CARLO GAVAZZI

EM24 E1

USER MANUAL

MANUALE UTENTE

BETRIEBSANLEITUNG

MANUEL D'EMPLOI

INSTRUCCIONES DE USO

BRUGERMANUAL

EM24 E1

Three-phase energy analyzer

Contents

Information property

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Safety messages

The following section describes the warnings related to user and device safety included in this document:

NOTICE: indicates obligations that if not observed may lead to damage to the device.

CAUTION! Indicates a risky situation which, if not avoided, may cause data loss.

IMPORTANT: provides essential information on completing the task that should not be neglected.

General warnings

This manual is an integral part of the product and accompanies it for its entire working life. It should be consulted for all situations tied to configuration, use and maintenance. For this reason, it should always be accessible to operators.

NOTICE: no one is authorized to open the analyzer. This operation is reserved exclusively for CARLO GAVAZZI technical service personnel.
Protection may be impaired if the instrument is used in a manner not specified by the manufacturer.

Service and warranty

In the event of malfunction, fault, requests for information, contact the CARLO GAVAZZI branch or distributor in your country. Installation and use of analyzers other than those indicated in the provided instructions void the warranty.

Download

| This manual	www.productselection.net/MANUALS/UK/EM24_im_use.pdf
Installation instruction - EM24	www.productselection.net/MANUALS/UK/EM24_im_inst.pdf
UCS software	www.productselection.net/Download/UK/ucs.zip

EM24 E1

Introduction

EM24 is a three-phase energy analyzer for DIN-rail mounting, with configuration joystick, frontal selector and LCD display.
The direct connection version (AV2) allows to measure up to 65 A, the CT connection version (AV5) allows to measure up to 34875 A by means of current transformers (5 A secondary output).
The DHCP function is able to speed the commissioning and all the configuration parameters can be set up via UCS.

Description

AV2

AV5
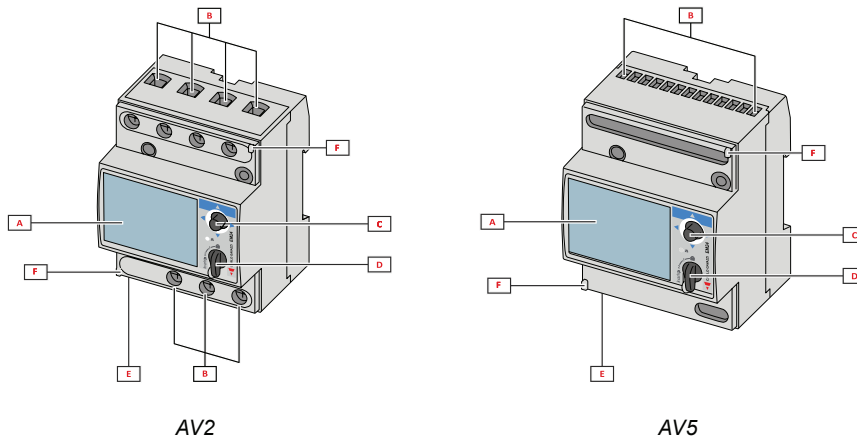
Part	Description
A	LCD display
B	Voltage/current connections
C	Joystick
D	Selector with pin for MID seal (programming block)
E	Inputs/outputs or communication port
F	Pins for MID seal (protection covers included)

UCS (Universal Configuration Software)

UCS desktop is available for free download. It can be connected to EM24 via Ethernet (Modbus TCP/IP) .
The following is possible with UCS:
- configure EM24 (online or offline)
- view system status for diagnostics and configuration checks

EM24 E1 use

Introduction

EM24 is organized in two menus:
- measurement and information menu: pages used to display the measurement pages, information relevant to the programmed parameters and instrument firmware release
- settings menu: pages used to set parameters

Display

The display is divided into 3 lines.

Symbol	Description
⅄	Displaying of phase-to-neutral system voltage
△	Displaying of phase-to-phase system voltage
↑	Displaying of max values
🏠	User ID
Σ	Displaying of system variables
dmd	Displaying of dmd variables
EEEE	Overflow. ***Note:*** *the DMD calculation, the hour-counter and the energy meters functions are inhibited and the alarm outputs are activated. The indication "EEEE" in a single phase variable automatically implies the overflow condition of the relevant system variable, and the PF indication is forced to "0.000".*

Network parameters setting
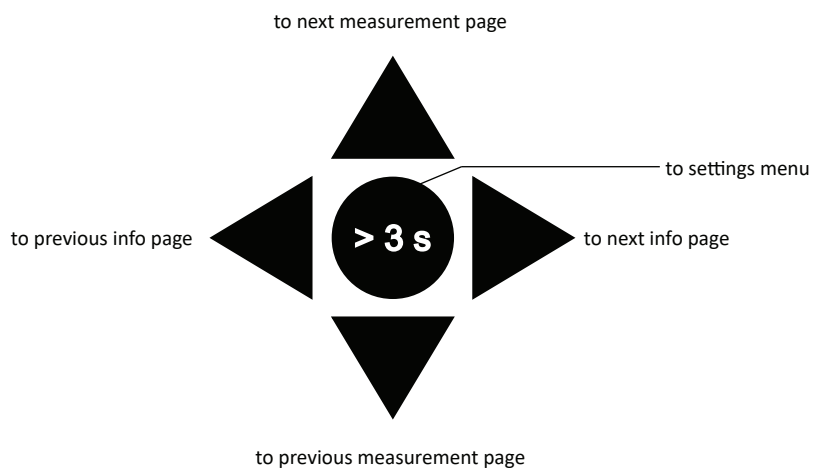
Setting network parameters via DHCP

Step	Action
1	Install EM24
2	Enable DHCP and exit with **End**
3	Connect the EM24 to the LAN network to which the PC is connected
4	Access the **Info** pages to view the assigned network parameters
5	Start UCS software and connect to EM24 via **Manual connection> Modbus TCP**
6	Enter the IP address displayed on the Info page (see point 4)
7	Access the settings, disable DHCP and assign the required network parameters (assigned by network administrator)

Setting network parameters without DHCP

Step	Action
1	Install EM24
2	Disable DHCP (default setting)
3	Connect the PC to the EM24 via Ethernet cable (point to point connection)
4	Set the PC network properties as follows: • static IP address • IP address of the same class as the EM24, e.g. if the IP of EM24 is 192.168.1.10 (default), you can set the PC address to 192.168.1.20 • Subnet mask: 255.255.255.0 • Gateway: not necessary
5	Start UCS software and connect to EM24 via **Manual connection> Modbus TCP**, enter the EM24 IP address (192.168.1.10 by default)
6	Access the settings and enter the required network parameters
7	Disconnect the Ethernet cable and connect the EM24 to the network to which the Modbus master is connected

Working with EM24 E1

Working with the measurement/info menu

to next measurement page

to settings menu

to previous info page   **> 3 s**   to next info page

to previous measurement page

Working with the settings menu

increase a parameter value

edit/confirm

to previous page   to next page

decrease a parameter value
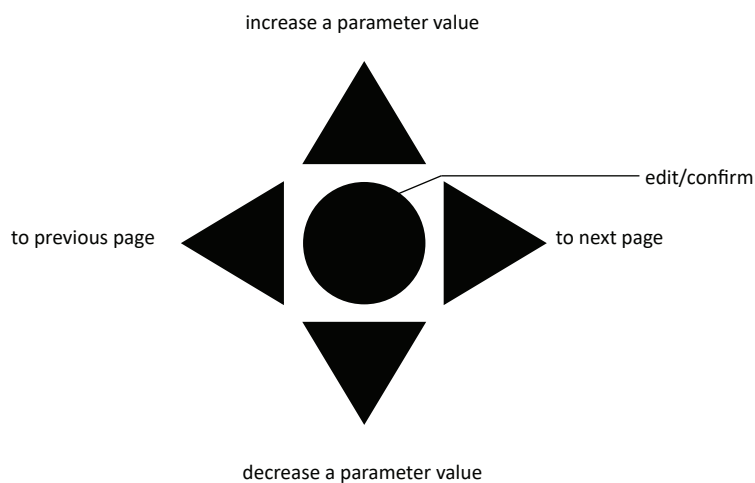
Resetting partial energy meter

Step	Action	Button
1	Press the button for at least 3 seconds	
2	In the **PASS** page, set the password **1357**	
3	Confirm operation	
4	In the **rESEt** page, set **YES**	
5	Confirm operation	

Step	Action	Button
6	In the **EnE PrES** page, set **YES**	
7	Confirm operation	

Setting a parameter

Example procedure: how to set **Ct rAtio**=20 and save changes.

Step	Action	Button
1	Power on the energy analyzer	
2	Press the joystick for at least 3 seconds	
3	In the **PASS?** page, select the correct password (default 0)	
4	Confirm operation	
5	Scroll pages until **Ct rAtio**	
6	Enter the editing mode	
7	Select 20	
8	Confirm operation	
9	Scroll pages until **End** to exit	

Menu description

Measurement menu - measurement pages

The displayed pages depend on the application set.

Page	Displayed measurements	Description
1	L1-L2-L3 $V_{LN\Sigma}$ Hz	Phase sequence System phase-neutral voltage Frequency
2	L1-L2-L3 $V_{LL\Sigma}$ Hz	Phase sequence System phase-phase voltage Frequency
3	Tot kWh (+) W_Σ dmd W_Σ dmd max	Total imported active energy System active power dmd System active power dmd max
4	kWh A dmd max PArt	Active energy Maximum dmd current Partial active energy
5	Tot kvarh (+) VA_Σ dmd VA_Σ dmd max	Total imported reactive energy System apparent power dmd System apparent power dmd max
6	kvarh VA_Σ PArt	Reactive energy System apparent power Partial reactive energy
7	kWh (+) t1 W_Σ dmd	Imported active energy, tariff 1 System active power dmd
8	kWh (+) t2 W_Σ dmd	Imported active energy, tariff 2 System active power dmd
9	kWh (+) t3 W_Σ dmd	Imported active energy, tariff 3 System active power dmd
10	kWh (+) t4 W_Σ dmd	Imported active energy, tariff 4 System active power dmd
11	kvarh (+) t1 W_Σ dmd	Imported reactive energy, tariff 1 W_Σ dmd
12	kvarh (+) t2 W_Σ dmd	Imported reactive energy, tariff 2 W_Σ dmd
13	kvarh (+) t3 W_Σ dmd	Imported reactive energy, tariff 3 W_Σ dmd
14	kvarh (+) t4 W_Σ dmd	Imported reactive energy, tariff 4 W_Σ dmd
15	kWh (+) X W X User X	Imported active energy Active power User
16	kWh (+) Y W Y User Y	Imported active energy Active power User
17	kWh (+) Z W Z User Z	Imported active energy Active power User
18	Total kvarh (-) VA_Σ dmd VA_Σ dmd max	Total exported reactive energy System apparent power dmd System apparent power dmd max
19	Total kWh (-) W_Σ dmd W_Σ dmd max	Total exported active energy System active power dmd System active power dmd max

20	Hours W_Σ PF_Σ	Total load operating hours System active power System power factor
21	Hours VAr_Σ PF_Σ	Total load operating hours System reactive power System power factor
22	var L1 var L2 var L3	Phase 1 reactive power Phase 2 reactive power Phase 3 reactive power
23	VA L1 VA L2 VA L3	Phase 1 apparent power Phase 2 apparent power Phase 3 apparent power
24	PF L1 PF L2 PF L3	Phase 1 power factor Phase 2 power factor Phase 3 power factor
25	W L1 W L2 W L3	Phase 1 active power Phase 2 active power Phase 3 active power
26	A L1 A L2 A L3	Phase 1 current Phase 2 current Phase 3 current
27	V L1-2 V L2-3 V L3-1	Phase 1-phase 2 voltage Phase 2-phase 3 voltage Phase 3-phase 1 voltage
28	V L1 V L2 V L3	Phase 1 voltage Phase 2 voltage Phase 3 voltage

Note: *in programming mode, the last displayed page is stored.*

Information Menu

Page	Page title	Information displayed
1	IP o.o.-.-	IP address (first part)
2	IP -.-.o.o	IP address (second part)
3	Sub o.o.-.-	Subnet mask (first part)
4	Sub -.-.o.o	Subnet mask (second part)
5	Gateo.o.-.-	Default gateway (first part)
6	Gate-.-.o.o	Default gateway (second part)
7	Port	Modbus TCP port
8	DHCP	DHCP enabling
9	Info	Ethernet diagnostic
10	Ut ratio	VT/PT ratio
11	CT ratio	CT ratio
12	1P/2P/3P/3Pn (2-3-4-wire) dmd (time)	System Connection (2-3-4-wire) Dmd integration time (min.)
13	Pulse	LED pulse weight (Number of kWh/kvarh per pulse)
14	Year	Firmware release Year of production

Settings from EM24 E1

General settings

The available settings depend on the application set.

Page title	Sub-menu	Description	Values	Default value
Cng PASS	-	Change password	From 0 to 9999	0
APPLiCAt		Application	tYP.A tYP.b tYP.C tYP.d tYP.E tYP.F tYP.G tYP.H	tYP.H
User	USEr 1	User	From 0 to 9999	1
	USEr 2		From 0 to 9999	2
	USEr 3		From 0 to 9999	3
dHCP	-	DHCP enabling	oFF/on	oFF
IP Addr	IP o.-.-.-	IP address	From 000 to 255	192
	IP -.o.-.-		From 000 to 255	168
	IP -.-.o.-		From 000 to 255	1
	IP -.-.-.o		From 000 to 255	10
SUb	SUb o.-.-.-	Subnet mask	From 000 to 255	255
	SUb -.o.-.-		From 000 to 255	255
	SUb -.-.o.-		From 000 to 255	255
	SUb -.-.-.o		From 000 to 255	0
GAtE	GAtE o.-.-.-	Default gateway	From 000 to 255	192
	GAtE -.o.-.-		From 000 to 255	168
	GAtE -.-.o.-		From 000 to 255	1
	GAtE -.-.-.o		From 000 to 255	1
Port	-	MODBUS TCP port		502
SELECtor	SELEC. 1	Page displayed according to selector position among the available pages for each application (see"Frontal selector" on page 15)	From 1 to 28	1
	SELEC. 2		From 1 to 28	25
	SELEC. 3		From 1 to 28	28
	SELEC.LoC		From 1 to 28	3
SYS	-	System	3P.n 3P.1 2P 1P 3P **Note:** *MID (PFA, PFB): only 3P.n*	3P.n
Ut rAtio	-	Voltage transformer ratio (VT)	AV5: from 1 to 6975 AV2: N/A	1
Ct rAtio	-	Current transformer ratio (CT)	AV5: from 1 to 6975 AV2: N/A	1
P int.ti	-	Dmd integration time (min)	From 1 to 30	15
FiLtEr.S	-	Interval of filter intervention with respect to full scale (%)	From 0 to 100	2
FiLtEr.Co	-	Filter coefficient	From 1 to 32	2
End	-	Exit and save	-	-

Note: *the **Ut rAtio** is available for compatibility with other versions, even though the AV5 version is not meant to be used with voltage transformers. It should be therefore set to 1.*

Essential information

Measurement management

Applications

Note: if an application <u>with easy connection</u> is selected, for the calculation of the active energy the power is always integrated, both in the case of imported and exported power . The current direction does not affect the measurement. If an application <u>without easy connection</u> is selected, both the active imported and exported are available.

Application	Measurements	Easy connection
A	System: • phase sequence • phase-neutral voltage • frequency • total imported active energy • active power dmd and dmd max	YES
B	System: • phase sequence • phase-neutral voltage • frequency • total imported active energy • active power dmd and dmd max • total imported reactive energy • apparent power dmd and dmd max	YES
C	System: • phase sequence • phase-neutral voltage • frequency • total imported active energy • active power dmd and dmd max • imported active and reactive energy by tariff	YES
D	Single phase: • imported active energy • voltage	YES
E	System: • phase sequence • phase-neutral voltage • frequency • total imported and exported active energy • active power dmd and dmd max • run hour meter • active power • power factor	NO
F	System: • phase sequence • phase-neutral voltage • frequency • total imported and exported active energy • active power dmd and dmd max • phase-phase voltage • active energy • maximum dmd current • partial active energy • total imported and exported reactive energy • apparent power, dmd and dmd max • partial reactive energy • run hour meter • active power • power factor	NO

Essential information

G	System: • phase sequence • phase-neutral voltage • frequency • total imported active energy • active power dmd and dmd max • phase-phase voltage • active energy • maximum dmd current • partial active energy • total imported reactive energy • apparent power, dmd and dmd max • reactive energy • run hour meter • active power • active power dmd • reactive power • power factor • imported active and reactive energy by tariff Single phase: • reactive power per phase • apparent power per phase • power factor per phase • active power per phase • current per phase • line-line voltages • line-neutral voltages	YES
H	System: • phase sequence • phase-neutral voltage • frequency • total imported and exported active energy • active power dmd and dmd max • phase-phase voltage • active energy • maximum dmd current • partial active energy • total imported and exported reactive energy • apparent power, dmd and dmd max • reactive energy • run hour meter • active power • active power dmd • reactive power • power factor • imported active and reactive energy by tariff Single phase: • reactive power per phase • apparent power per phase • power factor per phase • active power per phase • current per phase • line-line voltages • line-neutral voltages	NO

Programming pages

The following table shows which programming pages are available for each application

Page	Application							
	A	B	C	D	E	F	G	H
Change password	x	x	x	x	x	x	x	x
Application	x	x	x	x	x	x	x	x
User	-	-	-	x	-	-	-	-
DHCP enabling	x	x	x	x	x	x	x	x
IP address	x	x	x	x	x	x	x	x
Subnet mask	x	x	x	x	x	x	x	x
Default gateway	x	x	x	x	x	x	x	x
MODBUS TCP port	x	x	x	x	x	x	x	x

Selector	x	x	x	x	x	x	x	x
System	x	x	x		x	x	x	x
VT ratio	x	x	x	x	x	x	x	x
CT ratio	x	x	x	x	x	x	x	x
Average power integration time	x	x	x	-	x	x	x	x
Filter S	-	-	-	-	-	x	x	x
Filter Co	-	-	-	-	-	x	x	x
End	x	x	x	x	x	x	x	x

Tariff management

Managing tariffs via Modbus command

Change the tariff by entering the value corresponding to the current tariff according to the following table in the **1201Fh** registry:

Current tariff	Register value
T1	1
T2	2
T3	3
T4	4

Disabling tariff management

Set tariff management as disabled or enter 0 (default value) in the **1201Fh** register.

Frontal LED and selector

Frontal LED

The frontal red LED flashes proportionally to the active imported energy consumption if the selector is in 🔒 - **1** - **2** position, and to the reactive inductive energy consumption in **kvarh** ⊓ position. Any kind of negative (exported) energy will not be managed by the front LED.

Frontal selector

- **Lock** 🔒 position: the frontal selector prevents from accessing the programming mode
- **1, 2, kvarh** ⊓ position: quick access to measuring pages. Each position is associated with one measuring page according to the following table:

Application	Selector position	Page available
A	Lock 🔒	3
	1,2,3	1
B, C, E, F, G, H	Lock, 1, 2, kvarh ⊓	Can be set from 1 to 28
C	Lock, 1, 2, kvarh ⊓	Can be set from 1 to 28
D	Lock	28
	1	15
	2	16
	3	17

Maintenance and disposal

Cleaning

Use a slightly dampened cloth to clean the display. Do not use abrasives or solvents.

Responsibility for disposal

The product must be disposed of at the relative recycling centers specified by the government or local public authorities. Correct disposal and recycling will contribute to the prevention of potentially harmful consequences to the environment and persons.

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