Energy Management
Web-based embedded solution for monitoring of distributed conventional energy applications
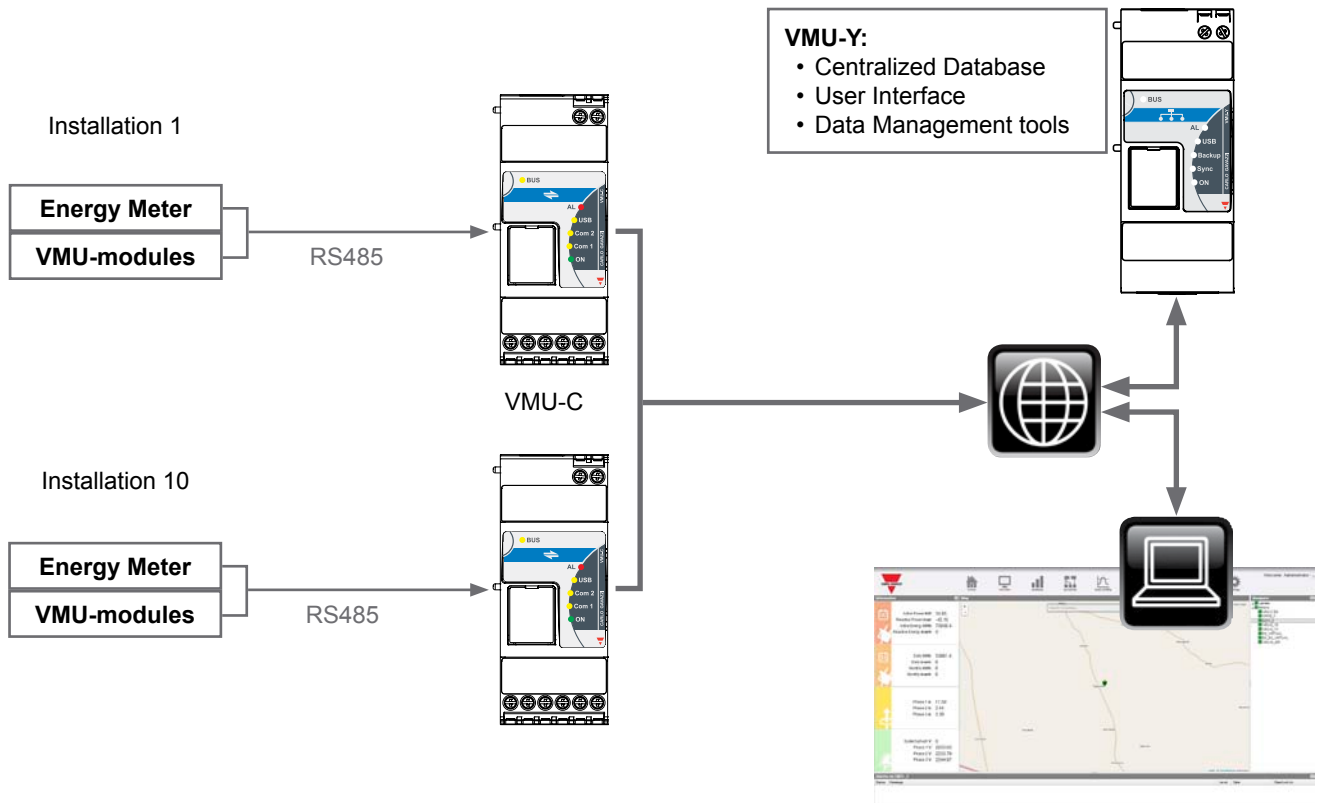# Type VMU-Y EM

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- Embedded solution with integrated database and web-server
- Monitoring and data management of up to 10 distributed installations
- Database replication from up to 10 VMU-C EM Web-servers
- Reliable and efficient communication from VMU-C EM to VMU-Y based on Web-Services

Product description

VMU-Y allows users to manage distributed installations. In each remote location one VMU-C EM unit is in charge of gathering data from the connected devices (Energy Meters and VMU-M, VMU-P units), store them inside its local DB, and transmit them to the VMU-Y, allowing to centralize in a single database and Web-Server, information from many plants, without the need of a dedicated PC.
Data may be accessed by means of the VMU-Y's web interface.

VMU-Y:
- Centralized Database
- User Interface
- Data Management tools

Installation 1

Energy Meter

VMU-modules

RS485

VMU-C

Installation 10

Energy Meter

VMU-modules

RS485

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VMU-Y EM, Web-based embedded solution for Energy data management

- Micro PC with Web-server capability
- Linux embedded operating system
- Distributed installations management (up to 10)
- Database replica from up to 10 remote or local VMU-C EM units
- AC,DC and environmental variables
- Alarms control with automatic emailing
- Data export in Excel ® format
- Internal data storage up to 32 GB
- Optional backup on micro SDHC or USB stick
- 3G Modem for Internet connection backup

- One Ethernet port
- Two multipurpose USB 2.0 ports
- 12 to 28 VDC power supply
- Dimensions: 2-DIN modules
- Protection degree (front): IP40

Product description

VMU-Y EM is a micro PC with Web-Server and Web-Services capabilities suitable to gather information from up to 10 VMU-C EM.
VMU-Y aggregates data from multiple installations in single centralized database, allowing user to access them anywhere by a standard Web-browser, through a highly interactive interface. All data are available as charts, tables and reports based on XLS format.
An optional 3G mobile modem (VMU-W) is available for providing backup Internet connection in the case of issues on the main line, so as to allow to remotely operate the VMU-Y.
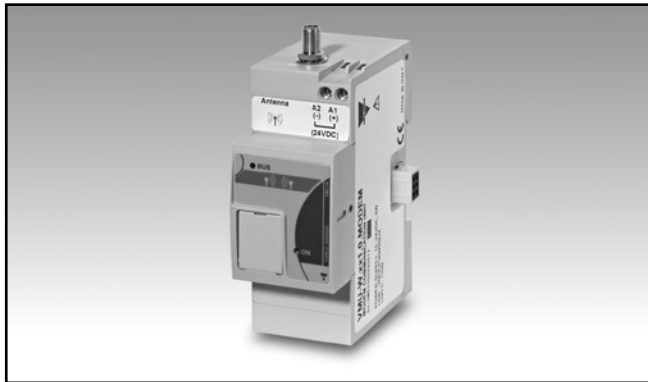
How to order   VMU-Y EM A WS X U X

Model
Application
Power supply
Function
Additional port
USB port
Option
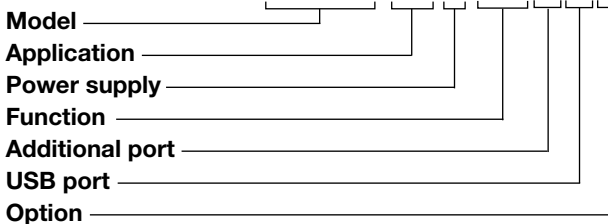
Type Selection

Application	Power supply	Function	Additional port
EM: Energy Management	**A:** from 12 to 28VDC	**WS:** Web-Server capability	**X:** none

USB port	Option
U: two USB 2.0	**X:** none

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VMU-W: Universal mobile modem for data communication

- Internet access point when regular wired network is not available
- Compatibility with quad-band GSM-GPRS-EDGE standards
- Compatibility with dual-band UMTS-HSPA standards
- SIM (25 x 15mm) for data communication (M2M SIM type only)
- Three available versions: one for Europe (EU27), one for USA and Canada and one for Australia
- 12 to 28 VDC power supply
- Dimensions: 2-DIN module
- Protection degree (front): IP40

Product description

Modem based on "UMM" (Universal Mobile Modem) communication technology for data communication when wired Internet is not available. This unit is suitable to be used in combination with VMU-Y to provide backup Internet connection in the case the wired connection is not available. The VMU-W modem is activated / deactivated remotely by SMS commands. Housing for DIN-rail mounting. IP40 (front) protection degree.

How to order   VMU-W A UMM 1 X

Model ——
Power supply ——
Comm. Technology ——
Area compatibility ——
Option ——

Type Selection

Power supply	Function	Area compatibility	Option
A: from 12 to 28VDC	**UMM:** universal mobile modem compatible with quad-band GSM-GPRS-EDGE standards; dual-band UMTS-HSPA. The supply includes already a stub antenna to be screwed on the RP-SMA connector.	**1:** Europe (EU27) **2:** USA and Canada **3:** Australia	**X:** none

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VMU-Y ᴇᴍ Main hardware characteristics

Memory		Other ports	
Flash (data)	32 GB	Mini USB	1, "D" device function for PC connection
RAM	128 MB (internal)	USB	1, "H" host function (not available when VMU-W is connected)
Back-up Memory - SD	32 GB micro SDHC type (removable, not supplied), industrial type (-25°C to 85°C) suggested (file system NTFS)		
		Connections	
		Ethernet	RJ-45 connector (10/100Base-T)
Back-up Memory - USB	32 GB USB stick (file system NTFS)	USB	High speed USB 2.0
Communication ports		Power supply	2 screw terminals
Ethernet	According to ISO9847		1.5 mm^2 max
Auxiliary bus			Min./Max. screw tightening torque: 0.4 Nm / 0.8 Nm
Left side	Compatible with VMU-W mobile modem	**Weight**	< 600 g

VMU-Y ᴇᴍ USB ports

Type	High speed 2.0 (max. 250mA)		It can be connected to a PC to perform the following functions:
Connections	"A" type as "Host" function on the top of the housing "Mini A" type as "Device" function on the front of the housing protected by front cover		- Back up connection to the internal Web Server in the case it is not possible to connect by Ethernet port Note: this port cannot be used when VMU-W is already connected
Host function (USB)	Available on the "H" USB port only, it can be used to perform the following actions: - VMU-Y's database backup Note: this port cannot be used when VMU-W is already connected		Note: both USB and mini USB ports are working in parallel, so relevant port fucnctions can work at the same time
		Working type	Hot swap
Device function (mini USB)	Available on the "D" USB port only, it is a virtual Ethernet port and works as a real Ethernet port performing all the functions of the main Ethernet port.	Communication speed	60MB/s (480Mbits/s)

VMU-W "Modem" Main hardware characteristics

5

Radio modem		**GPRS-EDGE connectivity**	
Communication technology	GSM, GPRS, EDGE standards. Quad band: 850MHz, 900MHz, 1800MHz, 1900MHz. UMTS and HSPA standards. Dual band: Europe (EU27): 900MHz, 2100MHz; USA and Canada (NAD): 850MHz, 1900MHz; Australia (AUD): 850MHz, 2100MHz.	Multi-slot	12 class
		Mobile-station	B class
		Downlink speed	GPRS: up to 107 kb/s EDGE: up to 296 kb/s
		Uplink speed	GPRS: up to 85.6 kb/s EDGE: up to 236.8 kb/s
		CSD (Circuit Switch Data)	Downlink/Uplink: up to 14.4 kb/s
Output power	Class 4 (2W, 33dBm) @ GSM 850/900MHz Class 1 (1W, 30dBm) @ GSM 1800/1900MHz Class E2 (0.5W, 27dBm) @ EDGE 850/900MHz Class E2 (0.4W, 26dBm) @ EDGE 1800/1900MHz Class 3 (0.25W, 24dBm) @ UMTS	**UMTS-HSPA connectivity**	
		Downlink speed	HSDPA 7.2 Mb/s (Category 8)
		Uplink speed	HSUPA 5.76 Mb/s (Category 6)
		W-CDMA (Wideband Code Division Multiple Access)	Downlink/Uplink: up to 384 kb/s
Modem configuration	By means of the PC browser: - access point name (APN); - connection number	**Auxiliary port**	
		Type and connections	Compatible with VMU-C unit only
Communication		**Connections**	
Purpose	- Access to the Web-Server (VMU-C) and all its functionalities if the wired network is not available; - To send SMS.	Antenna	RP-SMA female
		Power supply	2 screw terminals 1.5mm^2 max. Min./Max. screws tightening torque: 0.4 Nm / 0.8 Nm
SIM			
Type	SIM (25 x 15mm) for data communication (M2M SIM type only)		
Holder	On the front with protection cover		

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VMU-Y ᴇᴍ Memory management

Function	Micro-SD (SDHC)	USB (H)	USB (D)
Download (from VMU-C to micro-SD/USB)			
Configuration	YES	YES	YES
Full database	YES	YES	NO
Upload (from micro-SD/USB to VMU-C)			
Configuration	YES	YES	YES
Full database	YES	YES	NO

Note: both USB (D and H) and micro-SD storing are equivalent, if both are available than the priority is on the micro-SD.

VMU-Y ᴇᴍ Ethernet port

Protocol	HTTP	Client connections	Max 20 simultaneously
IP configuration	Static IP / Netmask / Default gateway	Connections	RJ45 10/100 BaseTX, Max. distance: 100m
DNS	Primary and secondary DNS as a static or dynamic management (using DHCP server if configured)	Insulation	See "Insulation between inputs and outputs" table

VMU-Y ᴇᴍ memory format and data occupancy

Description	Value
Total available memory for database and events	32 GB
Maximum backup size (on SD or USB)	32 GB
Resolution High resolution Low resolution	 From 5 to 60 minutes according to configuration Day
Database size management	Dynamic, based on: • Current number of VMU-C EM units which are replicating their database to VMU-Y • Total number of devices (Energy Meters and VMU-M units) connected to the VMU-C EM units • Number of Virtual meters created at VMU-Y EM level • Data resolution (from 5 to 60 minutes)
Range of historical data available with High resolution	Min.: 5 months Max: 10 years
Range of historical data available with Low resolution	30 years

VMU-Y EM TCP/IP networking

Inbound TCP/IP communication		
TCP/IP port number	**TCP/IP port description**	**Purpose**
80	HTTP	Access to the internal web-server
52325	SSH	Remote tunneling feature; connection from VMU-C to VMU-Y
from 1000 to 64000 (customer selected)	SSH	Remote tunneling feature; user access to remote VMU-C

Outbound TCP/IP communication		
TCP/IP port number	**TCP/IP port description**	**Purpose**
53	DNS	Domain name resolution
37	NTP	Network time services access
25	SMTP	Email message dispatching

VMU-Y EM LED configuration

Type Status	Single colour Changing according to the function	USB	Yellow Steady OFF: no communication; Slow blinking: backup going on Fast blinking: backup with errors Steady ON: daily backup completed correctly and SD inserted
Controlled functions	Power supply, USB port, SD port, alarms, database synchronization with VMU-C, modem backup mode		
Colour code and working mode Power on	 Green Steady ON: power supply is on	SD	Yellow Steady OFF: no communication; Slow blinking: backup going on Fast blinking: backup with errors Steady ON: daily backup completed correctly and SD inserted
Modem	Yellow Steady OFF: modem backup mode disabled Blinking: modem backup mode active		
Sync (VMU-C Database)	Blue Steady OFF: database synchronization with VMU-C is going on correctly Steady ON: problems with database synchronization with VMU-C	Alarm	Red Steady ON: alarms without acknowledgement in progress Steady OFF: no alarms without acknowledgement

VMU-W LED specifications

Type Status	Single colour Changing according to the function		OFF. - Fast blinking: net search / not registered / turning off. - Slow blinking: registered full service. - Steady ON: a call is active.

Colour and status
  Power supply
  Communication
	
	Green: steady ON
	Blue:
	- Steady OFF: the unit is		

VMU-Y EM based insulations between inputs and outputs

Type of input / output	DC Power supply	Ethernet	USB port "H" (Host)	USB port "D" (Service)	VMU-W
DC Power supply	-	0.5kV	0kV	0kV	0kV
Ethernet (LAN/Internet)	0.5kV	-	0.5kV	0.5kV	0.5kV
USB port "H" (Host)	0kV	0.5kV	-	0kV	0kV
USB port "D" (Service)	0kV	0.5kV	0kV	-	0kV
VMU-W	0kV	0.5kV	0kV	0kV	-

0kV: Inputs / outputs are not insulated
2kVrms: EN61010-1, IEC60664-1 - Over-voltage category III, Pollution degree 2, double insulation on systems with max. 300Vrms to ground
0.5kVrms: the insulation is functional type

VMU-Y EM, VMU-W General specifications

Operating temperature	-25 to +65°C (-13°F to 158°F)
Storage temperature	-30 to +70°C (-22°F to 149°F) (R.H. < 90% non-condensing @ 40°C)
Over voltage category	Cat. III (IEC 60664, EN60664) For inputs from string: equivalent to Cat. I, reinforced insulation.
Insulation (for 1 minute)	See table "Insulation between inputs and outputs"
Dielectric strength	4000 VAC RMS for 1 minute
Noise rejection CMRR	>65dB, 45 to 65 Hz
EMC (Immunity) Electrostatic discharges	According to EN61000-6-2 EN61000-4-2: 8kV air discharge, 4kV contact;
Immunity to irradiated electromagnetic fields	EN61000-4-3: 10V/m from 80 to 3000MHz;
Immunity to Burst	EN61000-4-4: 4kV on power lines, 2kV on signal lines;
Immunity to conducted disturbances	EN61000-4-6: 10V from 150KHz to 80MHz;
Surge	EN61000-4-5: 500V on power supply; 4kV on string inputs.

EMC (Emission) Radio frequency suppression	According to EN61000-6-3, CISPR 22, class B
Standard compliance (all units) Safety	IEC60664, IEC61010-1 EN60664, EN61010-1
Standard compliance (VMU-W only) Health and Safety EMC RF spectrum efficiency	EN 60950 EN301 489-1, EN301 489-7 EN301 511
Approvals	All units: CE, cULus Listed VMU-W only: R&TTE 99/5/CE
Housing Dimensions (WxHxD)	VMU-Y, VMU-W modules: 35.5 (+0.5 -0) x 90 x 67 mm
Material	Noryl, self-extinguishing: UL 94 V-0
Mounting	DIN-rail
Protection degree Front Screw terminals	IP40 IP20

Mean time to failure (MTTF)

Model	MTTF/MTBF - Years	Test conditions	Standard
VMU-Y	12.0	gf (ground, fixed), 50°C	MIL-HDBK-217F
VMU-W	26.0	gf (ground, fixed), 50°C	MIL-HDBK-217F

Power supply specifications

VMU-Y

Power supply	12 to 28 VDC
Power consumption	≤5W

VMU-W

Power supply	12 to 28 VDC
Consumption	≤5W

Sizing of Carlo Gavazzi DC power supply with one VMU-Y EM, and one VMU-W

VMU-W unit	Consumption	Start-up current	Power supply part number
1	PSW: 18.9W	13A for 1s	SPM4 24 1 (60W) or SPD 24 60 1B (60W)

Note: the consumption above includes already one VMU-Y unit.

VMU-Y EM Main functions

Overall features	Database replica from up to 10 VMU-C EM units; access by Web-interface to present real time and historical data for all the devices connected to the VMU-C EM units	**Alarms management** Overview	Local alarm management (email and SMS) performed by VMU-C EM units and/or centralized alarm management (email) based on VMU-Y EM is possible. Local alarm management is based on VMU-C EM functions[1]
Database synchronization			Centralized alarm management allows to send by email alarm queues coming from VMU-C EM units
Communication protocol	Carlo Gavazzi DP (Data Push) protocol based on Internet communication		
Replication interval	Configurable from 10 to 60 minutes (step 5 minutes)	Centralized emails	SMTP server configuration by Web interface
Replication direction	Data push from VMU-C EM to VMU-Y EM so as to avoid firewall hassles	Configuration Actions	Mail sent in case of - Alarms as working status of the monitored plants - Anomalies as working status of the monitoring system - Events as working status of devices connected through digital inputs
Internet connection VMU-Y	Wired (mobile communication allowed only to access the Web-Interface for maintenance)		
VMU-C	Wired or Mobile	**Data access**	
Configuration	The configuration of VMU-Y can be carried by using its integrated Web-Server. No additional configuration software is needed. Configuration of VMU-C units which exchange data with VMU-Y is made by connecting to the VMU-C's Web-Server[1]	User interface	Web-Server access by web-browser (Firefox, Chrome, Explorer, Opera, Safari supported)
		Data Export	Direct export from charts to CSV files Database export to XLS files
		User management Concurrent users Users profiling	Up to 20 Standard user with access to data and Administrators with access to configuration Data access configurable at single energy meter level
Clock Functions	Universal clock and calendar with automatic synchronization through Internet connection (NTP server connection is mandatory so as to obtain a unique time shared between VMU-Y and VMU-C)	Internationalization	Multilingual interface
		Data access tools Monitor view	Real time and historical data from Energy Meters
		Analysis view	Multiple variable trends analysis
Battery life	10 years	Alarms View	Alarm monitoring and acknowledgement tool
Data and Events logging Memory size	32 GB	Map view	Geographical location of target devices
Storage duration and interval	See "VMU-Y EM memory format and data occupancy"	Tree view	Hierarchical view of target devices
Storage data types	According to VMU-C EM[1]		

Notes:
(1): Please check the relevant VMU-C EM documentation for further information

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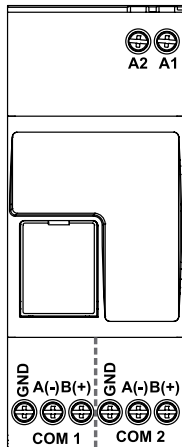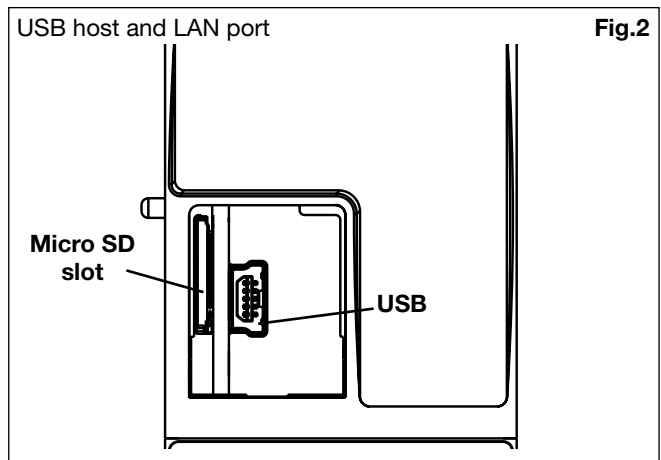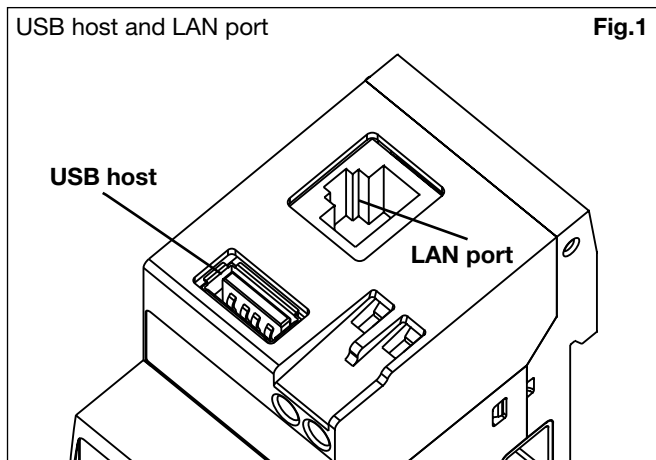## VMU-C EM Main functions (cont.)

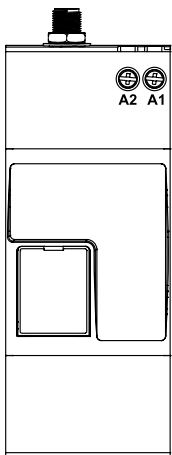| Advanced features		Broadcast commands	
Tariffs and cost management	Multiple tariffs and energy contract can be configured Active Excel based consumption costs reports Contracts comparison tool	Description	VMU-Y EM is allowed to send broadcast commands to one, some or all the VMU-C EM Commands are processed during database synchronization
Virtual meters	Virtual meters can be configured by aggregating multiple real or virtual energy meters[2]	Available commands	User add/delete NTP server configuration
Database Export tool	Tool allowing both exporting and charting of historical trends of whatever variable in the database		Email configuration Tunneling from VMU-C to VMU-Y Firmware update Database reset
Synoptic view	Tool for real time[3] inspection of a plant, represented by a background (including a layout or a schematic) surrounded by icons representing the necessary energy meters		Sampling interval setting VMU-C to VMU-C configuration copy Reboot

Notes:
(2): Creation of virtual meters requires database space, thus reducing data retention time (see "VMU-Y EM memory format and data occupancy")
(3): Real time is meant in compliancy with data replication interval time, so data refresh is possible with a maximum rate of once any 10 minutes
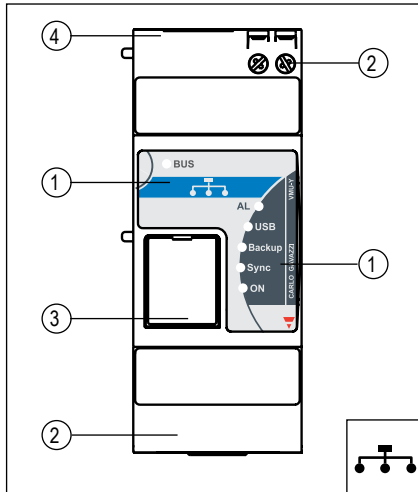
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VMU-Y EM connections

USB host and LAN port	Fig.1

USB host

LAN port

USB host and LAN port	Fig.2

Micro SD slot

USB

A2 A1

GND A(-) B(+) GND A(-) B(+)
COM 1 COM 2

Power Supply	Fig.3

A1 A2

+

-

VMU-W connections

A2 A1

Power Supply	Fig.1

A1 A2

+

-

Specification are subject to change without notice VMU-Y EM DS 090714

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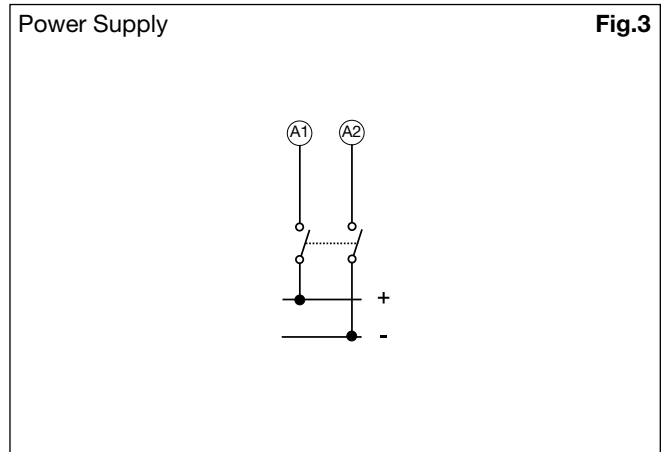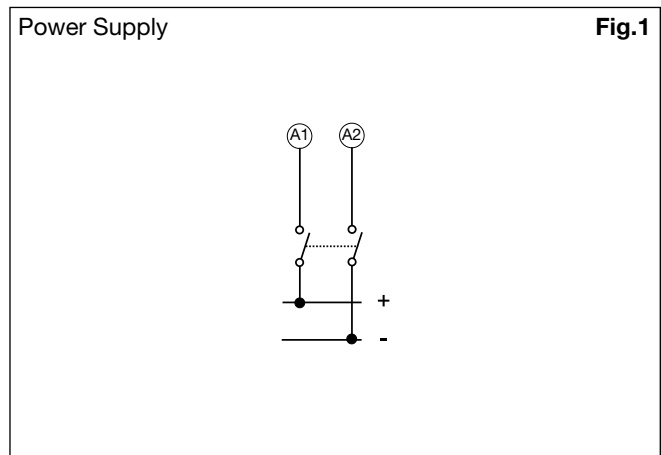
VMU-Y EM Front panel description

1. **LED**
   • Power ON (Green)
   Steady ON: power supply is on;
   • Modem (Yellow)
   Steady OFF: modem backup mode disabled
   Blinking: modem backup mode active
   • Sync (VMU-C Database) (Blue)
   Steady OFF: database synchronization with VMU-C is going on correctly
   Steady ON: problems with database synchronization with VMU-C
   • USB (Yellow)
   Steady OFF: no communication;
   Slow blinking: backup going on
   Fast blinking: backup with errors
   Steady ON: daily backup completed correctly and SD inserted
   • SD (Yellow)
   Steady OFF: no communication;
   Slow blinking: backup going on
   Fast blinking: backup with errors
   Steady ON: daily backup completed correctly and SD inserted
   • Alarms (Red)
   Steady ON: alarms without acknowledgement in progress
   Steady OFF: no alarms without acknowledgement
2. **Screw terminals**
   For power supply.
3. **Micro SD holder**
   Slot to plug-in the proper micro SD or micro SDHC memory and mini USB connector.
4. **USB and RJ connector**
   USB "A" type connector and RJ45 10/100 BaseTX connector for Ethernet communication.

VMU-W Front panel description
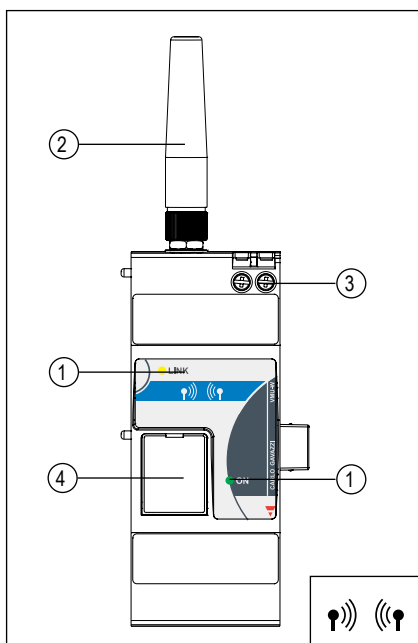
1. **LED.**
   • Power supply (Green):
   Steady ON
   • Link (Blue):
   Steady OFF: the unit is OFF.
   Fast blinking: net search / not registered / turning off.
   Slow blinking: registered full service.
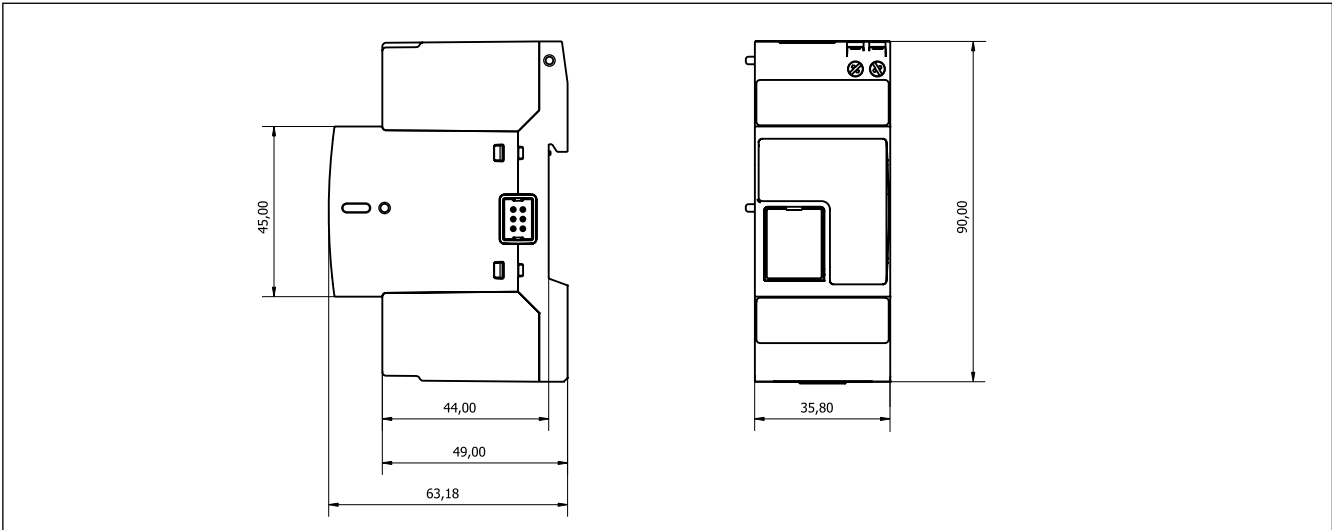   Steady ON: a call is active.
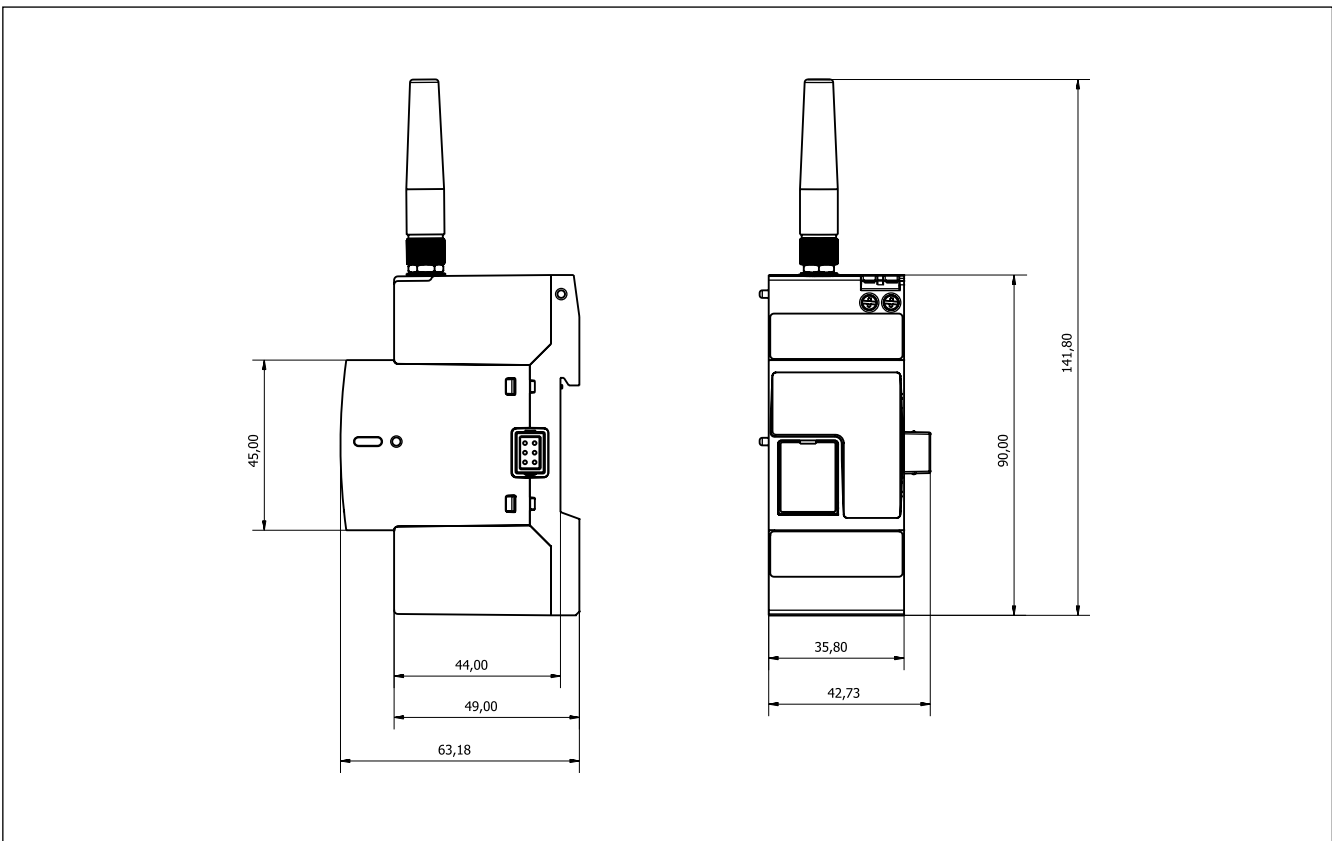2. **Antenna.**
3. **Power supply.**
   For power supply connections
4. **Sim card holder.**
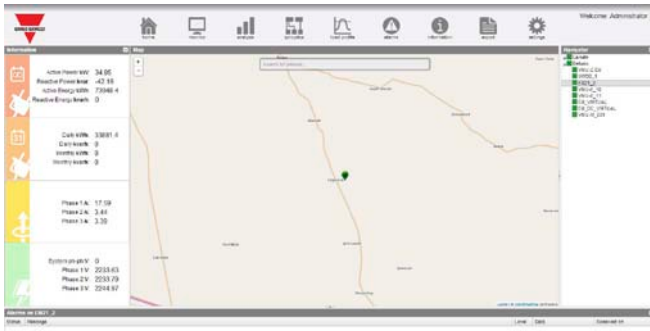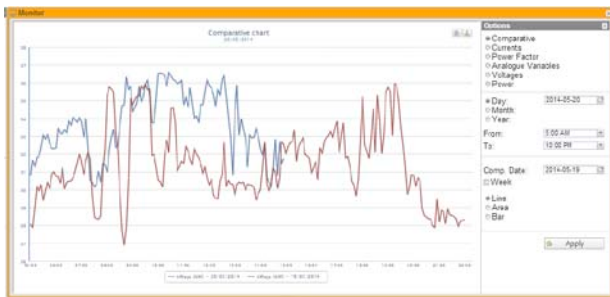   Proper slot for SIM card with protection cover

VMU-Y EM dimensions (mm)

VMU-W dimensions (mm)

Specification are subject to change without notice VMU-Y EM DS 090714

WEB-server

Home page including:
-Main toolbar on the top
-Hierarchical tree view on the right
-Main variables boxes on the left
-Alarms view at the bottom
-Map view in the centre

Monitor view
Each energy meter can be inspected about present and historical trends of any single variable, in the desired time interval
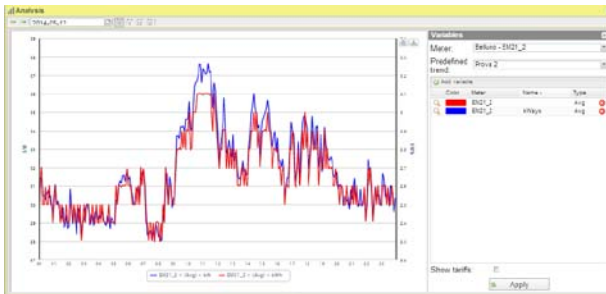
Analysis view
Trends charting tool, allowing to show and compare any combination of variables from one or multiple energy meters
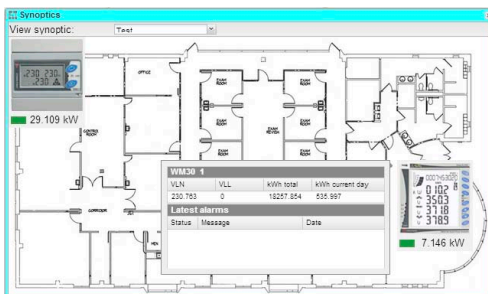
Synoptic tool
It allows to check the present plant status by examining active instruments' icons placed on static images (uploaded by the user) representing layouts or schematics
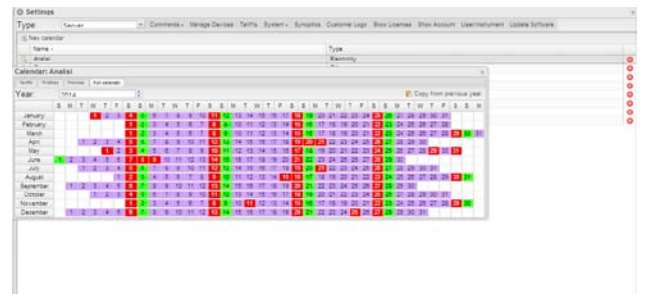
Settings tool
It allows to configure the VMU-Y EM's settings and the tariff and contract management parameters.
It allows also to send broadcast commands to VMU-C EM units.