









-  High processing capacity with minimal power consumption
-  Data acquisition from up to 11 devices (8 analog inputs, 3 digital inputs)
-  High interconnection flexibility through RS485, RS232, SDI-12 interfaces
-  Built-in battery charger
-  Automatic and protected service power management
-  UMTS transmission system incorporated
-  Iridium satellite or UHF radio (optional version)
-  Open source FreeRTOS Operating System

# Description

MicroSUM is a compact acquisition unit for environmental and meteo-climate monitoring stations, and it can directly manage at the same time weather sensors, analyzers, chemical-physical probes and other devices thanks to its analog, digital and pulse electrical outputs.

Its main features are the ease of use and configuration, as well as the efficiency of data management. It is at the same time a very versatile device, being MicroSUM a very performant and suitable datalogger for every kind of meteorological application. It has been designed to match the most various needs of data acquisition, processing and transmission, from the simplest ones related to single weather stations, to the most complex concerning monitoring networks managed by remote control centers.

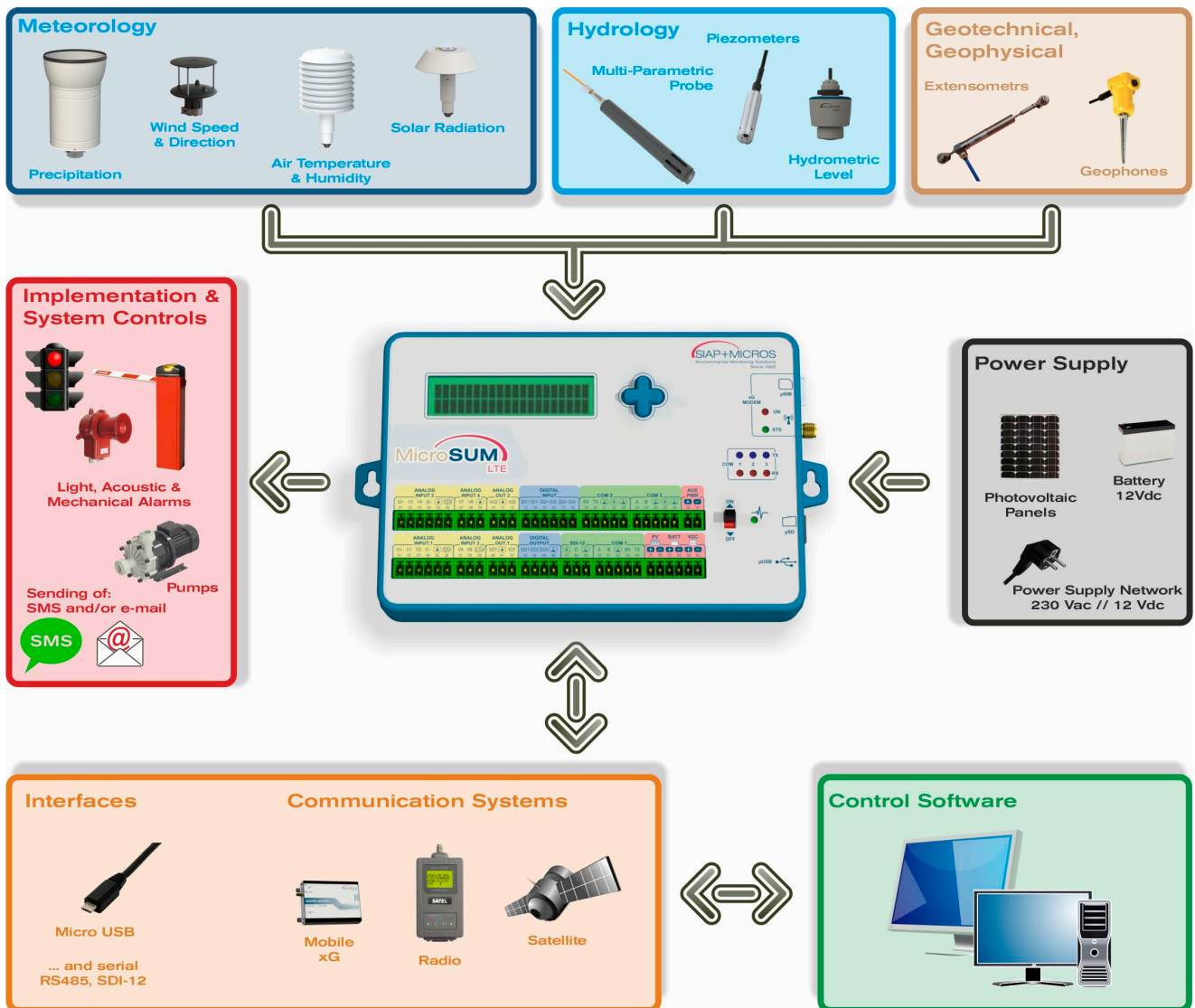
The very low power consumption represents another relevant outstanding feature, making it particularly suitable for applications in harsh environments with reduced insolation. Furthermore, an open source FreeRTOS operating system makes the device very easy to programme.

MicroSUM is extremely compact and terminal blocks are incorporated in a single element, allowing all the sensors connections to be very easy to handle, along with the power supply battery charger. The display is equipped with a Joystick to facilitate the data acquisition management.

MicroSUM can be provided also in the LTE version (UMTS/LTE modem incorporated), thus reducing the energy consumption and at the same time offering a more affordable device, being the two products integrated in a single one.

It is possible to connect additional communication devices such as UHF radios, satellite or short-range radios in free band, and this option is available for both versions of MicroSUM.

# Logical scheme



# Main Features

## DISPLAYING

Date and time, instant data and processed data. Possibility to perform commutations and tests.

## DATA PRE-PROCESSING (instantaneous measurements)

- Data validation (check of the measure);
- Data processing (corrective formulas, calculation algorithms, and more).

## STATISTICAL PROCESSING (recorded measures)

MicroSUM acquires the instantaneous values and stores them in a temporary archive. At the end of a settable time base, stored values are processed to compute and elaborate the desired statistical data.

For each measurement it is possible to define the acquisition frequency and the recording frequency.

Main statistical elaborations are: instant measurements, arithmetic mean, accumulation, period, integral, vector mean, trigonometric average, minimum and maximum.

## STORAGE

Initially the acquired data are saved in a temporary area (typically hourly set). Then data are permanently stored in an internal FAT memory area. Data can also be copied into an external SD memory card.

Memory management can be either in linear mode (continuous storage up to full memory card capacity), or circulate mode data are overwritten once the memory card is full.

Record track is done with a compact binary structure, to minimize the costs and time required to transfer data to a remote station.

## COMMUNICATION / TRANSMISSION

- Data transmission via: internal UMTS / LTE modem (in the LTE version).
- Optional transmission via UHF radio or satellite terminal (for all versions).
- Sending data to FTP servers and alarms also via SMS.
- Communication protocols TCP-IP, FTP, MODBUS.

## SELF DIAGNOSTICS

MicroSUM has a set of procedures for the following controls:

- Check on the single acquisition channel;
- Check on the storage area;
- Verification of communication with the transmission system;
- Proper MPPT charger working point management.

## CONFIGURABLE PARAMETERS

- Parameter name and engineering units;
- Minimum and maximum value detectable by the sensor (start of scale and full scale);
- Number of decimals after the decimal point to set the measurement;
- Corrective formula: conversion formula to obtain the value in engineering units from the incoming signal;
- Intervals for acquisition / recording and processing of data that can be generated;
- All information for sending data.

## ALARMS MANAGEMENT

- Possibility to set minimum and maximum alarm thresholds (hysteresis option included to reset prior condition);
- Possibility of sending alarm SMS and changing operating frequency for data transmission.



# Technical Specifications\*

## Hardware features

Processor	STM32L4 Ultra-low-power ARM Cortex M4 (32 bit) Frequency up to 80Mhz External watchdog system
Clock	RTC with 32768Hz quartz oscillator
Memory	1MB Flash (internal) 128KB SRAM (internal) 16MB Flash memory (internal) for configuration and data storage
Additional memory (optional)	µSD extra memory for data storage (16Gbyte)
Operating system	FreeRTOS
Display	Two 20x2 LCD alphanumeric lines with control joystick
N. 4 communication interfaces	COM1: RS232/RS485 COM2: RS232 e Vbat switchable and protected (max 5A) COM3: RS485 e Vbat switchable and protected (max 5A) SDI12 Recorder e Vbat switchable and protected (max 5A)
USB	microUSB slave. CDC (communication device class) for configuration, temporary power supply, tests and firmware updatings. MSC (mass storage device) for FAT internal and external memory management.
Analog Inputs	Either N. 8 single, or 4 differentials (2 per PT100). Converter A/D - 24 bits
Digital Inputs	N. 3 opto-isolated, (optionally sinusoidal version). Internal PULL-UP
Analog Outputs	N. 4 (12bit): 2 tension outputs (0-2,5V), 2 current outputs (4-20mA).
Digital Outputs	N. 3 open-drain
Modem integrated	Incorporated Sierra Wireless LTE modem – switched power supply (e020b-MICRO-LTE version), MicroSIM included. Direct connector RF SMA

## Power supply and Consumption

Power supply	Lead battery (12V). Solar panel (Max 100W, 24V). External 12V nominal power supply (typical 13,8V) - backup battery included. 10,5V - 15V power supply (without back up battery). Lithium battery (5,5V - 15V).
Consumption (typical)	2mA@12V
Charger	MPPT (14V - 18V) with automatic achieving of maximum efficiency. Compensated charger battery regulator.
Power supply provided to the connected devices	N. 3 Vbat outputs limited to 5A, switched on COM N. 2 12V outputs limited to 1,5A on analogic inputs N. 1 2,5V/10mA outputs

## More features

Control functions	Battery voltage and charging current Solar panel voltage Operating current
Protections	Protections against electrostatic discharge on each input. Protections against polarity inversions at each power supply. Overcurrent limitations on external power supplies.
Operating temperature range	-40 ÷ +80 °C

## Ordering codes

MicroSUM Datalogger	PEM-e020a-MICRO
MicroSUM Datalogger, integrated modem UMTS/LTE	PEM-e020b-MICRO-LTE
MicroSUM Datalogger, integrated modem	PEM-e020g-MICRO-MNB1