Description

- Linux S.O. with integrated Apache Web Server
- None additional software to install
- Intuitive and powerful browser-directed interface
- Access from Ethernet, WiFi, USB, serial and remotely
- Very high accuracy on all inputs @24 bit
- Compact and ultra-low power consumption, 100% operative
- Integrated battery charger in PWM technology
- Web interface in source code
- Dual level of user management to share on the same hardware up to 5 different configurations
- Integrated Barometer (optional)
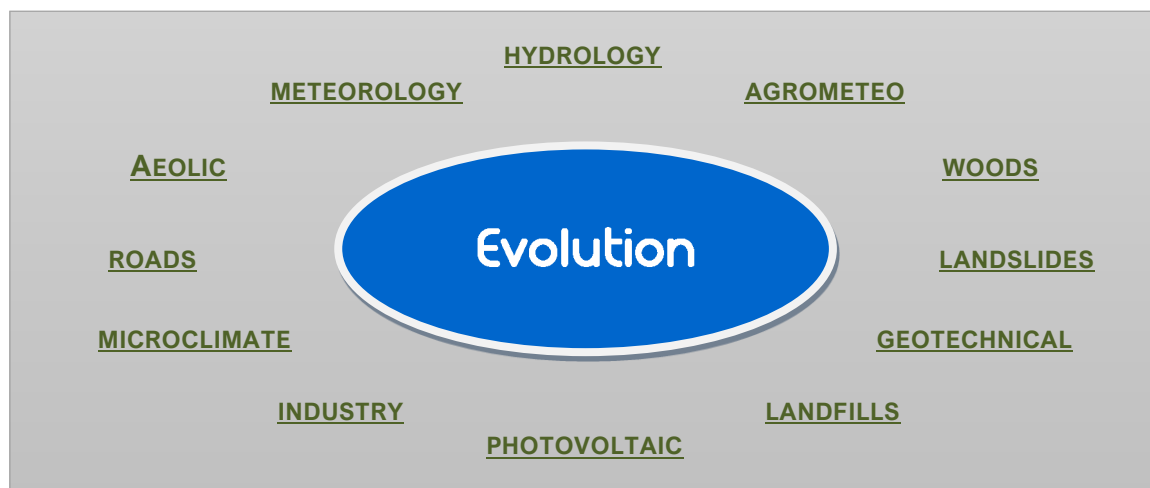- Integrated battery and solar panel voltage control
- Metal painted enclosure

Evolution-M represents the natural passage of the TMF series dataloggers, which have already been a great success for having revolutionized the world of data acquisition systems for over 15 years, to the most modern technology, leading today to the creation of this extraordinary product that for performance and ease of use is unrivaled, and which promises a second technological revolution in the sector.

A modular datalogger with very high precision, with operating system **Linux, Apache web server and interpreter PhP**usable **without no software external and/or owner**totally **configurable via web**.

Equipped with **more widespread interfaces modern communication** and with a **intelligent recognition automatic connected sensors** (both Nesa and third parties), in other words a very advanced and technologically advanced device.

Acquisition, processing, storage, alarm management, data processing and sending, programming, have never been so affordable for the user as with evolution. Un completely new and efficient user experience, expandable and upgradable at any time with a wide range of additional features. All this in line with the latest industry regulations.

Applicative Sectors

HYDROLOGY

METEOROLOGY   AGROMETEO

AEOLIC

WOODS

ROADS   **Evolution**   LANDSLIDES

MICROCLIMATE   GEOTECHNICAL

INDUSTRY   LANDFILLS

PHOTOVOLTAIC

Main Features

- Versatile and precise multi-channel instrument for analog, digital, frequency and serial signals
- High accuracy verified according to UNI CEI EN 13005 in cat. A
- Up to 5 users configurable with different totally independent configurations
- Built-in comprehensive surge and overcurrent protection
- Multi - power supply from solar panel, 12Vdc battery, external main power supply.
- AD@24bit, DA@16bit Converter
- Level III self-diagnostic functions
- Configurable processing and sending sampling time for each measure

- High number of configurable I/O (over 100)
- Standard PS2 connections or with the addition of intrinsically protected level II external terminals
- Three memory levels: internal, external, USB up to 512GB or external HD up to 1TB
- Support serial sensors RS485/ RS232, SDI12, Tcp-Ip, ModBus, etc.
- 10/100Mbs LAN and USB network interface
- Ability to create scripts or algorithms directly from the user
- Set of predefined statistical processing, others configurable at will by the user
- Dual redundant data sending system

Applications and use

In applications **Environmental**, evolution it is suitable for any type of monitoring, given its great versatility in integrating **sensors of all types and brands**. The **older monitoring networks** can be easily **update only by replacing the old datalogger** with evolution, the true hub of digital intelligence, and **maintaining existing sensors**, immediately giving a high added value to the technological content of the system. evolution is the datalogger **ideal in all weather conditions** for hydrological meteorological stations, automatic geotechnics, monitoring systems for photovoltaic and wind power plants, water quality controls, hydrological risk, landslide warning and much more. The**camera integration** or the **control of sirens and lights**, the ability to create **targeted applications** that allow to detect environmental and non-environmental parameters, interconnecting them with each other, allow the user to obtain **amazing results**, in accordance with the regulations of the reference sector.

In applications **Industrial** thanks to **standard protocols** and the ability to create **datalogger networks** as well as at the**high I/O**, evolution represents a powerful and flexible tool for supervision and control in plants ranging from **distributed control systems** (DCS), to the **verification of the concentration of gases in air** (emissions), at **temperature control Cells** or specific environments, **to manage high numbers of I/O** analog and digital (order of thousands), such as the status of switches, valves, photocells, pumps, to simpler **process controls** of the various industrial realities. Associate **wired signals** also **signals transmitted by radio** (VHF, UHF or SigFox/Lora LoraWan), ensures, where cable routing is a problem, the **maxim installation flexibility with minimal invasiveness**.

In the applications of **laboratory**, evolution offers maximum performance, thanks to an opening to the **customization and application** unprecedented. The **Standard equipment of functions is in itself very rich**, but the possibility of integrating **custom solutions** and targeted is only limited by the user's imagination. evolution **is programmable also with specific scripts** providing a library of applications that can be shared on the network, permitting the simplification of every research and development activity. An ideal instrument for laboratory measurements that can be certified with reference to the metrological chain.

General Specifications
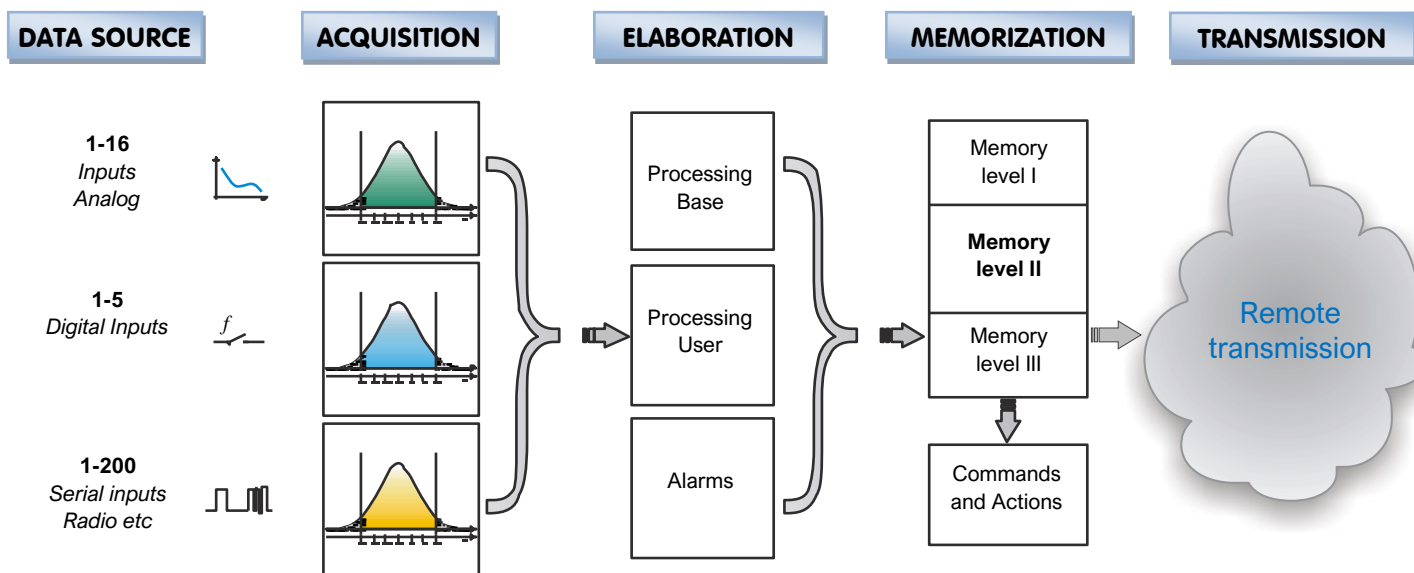
Acquisition capacity: evolution has an **acquisition capacity** of signals **practically unlimited**, tied only to available physical and logical connections. With a basic equipment that involves interfacing 1÷16 analog inputs, 1÷5 digital inputs, 2 RS232 serials, 1÷200 RS485 or SDI12 serial devices, USB, Lan network, wireless, IoT, I2CBus, ModBus, radio, etc., it is difficult to imagine anything more versatile.

Processing capacity: evolution encloses all the **computing power of a 32-bit processor** and already all the over twenty years of experience of Nesa and its scientific spin-off in the methodologies and algorithms of data processing and processing. From **storage of the primary sample according to the guidelines of CEI ENV 13005** to **standard statistical processing** (minimum, mean, maximum, standard deviation, quadratic deviation, etc.) and their validation and treatment **according to ISO 13528**, the implementation of specific **mathematical models** for **derived measures** such as the potential evapotranspiration of **Penman Motheith**, or sunshine duration by method **Angström-Prescott** Indexes **wind chill** and **Humidex**, are just a few examples of the potential that **the user can use, modify, recreate and share on the network with other users** along with the hundreds of functions already present.

The timing of acquisition and processing, storage and transmission are all independently programmable from 1min to 24h.

Memorization: evolution has **different types of memory** for the protection of data or copies thereof, **different levels of security**. A **level I** has an internal memory of **backup** containing all the data from the first ignition in the factory, the history of the datalogger, a circular memory, able to store on average 10 years of information. A second memory of **level II** said of **system** always internal, instead contains temporary data, which accumulates before a possible remote sending, is able to manage and contain data equal to about 5-7 years, therefore, it does not fear long periods of fault in remote transmission systems. Finally, a memory of **level III** or **external memory (USB or HD)** of variable capacity, but normally greater than the sum of the internal memories.

The **memory management**, given their abundant abilities, is **cyclic type** (overwriting older data) and **expertly optimized** (consumption and memory management) from the operating system **Linux**, also chosen for this potential. It is available to the user, the ability to choose whether to store unencrypted data (ASCII characters), or in encrypted form with 256-bit Hash key.

Data transmission: With evolution, data/alarm transmission has never been easier. In addition to the normal features already present in the previous TMF series dataloggers, and among these the possibility of choosing between **many channels available** also in redundancy between them (modem, radio, mobile phone network, satellites, copper or fiber cable, etc.) and having available the **most protocols** widespread among information transmission systems (RS232, RS485, Modbus, TCP-IP, SMTP, FTP, Socket, SigFox, Lora etc.), it is now possible "**dressing the information**" in the mode that best suits your needs for easy reading, such as email, XML, Excel, ASCII etc. Advanced features also allow the **Creating Specific Data Record**, if the Nesa dynamic format is not enough.

Local view and programming: In evolution the **powerful and very useful programming and data representation features both in numerical and graphic format from web**, already present in the TMF series, have been significantly enhanced with the latest generation libraries, light and effective, compatible with smartphones and tablets. Not only is it possible to see the **real-time data**, in numerical and graphic format, a function that allows a complete field control and is useful especially for slowly changing parameters, but also to control **the last two month of acquisition (historical)**, to immediately identify any anomalies or specificities in the measurements, by downloading the relative **Excel files,** certainly help for maintenance operations.

For programming, the **internal web-server** allows the **total management of the datalogger** both on the sensor interface side and related data processing acquisition (units of measurement, reliability range, representation accuracy, linearization with corrective formulas, type of processing, derived measurements, scanning and storage times, alarms, actions and commands, scripts that can be activated, etc.), and on the machine side, protections, storage and data transfer, all **without any proprietary software**, thanks to the **web interface in PhP** and **browser** normally available in every PC, tablet or smartphone. To all this are added **specific applications** for test of transmission system (target check), of memorization and diagnostic, available online on the machine.
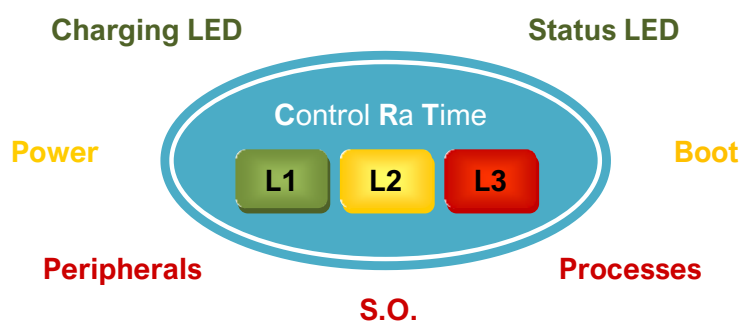
Finally, if the w**ifi functionality**, you no longer even need the physical connection to the datalogger. Through the wireless network, with a device equipped with WiFi interface, it is **you can access the datalogger while sitting comfortably at a distance** or pass a smartphone in front of the **QR-Code** of any monitoring station to be automatically redirected, after authentication, to the configuration web pages. From the point of view of the **operator technician who installs or maintains** to monitoring systems equipped with evolution, it is a **important help and simplification of use, completely innovative and avant-garde**.

Diagnostic: evolution has an effective management of the **diagnostic** following the guidelines of the **ISO14230**, inspired by the **robust automotive-derived KWP2000 protocol with three levels of restoration (watch dog)**. Diagnostics is performed **sequentially at each machine start** and **during operation (CRT)** at intervals adjusted to the operation in progress.

In particular, the functions of the **operating system** and **active processes** (acquisition, storage, transmission), the **Boot**the **device status** (where applicable), as well as conditions of **primary feeding** (solar panel or network), **secondary** (battery), and **operational environmental** (humidity temperature and pressure), if it activates its functionality. The **diagnostic log** it is always callable in the web pages inside the datalogger, **stored and downloadable** locally or remotely and can also be used for system alarm management.

Charging LED **Status LED**

Power

Control **R**a **T**ime

L1 L2 L3

Boot

Peripherals **Processes**

S.O.

General technician details

CPU	ARM Cortex A8 processor - 500MHz 32bit with Embedded Linux Kernel 2.6.37 operating system on board.
Internal memory	4MB NOR Flash for kernel, 128MB NAND + 128MB RAM programs, user programs and for data memory level I and II
External memory	USB pen-drive or Flash memory 8GB ÷ 512GB (-40°C+60°C) already supplied as data memory level III, or Hd or SSD
Communication ports	n. 2xRS232 (DE 9 Pin), n. 1xRS485, n. 3xUSB: 2xHost (12Mb/s) @500mA + 1xMiniUSB slave (480MB/s), n. 1xLAN Ethernet 10/100 Base T RJ45, 1xSDI-12 Slave (1÷100 connections), 1xI2Cbus and WiFi (optional).
Operator Local Interface	24x2 LCD display
Date clock	Internal with 1mS resolution and accuracy ±3 minutes per year, upgrade with NTP server (requires internet connection or Lan), or synchronization with optional GPS. Internal Lithium Battery 3.6Vdc
Watch dog	3 levels (1 hardware and 2 software) + led status visual control
Electrical protections	Internal against short circuits and indirect discharges with EMC filters Overcurrent with interchangeable fuse 6A External available on M2Ch modules type ESD ±3 kV according to IEC 61000–4-2
Consumption	Variable depending on the features activated: < 0.25W (15mA @ 12Vdc), clock rescaling in full operation < 1.5W full operations with GPRS functionality
Feeding	24Vac, 110Vac, 220Vac (with external power supply) 10,5 ÷ 24Vdc from Solar Panel, Wind Generator 10,8 ÷15Vdc battery.
Integrated charge controller	Regulator for hermetic cyclic batteries (max 5A continuous) with integrated 4-phase Dual Level Float Charge control, PWM control according to CEI 21-6/3. Integrated charging LED controller

Analog inputs	-100÷100mV / -2÷2Vdc Pt100 4wires / 0÷100mV 0÷2V/0÷5V/0÷10V	n. 8 ÷ 32 @ 24bit **differential**. Each entrance provides 12Vdc@250mA power supply and voltage reference to 2,048Vdc
		n. 16 ÷ 64 @ 24bit **single ended**. Each entrance provides 12Vdc@250mA power supply and voltage reference to 2,048Vdc
		n. 2 @ 12bit **used for battery monitor and primary power supply** n. 3 @ 12bit **used** for internal pressure and aux measurement
Digital inputs	n. 5 inputs in frequency (Max 5000Hz), status (On/Off) or count	
Web-configurable serial inputs	n. 1 ÷ 200 via RS485, RS232, SDI-12 (with its active functionality)	
Web-configurable radio inputs	n. 1 ÷ 100 (depending on the radio module)	
Web-configurable analog outputs	n. 4 @ 12bit - 0÷2Vdc (convertible via MCS option to 0÷1Vdc, 0÷5Vdc, 0÷10Vdc, 0÷20mA, 4÷20mA, RS485 or RS485-ModBus)	
Web-configurable digital outputs	n. 4 programmable open collector (Vmax=50V, Imax=200mA, 5000Hz) ON/OFF	
Other releases	n. 1 power output 12Vdc max 5A n. 1 controllable power output 12Vdc max 5A	
Sampling interval	< 100µS	
Primary sample validation interval	1 ÷ 10 sec programmable	
Interval of data processing and/or sending	1 sec ÷ 1440min preset steps	
I/O signal protections	Internal EMC protection filters each analog channel Opto-isolation 5KVrms digital inputs EMC filters on communication ports	
Integrated operational monitors	Battery Monitor Primary Power Monitor Pressure, (optional e-Bar)	
Supported protocols	**Modbus RTU & Tcp, TCP-IP, HTTP, FTP, SFTP, NTP, Telnet, SMTP, Socket, I²CBus, SDI-12, RS232/485 command line, SNMP, MQTT, IoT (Lora, SigFox)**. Other optional	
Programmability and teleprogramming:	Locally via LAN network cable, and remotely via GPRS modem, WiFi, satellite, modem, radio. Only needs a web browser or an XML configurator or text editor	
Processing algorithms included	Dew Point (Magnus Tetens), Vapour Pressure, Precipitation Intensity, Hourly Precipitation, Daily Precipitation, QNH, QFE, Potential Evapotranspiration (Penman Motheith), Heliophania (Angström-Prescott),wind chill, humidex. Others optional and user-implementable.	
Available data format	**ASCII txt file, Excel, CVS, XML, email, AES encripted,** others on request	
Operating temperature	-40 ÷ +70 °C without condensation	
Dimensions and protection	200x110x74,5mm – IP20	
(optional) Box IP65 – IP67	Standard polyester or stainless steel 300x400x220mm (other sizes on request) mod TMF-ALPS. TMF AL220 or TMF-ALPS+220	
Weight and material	700g – Polycarbonate and painted metal case Green version	
Installation	DIN Rail or wall or optional polyester or stainless steel container	
Basic rules of reference	EC WMO, EN-13005, ISO-13528, CEI-21-6/3, IEC-61400-12, ISO-9060, Legislative Decree 121/2020, DE 2018/850, CE-128/2009	
Integrated barometer (optional)	Accuracy: <0.4 hPa @ 20°C.. (range of your choice) Resolution: 0.05hPa Response time: <2sec	

Performance detail

Stabilized analog inputs @25°C *

		Input impedance		20 GΩ typical	
		Entry limits		10.2Vdc	
Ladder	Resolution Typ.	Accuracy 0÷40°C	Accuracy -40÷70°C	Offset	
±100mV	100nV	±50nV		±2µV	
±2V	2.5µV	±1µV		±5µV	
0÷2V	3µV	±8µV	±0.06% reading + offset	±5µV	
0÷5V	6µVt	±15µV		±10µV	
0÷10V	10µV	±30µV		±25µV	
0÷20mA	30nA	±80nA		±20nA	
4÷20mA	30nA	±80nA		±20nA	
Pt100	0.5/100°C	±0.05%	±0.05%		

*Components with Tcr 5ppm/°C

Digital inputs (frequency) @25°C

Duty Cycle 50%		
f (Hz)	Accuracy 0÷40°C	Accuracy - 40÷70°C
5	0.02%	0.025%
50	0.02%	0.025%
500	0.03%	0.05%
5000	0.05%	0.1%

Optionally activated features

External WiFi: In evolution you can activate the Hot Spot function. This allows you to access the datalogger via WiFi, or to connect to other networks nearby and use them for data transmission.

External GPS: by connecting an external USB GPS, evolution identifies the location in geographic coordinates WGS84 GD. These coordinates are stored and transmitted with the same frequency as the data. The function is activated by web browser. The st It GPS can also be used for synchronization of the date and time.

External GPRS/UMTS: In evolution you can activate either an external standard GPRS/3G/4G modem. There is no need to use specific modems with custom commands.

GPRS / UMTS

Outdoor camera: you can connect any IP camera directly to the lan port of evolution. Images from the camera are captured as individual frames, stored and transmitted at the same rate as the data. The function is activated by web browser.

Pressure with internal barometer: in evolution it is possible to have an internal precision barometer (code **e-Bar**). This function is useful for monitoring systems that provide for the mounting of the datalogger in containers with a degree of protection < IP68, as the connection that you have with the external air makes the atmospheric pressure inside and outside the container itself homogeneous. The feature is optional and is activated by web browsers

Gateway IoT: evolution through an IoT radio concentrator, it is able to interface up to a hundred transmitters to as many sensors with Pt100, 4-20mA or 0-2Vdc output (SFL.xx code) in a **5÷8Km radius, using Lora protocol**.

Optional standard interfaces

MCS: Signal conversion module with 18 bits of resolution that allows you to acquire any type of analog and digital signal by converting it into standard electrical outputs in voltage or current or in RS45 protocol at the command line or Modbus. Interfaces directly to evolution both to increase the number of inputs available on the RS485 line and to enhance the analog outputs of the datalogger by converting them to the user's preferred format.

M2Ch: Bi-channel input protection module for evolution. Equipped with a double electric protection to dischargers and varistors for induced surges and indirect discharges, it protects the datalogger safeguarding the acquired data and brings the signals on the terminal block for immediate interfacing with each sensor.

RELAY: DIN bar module for control, complete with socket and 12Vdc relay with double contact N.A and N.C. Maximum current on 8A contacts.
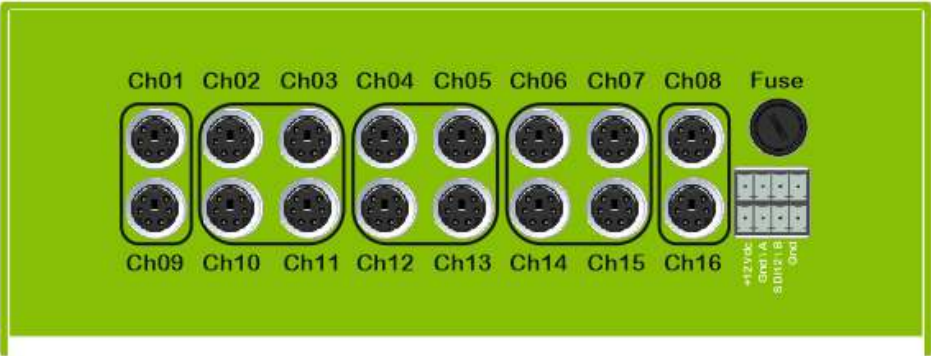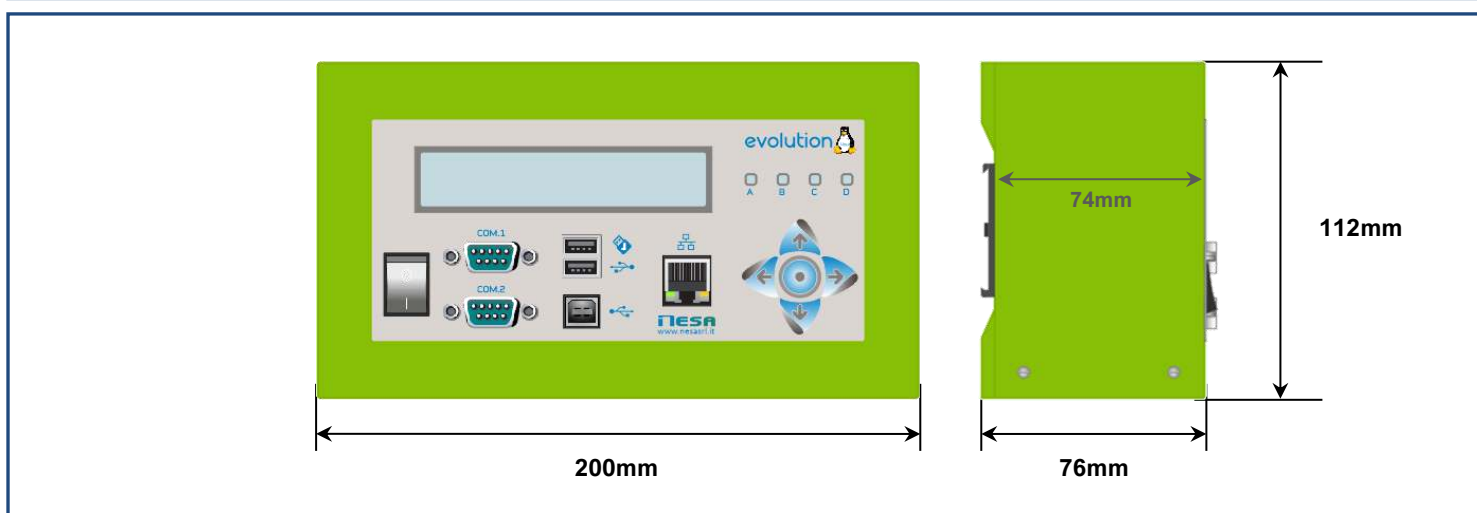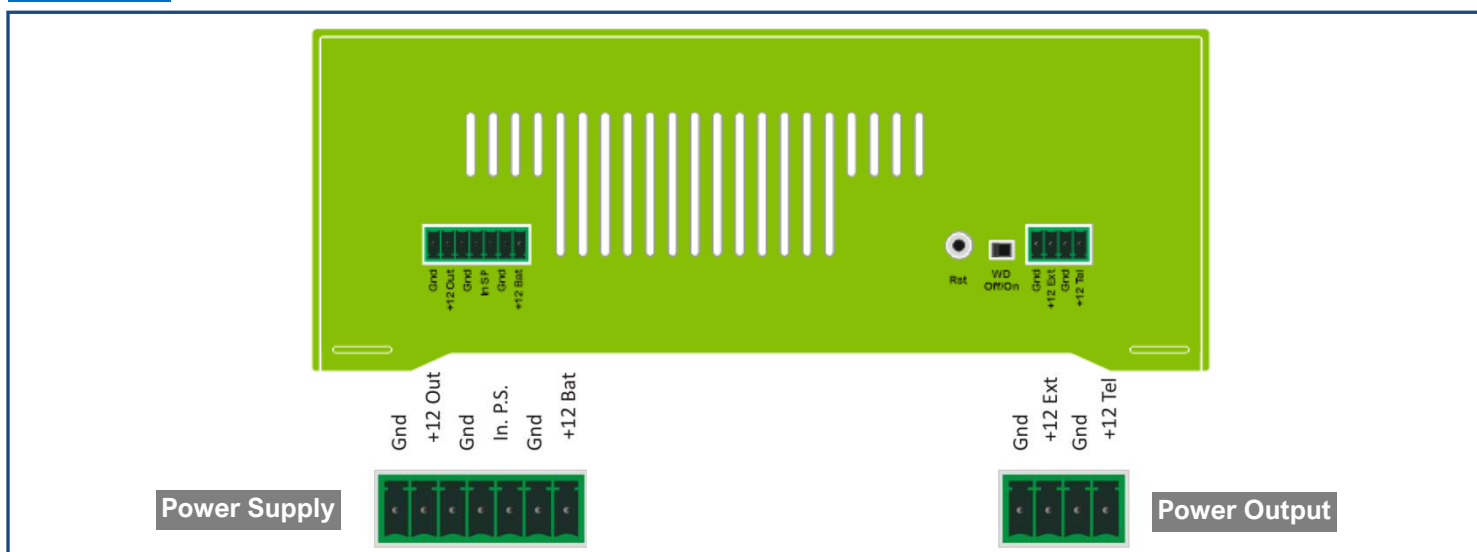
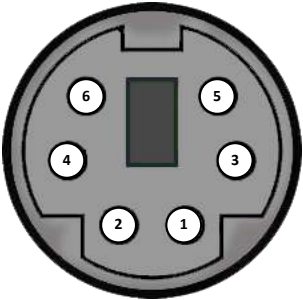**IS485/USB**: USB/RS485 interface can also provide a power supply 12Vdc@250mA max.

SFL. NESA-XX: IoT Radio interface for analog or digital sensors. It acquires signal from 0-2Vdc, 4-20mA, frequencies or states, and sends data to the datalogger's IoT Gateway concentrator with LpWan (Lora) technology in 860÷920MHz free frequency. Provides power to the sensors (see data sheet).

Dimensions

PS2 connector female

Analog channels	Ch02 ÷ Ch05 Ch10 ÷ Ch13	Differential inputs, common mode, Pt100 and sensor power supply	Pin	Description	Limits
			1	In+	22mA
			2	Vn+	+2.5V
			3	Vn-	- 2.5V
			4	In- (GND)	22mA
			5	No.c	
			6	+Vbatt	15V

Digital channels	Ch06 ÷ Ch07 Ch14 ÷ Ch16	Inputs in frequency, status or count	Pin	Description	Limits
			1	n.c.	--
			2	IN+	--
			3	IN-	--
			4	GND	
			5	n.c.	--
			6	+Vbatt	15V

Analog Outputs	Ch09	0-2Vdc voltage output convertible into: 0-1Vdc, 0-5Vdc, 0-10Vdc 0-20mA, 4-20mA RS485 (command line) or RS485ModBus	Pin	Description	Limits
			1	DAC.1	+2,048V
			2	DAC.2	+2,048V
			3	DAC.3	+2,048V
			4	DAC.4	+2,048V
			5	GND	0
			6	+Vbatt	15V

Digital Outputs	Ch01	Separately controllable outputs Open Collector	Pin	Description	Limits
			1	O.C.1	--
			2	O.C.2	--
			3	O.C.3	--
			4	GND	0
			5	O.C.4	--
			6	+Vbatt	15V

Expansions	Ch08	Channel for expansions	Pin	Description	Limits
			1	CLK	I2CBus Links
			2	DATE	
			3	SDI12	SDI12 Slave
			4	GND	0
			5	n.c.	
			6	+Vbatt	15V

What order

Logger	Datalogger evolution complete with manual, USB 2/8GB memory, web software included	EVOLUTION	
Options	Activation of the Internal Barometer		**e-BAR**
	External GPS module		**GPS**
	Modem GSM/GPRS		**GPRS/UMTS**
	Signal conversion module for single channel (x = indicate quantity)		**x.mcs**
	Module Bi-channel clamp interface with double level of signal protection (x = indicate quantity)		**x.m2ch**
	RELE module: 8Amax relay interface with double contact (N.A., N.C) (x = indicate quantity)		**x.Rele**
	Router function with wifi network and SSID		**Wifi**
	Additional RS485/USB interface with max power 12Vdc@250mA		**IS485/USB**
	IoT/Nesa radio gateway for SFL devices to be connected to Evolution dataloggers		**Gateway IoT**
	Wireless radio acquisition and transmission interface with IoT protocol - 868MHz (Europe) for low-power analog or digital sensors. See product sheet for exact code		**SFL. NESA-XX**