

Alpha-Log



- ▶ Linux operating system for data processing and communications. Open architecture based on integrated Linux PC
- ▶ Integrated web server for real-time data, diagnostic information and data download to Excel files via Internet browser
- ▶ Large number of analog, digital and serial inputs. Up to 200 channels managed between measured, derived and calculated quantities
- ▶ Large multi-level internal data memory (400 MB). Removable external memory (up to 32 GB)
- ▶ 3G/4G modem communication, Wireless Router, Ethernet, WiFi, Satellite. Redundant dual system with automatic switch from one mode to another
- ▶ RS232, RS485, SDI-12 ports for connection with serial sensors
- ▶ Data communication protocols: Modbus RTU/TCP data, FTP (client/server), SFTP, SMTP, SAP, MQTT, http
- ▶ Other supported protocols: SSH, NTP
- ▶ Low power consumption with energy saving modes management
- ▶ Programmable logics for messages notifications or activating external devices
- ▶ Alarms: use of SMS, MQTT, Email and local digital outputs
- ▶ Advanced processing for data statistical analysis: total values, moving and current statistical values, wind elaborations, rain intensity
- ▶ Remote system configuration also via modem, without the need of fixed IP SIM Card with or VPN
- ▶ Remote firmware update
- ▶ Internal temperature sensor and integrated atmospheric pressure

Alpha-Log is the latest born of the LSI LASTEM's data logger family. It contains the most efficient technical solutions assimilated in more than 40 years of experience regarding data acquisition systems. Alpha-Log was created with the objective of being an autonomous acquisition system, but also integrated into more complex systems. Based on a Linux architecture, it contains the power of this kind of operating system, but also an optimized hardware with extreme low consumption. Also, the usability and data management as well as the data output part has been designed having in mind the most modern needs .



▶ *Alpha-Log is a perfect synthesis between the classic needs of meteorological monitoring and the needs of those who want to acquire environmental parameters to manage them through complex systems, integrated in IOT networks or in local systems.*

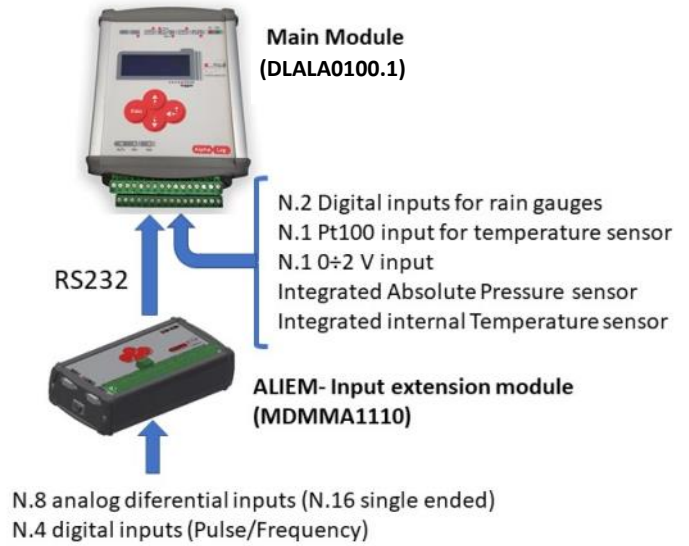
▶ **Inputs for analog and digital sensors**

Main module (DLALA0100.1)

- N.2 digital inputs for two independent rain gauges, or one rain gauge with double reed relay
- N.1 Pt100 input for Temperature sensor
- N.1 0÷2 V input
- Integrated Absolute Pressure sensor
- Integrated internal Temperature sensor

Inputs extension module ALIEM (MDMMA1110)

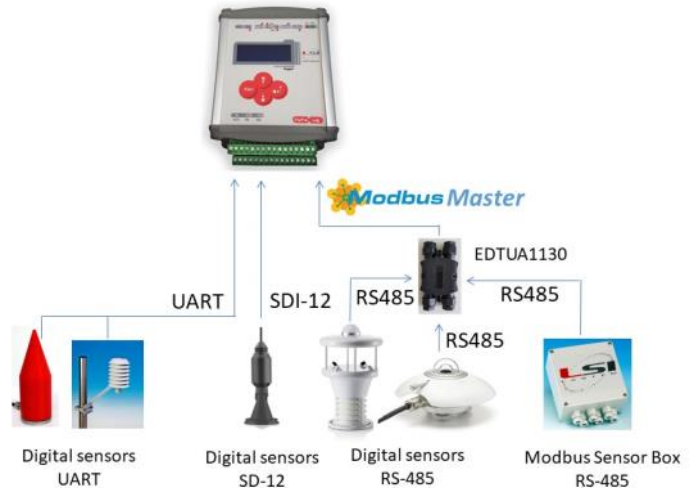
- N. 8 analog differential inputs (N.16 single-ended)
- N.4 digital inputs (Pulse/Frequency)



▶ **Inputs for Serial sensors**

Main module (DLALA0100.1)

- N.1 RS485 opto-insulated (N.32 Modbus sensors)
 - N.1 SDI-12
 - N.1 UART input for Storm Distance sensor (DQA601.3) or DMA672.1-672.4 thermo-hygrometer
- Connection on RS485 bus to one or more external sensors or Input extension modules (MDMMA110) by Modbus RTU protocol. Up to three RS485 devices, can be connected to a single bus console (EDTUA1130).



▶ **Internal web-server**

Alpha-Log has an internal web-server. Using any Internet browser, the following information are available:

- Diagnostic information (system date/hr, IP address, battery status, events/alarms log, output status, etc.)
- Instant values
- Data downloading from memory (ASCII, CSV, Excel, ZIP)

- Real-time chart of the selected parameter
- Numeric values of all instant values



▶ Sensors acquisition rate

Acquisition rate is programmable individually for each sensor (from 1 sec to 12 hours). To limit energy consumption from sensors requiring power supply, it is possible to set an advanced power supply from the acquisition event (warm-up) that is interrupted immediately after the acquisition itself.

▶ Data elaboration

Statistical elaboration of the raw data within one or more time basis programmable individually for each channel (from 1 sec to 24 hrs):

- Average/Minimum/Maximum/Standard Deviation
- Wind elaborations
- Totals, Current Totals (useful for rain totals (*))
- Current (*) and Mobile (**) Average/Minimum/Maximum/Standard Deviation

*Currents are values in which the statistical basis corresponds to the time elapsed since the last reset up to the current time. The reset time is programmable. Example: total rainfall of the current day (from midnight to the current time).

** Mobile values are whose statistical basis corresponds to the last observation period. Example: moving average of temperature over 10 minutes (every minute the value is updated always considering the average value of the last 10 minutes).

▶ Derived environmental quantities and mathematical functions

The library of derived quantities lists a serie of calculations using acquired measurements, constants and other calculated quantities. The library also includes mathematical functions. Alpha-Log manages up to 200 channels between acquired, derived and calculated quantities.

(see table Calculated Quantities)

▶ Data memory

Large internal circular memory (400 MB) plus an extractable USB external memory (capacity up to 32 GB) with FAT32 file system. The external memory can be read directly from a PC. Alpha-Log stores data in ASCII format. The open operating system allows to develop alternative storage formats.

▶ Data communication devices

It is possible to send data to multiple independent remote servers (up to 3) by means of different devices:

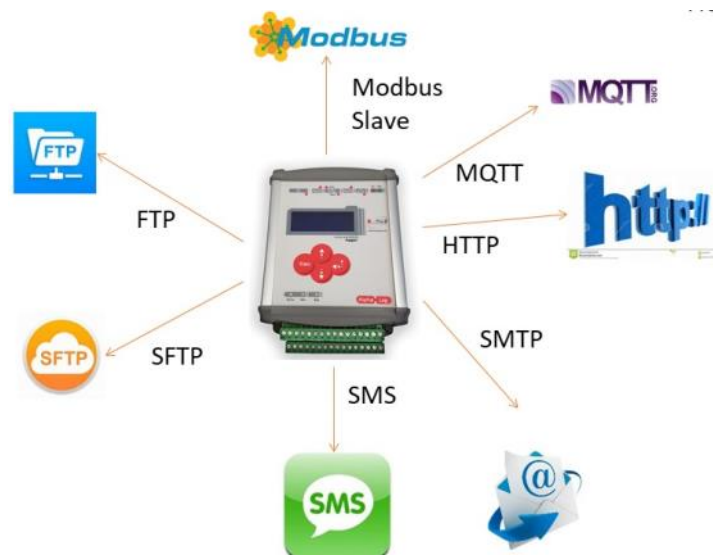
- Modem 3G e 4G
- 3G-4G router
- Ethernet, Wi-Fi
- Satellite

Alpha-Log can be connected simultaneously to two communication devices and automatically choose the best option according to the availability of the signal, thus optimizing communication performance and its cost.

▶ Data communication protocols

Available data communication protocols:

- FTP (ASCII format)
- SFTP (ASCII format)
- SAP (Simple ASCII Protocol, property)
- Modbus-RTU/TCP
- MQTT (to Broker MQTT)
- SMTP (Email)
- HTTP (read *Internal web server* part)
- SMS



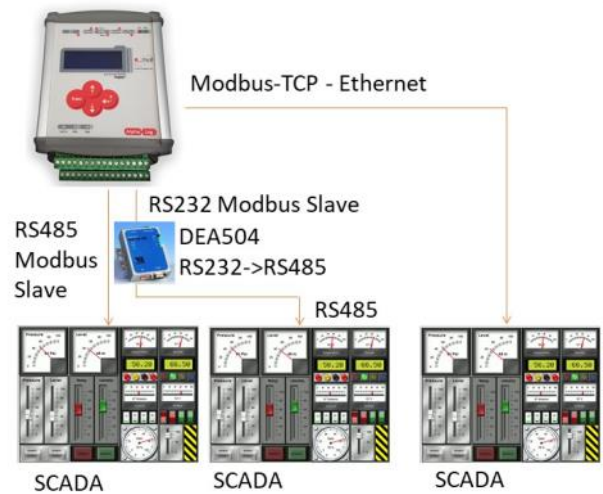
▶ Data communication protocols (Modbus protocol)

Data delivery to Modbus Master devices using:

- Modbus RTU on RS232 or RS485
- Modbus TCP on Ethernet

Transmitted data by Modbus protocol can concern instantaneous values, but also mobile statistical values*.

* Mobile values are whose statistical basis corresponds to the last observation period. Example: moving average of temperature over 10 minutes (every minute the value is updated always considering the average value of the last 10 minutes).



▶ Communication time rate

Depending on the protocol and the communication device used, it is possible to choose the shortest data communication time base to the remote server:

- Via FTP: minimum 3 minutes
- Via MQTT: minimum 1 second

It is possible to set different data communication rate according to alarm statuses. For example: increase the communication rate when the rain intensity is greater than a certain programmable threshold.

▶ ASCII file data format

The main data stream to the server (one or more servers) is made using ASCII (*.txt) file by FTP protocol. The content of each column inside the file is configurable.

1st column: yyyy/mm/dd

2nd column: hh/mm/ss

After the 2nd column it is possible to add following programmable information:

- Metadata: fix values in numeric format
- Data Elaborations (read *Data Elaboration*)

The sequence of the columns after the second one is programmable.

▶ Switched power supply outputs

- Alpha-Log: N.3 independent and protected electrical outputs
- Input Extension Module (MDMMA1110): N.7 independent electrical outputs

Outputs are useful to power sensors and external devices activated with configurable logics depending on the sensor requirement or event occurrences.

These outputs become relay outputs using an external module (MG3023).

▶ Warnings by SMS, E-mail and MQTT

Notifications/alerts delivery:

- E-mail: with editable text, scheduling and distribution lists. E-mail attachment contains the file with the data that generated the event. Possibility of replicating message via SMS through applicable Web services.
- SMS: with editable text, scheduling and distribution lists up to 5 users. Active only when the device is working in low-power mode and connected through 3-4 G modem.
- MQTT: Alpha-Log can send data to a MQTT Broker server: instant values, elaborations and alarm notifications.

▶ Built-in Absolute Pressure sensor

Alpha-Log is equipped with an internal Absolute pressure sensor, 500÷1100 hPa range, ±1 hPa (-20÷85°C) accuracy.

▶ Peripherals

Alpha-Log is equipped with the following peripherals:

- N.1 RS232-DCE port (EMI, IEC, ESD, EFT filters)
- N.1 RS232-DTE port (EMI, IEC, ESD, EFT filters)
- N.1 RS485 opto-insulated port
- N.2 USB Host ports, Type-A connector
- N.1 Ethernet port (RJ45)
- N.1 SDI-12 port (available within year 2020)

▶ Firmware update

Alpha-Log's firmware can be updated remotely, or locally via USB pen-drive.

▶ Configuration

Alpha-Log's configuration is carried out by means of the 3DOM program on PC. The configuration file is sent to the FTP server. Alpha-Log is programmed to import the configuration file directly from this FTP server. The file can also be saved on a pen drive and loaded, via the USB port, into the instrument.

▶ Display

Alpha-Log is equipped with a back-lit LCD display (4x20 chrs). The following information are listed:

- Real-time measurements list
- Last 20 alarms list
- Statistics on communication
- System actual&start date/time
- Operative mode
- Battery status
- IP address
- Servers list
- Internal/external memory status
- Electrical output status
- Etc

▶ Camera

Alpha-Log can manage an external independent IP camera using on/off programmable logics related to the measurement and alarms status.

In this way, it is possible to increase/decrease the number of images according to the programmed events reducing the system's power consumption and communication costs. The IP camera can be connected to the same Router used by Alpha-Log for data communication.

▶ Clock synchronization

The internal clock (accuracy 30 seconds / month) is updated through NTP (Network Time Protocol) whenever Alpha-Log activates an Internet connection. The time zone is defined by the configuration.



▶ Power supply

Alpha-Log runs at 9÷30 Vdc. The internal regulator allows to charge an external Pb battery, through solar panel or main power supply.

▶ Power consumption and battery duration

Alpha-Log average electrical consumption is 0,03 W during stand-by and measurements; 2,4 W with active communication. Power consumption of the input extension module (ALIEM) is 0.12 W being always active. All this power consumptions do not include the external communication device. Battery life is explained in the following tables

Comm.rate	Consumption Alpha-Log (average)	Consumpt. Alpha-Log+Aliem (average)
1 com/day	60 mW	
1 com/hr	600 mW	

Power consumption. Using 3G modem and sensors without own power consumption, display off.

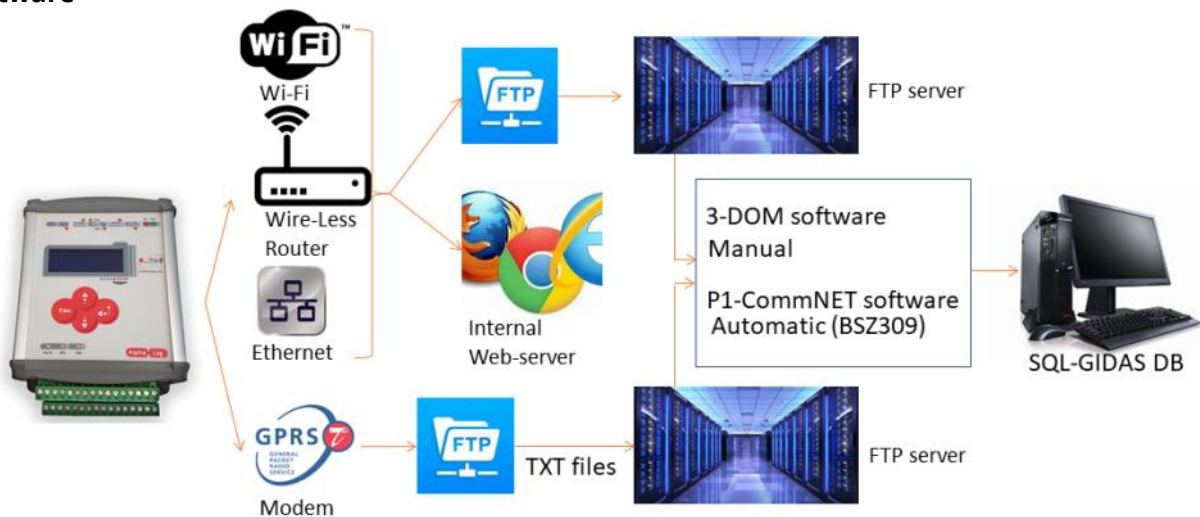
Comm.rate	Battery power Battery life (days)			
	Battery size	9 Ah	15 Ah	40 Ah
1 com/day		100	150	400
1 com/hr		7	10	30

Power autonomy in days. Alpha-Log only, including 3G modem. Using sensors without own power consumption. Starting from fully charged battery and without sun.

Comm.rate	Battery power Battery life (days)			
	Battery size	9 Ah	15 Ah	40 Ah
1 com/day		90	130	359
1 com/hr		6	8	24

Power autonomy in days. Alpha-Log and Input Extension module; including 3G modem. Using sensor without own power consumption. Starting from fully charged battery and without sun.

▶ Software



Alpha-Log pushes data to the server for their further management without any specific LSI LASTEM software applications. However, from the server, it is possible to upload the same data on a PC, where it is possible to use any LSI LASTEM's application that uses the SQL-Gidas database, as BSZ311-Gidas-Viewer (see the LSI LASTEM's software catalogue); to do this, there are two possibilities:

- Using 3DOM program: data downloading (in manual mode) from a specific FTP area (where Alpha-Log has sent its data) and saving them on a local SQL-GIDAS database (or TXT file).
- Using P1-CommNET program (BSZ309): data downloading (in automatic and continuous mode) from a specific FTP area (where Alpha-Log has sent its data) and saving them on a local SQL-GIDAS database (or TXT file).

▶ Installation

Alpha-Log can be placed inside IP66 enclosure ELF series against shock, water, dust and atmospheric agents. Depending on the ELF's model, the enclosure can also accommodate power systems, communication devices and batteries.



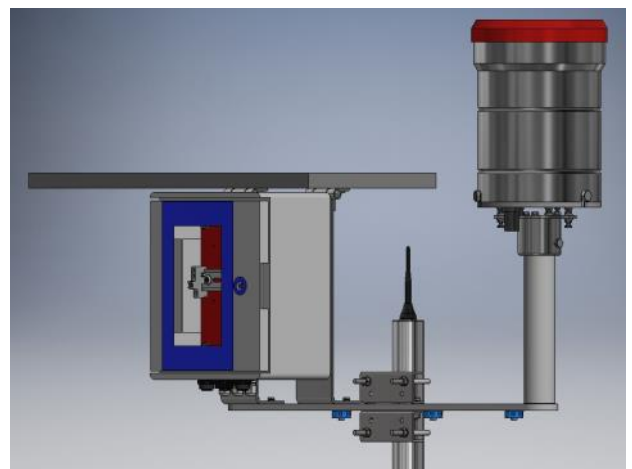
IP66 enclosure are available for both portable or fix applications.

▶ ELU001-002 enclosures

Depending on the installation requirements, Alpha-Log can be also placed inside ELU001-002 IP66 enclosure. ELU001-002 are special enclosures including the following parts.

ELU001:

- IP66 enclosure with transparent window. Room for Alpha-Log data logger and Modem (not included)
- Tilttable 20 W solar panel (included)
- 9 Ah rechargeable battery (included)
- Bar for sensors mounting (included)
- IP67 connectors (included) for Rain gauge connection (using DWA505.1 cable) and T+RH% (DMA672.1-4) sensor





ELU002:

- IP66 enclosure with transparent window. Room for Alpha-Log data logger and Modem (not included)
- 85-264 Vac power unit
- 9 Ah rechargeable battery (included)
- Bar for sensor mounting (included)
- IP67 connectors (included) for Rain gauge connection (using DWA505.1 cable) and T+RH% (DMA672.1-4) sensor



See the complete range of enclosures in the *Accessories for data logger* catalogue.

Alpha-Log models

Code	DLALA0100.1	MDMMA1110
		
Description	Alpha-Log data logger	ALIEM-Alpha Log Inputs Extension Module
Inputs type	Terminal block	Terminal block
Analog inputs	N.1 0÷2 Vdc input	N.8 differential (N. 16 single ended)
Digital inputs	N.2 pulse inputs	N. 4 (on/off or frequency/counter)
RS232 ports	N.2	N.2
USB ports	N.2	NO
RS485 port	N.1	NO
SDI-12 port	N.1	NO
Integrated Absolute Pressure sensor	YES	NO
Integrated Temperature sensor	YES	YES
On/off outputs	YES	YES
Backlit display	YES	NO
Internal battery	NO	NO
Included accessories	Ethernet cable, DIN-bar mounting	RS232/USB adapter, RS232 cable, DIN-bar mounting

Alpha-Log (DLALA0100.1)—Technical Features

Analog Inputs On ALIEM Inputs Extension Module (MDMMA1110)		Range	Resolution	Accuracy (@ 25°C)	
	Voltage	-300÷1200 mV	40 µV	±160 µV	
		±78 mV	3 µV	±30 µV	
		±39 mV	1,5 µV	±15 µV	
	Pt100	-50÷70 °C	0,003 °C	±0,1°C	
		-50÷600 °C	0,011 °C	±0,3°C	
		0÷6000 Ω	0,1 Ω	±1,5 Ω	
	Thermo-couples	E-IPTS 68	< 0,1 °C	±0,6 °C	
		J-IPTS 68	< 0,1 °C	±0,6 °C	
		J-DIN	< 0,1 °C	±0,6 °C	
		K-IPTS 68	< 0,1 °C	±0,5 °C	
		S-IPTS 68	0,22 °C	±2,0 °C	
		T-IPTS 68	< 0,1 °C	±0,5 °C	
	Inputs number	N.8 differential (16 single-ended)			
	ESD protections	±8 kV contact discharge IEC 1000-4-2			
	Max input voltage	1,2 V			
	EMC filters	EN61326-1 2013			
	Temperature error (@-10÷30°C)	300÷1200 mV < ±0,01% FSR, ;±39 mV < ±0,01% FSR ±78 mV < ±0,01% FSR			
	Inputs Frequency/pulses On ALIEM Inputs Extension Module (MDMMA1110)	Inputs number	N.4		
Feature		n.4 inputs: frequency/counter/ON/Off logic-state (0÷3 Vdc), of which: <ul style="list-style-type: none"> • N. 2 optoelectronic sensors (max 10 kHz) • N. 2 max 1 kHz 			
Accuracy		3 Hz @ 5 kHz			
Protections		Transient voltage suppressor 600 W, <10 µs			
Inputs Pulses (Rain gauge)	Inputs number	N.2			
	Features	Redundancy modes: <ul style="list-style-type: none"> • N.2 single relay reeds from two rain gauges • One rain gauge with double reed relay system 			
	Power supply	Limited to 1 mA per reed relay			
	Input type	Open collector with 3,3 V pullup resistance (positive input)			
	Max input frequency	480 KHz			
	Linearization	Yes (using correction formula for Class A rain gauges according to UNI EN 17277:2020)			

	Protection	<ul style="list-style-type: none"> • From reed relay rebounds • From over-tension (> 5V) • 400 W peak pulse power capability at 10/1000 μs waveform. Repetition rate (duty cycle): 0,01 % • IEC-61000-4-2 ESD 30 kV (air), 30 kV (contact) • ESD protection of data lines in accordance with IEC 61000-4-2 • EFT protection of data lines in accordance with IEC 61000-4-4
Input (Temperature RH%)	Input	UART-TTL (DMA672.1 sensor), (DMA672.4 sensor when ELUxxx box is used)
	Range	<ul style="list-style-type: none"> • Temperature: -40÷70°C • RH%: 0÷100% • DewPoint: -40÷70°C
	Resolution	<ul style="list-style-type: none"> • Temperature: 0,1°C • RH%: 0÷100% • Dew Point: 0,1°C
Input Pt100 (Temperature sensor)	Input	Pt100 (3 wires)
	Range	-40÷70°C
	Resolution	0,1°C
	Accuracy	±0,25 °C
Input Voltage	Range	0÷2 V
	Resolution	NA
	Accuracy	NA
Internal Measurement (Absolute Pressure)	Range	500÷1100 hPa
	Resolution	Typically 0,084 hPa
	Accuracy	±1 hPa (-20÷85°C)
	Long term stability	±1 hPa/year
Internal Measurement (Power)	Mode	Battery or power supply level
	Type	Voltage
SDI-12 input	Type	V1.1 compliant
	Protections	<ul style="list-style-type: none"> • Opto-insulation • Over-current protection by self-replacing PTC fuse • IEC-61000-4-2 ESD 30 kV (air), 30 kV (contact) • DATA-SDI12 line protection with gas discharger and digital insulation: <ul style="list-style-type: none"> ◇ 1-2 kA surge capability tested with 8/20 μs pulse as defined by IEC 61000-4-5 ◇ Conform to ITU-T K12, IEC 1000-4-5 ◇ Insulated Data line up to 4000V peak and 2500V rms per minute
RS485 Input/output	Input numb.	N.1
	Mode	<ul style="list-style-type: none"> • Connection to sensor (Modbus RTU Master protocol) • Connection to SCADA/PLC systems (Modbus RTU Slave protocol)
	Power supply	3kVdc insulated

RS232 Input/output	Inputs numb.	N.2
	Mode	<ul style="list-style-type: none"> • Connection to Input Extension Module (MDMMA1110) • Connection to communication devices (modem 3G/4G) • Connection to SCADA/PLC devices (Modbus RTU - Slave protocol)
USB Input/output	Number	N.2
	Type	Host, connection type A
	Mode	<ul style="list-style-type: none"> • Connection to pen-driver • Connection to Wi-Fi antenna (optional)
Switched power supply outputs	Outputs numb.	N.3 (programmable triggering)
	Type	Solid-state $V_{Out} = V_{In}$
	Max tension	1,1 A for each output
	Mode	<ul style="list-style-type: none"> • External sensors power supply • Communication system power supply • Alarm • Timer (date/time or cycles)
	Protections	400 W peak pulse at 10/1000 μ s waveform Repetition rate (duty cycle): 0,01%
Memory	Type	Three levels storage system for greater reliability: <ul style="list-style-type: none"> • 8/16 MB on Flash chip LSI LASTEM file system • 400 MB on Flash chip with UBIFS file system • Up to 32 GB on USB memory stick with FAT32 file system
User's interface	Display	57x19 mm. 4 lines x 20 char. Backlit
	Keyboard	N.4 buttons
	Leds	Diagnostic about: <ul style="list-style-type: none"> • Data transmission activity • System status • Battery charge status • Internal Linux computer status (ready/error)
Clock	Accuracy	1 minute/month accuracy
	Synchronization	Automatic from internet time (NTP)
ADC	Resolution	12 bit oversampled to 14 bit; 16 bit optional
	Filter	Noise filtering for 50/60 Hz
Data Transmission	Modem	External 3G/4G modem (connection to RS232 port)
	Router	3G/4G router (connection to Ethernet port)
	Wifi	External antenna connected to USB port
Linux Computer	Type	Linux based internal computer with open and end-user extensible architecture
	Processor	32 bit
	ADC converter	16 bit

	Power modes	<ul style="list-style-type: none"> Always ON (always connected to Internet) Automatic power ON (awake for data transmission only for best energy performance)
	Linux kernel	V. 2.6.35, Debian Wheezy distribution
	Ethernet	Ethernet 10/100 Mbps
	USB ports	n.2 USB ports, Host, Type-A connector
	Flash memory	2 GB Flash with UBIFS file system
	RAM	128 MB
Watch dog	Type	Dual/redundant watch dog system
Power supply	Power supply	6÷30 Vdc
	Inputs	Separate inputs from 6÷30 Vdc power supply : <ul style="list-style-type: none"> From solar panel (17 Vmin), Max current: 5 A. Recharge voltage: 13,8 V From battery/main power supply, Max current: 5 A
	Peak pulse power capability	400 W peak pulse at 10/1000 µs waveform, Repetition rate (duty cycle): 0,01%
	Battery charge	17 V
	Protections	<ul style="list-style-type: none"> IEC-61000-4-2 ESD 30 kV (air), 30 kV (contact) Over-current protection by self-replacing PTC fuse Polarity inversion protection Over current protection by input power supply (>33V) 400 W peak pulse power capability at 10/1000 µs waveform
Environmental Limits	Operating temperature	-30÷60 °C
	Operating humidity	10÷99 % RH, not condensing (conformal coating option)
	Storage temperature	-40÷80 °C
Physical parameters	Weight	600 gr
	Dimensions	160x125x50 mm
	Mounting	DIN mounting rail 35 mm
EMC	Protections	EN61326-1 2013