



Environmental
Monitoring Solutions

HYDROLOGY AND EARLY WARNING Monitoring equipment



 **Pluvi-ONE system**

The intensification of hydrological cycle with heavier rainfalls, due to global warming, raises concerns about future floods and their devastating impact on population and on cities where exposure to these events has also increased due to urbanization. Also the modes of occurrence have changed, and flash flooding are increasingly frequent, with a short response time of a few hours or less. A flash flood disaster is caused by heavy rains with a short duration in steep areas with poor vegetation cover, the causes are hydrological conditions, frequency of rainfall events and human activities. In recent years, flash flood disaster events have led to serious death and economic losses.

The development of adequate adaptation solutions such as early warning systems is crucial in this situation and with the perspective of a worse one in the future. Floods are becoming one of the major problems in most of the countries around the world. Although, the ability of monitoring rainfall and water level or of tracking storm path in real-time is essential in order to make a reasonable decision on the actions necessary to be performed to prevent flooding. The possibility of receiving alerts when pre-defined thresholds are passed is crucial to lower the hydrological risk.



► Pluvi-ONE system

Pluvi-ONE is a new integrated system for rain monitoring and early warning information that performs two different tasks: produce accurate rain measurements (including other quantities as water level, storm distance, etc) and early warnings messages in case of alarm situations. The system is designed for measuring in remote and unattended locations and to send its results and alarms. Pluvi-ONE is a complete system including rain gauge, data controller, power system and communication part. Pluvi-ONE system has a series of unique features currently available in a single device and represents the "state of the art" solution for rain measurements and early warning activities in hydrometric monitoring networks.



Pluvi-ONE system



- ▶ Rain and Storm distance (lightning) monitoring system
- ▶ Optional water level, air temperature+RH% and temperature sensors
- ▶ Smart rain analysis: totals and running cumulative values for alarm purpose
- ▶ Powerful data logger
- ▶ Large memory 16 MB plus external memory 4 GB
- ▶ GPRS/3G/4G modem and router for remote communications
- ▶ Class A rain gauge with double rain gauge redundancy
- ▶ Local display
- ▶ Integrated web server for real-time data, diagnostic information and data download to Excel files via Internet browser

Pluvi-ONE is a new integrated solution for rain monitoring and early warning activities. The system produces accurate rain measurements in term of amount and intensity using Class A rain gauge (UNI EN 17277:2020) with intensity correction formula. Additional sensors (water level, storm front distance, temperature and RH, temperature) are also available in the same system. Pluvi-ONE is an early warning system in case of alarm situations that sends messages via SMS, Email, MQTT when set thresholds are passed.

DQA230.1 Rain Gauge

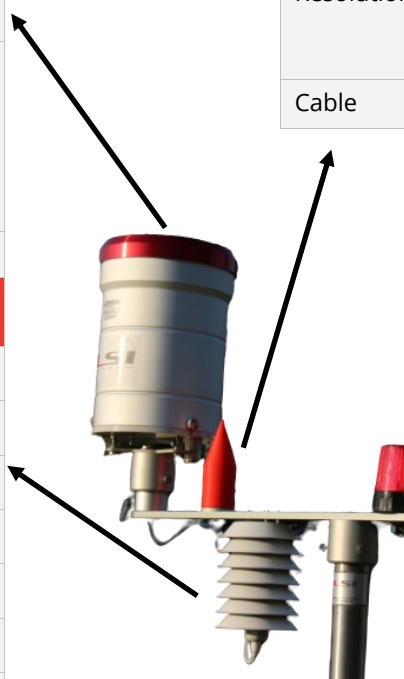
Principle	Tipping bucket with siphon
Diameter	203 mm
Collector area	323 cmq
Accuracy	Accumulated rain fall amount 0...20 mm/h: ± 0.2 mm 20...240 mm/h: 1% >240 mm/h: 2%
Cable	L=5 m

DMA672.1 Temperature+RH%

Temp. element	RTD (Pt100 1/3 DIN)
RH element	Capacitive
Range (Temp.)	-50...100 °C
Range (RH%)	0...100%
Accuracy (Temp)	0.1 °C (@ 0 °C)
Accuracy (RH%)	$\pm 1\%$ (@ 5...95%)
Cable	L=3 m

DQA601.3 Storm Distance

Type	Sensitive RF receiver
Range	5...40 km
Resolution	14 steps (5, 6, 8, 10, 12, 14, 17, 20, 24, 27, 31, 34, 37, 40 km)
Cable	L=5 m





▶ Inputs

N.2 frequency inputs for rain gauges
 N.1 Pt100 temperature sensor
 N.1 RS232 for air temperature+RH%
 N.1 RS232 for storm distance sensor
 N.1 1÷2 V for water level sensor
 N.1 RS485 optoinsulated

▶ Remote communication

Can be equipped with the following optional communication devices:

- GPRS/3G/4G modem/router
- Satellite

Data delivery can be to several FTP sites and MQTT broker server.



▶ Storm front distance

Built-in sensor to detect the lightning strikes event and its distance:

- Date/time for each event (strike)
- Estimation of the storm front (not strike) within an area of in 5÷40 km

▶ Local communication to PC

Pluvi-ONE can be connected to a local PC using the following modes:

- Wi-Fi
- Ethernet



▶ Water level

One analog input to receive 0/4÷20 mA or 0÷2 V from water level sensor. LSI LASTEM supplies water level sensors based on different technologies (piezometric, ultra-sonic, radar).

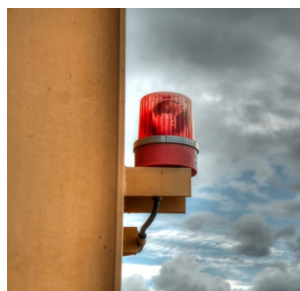
▶ Data memory

Pluvi-ONE has a big internal memory of 400 MB, plus one USB port for pen drivers up to 32 GB capacity.



▶ Early Warning System

Alpha-Log data logger generates alarm information by SMS, Email, MQTT and local switched power outputs. Alarm logics are user's programmable.



▶ Local switched power outputs (Reed Relay)

Alpha-Log has 3 outputs to trigger external devices (sirens, sound and light alarms, beepers) using programmable logics.

▶ Power supply

Pluvi-ONE has 2 separate inputs for 6÷30 Vdc power supply:

- From solar panel (17 Vmin), Max current: 5 A. Recharge voltage: 13,8 V
- From battery/main power supply, Max current: 5 A

▶ Power consumption

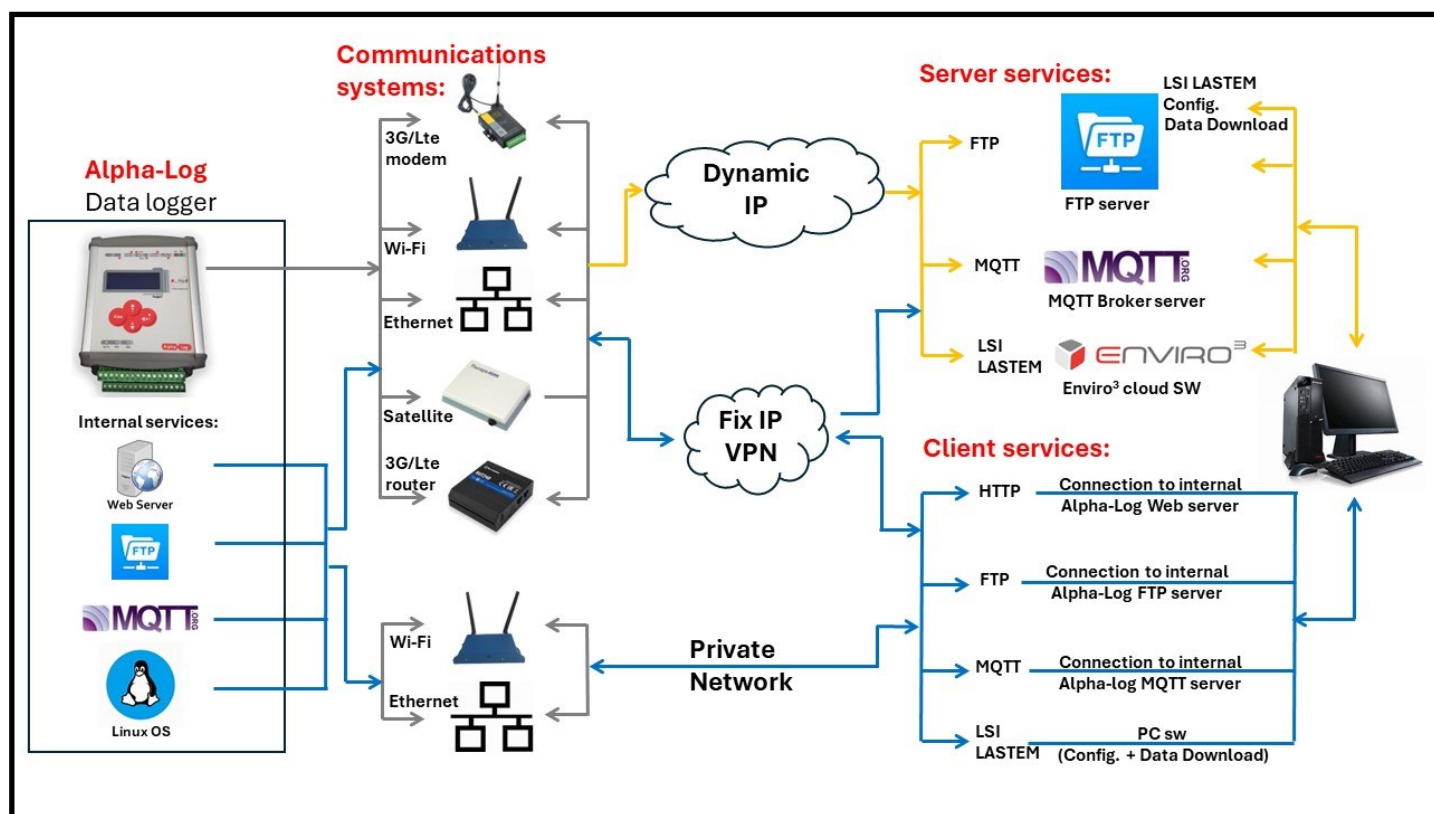
Alpha-Log average electrical consumption is 0.03 W during stand-by and measurements. This allow to run the system for 100 days with 9 Ah battery and 1 data communication per hour, by 3G modem.

▶ Class A rain gauges (UNI EN 17277:2020)

LSI LASTEM produces rain gauges designed with the scientific contribution of the WMO - CIMO Lead Center on Precipitation Intensity - Benedetto Castelli to be classified as Class A according to the European standard UNI EN 17277:2020.

The standard defines relative percentage error limits on the measurement of precipitation intensity, an indispensable parameter for calculating the accumulated rainfall, with respect to a reference value on the 1 minute scale, to classify the instruments into three classes (A, B, C). In order to fall into Class A (accuracy on intensity <±3%), rain gauges must be built with particular attention to the mechanics of the components. Mechanics alone, however, is not enough to define a Class A rain gauge, it is therefore always necessary to apply a software correction to bring the measured intensity values as close as possible to the reference values. The LSI Lastem DQA230-231-235-236 rain gauges, when connected to the Alpha-Log data logger that has the ability to correct the intensities with the parameters derived from calibration certificate SVICA3105, are in Class A.





► The availability and accessibility of data within the network will depend on the type of communication equipment selected and whether the communication allows for outgoing data only from the data logger (Dynamic IP) or both outgoing and incoming data (Fixed IP, VPN, Private Network).

► Internal web-server

Alpha-Log data logger 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)

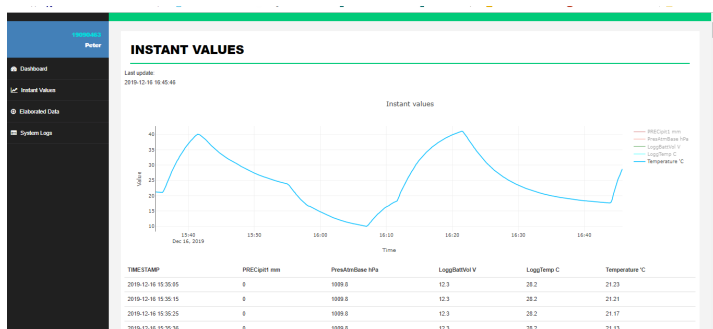
► Warnings by SMS, E-mail and MQTT

Notifications/alarms delivery:

- E-mail: with editable text, scheduling and distribution lists. E-mail attachment contains the file with the data that generated the event
- 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 3G-4G modem
- MQTT: data delivery to a MQTT Broker server: instant values, elaborations and alarm notifications. LSI Lastem provides software application (X-Panel) to get real-time dash bord of the online values

► ASCII file data format

The main data stream from the Alpha-Log data logger to the server (one or more servers) is made using ASCII (*.txt) file by FTP protocol. LSI Lastem provides software applications (GIDAS-Viewer) to receive data saved in the FTP server on a remote PC and to produce charts, tables and report of the measurements.



► Pluvi-ONE Kit



NOTES	
A	software by LSI-LASTEM for data management
B	when main power supply is available, solar panel is not required
C	needed with 2 IP devices (example: data logger and IP camera) using the same data communication device
D	when rainfall intensity is not needed
E	if thermo-hygrometer is not present
F	summersible device
G	required to fix the pole on wall or structures

Drw. Ref.	Cod.	Description	Kit	Ref. Note
		Data Logger (see catalogue MW9005-ENG-01)		
1	DLALB0100	Alpha-Log/7GB/n.2 RS232/n.1 RS485/n.2 USB/n.1 Ethernet	1	
	XLA010	Pen Driver 8Gb	1	
		Software (see catalogue MW9003-ENG-03+04)		A
	BSZ309	SW PluviONE CommNET	1	
	BSZ311	SW Gidas Viewer/PC	1	
		IP66 enclosure (see catalogue MW9005-ENG-07)		
2	ELF340	Box IP66/50x40x16cm/230V->13,8V/50W/batt.2Ah	1	
		Solar panel (see catalogue MW9005-ENG-07)		
3	DYA109	Solar pannel/80W/cable L=5m		
	DYA064	Arm/Solar panel/to D=45÷65mm pole		
		Modem (see catalogue MW9005-ENG-07)		
	TXCMA2200	Modem/4G/Antenna+Cable/12V	1	
	DEA611	External antenna 2DB/5 m cable/support	1	
		4G LTE cat. 4 Global router (see catalogue MW9005-ENG-07)		
	TXCRB2200	4G LTE cat. 4 Global router, Wi-Fi, 1 Ethernet port, antennas, power 9...30 Vdc, DIN rail mount	Altern. to Modem	
	TXCRA2210	4G LTE cat. 4 Global router, Wi-Fi, 4 Ethernet ports, antennas, power 9...30 Vdc, DIN rail mount		C
		Rain gauge (Tipping bucket) (see catalogue MW9000-ENG-18)		
4	DQA230	Sensor/Class A rain gauge/324cmq/Hz/Certificate	1	
	DQA230.1	Sensor/Rain gauge/324cmq/Siphone/Hz	Altern.to DQA230	D
	DWA505A	Cable/Rain gauge/L=5m/	1	
	DYA040.2	Arm/DQA230-231/to D=50mm.pole	1	

Drw. Ref.	Cod.	Description	Kit	Ref. Note
		Temperature and RH% sensor (see catalogue MW9000-ENG-05)	Optional	
	DMA672.1	Sensor/T+RH%/Pt100+0÷1V/12V/Cable L.3 m	1	
	DYA230	Radiant screen/NV/DMA672.1/DYA049	1	
	DYA049	Collar/for sensor arm to D=45÷65mm pole	1	
		Storm Front distance sensor (see catalogue MW9000-ENG-21)	Optional	
	DQA601.3	Sensor/Front distance/UART-TTL/5÷24V		E
5		Water level sensor (Radar) (see catalogue MW9003-ENG-01)	Optional	
	PRLVA3001	Sensor/Water level/Radar/0÷8m/4÷20mA/9÷35V/Cable L=10m	1	
	PRLVA3002	Sensor/Water level/Radar/0÷15m/4÷20mA/9÷35V/Cable L=10 m	Altern. to PRLVA3001	
	PRLVA3003	Sensor/Water level/Radar/0÷30m/4÷20mA/9÷35V/Cable L=10 m	Altern. to PRLVA3001	
	DYA044.2	Arm/PRLVA3001-2-3/to D=45-65mm.pole	1	
		Water level sennsor (Piezometric) (see catalogue MW9003-ENG-01)	Altern. to Radar	F
	DQC001.15	Sensor/Water level/Piezom./0÷10m/4÷20mA/12÷36V/Cable L=15 m	1	
	DQC001.30	Sensor/Water level/Piezom./0÷10m/4÷20mA/12÷36V/Cable L=30 m	Altern. to DQC001.15	
	DQC001.50	Sensor/Water level/Piezom./0÷10m/4÷20mA/12÷36V/Cable L=50 m	Altern. to DQC001.15	
	DQC001.80	Sensor/Water level/Piezom./0÷10m/4÷20mA/12÷36V/Cable L=80 m	Altern. to DQC001.15	
		Pole H.2 m (see catalogue MW9007-ENG-01)		
	DYA006.1	Pole/H=2m/D=50mm	1	
	DYA020	Tripod/concrete installation/pole D= 50 mm	1	
	DYA020.1	Anchoring bolts for tripod/3 set	1	
	DYA004	Arm for mast wall installation/D=50mm/ 1set	Optional	G



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