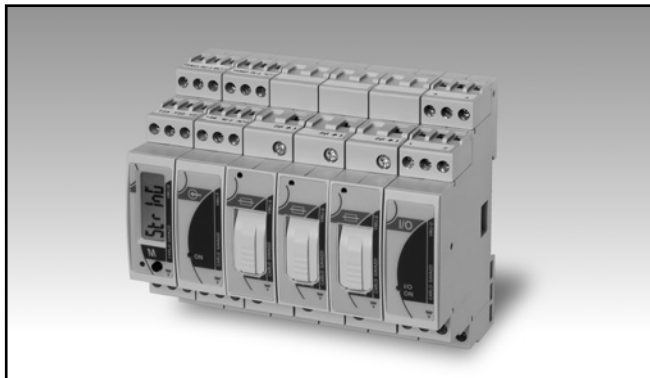# Energy Management
Control solution for solar PV applications
Type Eos-Array

CARLO GAVAZZI

- Modular local control system for PV plants
- Up to 17 DIN modules configuration equivalent to 280mm width
- Eos-ArraySoft freeware software for easy product configuration
- Eos-Array can be formed by maximum 17 units
- Eos-Array can manage in addition to VMU-M master unit up to:
  - 1 VMU-P unit;
  - max 15 VMU-S units;
  - max 7 VMU-O units;
  - max 1 VMU-1.

VMU-M, master module and data logger

- Master communication capability
- RS485 communication port (Modbus)
- Local communication bus management up to 15 mixed VMU-S, VMU-P and VMU-O units
- Two digital inputs
- Two temperature inputs: Pt100 or Pt1000
- Single virtual or real alarm set-point connectable to any available variable
- Data and event stamping system
- Display readout: 6 DGTs
- 12 to 28 VDC power supply
- Dimensions: 1-DIN module
- Protection degree (front): IP40
- 1 Metal-ion non-replaceable battery; 0.04 g.
  Note: The device contains metal-ion batteries. For the sending, you must comply with the relevant packaging and labeling regulation.

Product Description

Eos-Array is a combination of modules which performs a complete control of a photovoltaic plant. The core unit is VMU-M which performs the local bus management of VMU-S, VMU-P both measuring units and VMU-O I/O unit. VMU-M assigns the proper local unit address automatically (up to 15 units) and gathers all the local measurements coming from VMU-S and VMU-P measuring units. VMU-M can provide by means of VMU-O modules two relay outputs so to manage alarms or/and external loads (like a lighting system, a module washing system and so on) and two temperature inputs. These latter two measuring inputs can become, according to the programmed function, also two digital inputs. Housing for DIN-rail mounting, IP40 (front) protection degree.

How to order

VMU-M 4 A S1 T2 X

Model
Function
Power supply
Communication
Inputs
Option
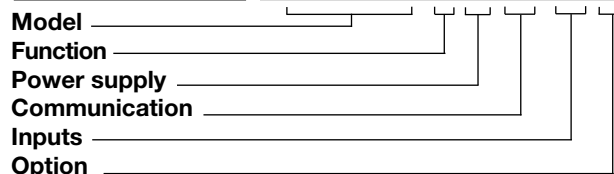
Type Selection

Function	Power supply	Communication	Inputs
4: Data storage 4Mbyte **(*)**	**A:** From 12 to 28VDC **(*)**	**S1:** RS485 Modbus **(*)**	**T2:** two temperature inputs or two digital inputs for free of voltage reading contacts **(*)**

Option

X: none

(*) as standard.

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VMU-S, string measuring unit
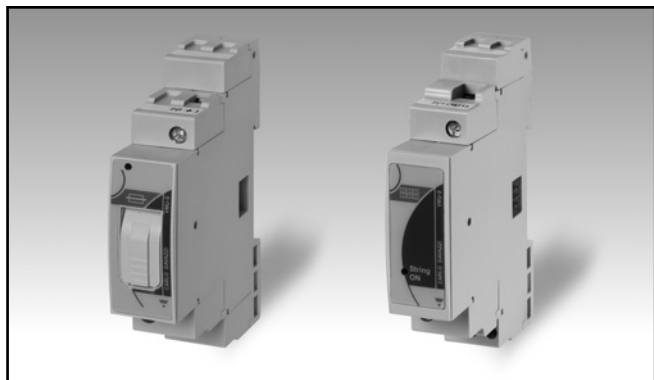
- **Direct DC voltage measurement up to 1000V**
- **Energy measurements: kWh**
- **Direct DC current measurement up to 16A or up to 30A without fuse**
- **Instantaneous variables data format: 4 DGTs**
- **Energies data format: 6 DGT**
- **Instantaneous variables: V, A, W.**
- **Accuracy: Class 1 (kWh) ±0.5 RDG (current/voltage)**
- **Auxiliary power supply from VMU-M unit**

- **Integrated 10.3x38mm fuse holder for string protection**
- **Dimensions: 1-DIN module**
- **Protection degree (front): IP40**

- **String alarm management by means of VMU-M unit only**
- **Fuse blow detection by means of VMU-M unit only**
- **PV module connection control by means of VMU-M unit only**

Product Description

Variables measuring unit with built-in protection fuse-holder (the fuse is not provided); particularly indicated for DC current, voltage, power and energy metering in PV solar applications. The current inputs/outputs and also the voltage inputs are made so to simplify the string common connections. Direct connection up to 16A or 30A depending on the model. Moreover the unit is provided with an auxiliary serial communication bus. Alarms, fuse blow detection, PV module connection and serial communication are managed by means of VMU-M module. Housing for DIN-rail mounting, IP40 (front) protection degree.
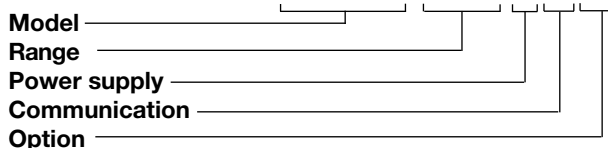
How to order

VMU-S AV10 X S FX

Model
Range
Power supply
Communication
Option

Type Selection

Range	Power supply	Communication	Option
AV10: 1000V DC, 16A (Direct connection) **(*)** **AV30:** 1000V DC, 30A (Direct connection) **(**). In this case the "Option" is "XX".	**X:** from 12 to 28VDC, self-power supply from VMU-M unit	**S:** auxiliary communication bus, compatible only to VMU-M module **(*)**	**XX:** none (no fuse holder) **FX:** with fuse holder

(*) as standard.
(**) on request.

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VMU-1, isolation enhancement unit
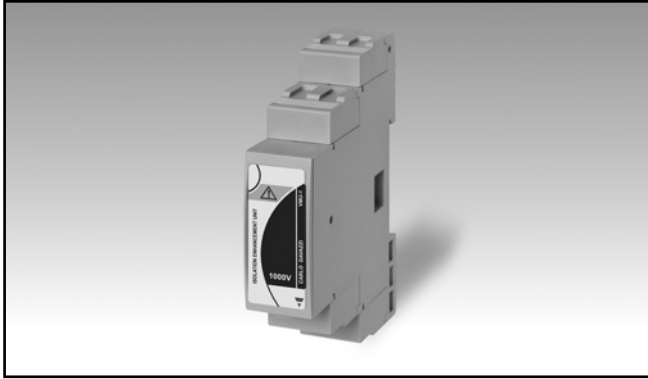
- **Isolation enhancement of voltage measuring inputs to earth of VMU-S: from 800VDC (without VMU-1) to 1000VDC max.**
- **Dimensions: 1-DIN module**
- **Protection degree (front): IP40**

Product Description

Isolation enhancement unit suitable to be used in combination with VMU modules. VMU-1 allows to enhance the isolation of the voltage measuring input to earth from 800VDC to 1000VDC.

The module is to be mounted between the first VMU-S and all the other VMU modules. Housing for DIN-rail mounting, IP40 (front) protection degree.

How to order

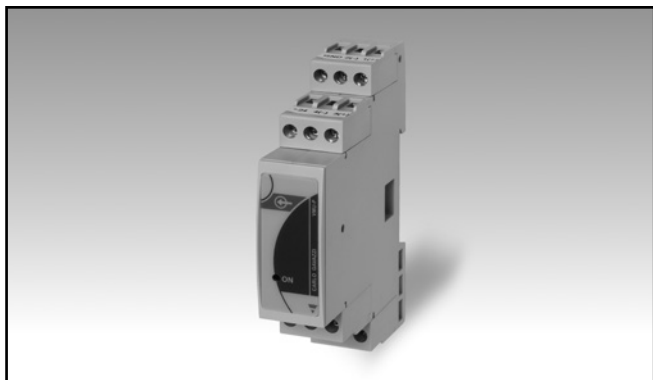**Standard model**

VMU-1 1000

Type Selection

Standard model

Isolation voltage 1000V: isolation enhancement on VMU-S voltage measuring input to earth from 800VDC (without module) to 1000VDC.
Note: only one VMU-1 is needed per Eos-Array

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VMU-P, environment variable unit

- **Measurements: PV module temperature, air temperature, sun irradiation, wind speed**
- **Two temperature inputs: Pt100 or Pt1000**
- **One 120mV or 20mA DC input with scaling capability for irradiation measurement**
- **One pulse input for wind speed measurement**
- **Auxiliary communication bus to VMU-M unit**
- **Auxiliary power supply from VMU-M unit**
- **Dimensions: 1-DIN module**
- **Protection degree (front): IP40**

Product Description

Environment variable measurement unit particularly indicated for PV module temperature, air temperature, sun irradiation, wind speed metering in PV solar applications. Moreover the unit is provided with a specific serial communication bus which is managed by means of the additional VMU-M module. Housing for DIN-rail mounting, IP40 (front) protection degree.

How to order

VMU-P 2TIW X S X

Model
Range
Power supply
Communication
Option
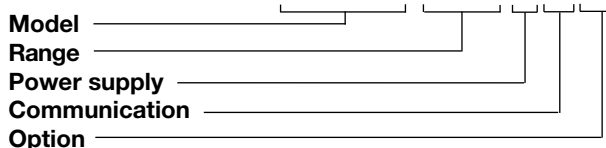
Type Selection

Range	Power supply	Communication	Option
2TIW: Two "Pt" temperature type probes, mV sun irradiation and wind speed measuring inputs **(*)**	**X:** from 12 to 28VDC, self-power supply from VMU-M unit	**S:** auxiliary communication bus, compatible only to VMU-M module **(*)**	**X:** none
2TCW: Two "Pt" temperature type probes, mA sun irradiation and wind speed measuring inputs (*)			

(*) as standard.

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VMU-O, inputs/outputs unit
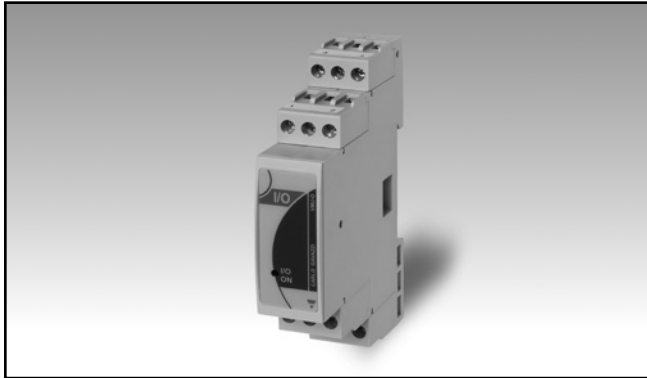
• Expansion I/O module (digital inputs and outputs)
• Two relay outputs managed by the VMU-M module
• Two digital inputs managed by the VMU-M module
• Auxiliary power supply from VMU-M module
• Dimensions: 1-DIN module
• Protection degree (front): IP40

Product Description

I/O unit suitable to be used in combination with VMU-M modules. VMU-O allows to add, for every single unit, two digital inputs and two relay outputs to a VMU-M based system. Housing for DIN-rail mounting, IP40 (front) protection degree.

How to order

VMU-O X I2 R2 X

Model
Power supply
Inputs
Outputs
Option
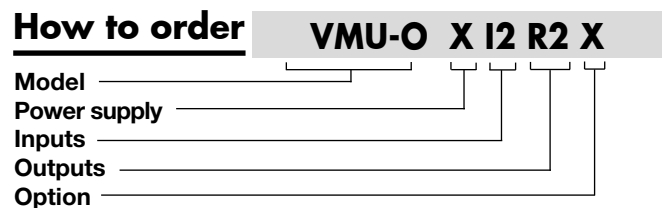
Type Selection (Standard model)

Power supply	Inputs	Outputs	Option
X: from 12 to 28VDC, self-power supply from VMU-M unit	**I2:** two digital inputs **(*)**	**R2:** two relay output **(*)**	**X:** none

Type Selection (Antitheft model)

Power supply	Inputs	Outputs	Option
X: from 12 to 28VDC, self-power supply from VMU-M unit	**I3:** three digital inputs **(*)**	**R1:** one relay outputs **(*)**	**AT:** antitheft compability

Note: in case of "Antitheft application" every single Eos-Array can manage the combination of one VMU-O.X.I3.R1.AT module and up to three VMU-O.X.I2.R2.X modules.

(*) as standard.

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# VMU-AT, Antitheft sensor for VMU-O with "AT" option

- **Plastic fibre optic sensor**
- **Sensing distance up to 200m**
- **Static output compatible with VMU-O "AT" option**
- **Auxiliary power supply from VMU-O "AT" option**
- **Dimensions: 14 x 31 x 73 mm housing**
- **Protection degree (front): IP50**

Product Description

Antitheft plastic fibre optic sensor to be used in combination with VMU-O "AT" I/O unit, suitable to carry out an antitheft control on PV modules which are passed by 2.2 mm plastic fibre optic.

The maximum loop distance which can be covered by the sensor is 200m. Housing for DIN-rail mounting, IP50 (front) protection degree.

How to order

VMU-AT X P M C X

Model ——————————
Power supply ——————
Plastic fibre ————————
200m sensing distance ——
Output ————————————
Option ————————————
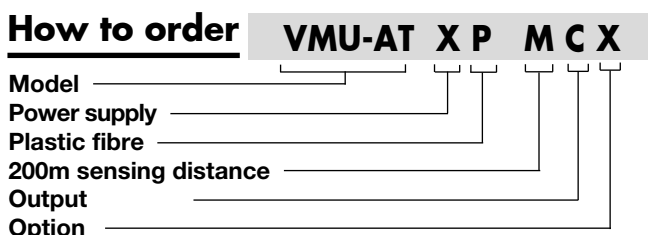
Type Selection

Power supply

X: from 12 to 28VDC, self-power supply from VMU-O "AT" option unit

Fibre optic

P: plastic **(*)**

Sensing distance

M: 200m **(*)**

Output

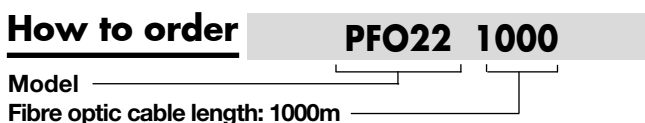**C:** open collector

Option

X: none

(*) as standard.

Product Description

PFO22-1000 is a specific plastic fibre optic cable which is made for VMU-AT sensor and is supplied in a quantity of 1000m. The working temperature is -55 to 70°C.

How to order

PFO22 1000

Model ——————————————
Fibre optic cable length: 1000m ——

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VMU-M Display and LED specification

Display		
Type	1 line (max: 6-DGT) LCD, h 7mm	
Information read-out	From 4 to 6-DGT depending on the information.	

LED		
Type	Dual colour	
Status and colour	Green steady light: the module is power supplied and there is no communication on the RS485 bus.	

Green blinking light: the communication on the RS485 bus is working. Red: alarm detected (any). In case of alarm/communication condition the LED alternates its colour from red (alarm) to green. The blinking time is approx. 1 second.

VMU-S LED specification

LED		
Type	Multicolor	
Status	ON steady light: the module is power supplied and there is no alarm.	
Colour AV10 range code	Green: the power supply is ON, there is a string current up to 1A; Yellow: there is a string current from 1.1 to 3A; Light orange: there is a string current from 3.1 to 6A; Orange: there is a string current from 6.1 to 8A; Dark orange: there is a string current from 8.1 to 10A; Red: there is a string current higher than 10A; White: the unit is enabled by VMU-M module for data reading and displaying. Green OFF: module not acknowledged in the Eos-Array. Cycling from blue to any other colour listed above (from yellow to red): string alarm. Cycling from blue to green: blown fuse. Cycling from blue to violet: inverted string polarity. Cycling from white to any other colour: the unit is enabled by VMU-M module for data reading and displaying and shows the status of the module according to	Colour AV30 range code

the colour list above.The cycling time is approx. 1 second.
Green: the power supply is ON, there is a string current up to 1A; Yellow: there is a string current from 1.1 to 6A; Light orange: there is a string current from 6.1 to 12A; Orange: there is a string current from 12.1 to 16A; Dark orange: there is a string current from 16.1 to 20A; Red: there is a string current higher than 20A; White: the unit is enabled by VMU-M module for data reading and displaying. Green OFF: module not acknowledged in the Eos-Array. Cycling from blue to any other colour listed above (from yellow to red): string alarm. Cycling from blue to violet: inverted string polarity. Cycling from white to any other colour: the unit is enabled by VMU-M module for data reading and displaying and shows the status of the module according to the colour list above. The cycling time is approx. 1 second.

VMU-P LED specification

LED		
Type	Multicolor	
Status and colour	Green: the power supply is ON.	

White: the unit is enabled by VMU-M module for data reading and displaying.

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VMU-O LED specification

LED			one or both digital outputs are activated. Cycling from one colour to any other one: the unit shows the status of the module according to the colour list above. The cycling time is approx. 1 second.
Type	Multicolor		
Status and colour	Green: the power supply is ON. White: the unit is enabled by VMU-M module for data reading and displaying. Red: one or both digital inputs are activated. Blue:		

VMU-AT LED specification

LED		Loop status	Red: the optical loop is closed
Power supply status	Green: the power supply is ON		

VMU-M input specifications

Digital inputs		Insulation	See the table "Insulation between inputs and outputs"
Number of inputs	2		
Working mode	First input: detection of ON/OFF status Second input: counting of pulses coming from an energy meter	**Temperature inputs**	
		Number of inputs	2
		Temperature probe	Pt100, Pt1000
Purpose	- First input: trip of protection detection, the status is transmitted only by means of the communication port. - Second input: trip counter, interfacing with an energy meter (-kWh) so to measure the total efficiency of the system.	Number of wires	2 or 3-wire connection
		Wire compensation	Up to 10Ω.
		Accuracy (Display + RS485)	See "Temperature input characteristics"
		Temperature drift	±150ppm/°C
		Engineering unit	Selectable °C or °F
		Insulation	See the table "Insulation between inputs and outputs"
Input frequency	20Hz max, duty cycle 50%	**Key-pad**	1 push-button for variable scrolling and programming. Full programming can be carried out only using Eos-ArraySoft.
Pre-scaler adjustment	From 0.001 to 10.000 kWh/pulse (only for the second input)		
Contact measuring voltage	3.3VDC		
Contact measuring current	<1mA		
Contact resistance	≤1kΩ closed contact; ≥20kΩ open contact		

VMU-S input specifications

Rated inputs			AV30 range: 1000V DC
Current type	1 (shunt)	**Accuracy**	(@25°C ±5°C, R.H. ≤60%)
Current range	AV10 range: 16A DC @ 40°C, 15A @ 50°C, 14A @ 55°C, 12A @ 60°C, 10A @ 65°C AV30 range: 30A DC @ 55°C, 25A DC @ 60°C, 20A DC @ 65°C	AV10 range code	
		Current	±(0.5%RDG+2 DGT) from 0.05A to 16A
		Voltage	±(0.5%RDG+2 DGT) from 20V to 1000V
		Power	±(1% RDG+ 2DGT)
Voltage	AV10 range: 1000V DC	Energy	±(1% RDG)

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VMU-S input specifications (cont.)

Start up current	0.05A	AV30 range code	2W
Start up voltage	10V	Voltage	> 2.5M
AV30 range code		Current	< 0.003Ω @ 0.5 Nm (screw terminal torque).
Current	±(0.5%RDG+2 DGT) from 0.2A to 30A	**Voltage Overloads**	
Voltage	±(0.5%RDG+2 DGT) from 20V to 1000V	Continuous	1100V
		For 500ms	1600V
Power	±(1% RDG+ 2DGT)	To earth	800V (extended to 1000V in case of combined use of VMU-1.1000V unit)
Energy	±(1% RDG)		
Start up current	0.2A		
Start up voltage	10V		
Temperature drift	≤200ppm/°C	**Current Overloads**	
Measurement sampling time	2 sec.	Continuous	AV10 range: 16A AV30 range: 30A
Variables format		For 1s	AV10 range: 100A max AV30 range: 150A max
Instantaneous variables	4-DGT (A, W), 5-DGT (V)		
Resolution	0.1V; 0.01A; 0.01kW	**Protection**	
Energies	Total: 5+1 DGT (0.1KWh)	Fuse holder	Integrated into the module
Max. and Min. data format	See "Stored set of variables coming from …"	Fuse type	gPV
		Fuse size	10x38mm (IEC60269-1-6)
Input impedance		Fuse current	Fuse NOT provided. Note: the fuse rated current has to be ≥1.4 Isc at 45°C ambient temperature. See fuse manufacturer specifications for further details including de-rating caused by higher ambient temperature.
AV10 range code			
Voltage	> 2.5MΩ		
Current	< 0.006Ω(+ fuse impedance) @ 0.5 Nm (screw terminal torque). For current input of 16A the fuse has therefore a nominal current of 32A AC. The maximum dissipation power has not to exceed		

VMU-P input specifications

Temperature drift	≤200ppm/°C		±(0.1%RDG+1DGT) 25% to 120% FS.
Variables format		Temperature drift	±150ppm/°C
Instantaneous variables	4 DGT (Temperature, solar irradiation and wind speed)	Scaling factor	
		Operating mode	Dual scale: - Input: programmable range from 3 to 150.0 (mVDC) - Display: programmable range from 0 to 9999 (kW/m², kW/ft²)
Resolution	0.1°C/0.1°F; 1W/m², 1W/ft²; 0.1m/s, 0.1ft/s		
Max. and Min. data format	See "Stored set of variables coming from …"		
Temperature probe inputs		Decimal point position	Fixed.
Number of inputs	2 (Input 1: PV module; Input 2: air)	Impedance	> 30KΩ
		Overload	
Temperature probe	Pt100 or Pt1000	Continuous	10VDC (measurement available up to 150mV on both display and communication bus)
Number of wires	Up to 3-wire connection		
Wire compensation	Up to 10Ω.		
Accuracy (Display + RS485)	See table "Temperature input characteristics"		
Temperature drift	±150ppm/°C	For 1s	20VDC
Engineering unit	Selectable °C or °F	Insulation	See the table "Insulation between inputs and communication bus"
Insulation	See the table "Insulation between inputs and communication bus"		
Irradiation sensor inputs (range code: 2TIW)		**Irradiation sensor input (range code: 2TCW**	
Number of inputs	1	Number of inputs	1
Range	3 to 120mVDC	Range	0 to 20mADC
Accuracy (Display + RS485) (@25°C ±5°C, R.H. ≤60%)	±(0.2%RDG+1DGT) 0% to 25% FS;	Accuracy (Display + RS485) (@25°C ±5°C, R.H. ≤60%)	±(0.2%RDG+1DGT) 0% to 25% FS;

VMU-P input specifications (cont.)

		(@25°C ±5°C, R.H. ≤60%)	±(0.02%RDG+1DGT) 0% to 25% FS;
	±(0.1%RDG+1DGT) 25% to 120% FS.		±(0.01%RDG+1DGT) 25% to 110% FS.
Temperature drift	±150ppm/°C	(Display + RS485)	
Scaling factor		Temperature drift	±150ppm/°C
Operating mode	Dual scale:	Scaling factor	
	- Input: programmable range from 0 to 25.0 (mADC)	Operating mode	Dual scale:
			- Input: programmable range from 0 to 999.9 (Hz)
	- Display Data format: programmable range from 0 to 9999 (kW/m^2, kW/ft^2)		- Display: programmable range from 0 to 299.9 (m/s, ft/s)
Decimal point position	Fixed	Decimal point position	Fixed and depending on the input/display scale.
Impedance	≤23Ω		
Overload		Impedance	680Ω
Continuous	50mADC (measurement available up to 25mA on both display and communication bus)	Operating input	2.5V$_{peak}$ to 9V$_{peak}$/5mA$_{peak}$ to 35mA$_{peak}$, duty cycle 50%
		Impedence	220Ω
		Overload	
For 1s	150mADC	Continuous	7V$_{RMS}$/25mA$_{RMS}$ (AC/DC)
Insulation	See the table "Insulation between inputs and communication bus"	For 1s	14V$_{RMS}$/50mA$_{RMS}$ (AC/DC)
		Insulation	See the table "Insulation between inputs and communication bus"
Wind speed sensor inputs			
Number of inputs	1		
Range	0 to 1000Hz max, duty cycle 50%		
Accuracy			

VMU-M Output specifications

RS485		Insulation	See the table "Insulation between inputs and outputs"
Type	Multidrop, bidirectional (static and dynamic variables)		
		Auxiliary communication bus	This is the communication bus to the VMU-S, VMU-P and VMU-O units where VMU-M performs the master function in this network. VMU-M unit can gather the following information from the bus:
Connections	2-wire. Max. distance 1000m		
Addresses	247, selectable by means of the front push-button		
Protocol	MODBUS/JBUS (RTU)		
Data (bidirectional)			- All variables available on the bus;
Dynamic (reading only)	All variables, see table "Measured variables, data format and messages" in the VMU-S document		- Blown protection fuse; - PV reverse voltage and current polarity. The local address in both the VMU-S, VMU-P and VMU-O units is automatically assigned by VMU-M master unit based on their positions. It can manage up to 15 different addresses (units).
Static (writing only)	All the configuration parameters.		
Data format	1 start bit, 8 data bit, no parity,1 stop bit		
Baud-rate	Selectable: 9600, 19200, 38400, 115200 bits/s Parity: none		
Driver input capability	1/5 unit load. Maximum 160 transceivers on the same bus.		
Special functions	None	Insulation	See the table "Insulation between inputs and outputs"

VMU-O Input/Output specifications

Maximum number of modules managed by every single VMU-M module	Up to 7	Number of outputs Purpose	2 Alarm notification as a String alarm or as a digital input status changing (OR function); activation of a lighting system (by means of the internal clock or as a remote control); activation of a module washing system (by means of the internal clock, as a remote control or as a changing of efficiency of the PV panels).
Digital inputs			
Number of inputs	2		
Working mode	Detection of OPEN/CLOSED contact status		
Purpose	Trip of protection detection, the status is transmitted only by means of the communication port.		
Input frequency	2Hz max, duty cycle 50% 3.3VDC	Type	Relay, SPST type AC1: 5A @ 250VAC AC15: 1A @ 250VAC Available by means of VMU-O module only
Contact reading voltage			
Contact reading current	<2mA		
Contact resistance	≤300Ω closed contact; ≥10kΩ open contact		
Insulation	See the table "Insulation between inputs and outputs"	Insulation	See the table "Insulation between inputs and outputs"
Digital output			

VMU-M and VMU-P Temperature input characteristics

Probe	Range	Accuracy	Min Indication	Max Indication
Pt100	-50°C to +200.0°C	±(0.5%RDG +5DGT)	-50.0	+200.0
Pt100	-58°F to +392°F	±(0.5%RDG +5DGT)	-58.0	+392.0
Pt1000	-50°C to +200.0°C	±(0.5%RDG +5DGT)	-50.0	+200.0
Pt1000	-58°F to +392°F	±(0.5%RDG +5DGT)	-58.0	+392.0

VMU-O with "AT" option, Input/Output specifications

Maximum number of module managed by every single VMU-M module	Up to 1		between inputs and outputs"
Digital inputs		**Digital output**	
Number of inputs	3	Number of outputs	1
Working mode	Detection of ON/OFF status	Purpose	Antitheft notification in case of function enabling (EosArraySoft) or alarm notification as a String alarm or as a digital input status changing (OR function); activation of a lighting system (by means of the internal clock or as a remote control); activation of a module washing system (by means of the internal clock, as a remote control or as a changing of efficiency of the PV modules).
Purpose	Detection of the output status of up to 3 VMU-AT units, the same inputs can be used also to detect standard free of voltage contacts of other devices.		
Working logic	The inputs in case of Antitheft purpose selection work as an OR logic (EosArraySoft), if this function is not enabled every input works independently from each other.		
Input frequency	2Hz max, duty cycle 50% 3.3VDC		
Contact reading voltage		Type	Relay, SPST type AC1: 5A @ 250VAC AC15: 1A @ 250VAC
Contact reading current	<2mA		
Contact resistance	≤300Ω closed contact; ≥10kΩ open contact	Insulation	See the table "Insulation between inputs and outputs"
Insulation	See the table "Insulation		

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VMU-AT Antitheft sensor specifications

Maximum number of sensors managed by every single VMU-O "AT" module	Up to 3
Optical sensing	
Maximum operational distance	200m (loop)
Sensitivity	Automatic adjusted
Light source	GaAIAs, LED 660 nm
Light type	Red modulated
Operating frequency	1Khz
Response time on fibre breaking	0.5 seconds
Fibre Optic	
Material	Plastic
Diameter	2.2 mm

Compatible model	PGU-CD1001-22
Working temperature	-55 to +70°C
Digital output	
Number of outputs	1
Type	Open collector
Insulation	Operational insulation only (50VACRMS)
Power Supply	12 to 28 VDC
Connection	
Cable	Length: 0.5m, black colour, PVC material

Main Function

Displaying	
Own VMU-M module	1 parameter per page See "Stored set of variables from …" and "Alarm and diagnostics messages"
When a VMU-S module is selected	All the information related to the status of the string being selected by means of the front key (see "Variable" in the table "List of the variables that can be...").
When a VMU-P module is selected	All the information related to the status of the environment probes being selected by means of the front key (see "Variable" in the table "List of the variables that can be...").
When a VMU-O module is selected	All the information related to the status of the inputs/outputs being selected by means of the front key (see "Variable" in the table "List of the variables that can be...").
Password	Numeric code of max. 4 digits;

1st level	2 protection levels of the programming data: Password "0", no protection;
2nd level	Password from 1 to 9999, all data are protected
Reset	By means of the front push-button when the relevant VMU-S is selected
Alarms	
Number of alarms	One, independent for every single available variable (see the table "List of the variables that can be…")
Alarm types	Virtual alarm or real alarm
Alarm modes	Up alarm, down alarm (see the table "List of the variables that can be connected to …")
Set-point adjustment	From 0 to 100% of the display scale
Hysteresis	From 0 to full scale
On-time delay	0 to 3600s
Output status	Selectable; normally de-energized or normally energized
Min. response time	$\leq$ 700ms, set-point on-time delay: "0 s"

Main Function (Cont.)

Clock

Functions	Universal clock and calen-dar. Activation: NO/YES
Daylight-saving enabling	
Time format	Houre:minutes with selectable 24 hours or AM/PM
Date format	Month-Day, where the month is displayed in a three letter format (e.g.: JAN-FEB-MAR) and the date as a number. Year is displayed in a two digit format.
Battery	Life: 10 years

Data logging

Data	The data are not available on the display but they can be both checked and downloaded using RS485 communication port in combination with Eos-ArraySoft software.
Function enabling	Activation: NO/YES
Function description	All the events gathered from both VMU-S, VMU-O and VMU-P modules are stored individually into the internal memory.
Stored data type	Variables: V, A, W, Wh, PV module temperature, ambient temperature, irra-diation, wind speed, string efficiency and BOS effi-ciency.
Storage interval	Selectable: 1-5-10-15-30-60 minutes
Sampling management	The sample stored within the selected time interval results from the continu-ous average calculation of the measured values. The average is calculated with an interval within two fol-lowing measurements of approx. 2s.
Storage duration	Before overwriting: depending on the storage interval, see "Historical data storing time table"
Data format	Variables, date (dd:mm:yy) and time (hh:mm:ss)
Storage method	Circular FIFO
Memory type	Flash
Memory retention time	10 years

Event logging

Data displaying	The data are not available on the display but they can be both checked and downloaded using RS485 communication port in combination with Eos-ArraySoft software.
Function enabling	Activation: NO/YES
Type of stored events	VMU-O digital input/output status change (real and vir-tual alarms), string alarms (see "String control"), VMU-M 1st digital input status change. The events are recorded as soon as they occur. For more infor-mation about the type and stored data, see "List of the variables that can be connected to …."
Number of events	Max. 10 000.
Data reset	The reset can be carried out only using Eos-Array-Soft.
Data format	Event, date (dd:mm:yy) and time (hh:mm:ss)
Storage method	Circular FIFO
Memory type	Flash
Memory retention time	10 years

String control

Function enabling	Activation: NO/YES
Function selection	Match max. control or median control
Function description	Match max. control: this function is helpful only if there are at least two string controls (VMU-S units). The highest value of the meas-ured string power among those available is used as a reference value. The alarm set-point is a value which can be set by the user as a percentage of the refer-ence value below which there is the alarm condi-tion.
	- Median control: the measurement of the string power is performed by the local VMU-S module individually. Within the VMU-M system all values coming at the same instant

Main Function (Cont.)

	from every VMU-S module are used to calculate the "median" value which becomes the reference value to which the dynamic window set-point (in percentage set by the user) is linked. The abnormal condition is detected when the measured instantaneous string power is out of the set window alarm. The alarm activates, with reference to the failed string, either a relay output (only in case of "VMU-O" connection) or/and a message which is transmitted by means of the RS485 communication port to an acquisition system.	Control type "1"	The VMU-P module is present and both PV module temperature and irradiation are measured to calculate the reference value for the efficiency calculation.
		Control type "2"	The VMU-P module is present and both ambient temperature and irradiation are measured to calculate the reference value for the efficiency calculation.
String window alarm	The alarm is set as the string power control, the value is programmable in percentage (of the measured string value) from 0.1 to 199.9.	**BOS efficiency measurement**	The total efficiency measurement is based on the comparison between the generated energy and the exported energy supplied to the grid. The grid supplied energy is measured by means of a "S0" output coming from an energy meter like EM21-72, EM24-DIN, EM26-96 where the pulsating output (-kWh) is connected to the second digital input of VMU-M.
Other alarms	The alarms can be connected also to: A and V.		
"PV string" efficiency measurement		**Fuse blow detection** (only AV10 range code)	Warning message transmission through the local port to the VMU-M unit.
Function enabling	Activation: NO/YES Three type of controls are available	**Wrong PV string connection**	Warning message transmission through the local port to the VMU-M unit.
Control type "0"	The VMU-P unit is not available therefore the single strings are used to calculate the reference value for the efficiency calculation.		

Note: the "String control", the "PV string efficiency" and the "BOS efficiency" can be carried out only in case a minimum system is available like a VMU-M, plus a VMU-S, plus a VMU-P and an energy meter with pulsating output.

Insulation between inputs and outputs

Module		Any	VMU-M			VMU-P			VMU-O		VMU-S		
	Type of input/output	Local bus	DC Power supply	Temperature or digital inputs: Ch1, Ch2	RS485	Temperature: Ch1, Ch2	Solar irradiation	Wind speed	Digital inputs: Ch1, Ch2, Ch3	Relay outputs: Ch1, Ch2	Input string (V-)	Input string (A+)	Output string (A+)
Any	Local bus	-	0kV	0kV	0kV	0kV	0kV	0kV	4kV	4kV	4kV	4kV	4kV
VMU-M	DC Power supply	0kV	-	0kV	0kV	0kV	0kV	0kV	4kV	4kV	4kV	4kV	4kV
	Temperature or digital inputs: Ch1, Ch2	0kV	0kV	-	0kV	0kV	0kV	0kV	4kV	4kV	4kV	4kV	4kV
	RS485	0kV	0kV	0kV	-	0kV	0kV	0kV	4kV	4kV	4kV	4kV	4kV
VMU-P	Temperature: Ch1, Ch2	0kV	0kV	0kV	0kV	-	0kV	0kV	4kV	4kV	4kV	4kV	4kV
	Solar irradiation	0kV	0kV	0kV	0kV	0kV	-	0kV	4kV	4kV	4kV	4kV	4kV
	Wind speed	0kV	0kV	0kV	0kV	0kV	0kV	-	4kV	4kV	4kV	4kV	4kV
VMU-O	Digital inputs: Ch1, Ch2, Ch3	0kV	0kV	0kV	0kV	0kV	0kV	0kV	-	4kV	4kV	4kV	4kV
	Relay outputs: Ch1, Ch2	4kV	4kV	4kV	4kV	4kV	4kV	4kV	4kV	-	4kV	4kV	4kV
VMU-S	Input string (V-)	4kV	4kV	4kV	4kV	4kV	4kV	4kV	4kV	4kV	-	4kV	>5MΩ
	Input string (A+)	4kV	4kV	4kV	4kV	4kV	4kV	4kV	4kV	4kV	4kV	-	4kV
	Output strimg (A+)	4kV	4kV	4kV	4kV	4kV	4kV	4kV	4kV	4kV	>5MΩ	4kV	-

Note: The isolation between the two relay outputs is 4kV.

0kV	Inputs / outputs are not insulated. Use insulated probes and free of voltage contacts inputs.
4kVrms	EN61010-1, IEC60664-1 - Over-voltage category III, Pollution degree 2, double insulation on systems with max. 300Vrms to ground
4kVrms	IEC60664-1 - Using protection device with clamping voltage ≤4KV (surge suppressor) the system insulation can be considered as reinforced for string output voltage up to 1000V (800V to earth). IEC60664-1, IEC61730-2 application class B: impulse withstand voltage 1,2/50µsec: 6000V.
4kV	Only if the fuse is not present. The fuse is only for over-current protection (it has not to be considered as a disconnecting device).

General specifications

Operating temperature	See table "String current vs. operating temperature".
Storage temperature	-30 to +70°C (-22°F to 158°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	65 dB, 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 single 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 According to CISPR 22

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General specifications (cont.)

Standard compliance	
Safety	IEC60664, IEC61010-1 EN60664, EN61010-1
Approvals	CE, cULus Listed
Housing	
Dimensions (WxHxD)	17.5 x 90 x 67 mm

Material	Noryl, self-extinguishing: UL 94 V-0
Mounting	DIN-rail
Protection degree	
Front	IP40
Screw terminals	IP20

Connections

VMU-M	
Connections	Screw-type
Cable cross-section area	1.5 mm2 max, Min./Max. screws tightening torque: 0.4 Nm / 0.8 Nm
Screw terminal purposes	
1.5 mm^2	3+3 screw terminals used for two temperature inputs 3 screw terminals used for RS485 communication 2 screw terminals used for power supply

VMU-S AV10	
Connections	Screw-type
Cable cross-section area	
Current (+)	Min. 2.5 mm^2, max 6 mm^2 in case of flexible wire, Max. 10 mm^2 in case of rigid wire. Screws tightening torque: Max 1.1 Nm
Voltage (-)	Max 1.5 mm^2. Screws tightening torque: Max 0.5 Nm
Screw terminal purposes	
10 mm^2	1+1 screw terminals: 1 positive for string input and 1 positive for string output (to the Inverter)
1.5 mm^2	3 screw terminals: not power input, only for negative voltage signal measurement

VMU-S AV30	
Connections	Screw-type
Cable cross-section area	
Current (+)	Min. 2.5 mm^2, max 10 mm^2 in case of flexible wire, Max. 16 mm^2 in case of rigid wire. Hole dimension: 7.2x5.1mm. Screws tightening torque: Max 0.7 Nm
Voltage (-)	Max 1.5 mm^2. Screws tightening torque: Max 0.5 Nm

Screw terminal purposes	
16 mm^2	1+1 screw terminals: 1 positive for string input and 1 positive for string output (to the Inverter)
1.5 mm^2	3 screw terminals: not power input, only for negative voltage signal measurement

VMU-P	
Connections	Screw-type
Cable cross-section area	1.5 mm^2 max. Min./Max. screws tightening torque: 0.4 Nm / 0.8 Nm
Screw terminal purposes	
1.5 mm^2	3+3 screw terminals used for two temperature probes 2 screw terminals used for wind speed sensor, 2 screw terminals used for solar irradiation sensor

VMU-O	
Connections	Screw-type
Cable cross-section area Relay outputs and digital inputs	Max 1.5 mm^2 Min./Max. screws tightening torque: 0.4 Nm / 0.8 Nm
"X" type Screw terminal purposes	
1.5 mm^2	2+2 screw terminals: two for 1st relay output and two for 2nd relay output (SPST type) 2+2 screw terminals: two for 1st digital input and two for 2nd digital input
"AT" type Screw terminal purposes	
1.5 mm^2	2 screw terminals for relay output (SPST type) 2+2+2 screw terminals: two for 1st digital input, two for 2nd digital input and two for 3rd digital input
Weight (all modules)	Approx. 100 g (packing included)

Power supply specifications

VMU-M			
Power supply	12 to 28 VDC	Power supply	Self-power supplied through the communication bus
Power consumption	≤1W		
VMU-S-P-O		Power consumption	≤0.7W

String current vs. operating temperature

VMU-S AV10 Input current	VMU-O Max. contact current	Other modules	Operating temperature	
10A DC max.	2.5A	VMU-M, VMU-P	-25 to + 65°C	-13°F to 149°F
12A DC max.	3.0A	VMU-M, VMU-P	-25 to + 60°C	-13°F to 140°F
14A DC max.	3.5A	VMU-M, VMU-P	-25 to + 55°C	-13°F to 131°F
15A DC max.	4.0A	VMU-M, VMU-P	-25 to + 50°C	-13°F to 122°F
16A DC max.	5.0A	VMU-M, VMU-P	-25 to + 40°C	-13°F to 104°F
VMU-S AV30 Input current				
20A DC max.	2.5A	VMU-M, VMU-P	-25 to + 65°C	-13°F to 149°F
25A DC max.	3.0A	VMU-M, VMU-P	-25 to + 60°C	-13°F to 140°F
30A DC max.	3.5A	VMU-M, VMU-P	-25 to + 55°C	-13°F to 131°F

R.H. < 90% non condensing @ 40°C (104°F)

Sizing of Carlo Gavazzi DC power supply without antitheft functionality

VMU-S units	VMU-O units	VMU-P units	Consumption	Start up current	Power supply part number
From 1 to 3	None	None	PS_W: 2.5W_{typ}	1.5A for 1s	SPD 24 18 1B or SPM3 24 1
From 1 to 3	Up to 1	Up to 1	PS_W: 5W_{typ}	1.5A for 1s	SPD 24 18 1B or SPM3 24 1
From 4 to 10	From 2 to 4	Up to 1	PS_W: 11W_{typ}	1.5A for 1s	SPD 24 30 1B or SPM3 24 1
From 11 to 14	Up to 1	Up to 1	PS_W: 10W_{typ}	1.5A for 1s	SPD 24 30 1B or SPM3 24 1
Max. 14	Max. 7	Max. 1			Note: VMU-P as 1.8W includes also the CG (part number DWS-V) wind sensor consumption.

Note: the consumption above includes already one VMU-M unit without any antitheft management. For different units combination not mentioned above the consumption calculation is the following: PS_W:<$1W+n_{VMU-S}*0.5W+n_{VMU-O}*0.7W+n_{VMU-P}*1.8W$. Where "n" is number of power supplied units.

Sizing of Carlo Gavazzi DC power supply with antitheft functionality

VMU-S units	VMU-O.X units	VMU-O AT units	VMU-AT units	VMU-P units	Consumption	Start up current	Power supply part number
10 to 14	None	Up to 1	Up to 3	None	PS_W: 12W_{typ}	1.5A for 1s	SPD 24 30 1B or SPM3 24 1
10 to 13	Up to 1	Up to 1	Up to 3	Up to 1	PS_W: 13W_{typ}	1.5A for 1s	SPD 24 30 1B or SPM3 24 1
10 to 12	Up to 2	Up to 1	Up to 3	Up to 1	PS_W:14W_{typ}	1.5A for 1s	SPD 24 30 1B or SPM3 24 1
10	Up to 3	Up to 1	Up to 3	Up to 1	PS_W:14W_{typ}	1.5A for 1s	SPD 24 30 1B or SPM3 24 1
Max. 14	Max. 3	Max. 1	Max. 3	Max. 1			Note: VMU-P as 1.8W includes also the CG (part number DWS-V) wind sensor consumption.

Nota: in order to carry out, in the Eos-Array, the proper antitheft functionality, one VMU-O.X.I3.R1.AT unit and up to three VMU-AT.X.P,M,C,X sensors have to be added, in this case the maximum equivalent added consumed power is 4W. For different units combination not mentioned above the consumption calculation is the following: PS_W:<$1W+n_{VMU-S}*0.5W+n_{VMU-O.X}*0.7W+n_{VMU-O\ AT}*0.7W+n_{VMU-AT}*1.1+n_{VMU-P}*1.8W$. Where "n" is number of power supplied units.

Stored set of variables in the VMU-M module

No.	Variable	Data format	Notes
1	Temperature 1	-60.0 to 400.0	The range is extended so to cover both °C and °F indication
2	Temperature 2	-60.0 to 400.0	The range is extended so to cover both °C and °F indication
3	BOS efficiency	0.0 to 999.9	"Total efficiency" result in percentage
4	AC energy value	0.0 to 99999.9	The value is in kWh and is the result of the totalized pulses coming from external energy meter

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Stored set of variables coming from every single VMU-S module

No.	Variable	Data format	Sub-address	Notes
1	V	0.0 to 1250.0	From 1 to 15	
2	A	0.0 to 20.00	From 1 to 15	
3	kW	0.0 to 99.99	From 1 to 15	
4	kWh	0.0 to 99999.9	From 1 to 15	
5	String efficiency	0.0 to 999.9		"PV string" effinciency result in percentage. Every string in the network has its own data.

Stored set of variables coming from every single VMU-P module

No.	Variable	Data format	Sub-address	Notes
1	Temperature 1 (PV module)	-60.0 to 400.0	From 1 to 15	PV module temperature (°C/°F). The range is extended so to cover both °C and °F indication
2	Temperature 2 (Environment)	-60.0 to 400.0	From 1 to 15	Ambient temperature (°C/°F). The range is extended so to cover both °C and °F indication
3	Solar irradiation	0.0 to 9.999	From 1 to 15	Irradiation kW/m^2 ($kW/feet^2$). (e.g. in: 0 to $1kW/m^2$ ($1kW/feet^2$), out: 0 to 100mV)
4	Wind speed	0.0 to 299.9	From 1 to 15	Wind speed (m/s) or feet/s

Alarm and diagnostics messages

No.	Message	Notes
1	Conn.CY (AV10 only)	Fuse blow detection. The status of each fuse is indicated by the colour change of the relevant LED on the VMU-S module.
2	StrinG	String failure warning: the "String control" function has detected a failure. The STRING information is given in combination with the LED alarm on VMU-M and the LED colour code on every single string.
3	Conn.PY	The string is wrongly connected (reverse polarity)
4	SYSteM	Power-up self-test error
5	buS	Auxiliary bus communication error
6	ALArM	Variables alarm (any)
7	tHEFt	Theft warning: removal of the PV modules in the fibre optic loop controlled by the relevant VMU-AT sensor. The THEFT information is given in combination with the LED alarm on VMU-M and the LED colour code on the relevant VMU-O.AT module.

Historical data storing time table

Time interval (minutes) (1)	From 1 to 15 strings			
	Data storing time			
	Min. days	Min. weeks	Min. months	Note
1	6	0	0	**(2), (3), (4)**
5	34	4	1	**(2), (3), (4)**
10	69	9	2	**(2), (3), (4)**
15	104	14	3	**(2), (3), (4)**
30	208	29	7	**(2), (3), (4)**
60	416	59	14	**(2), (3), (4)**

(1) Every value stored in the memory, is the result of the average calculation, in the selected time interval of the variable being measured and sampled every 2 seconds. **(2)** A maximum of 10 000 variable sets can be stored into the memory independently from the type and quantity of managed modules (for a maximum of 15). **(3)** The stored variables are coming from the VMU-P module and are: PV module temperature, ambient temperature, irradiation and wind speed. **(4)** The stored variables are relevant to both String efficiency and BOS efficiency.

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List of the variables that can be displayed and connected to ...

- RS485 communication port
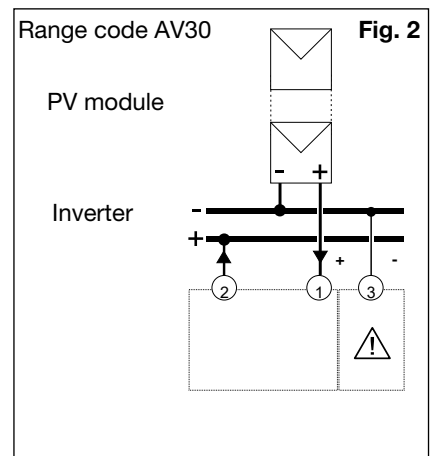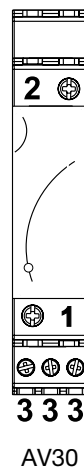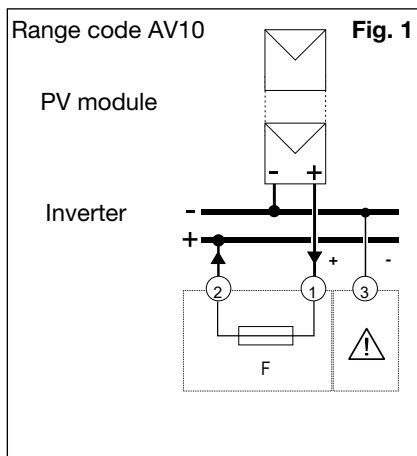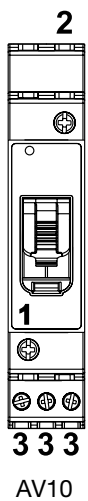- Real and virtual alarms and events
- Data-logging

No	Variable	Event-logging	Data-logging	Alarm output	Module (from)	Notes
1	°C (°F) (input 1)	Yes	Yes	Yes	VMU-M	As alternative of status detection (4)
2	°C (°F) (input 2)	Yes	Yes	Yes	VMU-M	As alternative of variable (5)
3	% BOS efficiency	Yes	Yes	Yes	VMU-M	BOS efficiency calculation of the PV plant (in case of one VMU-M unit only). In all othre cases the calculaion is made by the software.
4	ON / OFF status (input 1)	Yes	Yes	No	VMU-M	As alternative of variable (1)
5	kWh (input 2)	Yes	Yes	No	VMU-M	Counting of pulses coming from an energy meter, as alternative of variable (2)
6	Reset kWh (input 2)	No	No	No	VMU-M	Resetting of totalized pulses from AC energy meter
7	Error: 1	Yes	No	Yes (a)	VMU-M	Local bus communication problems
8	Error: 2	Yes	No	Yes (a)	VMU-M	Changed system modules configuration
9	Error: 3	Yes	No	Yes (a)	VMU-M	Incoherent programming parameters
10	Error: 4	Yes	No	Yes (a)	VMU-M	More than one VMU-P unit connected to the bus
11	Error: 5	Yes	No	Yes (b)	VMU-M	Short circuit on probe input 1
12	Error: 6	Yes	No	Yes (b)	VMU-M	Open circuit on probe input 1
13	Error: 7	Yes	No	Yes (b)	VMU-M	Short circuit on probe input 2
14	Error: 8	Yes	No	Yes (b)	VMU-M	Open circuit on probe input 2
15	Status: 1	Yes	No	No	VMU-M	Local programming access
16	Status: 2	Yes	No	No	VMU-M	Power ON/OFF
17	V	Yes	Yes	Yes	VMU-S	Available from every string
18	A	Yes	Yes	Yes	VMU-S	Available from every string
19	kW	Yes	Yes	Yes	VMU-S	Available from every string
20	kWh	Yes	Yes	No	VMU-S	Available from every string
21	Reset string kWh	No	No	No	VMU-S	Resetting DC string energy meter
22	Reset all strings kWh	No	No	No	VMU-S	Resetting all DC string energy meters
23	% string efficiency	Yes	Yes	Yes	VMU-S	String efficiency
24	Status: 1	Yes	No	Yes	VMU-S	Incoherent programming parameters
25	Status: 2	Yes	No	Yes	VMU-S	Fuse blow detection
26	Status: 3	Yes	No	Yes	VMU-S	Reverse string current or voltage
27	Status: 4	Yes	No	Yes	VMU-S	High temperature inside VMU-S unit
28	String control	Yes	Yes	Yes	VMU-S	
29	°C (°F) input 1	Yes	Yes	Yes	VMU-P	PV module temperature
30	°C (°F) input 2	Yes	Yes	Yes	VMU-P	Air temperature
31	kWp/m^2 (kWp/ft^2)	Yes	Yes	Yes	VMU-P	Solar irradiation
32	m/s (ft/s)	Yes	Yes	Yes	VMU-P	Wind speed
33	Error: 1	Yes	No	Yes	VMU-P	Incoherent programming parameters
34	Error: 2	Yes	No	Yes (c)	VMU-P	Short circuit on probe input 1
35	Error: 3	Yes	No	Yes (c)	VMU-P	Open circuit on probe input 1
36	Error: 4	Yes	No	Yes (c)	VMU-P	Short circuit on probe input 2
37	Error: 5	Yes	No	Yes (c)	VMU-P	Open circuit on probe input 2
38	Status: input 1	Yes	No	No	VMU-O	ON /OFF status detection
39	Status: input 2	Yes	No	No	VMU-O	ON /OFF status detection
40	Status: output 1	Yes	No	No	VMU-O	ON /OFF status detection
41	Status: output 2	Yes	No	No	VMU-O	ON /OFF status detection
42	Error: 1	Yes	No	Yes	VMU-O	Incoherent programming parameters

Note about "Alarm output": YES (a), YES (b) and YES (c) are according to the relevant letter "OR" logic alarms.
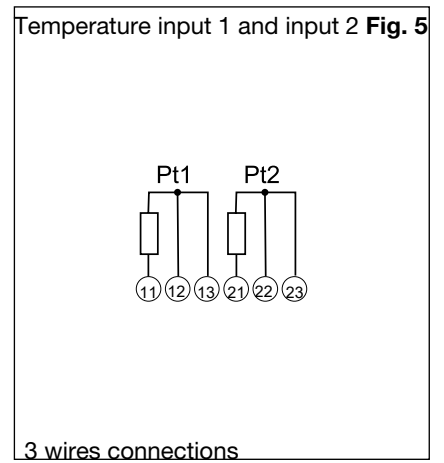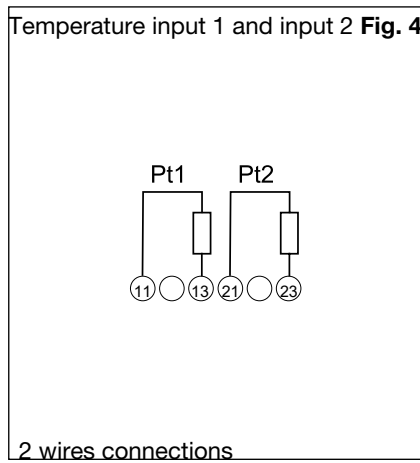
VMU-M connections

GND A B

23   21
22
12
11   13
1   2

Power supply	**Fig. 1**

RS485 port	**Fig. 2**

Digital input 1 and input 2	**Fig. 3**

Temperature input 1 and input 2	**Fig. 4**

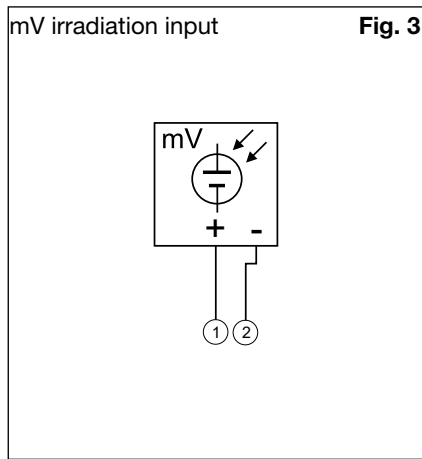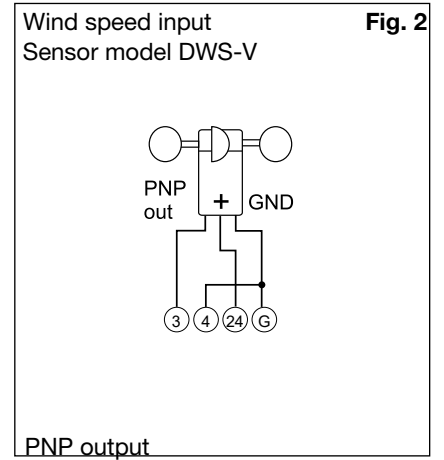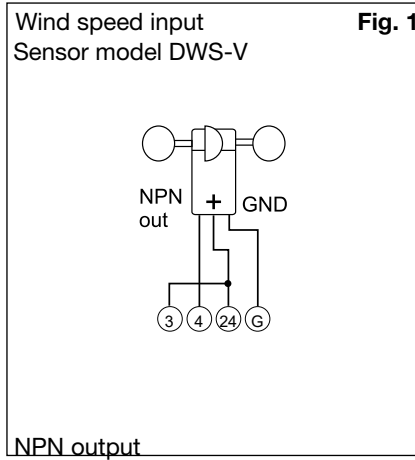2-wire connections

Temperature input 1 and input 2	**Fig. 5**
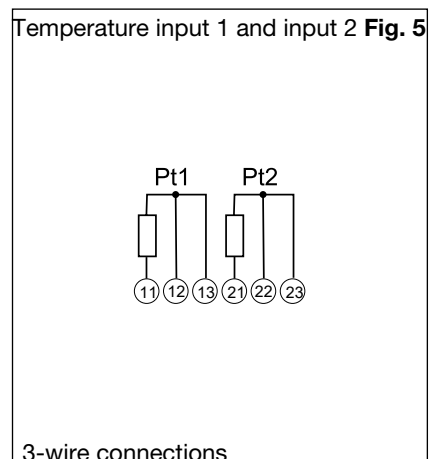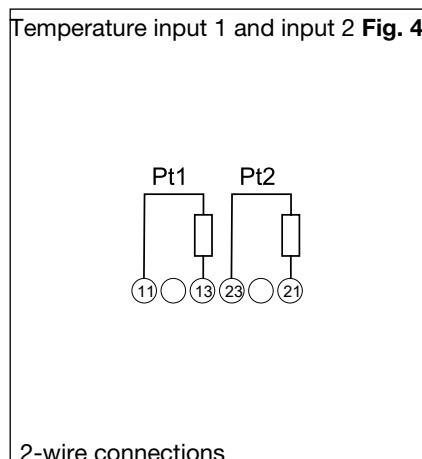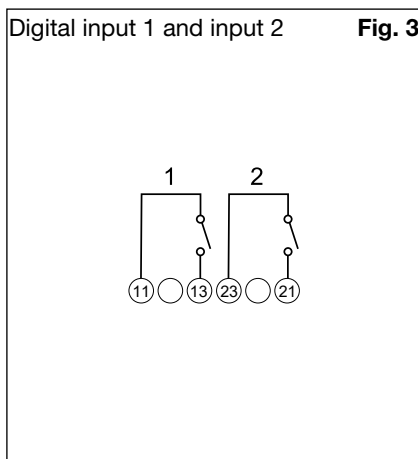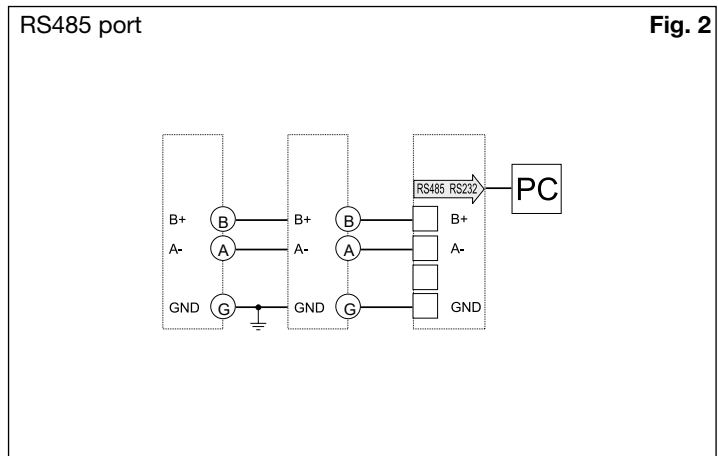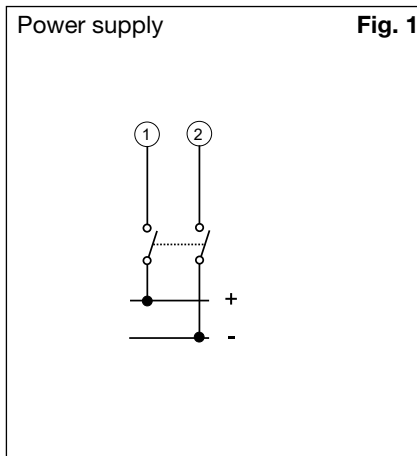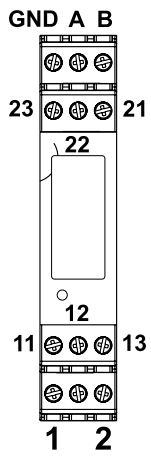
3-wire connections

VMU-S (AV10 and AV30) connections

2

1

3 3 3

AV10

Range code AV10	**Fig. 1**

PV module

Inverter

F= 10.3x38mm (IEC269-2-1) 1.25 Isc DC

2

1

3 3 3

AV30

Range code AV30	**Fig. 2**

PV module

Inverter

⚠ = Not power input, only for voltage signal measurement.

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VMU-P (2TIW) connections

2
GND ⊕⊕⊕ 1
+24 ⊕⊕⊕ 3
4
12
11 ⊕⊕⊕ 13
21 ⊕⊕⊕ 23
22

| Wind speed input **Fig. 1** |
| Sensor model DWS-V |

NPN out + GND

③ ④ ㉔ Ⓖ

NPN output

| Wind speed input **Fig. 2** |
| Sensor model DWS-V |

PNP out + GND

③ ④ ㉔ Ⓖ

PNP output

| mV irradiation input **Fig. 3** |

mV

+ −

① ②

| Temperature input 1 and input 2 **Fig. 4** |

Pt1   Pt2

⑪ ◯ ⑬ ㉑ ◯ ㉓

2 wires connections

| Temperature input 1 and input 2 **Fig. 5** |

Pt1   Pt2

⑪ ⑫ ⑬ ㉑ ㉒ ㉓
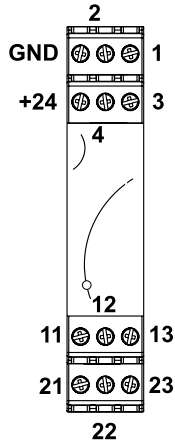
3 wires connections

VMU-P (2TCW) connections

1
GND ⊕⊕⊕ A2
  AUX2 +24V
A1 ⊕⊕⊕ 3
AUX1 +24V
4
12
11 ⊕⊕⊕ 13
21 ⊕⊕⊕ 23
22

| Wind speed input **Fig. 1** |
| Sensor model DWS-V |

NPN out + GND

③ ④ Ⓐ1 Ⓖ

NPN output

| Wind speed input **Fig. 2** |
| Sensor model DWS-V |

PNP out + GND

③ ④ Ⓐ1 Ⓖ

PNP output

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VMU-P (2TCW) connections (cont.)

	20mA irradiation input	**Fig. 3**

2 wires connections

	20mA irradiation input	**Fig. 4**

3 wires connections

Temperature input 1 and input 2 **Fig. 5**

2 wires connections

Temperature input 1 and input 2 **Fig. 6**

3 wires connections

VMU-O connections

Digital input 1 and 2   **Fig. 1**

Digital outputs 1 and 2   **Fig. 2**

VMU-O "AT" option connections

Digital input 1, 2 and 3   **Fig. 1**

Digital output   **Fig. 2**

VMU-AT connections

Fiber optic loop

VMU-AT

Brown		Blue
Marrone		Blu
Braun	Black	Blau
Marron	Nero	Bleu
Marrón	Schwarz	Azul
	Noir	
	Negro	

VMU-AT **2**
VMU-AT **3**

11 12 13   21 22 23   31 32 33

I1   I2   I3

VMU-O

VMU-AT mounting and use

Fibre optic through PV panel

Example of fibre optic loop through PV panels

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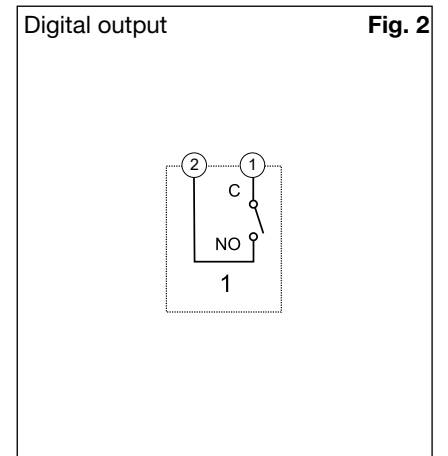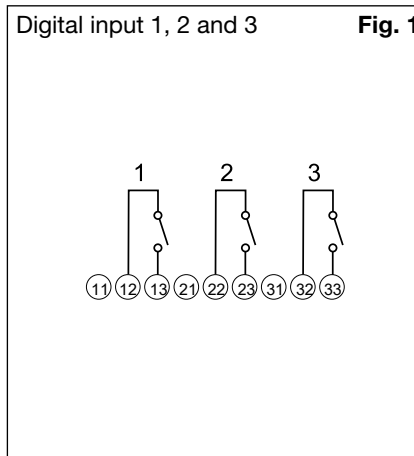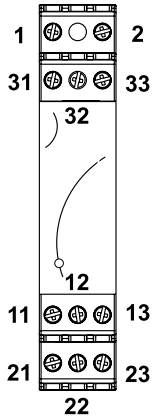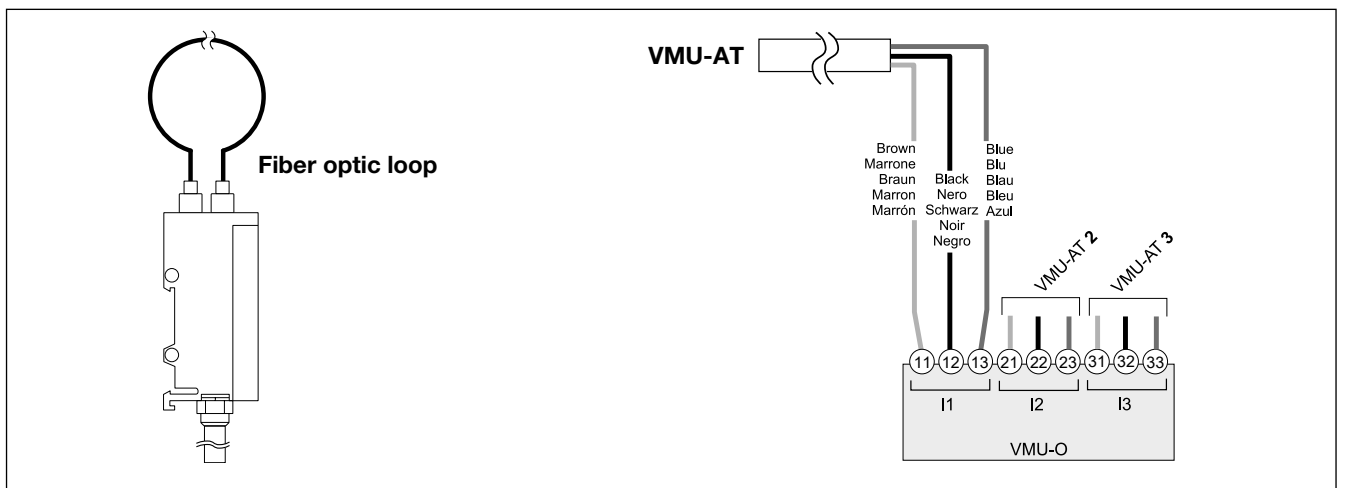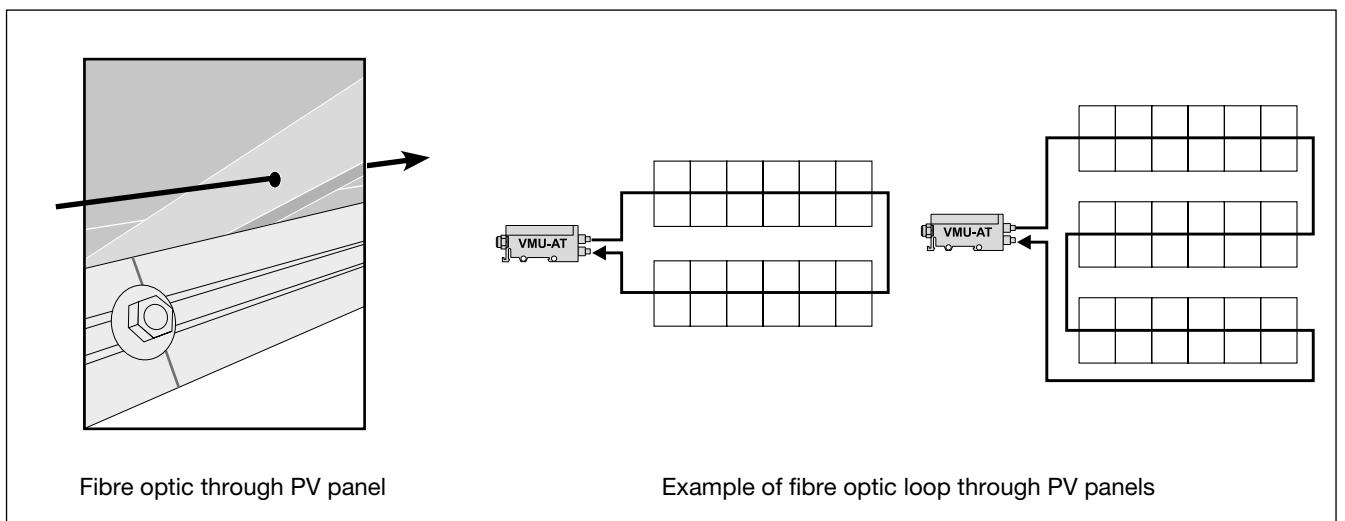
VMU-1 mounting and positioning
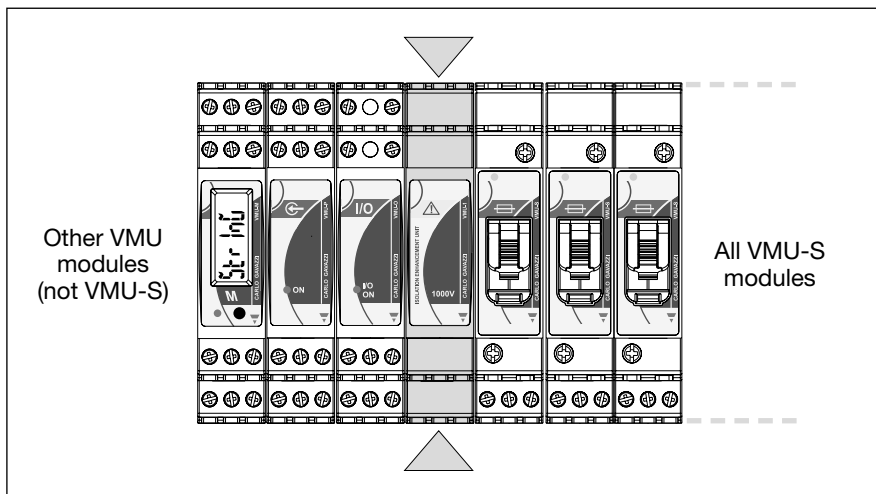
The VMU-1 has to be mounted between the group of VMU-S and all the other modules as shown in the example picture on the left.

Every Eos-Array has to be equipped only with one VMU-1.

Other VMU modules (not VMU-S)

All VMU-S modules

VMU-M Front panel description
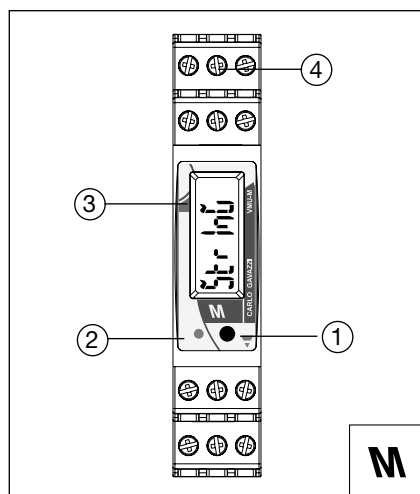
1. **Push button.**
   To program the configuration parameters and to scroll the variables. One key function: short time pushbutton click: variable scroll or parameter increasing. Long time pushbutton click: programming procedure entering, parameter selection confirmation.
2. **LED.**
   Green steady light: the module is power supplied and there is no communication on the RS485 bus. Green blinking light: the communication on the RS485 bus is working. Red: alarm detected (any). In case of alarm/communication condition the LED alternates its colour from red (alarm) to green. The blinking time is approx. 1 second.
3. **Display.**
   LCD-type with alphanumeric indications to:
   - display some configuration parameters;
   - display some measured variables.
4. **Screw terminals.**
   For power supply, bus and digital inputs/output connections

# VMU-S Front panel description (AV10 range code: 16A)

1. **LED**
   Green: the power supply is ON, there is a string current up to 1A;
   Yellow: there is a string current from 1.1 to 3A;
   Light orange: there is a string current from 3.1 to 6A;
   Orange: there is a string current from 6.1 to 8A;
   Dark orange: there is a string current from 8.1 to 10A;
   Red: there is a string current higher than 10A;
   White: the unit is enabled by VMU-M module for data reading and displaying.
   Cycling from blue to any other colour listed above (from yellow to red): string alarm
   Cycling from blue to green: blown fuse.
   Cycling from blue to violet: inverted string polarity.
   Cycling from white to any other colour: the unit is enabled by VMU-M module for data reading and displaying and shows the status of the module according to the colour list above.

2. **Screw terminals**
   For string connections

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VMU-S Front panel description (AV30 range code: 30A)

1. **LED**
   Green: the power supply is ON, there is a string current up to 1A;
   Yellow: there is a string current from 1.1 to 6A;
   Light orange: there is a string current from 6.1 to 12A;
   Orange: there is a string current from 12.1 to 16A;
   Dark orange: there is a string current from 16.1 to 20A;
   Red: there is a string current higher than 20A;
   White: the unit is enabled by VMU-M module for data reading and displaying.
   Cycling from blue to any other colour listed above (from yellow to red): string alarm
   Cycling from blue to violet: inverted string polarity.
   Cycling from white to any other colour: the unit is enabled by VMU-M module for data reading and displaying and shows the status of the module according to the colour list above.

2. **Screw terminals**
   For string connections

VMU-P Front panel description
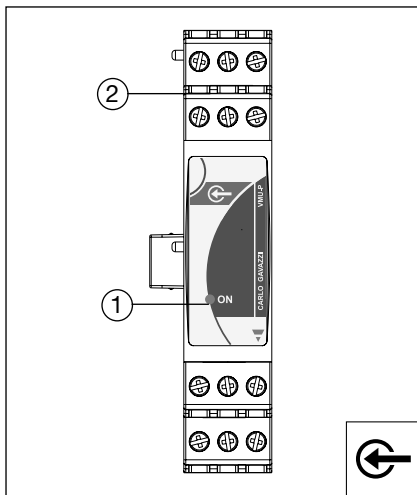
1. **LED**
   ON steady light: the module is power supplied.
   Green: the power supply is ON.
   White: the unit is enabled by VMU-M module for data reading and displaying
   .
2. **Screw terminals**
   For measuring input connections

VMU-O/VMU-O AT Front panel description
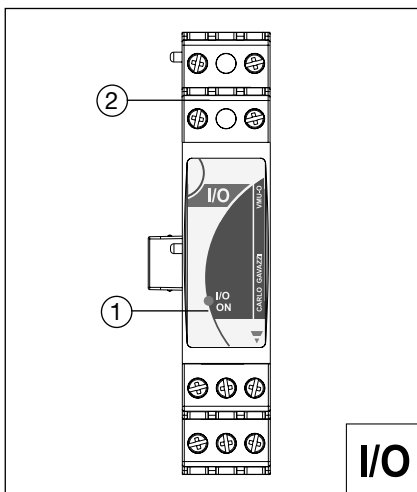
1. **LED**
   ON steady light: the module is power supplied.
   Green: the power supply is ON
   White: the unit is enabled by VMU-M module for data reading and displaying.
   Red: one or up to three digital inputs are activated
   Blue: one or both digital outputs are activated
   Cycling from one colour to any other one: the unit shows the status of the module according to the colour list above.
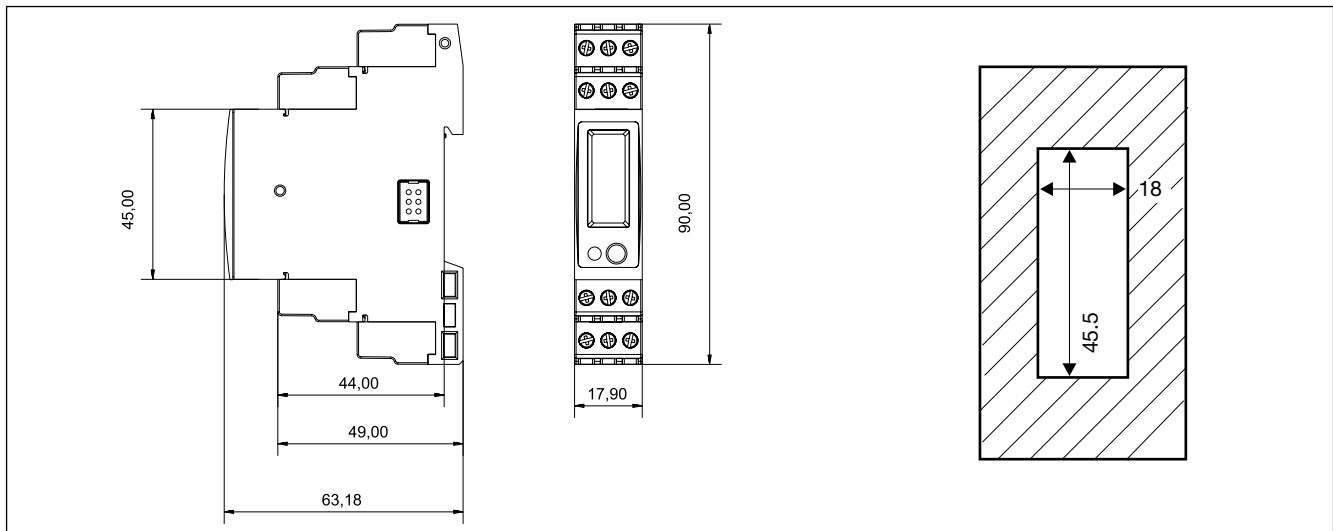   The cycling time is approx. 1 second.

2. **Screw terminals**
   For digital inputs and outputs connections

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VMU-AT Front panel description
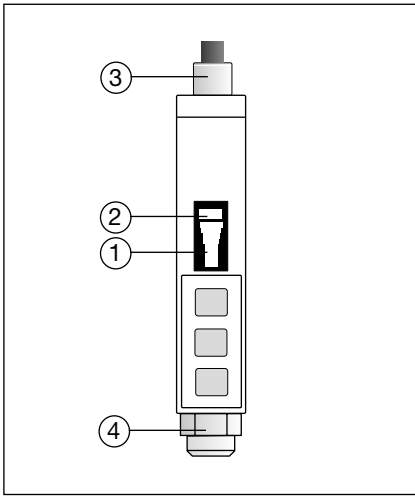
1. **Green LED**
   The power supply is ON
2. **Red LED**
   The optical signal loop is working
3. **Optical fibre connectors**
   One RX and one TX optical fibre connector
4. **One cable**
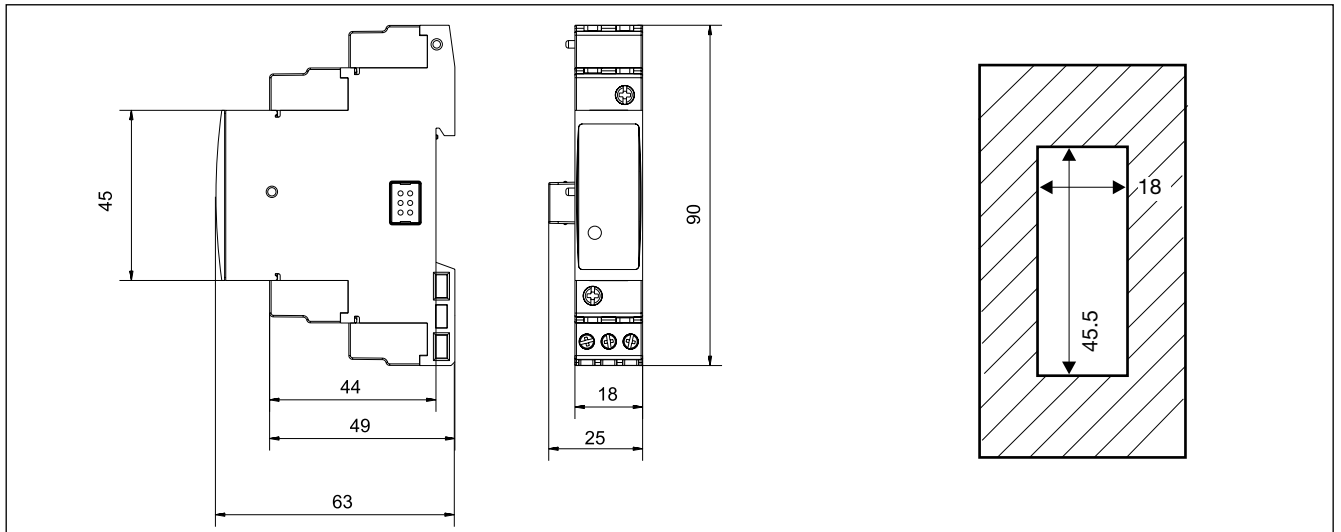   Cable for power supply and signal output.
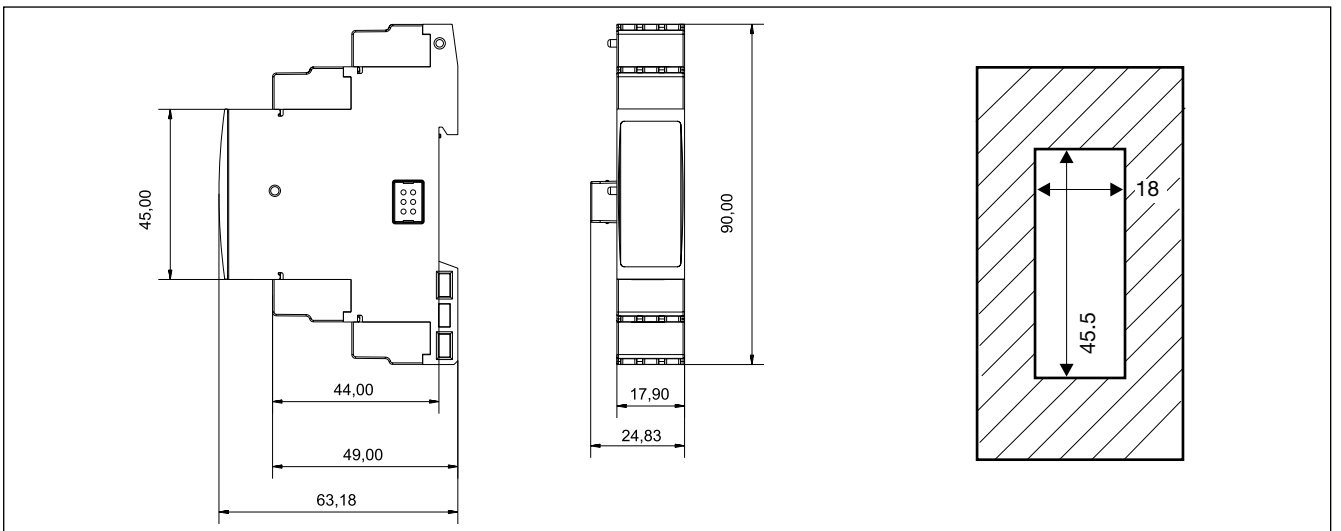
VMU-M Dimensions and panel cut-out (mm)
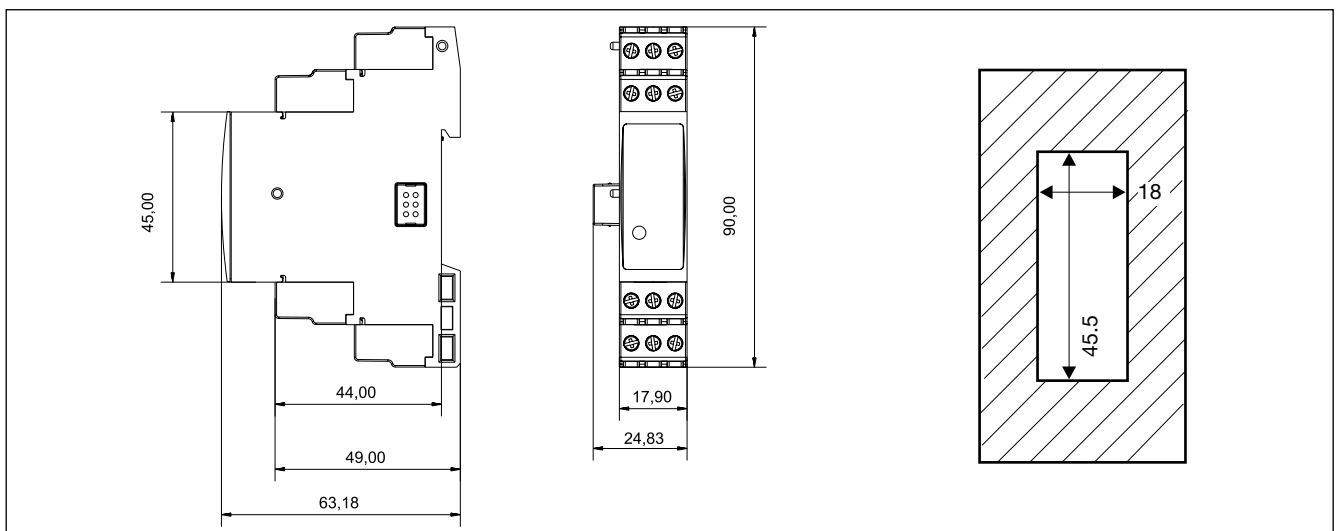
VMU-S (AV10) Dimensions and panel cut-out (mm)

Specifications are subject to change without notice   Eos-Array DS 140916

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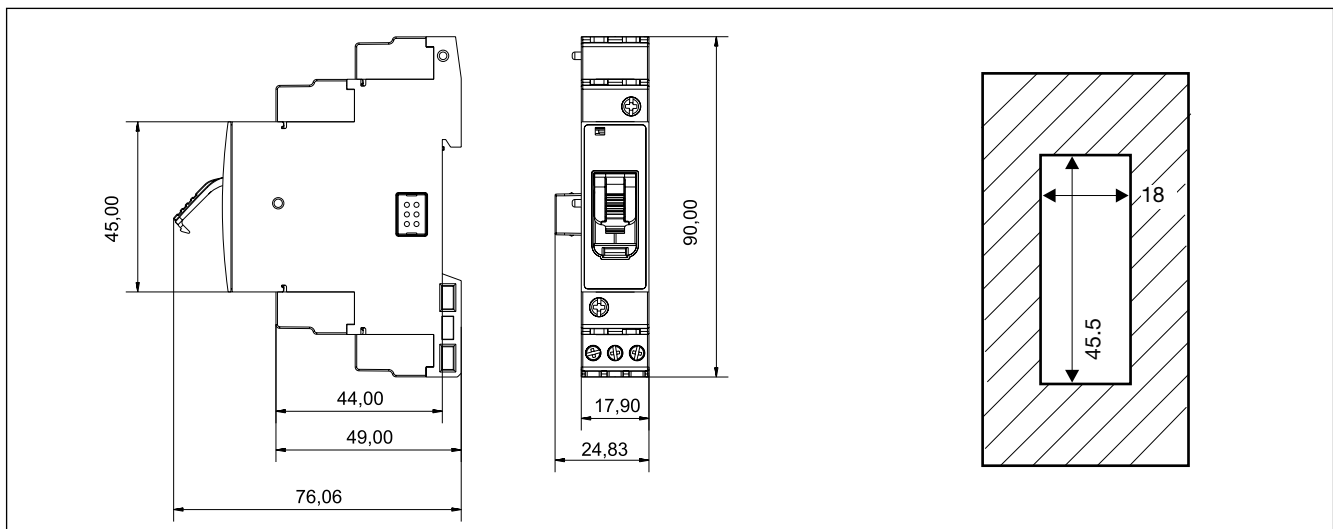
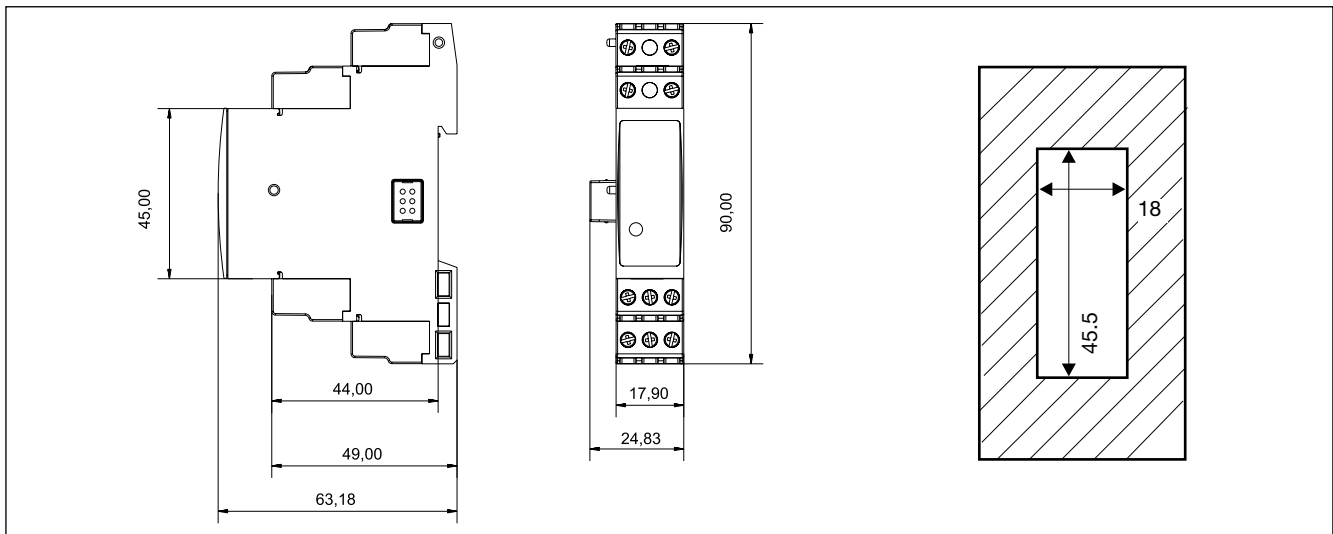## VMU-S (AV30) Dimensions and panel cut-out (mm)

VMU-1 Dimensions and panel cut-out (mm)

VMU-P Dimensions and panel cut-out (mm)

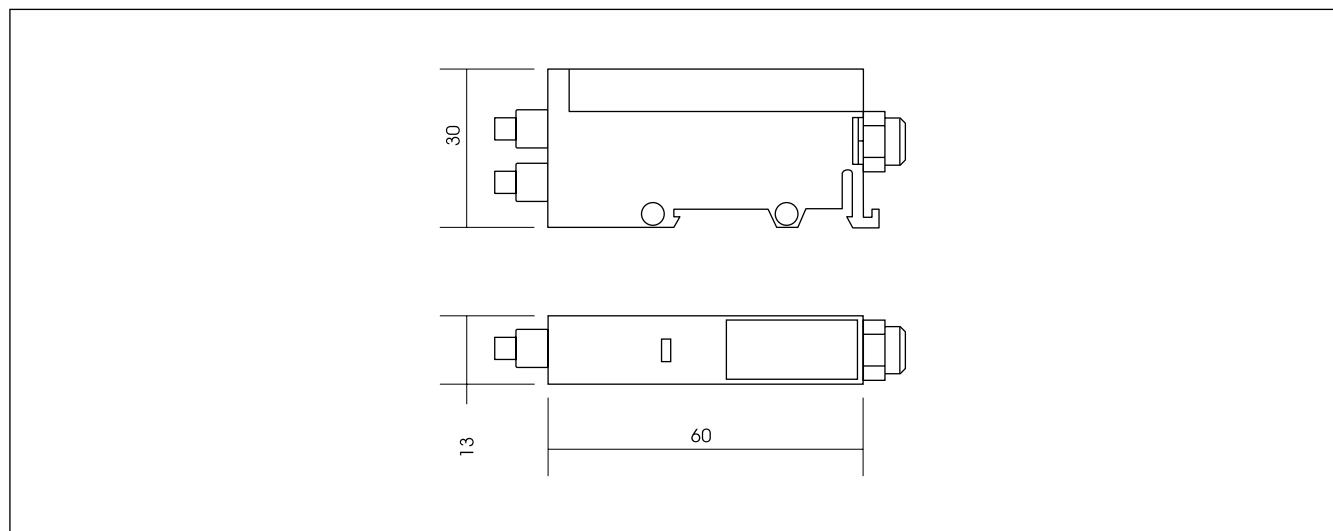## VMU-O/VMU-O AT Dimensions and panel cut-out (mm)

VMU-AT Dimensions (mm)

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Mean time to failure (MTTF)

Model	MTTF/MTBF - Years	Test conditions	Standard
VMU-M	24.2	gf, 50° C	MIL-HDBK-217F
VMU-S	35.4	gf, 50° C	MIL-HDBK-217F
VMU-P	65.4	gf, 50° C	MIL-HDBK-217F
VMU-O	31.7	gf, 50° C	MIL-HDBK-217F

gf: ground, fixed.

Eos-ArraySoft parameter programming and variable reading software

Eos-ArraySoft

Multi-language software (Italian, English, French, German, Spanish) for variable reading and parameters programming. The program runs under Windows XP/Vista/7.

Application

Up to two different applications can be selected:
- Solar: a management of a limited network where Eos-ArraySoft manages basically one VMU-M unit with relevant VMU-S, VMU-P and VMU-O modules and maybe an energy meter connected to the VMU-M digital input;
- Solar extended: a management of a complex network where Eos-ArraySoft manages many VMU-M modules and relevant sub networks (VMU-S, VMU-P and VMU-O units) and maybe an energy meter (EM21-72D, EM24-DIN, EM26-96) connected to the same RS485 bus.

Configuration mode

There are two configuration levels:
- the RS485 communication network which can include either one or more VMU-M units;
- the auxiliary network with all the parameters relevant to the following modules: VMU-M, VMU-S, VMU-P, VMU-O.

Data storing

In pre-formatted XLS files (Excel data base).

Data download

Manual or automatic at programmable intervals.

Data displaying

The following matrix is available:
- String 1: V-A-kW-kWh;
- String 2: V-A-kW-kWh;
- String n: V-A-kW-kWh.
- Main: PV module temperature, air temperature, irradiation and wind speed.

Alarm set-up

Alarm parameters.

Modem management

GSM/GPRS modem configuration (connected to the PC) SMS messages.