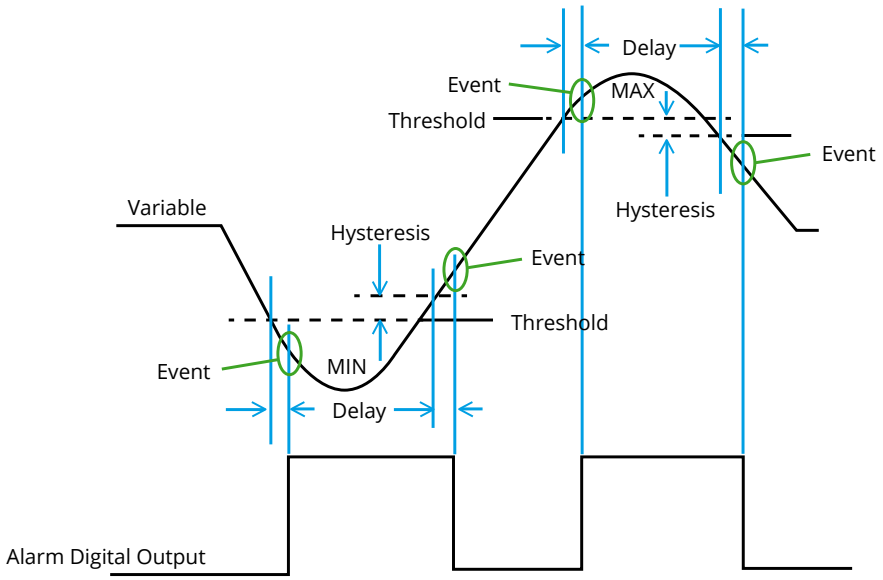
Communication

Selecting Communication output, the output status is controlled directly via communication bus.

7.4.Alarms (ALM)

ALM configuration is used to get info on threshold violations of specific parameters. When the measurement quantity exceeds the limit, an alarm will be given to prompt users to make corresponding treatment measures in time.

Each alarm can only be triggered when certain conditions are met. The following graph describes the process of triggering and releasing an alarm:



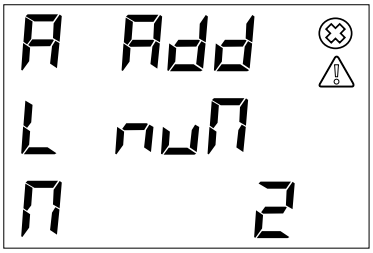
When the value of the alarm variable exceeds the threshold and the delay, the alarm will be generated; and when the alarm variable recovers to the normal range and exceeds the hysteresis and delay, the alarm will be released. Alarm can be connected to certain DO to control the alarm signal output at the DO. If the alarm is stored in flash, it can be viewed later in the read data menu. When the device is in alarm state, ICON will be displayed.

Each EXM provides up to 15 alarms; following parameters are available:

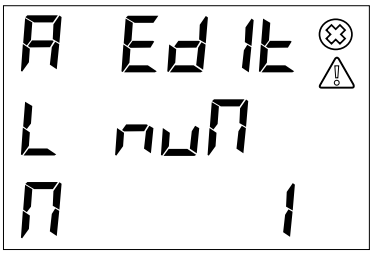
Menu	Description
NUM	Select which alarm will be edited, max 15 alarms can be selected
VARIABLE	Select alarm variable
PHASE	Select the phase of alarm variable
TYPE	Type of alarm: cross-up (MAX) or cross-down (MIN)
SETPOINT	Set threshold
DELAY	Delay time
HYSTERESIS	Set hysteresis
LOG	Storing the alarm
PORT	Select digital output port for alarm

NUM

CFG>ALM



- “Add” indicates that the alarm is not yet present. If it needs to be added, press the button “**OK**” to go to the event and configure the subsequent parameters.



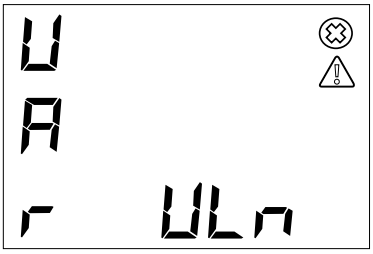
- “Edit” indicates that the alarm is already present. If it needs to be modified, press the button “OK” to go to the event and modify the configurations.

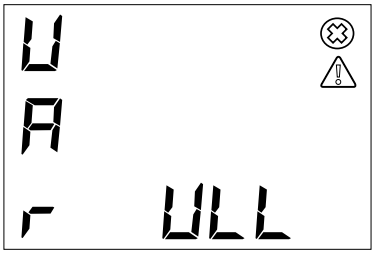
If certain event needs to be deleted from the alarm list, the alarm variable is selected as “NONE”. For details, see “**VARIABLE**”.

VARIABLE

Select one variable as alarm variable or event variable.

CFG>ALM>VAR



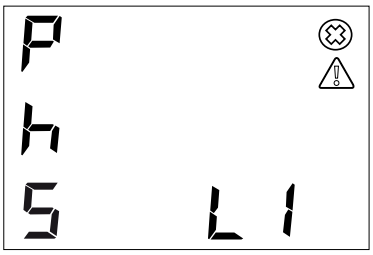


Variable	Description
VLN	Phase voltage
VLL	Line voltage
I	Phase current
P	Active power
Q	Reactive power
S	Apparent power
PT	Total active power
QT	Total reactive power
ST	Apparent power
PF	Power factor
PFT	Total power factor
F	Frequency

PHASE

When a variable is selected, a specific **phase** of the variable needs to be selected.

CFG>ALM>PHS



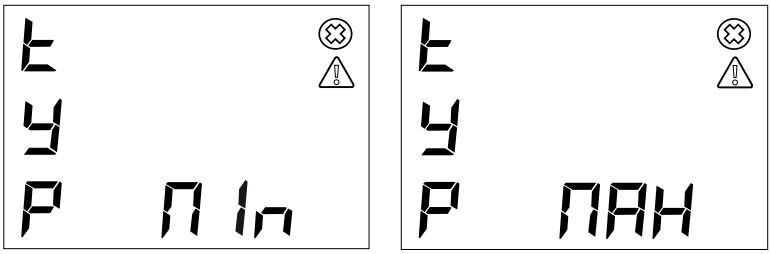
Phase	Description
L1	Phase 1
L2	Phase 2
L3	Phase 3
TOT	Total phase (when PT/QT/ST/PFT is selected variable)

Different variables contain different phases, so the phase selection depends on the variable selected.

TYPE

TYPE includes MAX (cross-up event) and MIN (cross-down event).

CFG>ALM>TYP



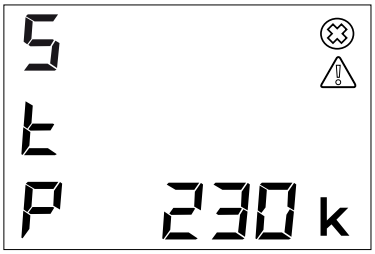
SETPOINT

SETPOINT includes numerical value and magnitude. Different variables correspond to different thresholds, magnitudes, and units, and you need to select variables before setting SETPOINT.

Variable	Value range
Active Power	0~9999MW
Active Power Total	0~9999MW
Reactive Power	0~9999MVar
Reactive Power Total	0~9999MVar
Apparent Power	0~9999MVA
Apparent Power Total	0~9999MVA
Power Factor	0.000~0.999
Current	0.000~(50*120%)kA
Phase Voltage	0.000~(750*120%)kV
Line Voltage	0.000~(750*√3*120%)kV
Frequency	0~70Hz

Notes: The upper limit of each setpoint is calculated based on the maximum values of CT and VT primary and increase redundancy by 20% except for some particular variables.

CFG>ALM>STP

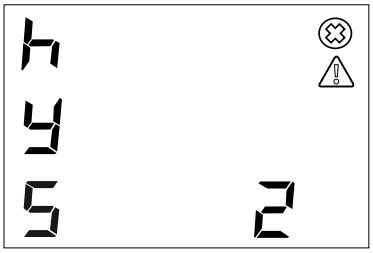


After the number is set, it is needed to use Button “Up” and Button “Down” to adjust the magnitude.

HYSTERESIS

HYSTERESIS is a percentage value, and its setting range is 0%-50%.

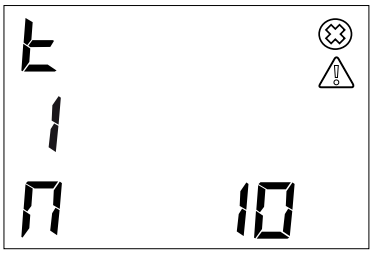
CFG>ALM>HYT



DELAY

DELAY is used to verify whether the variable value really exceeds the limit or is recovered, and its setting range is 1-900s.

CFG>ALM>TIM

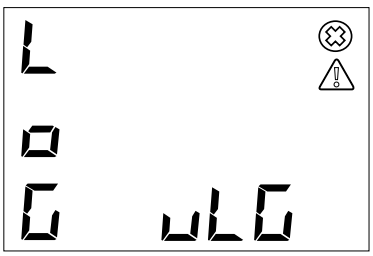


LOG

All alarms are by default in UNLOG mode, meaning that alarms are not stored in any flash memory.

This parameter is used to set whether the alarm is stored or not.

CONF>ALM>LOG

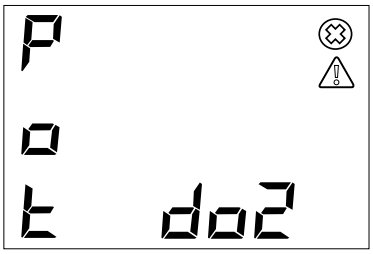


After device restart, all alarms will be erased, and it will not be possible to retrieve them.

PORT

Each alarm event can be connected with certain DO, and different alarms can be connected to the same DO.

CFG>ALM>POT



- The optional Dos include DO1, DO2 and NONE.

Only the DOs configured as alarm output can appear in the list. For details, see “7.3.Input/output (I/O)”.

7.5.Communication (COM)

Com menu allows to set all the parameters related to the communication protocol available for a specific product version. The embedded communication protocol varies according to the different product versions. Please refer to “3.3.Versions” for the details on the embedded communication protocols.

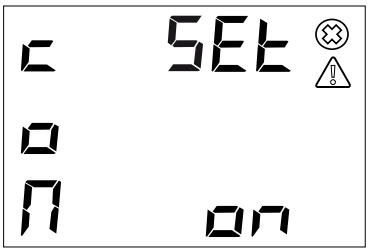
Based on product version following configuration menu is available:

Communication Protocol	Parameter	Description
Modbus RTU	ADD	Bus address
	BAU	Baud rate
	PAR	Byte format

Modbus RTU (EXM-RS)

Enable communication set, the communication configure menu will be valid.

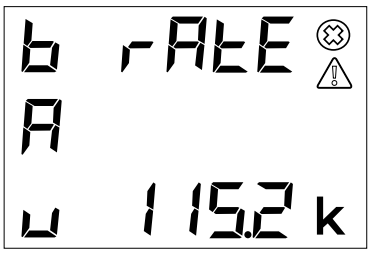
CONF>COMM



- **Baud rate (BAURATE)**

BAURATE represents data transmission baud rate. The higher the **BAURATE**, the faster the data transmission.

CFG>COM>BAURATE

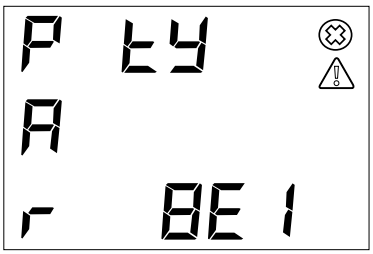


The optional Baud rates include 9600, 19200, 38400, 57600 and 115200 bps.

• Byte format (PAR)

BYTE comprises three parts – bits per byte, parity bit and stop bit.

CFG>COM>PAR



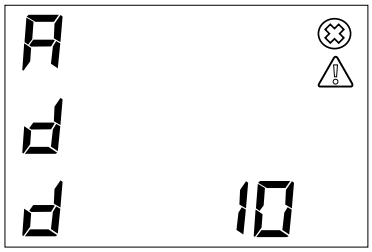
The optional byte formats include:

BYTE	Description
8E1	8 even parity bits and 1 stop bit
8O1	8 odd parity bits and 1 stop bit
8N1	8 No Parity bits and 1 stop bit

• Address (ADD)

For the devices that adopt the Modbus RTU protocol, a unique address on the bus needs to be set.

CFG>COM>ADD



The address range is 1-247.

8. Data reading (RED)

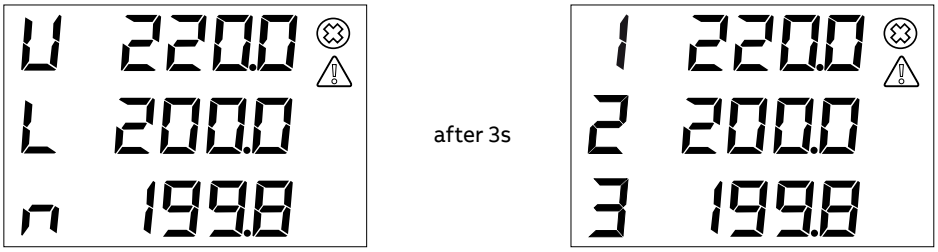
RED section allows to visualize all the parameters measured by D1M.

Specifically, it includes the following menus:

Menu	Description
REAL	Real-time measurements
ENRG	Energy measurements
PWQT	Power quality
I/O	State of digital input/output port
NTF	Notification message
PWF	Record the power off as a warning in warning list

Specifically, in the menu: “REAL” and “PWQT”, the measurement item associated with each phase and the phase number are put as alternating values periodically displayed like below:

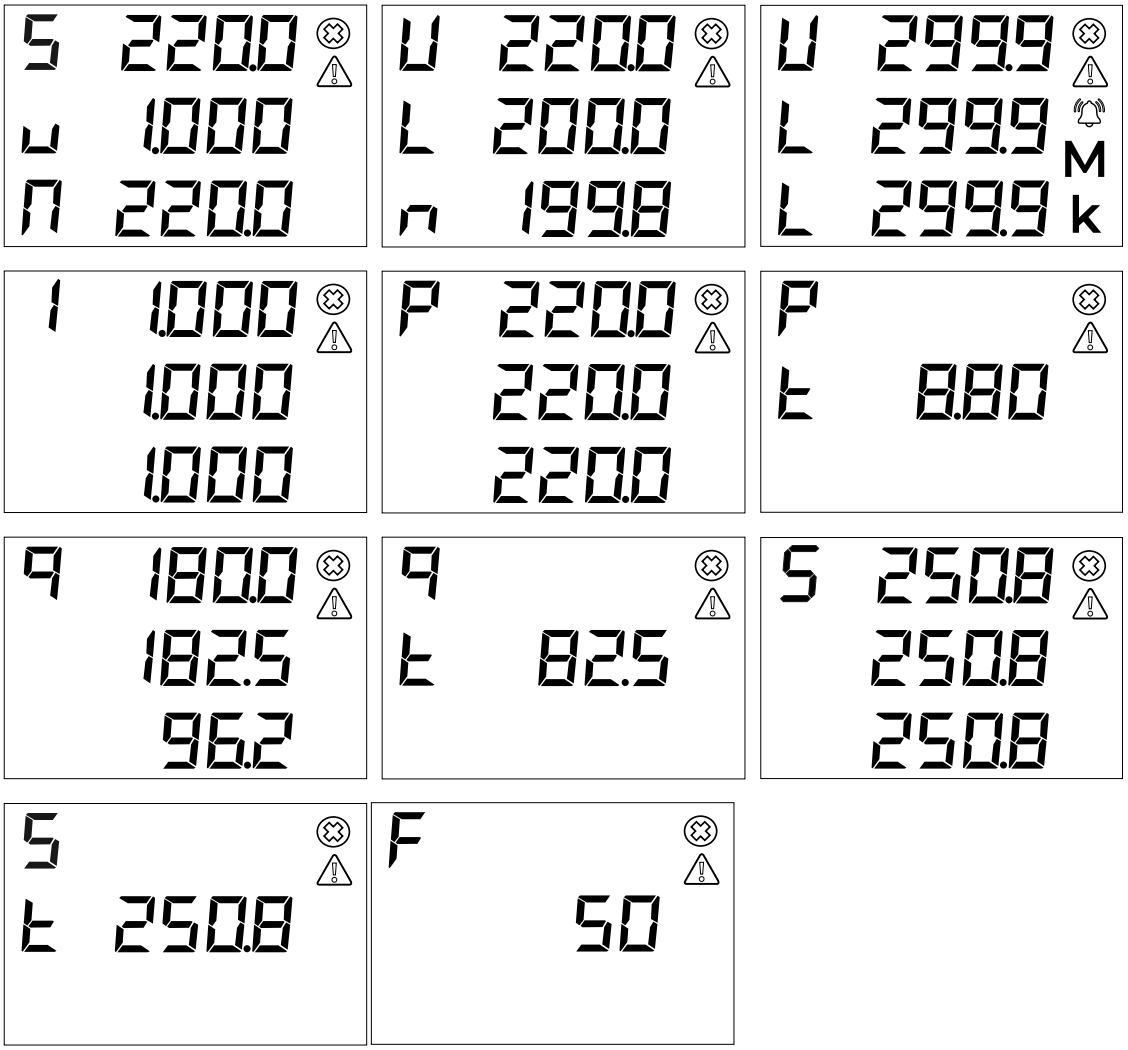
e.g.



8.1.Realtime (REAL)

REAL means the real-time data of the current electric energy, including the following items:

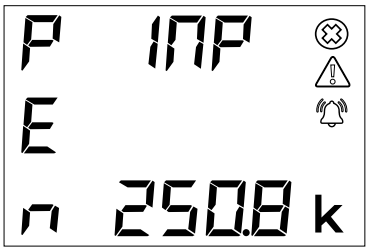
RED>REAL

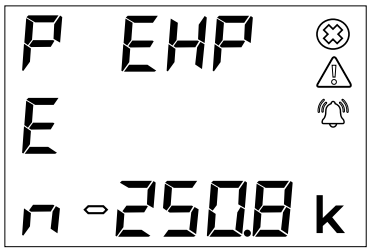


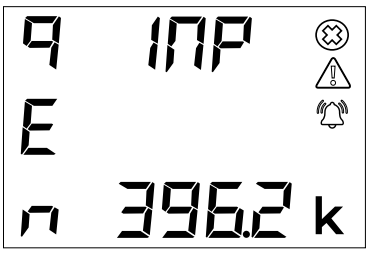
REAL	Measurement Unit	Description
SUM	V, A, W	Summary measurements, average of 3 phases VLL, average of 3 phases I, and active power total
VLN	V	Phase voltage
VLL	V	Line voltage
I	A	Current
P	W	Per phase active power; when WIRI is selected as ‘1N1T’, this data is absent
PT	W	Total active power
Q	VAR	Per phase reactive power; when WIRI is selected as ‘1N1T’, this data is absent
QT	VAR	Total reactive power
S	VA	Per phase apparent power; when WIRI is selected as ‘1N1T’, this data is absent
ST	VA	Total apparent power
F	Hz	Frequency

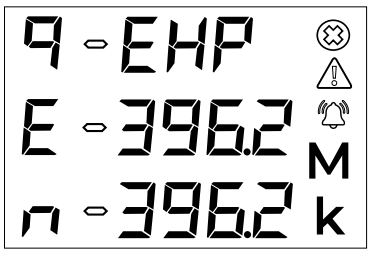
8.2.Energy (ENRG)

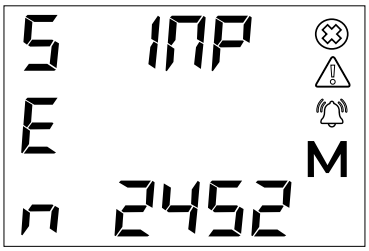
RED>ENRG

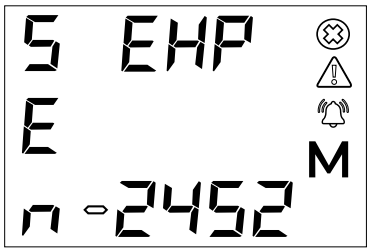


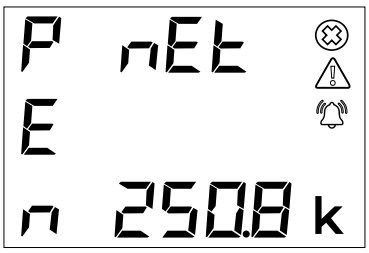


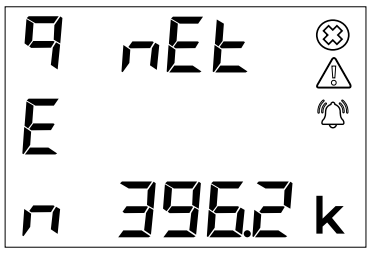


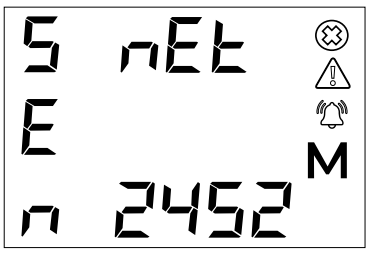








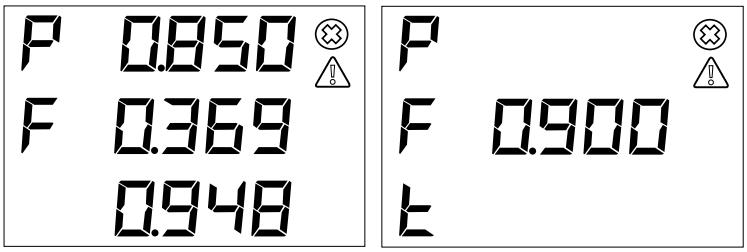




ENRG	Measurement Unit	Description
PEN IMP	VAh	Total imported active energy
PEN EXP	VARh	Total exported active energy
QEN IMP	Wh	Total imported reactive energy
QEN EXP	Wh	Total exported reactive energy
SEN IMP	Wh	Total imported apparent energy
SEN EXP	VARh	Total exported apparent energy
PEN NET	VARh	Net active energy
QEN NET	VAh	Net reactive energy
SEN NET	VAh	Net apparent energy

8.3.Power Quality (PWQT)

RED>PWQT



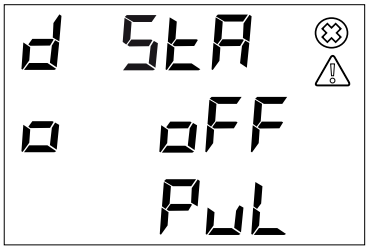
PWQT	Description
PF	Per phase power factor; when WIRI is selected as ‘3 3T’, ‘3 2T’, ‘3 1T’ or ‘1N1T’, this data is absent
PFT	Total power factor

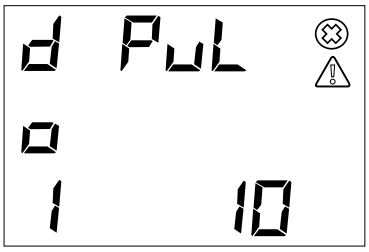
8.4.I/O

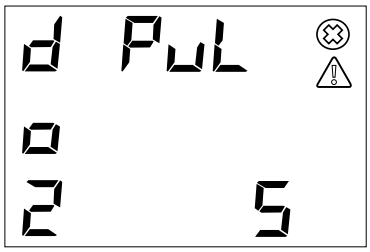
I/O sub-menu includes the reading of status and/or pulses for DO, according to the product version:

Menu	Description
DO STA	State of digital output port
DO1 PUL	DO1 Pulse counter
DO2 PUL	DO2 Pulse counter

RED>I/0







The state classifications include:

State	Description
ON	DO is on
OFF	DO is off
PULSE	Pulse output

8.5.Notifications (NTF)

NTF includes the following items:

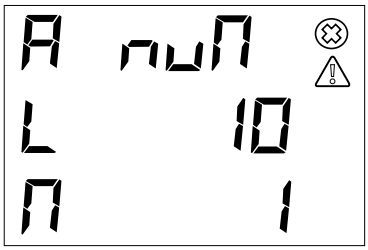
Menu	Description
ALM	Alarm list, Related to the alarm status and information
WRN	Warnings list, related to installation conditions and device settings
ERR	Errors list, related to the device and to its self-diagnostics

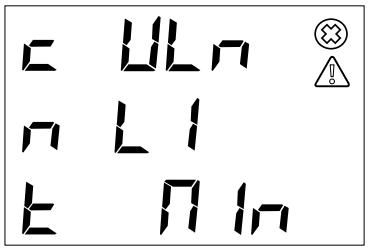
Alarms (ALM)

ALM is generated based on the Alarm configured by the user. When the conditions meet the alarm parameters, the ALARM notification will be generated and Icon will be displayed.

ALARM comprises alarm count and specific alarm message. The alarm message consists of alarm number, variable name, type, phase.

RED>NTF>ALM



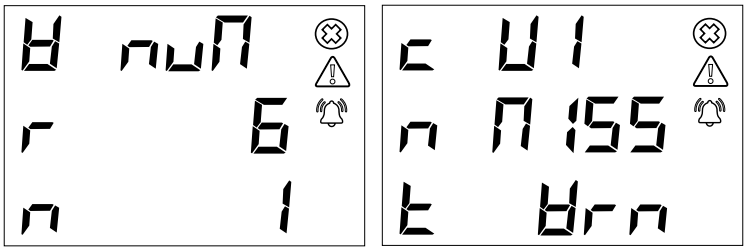


Warnings (WRN)

WRN is generated when the device detects the operating conditions. When there is a WARN notification, Icon ⚠ will be displayed; and when there is no warn messages, Icon ⚠ will disappear.

WRN comprises warn count and specific warn message.

RED>NTF>WRN



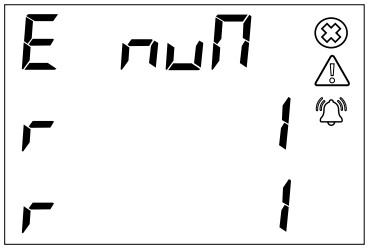
Warning	Definition
VOLT REVES	U1, U2 and U3 are inverse in 3 phases system
V1 MISS	Voltage 1 Missing
V2 MISS	Voltage 2 Missing
V3 MISS	Voltage 3 Missing
I1 MISS	Current 1 Missing
I2 MISS	Current 2 Missing
I3 MISS	Current 3 Missing
I1 REVES	Current 1 Reverse
I2 REVES	Current 2 Reverse
I3 REVES	Current 3 Reverse
I12 REVES	Current 1 with 2 Reverse
I23 REVES	Current 2 with 3 Reverse
I31 REVES	Current 3 with 1 Reverse
DATA UDIS	Measurement value too big cannot display on the displayer
USET PWD	Not Locked device, not set password
FREQ WRNG	Frequency out of the metering limit
V2 CONN	U2 connected for single phase wires setup
V3 CONN	U3 connected for single phase wires setup
I2 CONN	I2 connected for single phase wires setup
I3 CONN	I3 connected for single phase wires setup

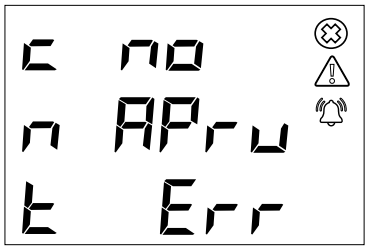
Errors (ERR)

ERR is generated when the device detects operating fatal conditions. When there is an ERROR notification, Icon ⊗ will be displayed and it will not disappear until the error is solved.

ERROR comprises error count and specific error message.

RED>NTF>ERR



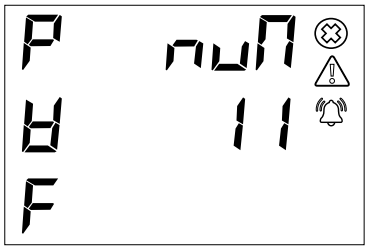


Error	Definition
LOG ERR	Audit log error
FLSH ERR	Flash chip error or RAM memory CRC error
FW INVD	Firmware upgrade invalid image
EPRM ERR	Persistent storage error or EEPROM chip error
NO APRV	Product was not approved
FW FAIL	Firmware upgrade error

8.6.Power Outage (PWF)

PWF is used to record the number and time of power outage. The maximum record number is 999.

RED>NTF>PWF



In additional, record the power off as a warning in warning list, light up the warning icon after next power on.

9. Conclusion

Thank you for using AEG EXM series Multimeter and reviewing this user manual. In the future, if you encounter any problems, please contact ABB technical support, we will be happy to help you.

AEG

AEG

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