>> **PLUVI-ONE** Rain monitoring and early warning system

General Catalog

Components

Pluvi-ONE
Rain monitoring and early warning system

data loggers

Milano
ITALY

LSI LASTEM s.r.L

40 years of experience in environmental technology

Since 1972, LSI LASTEM Srl of Milano (Italy) develops, manufactures and delivers worldwide the most complete range of high quality environmental monitoring systems. LSI LASTEM instruments suits virtually any type of application, guaranteeing accurate and reliable measurement of environmental parameters both for portable and long term monitoring, outdoors and indoors. Our comprehensive range of products includes sensors, data acquisition systems, software and installation Accessorieses.

Products

Instrumentation for indoor and outdoor environmental monitoring applications

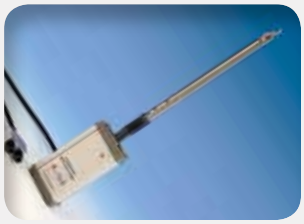
LSI Lastem catalogue features one of the most complete ranges of instruments available on the market. We supply our products as complete, turn-key solutions or as components for third-party integration.

METEOROLOGICAL SENSORS

Our broad range of sensors covers virtually any meteorological parameter, including wind, temperature, relative humidity, solar radiation, rain, atmospheric pressure, evaporation, visibility and more.

INDOORS SENSORS

A full set of sensors for high-end indoors monitoring applications including solutions for temperature, relative humidity, air speed, light, radiative quantities, pressure, gas concentration and more.



DATA LOGGERS and SOFTWARE

A complete range of data loggers for environmental applications, featuring low power consumption, protection against severe environmental conditions and extensive set of signal supported and communication protocols.

Systems

LSI Lastem knowledge and expertise, the result of 40 years of business in the environmental market, has helped customers put together an incredible number of application-specific monitoring solutions.

INDOORS APPLICATIONS

Indoor Environmental Quality

Since his inception, indoor environmental assessment has been LSI Lastem's core business. Over the years, we implemented the most complete range of systems to measure the critical quantities defining health and comfort of building occupants.

Heat stress and thermal comfort

State-of-the-art systems for the measurement of thermal comfort and heat/cold stress in health and safety applications according to relevant ISO standards. Over the years this application has become a true LSI Lastem's specialty.

HVAC

Complete solutions for thermal comfort and indoor air quality monitoring in order to regulate HVAC (Heating, Ventilation Air Conditioning) systems performances and attain a better thermal sensation with optimal energy expenditures.

Buildings assessment/Wall insulation

Complete systems for testing building environmental performances as function of energy saving capacity and related environmental comfort (Green Building Rating Tools) - including wall thermal transmittance, thermal comfort, indoor air quality and ventilation, light controls.

Controlled Atmosphere Processing Environments

Monitoring of ambient temperature, relative humidity, air speed, pressure, IAQ and other parameters relevant for optimal storing and processing purposes in clean rooms, white chambers, laboratories, warehouses, caves and green houses.

Museums and heritage

Practicing on Italy's immense cultural and artistic heritage and in cooperation with the most renowned restoration institutes, LSI Lastem has implemented monitoring solutions for the critical environmental and chemical parameters affecting conservation of artworks in museums, archeological sites and natural caves.

ENVIRONMENT AND POLLUTION

Air Quality Monitoring
Meteorological measurements for the analysis of the atmosphere dynamics and data correlation for air quality networks, stack emissions and gas analyzers systems.

Landfills and waste plants monitoring
Monitoring of meteorological parameters in environmental-hazardous plants such as landfills and waste treatment plants. Solutions for odours dynamics, rain quantity and deepwater level&quality.

Compost and biofilters
Systems to monitor the compost maturation process and bio-filtration activity. We provide solutions for temperature, oxygen and water content monitoring, for on-line (wireless or cabled) and portable applications.

METEOROLOGICAL APPLICATIONS

AWS and Synoptic Meteorological systems
Complete surface weather observation systems according to WMO standards for general or specific meteorological observations, operating individually or in networks.

Road and transportation monitoring systems
Meteorological measurements systems for roads, railroads, seaports and airports-including specific parameters such as wind, visibility, precipitation intensity and type, road-surface conditions and present weather.

Hydrology systems
Meteorological systems to control water both as a resource and as a hazard in hydrological networks and water-basin management – including measures of rain intensity, level and quality of water and snow.

Agrometeorology
Climate is the single most important factor for crops growth and health. We offer a complete range of application-specific monitoring for leaf wetness, evapotranspiration, soil water content and photosynthetic-active radiation.

Wind energy
From site assessment to wind turbine control, our complete meteorological catalogue with its full range of anemometers and data logger, gives wind energy professionals one of the most complete arrays of solutions available on the market.

Solar energy
As Italy evolved into a premium solar energy market, we became the preferred choice for plant owners, EPC contractors and monitoring systems producers as we developed a unique knowledge of the application to go along with our meteorological and radiometric know-how.

The LSI LASTEM Story

40 years of experience in environmental technology

www.lsi-lastem.com

1972 - Laboratori di Strumentazione Industriale (LSI) Spa is organized in Milano by former members of a previously existing electronic research company (LRE) and begins the production of electrical thermometers. Soon afterwards, the company adds systems to measure relative humidity through the psychrometric method and hot-wire anemometers to his portfolio.

1975 - The company introduces graphic recorders for the online printing of the measured values and a line of converters for the connection of sensors to industrial systems. In just a short time, the range of products and measured quantities is remarkably increased with the introduction of sensors for the measurement of different types of temperature radiant, contact and of liquids, along with luxmetric sensors and hygrometers.

1979 - Introducing the LASTEM logo, the company begins the production and distribution of his line of sensors and data acquisition systems specific for meteorological applications. LASTEM Srl is now operative.

1980 - LSI is the first company in Italy to produce instruments for the measurement and storage of the thermal environments parameters requested in the health and safety regulations in working environments.

1985 - LSI and LASTEM transfer their head offices from Viale Liguria (Milan) to the current Settala (MI) headquarters, consisting in three twin buildings.

1990 - After the consolidation of computer technology and storage possibilities, LSI develops a series of PC-compatible acquisition systems and software.

1995 - A new concept of measurement is then started: multi-measurement system - one single system able to measure not just a few parameters, but a whole range of quantities which, altogether, can solve a specific application need.
The multi-measurement concept has been a company mainstay since, widening the range of sensors for the measurement of environmental quantities such as gas concentration, thermic flows, lux and radiation.

2000 - LSI further develops its range, with a new sensor line equipped with data transmission via radio to data acquisition systems.

2004 - Aiming at offering a more complete range of services and better quality standards to his clients, LSI creates the new “After-Sale Services” division, designed to offer support and service after the purchase of the instruments: Telephonic Assistance, Data Collection, Repair Service and External Assistance.

2006 – LSI and LASTEM are united under the same brand and logo, with the new LSI LASTEM name.

2010 – A new concept of multi-position measurement is started: thanks to radio technology applied to data loggers and sensors, the multi-measurement concept is extended to a multi-position concept. Now LSI Lastem can develop complex systems producing simultaneous measurement of a number of parameters in different positions of the targeted environment.

LSI LASTEM Headquarters
Settala (MI) ITALY

www.lsi-lastem.com

LSI LASTEM headquarters in Settala, near Milano, Italy is a 1325 m^2, 3 twin-building structure that's been home to our company since 1985. Here, a team of 30 professionals is employed in engineering, production, aftersales, marketing and administration departments.

R&D
Each and every LSI Lastem product is designed, developed and tested here. Our skill set includes physics, mechanics, electronics, firmware and software engineering.


Mechanical Shop
The backbone of LSI Lastem products takes shape in our in-house shop. Our expert craftsmen produce here sensor bodies, supports and mechanical components.


Sensors assembly division
Given our extensive range of sensors, this is always one of the busiest areas of the company. After completion, sensors are moved in the nearby calibration laboratories for testing.


Data Loggers Assembly division
Data Loggers are the absolute core of our systems. Here they are assembled, configured and tested – the latter activity lasts for a 7-day period.


adquarters

Settala (MI) ITALY

Calibration Laboratories

To ensure consistent and dependable performance, we calibrate each sensor against traceable standards in a specific calibration facility. Our laboratory is accredited by ACCREDIA Italian Accreditation System, the National Body for accreditation activities, equivalent to ISO/IEC 17025.

Aftersales

We have a skilled, dedicated team for aftersales services. Their duties include repairs, calibrations, on-site installations and maintenance. In addition, we perform data management services to our customer - data download, validation and web publication.

Training

We have always believed in the benefit of offering training for our customers to make the use of our system more productive and easier. That's why we have a dedicated room for our year-round training seminars.

Pluvi-ONE
Rain monitoring and early warning system

www.lsi-lastem.com

Highlights

- Smart rain analysis: totals, intensity and running/ current cumulative values
- Alarms: instant messaging service, FTP and local digital outputs
- Large internal memory, plus external memory
- GPRS/3G, Ethernet, WiFi, UHF radio and Satellite communications
- Class A rain gauge with double rain gauge option for redundancy
- Inputs for air temperature, RH, water level, lightning, SDI-12 and Modbus-RTU sensors.
- Backlit display readable from outside
- Configuration file saved in FTP server and ready for automatic remote upload into Pluvi-ONE system. Local upload using USB flash drive
- Remote firmware update
- Open architecture based on built-in Linux PC

Pluvi-ONE is a new integrated system for rain monitoring and early warning information. It is composed of a rain gauge installed on a pole together with data logger data controller), power system and communication devices. Pluvi-ONE unique features makes it a state-of-the-art solution for rain monitoring and early warning applications in hydrology and rain monitoring networks.

Main Features

Measurements

Pluvi-ONE supports the following measurements:

- Rain: n.2 pulse-digital inputs for two independent rain gauges or a single double-reed relay rain gauge

- Temperature: n.1 analogue input for three wires Pt100 temperature sensor

- Temperature and RH: n.1 dedicated serial-digital input for temperature and RH sensor

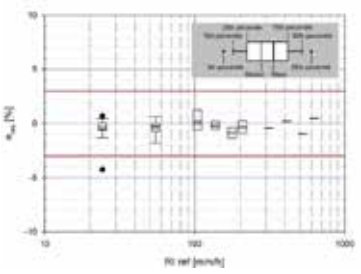
- Water level: n.1 0/4÷20 mA analogue input for water level sensors

- Storm front distance: n.1 dedicated serial-digital input for lightning sensor

- Barometric pressure: n.1 internal Barometer (integrated inside the data controller board).

Class A rain measurements

LSI LASTEM rain sensor is a tipping-bucket rain gauge of 203 mm diameter with 0.2 mm resolution (option 0.1 mm with larger inlet area), heater (option) and siphon (option). When without siphon, Pluvi-ONE adjusts its measurements at different intensities using a correction algorithm in conformity to the UNI11452:2012 standard for class A rain gauge.



Residual percentage relative errors eres [%] of one-minute rainfall intensity measurements assessed from LSI LASTEM rain gauge under various reference rates RIref [mm/h] after dynamic calibration performed. The two red lines indicate the current CIMO limits (3% for the Class A) showing that LSI LASTEM rain gauge can easily fulfil tight accuracy requirements on a wide range of rainfall rates when proper calibration and RI computation algorithms are used

Redundancy of rain data

Pluvi-ONE can be connected to two rain sensors to produce a redundant system for rain measurement. Redundancy mode can be applied using two rain gauges or one rain gauge with dual reed relay.
The redundancy logics stores the correct rain measure when one of the two sensors report a faulty condition; Pluvi-ONE can trigger an alarm output related to the fault.

Lightning sensor

Pluvi-ONE has one dedicated input for sensor (DQA601) to detect the storm front distance (not lightning.strike intensity) within an area of in 6÷40 km measured in 14 steps (5, 6, 8, 10, 12, 14, 17, 20, 24, 27, 31, 34, 37, 40 km).
Utilizing a sensitive RF receiver and integrated proprietary algorithm, the DQA601 detects the electrical emissions from lightning activity and then provides for an estimation of the distance to the head of the storm from 40 km away, while rejecting disturbances from man-made signals such as motors and microwave ovens. The estimated distance which is displayed in the distance estimation register does not represent the distance to the single lightning but the estimated distance to the leading edge of the storm.

Temperature and RH measurement

Pluvi-ONE can be equipped with a Pt100 temperature (or digital air temperature and RH) sensor equipped with a radiant shield.

Water level measurement

Pluvi-ONE has one analog input to receive 0/4÷20 mA coming from water level sensors. LSI LASTEM supplies water level sensors based on different technologies: piezometric, ultra-sonic, radar.

Integrated Pressure sensor

Pluvi-ONE has an integrated barometric pressure sensor with 300÷1100 hPa range and optimal accuracy of ±0,25 hPa (-20÷85°C)

SDI-12 input (available by year 2018)

Pluvi-ONE is equipped with a SDI-12 (v.1.1) input to receive signals from sensors using this connection technology.

GPS

Pluvi-ONE can be equipped with an optional GPS receiver (DFA215) connected to RS-232 port.
It send the geographical position of the system to the remote server.

Modbus RTU Master/ Slave protocol (available by year 2018)

Pluvi-ONE can be connected to external sensors using Modbus RTU protocol over RS485 bus in Master mode. Alternatively, Modbus can work in Slave mode sending data to Modbus Master devices.

Data elaboration

Pluvi-ONE produces, stores and send statistical information to FTP servers (in ASCII format) using up to 6 different statistical programmable time bases (user's programmable from 1 minute to 24 hours'). Each measured quantity can have different statistical information:
- Current/Inst/Min/Time Min/ Max/Time Max/Ave/SD (for Rain intensity, Temperature, RH, Water level, Pressure, Storm front distance)
- Total/Current (for rain)

Current is the statistical or total value since the last reset up to the current time. The reset time span is programmable.

Memory

Pluvi-ONE has a big internal data memory of more than 400 MB. An external USB memory (industrial grade) can be used to extend it up to 32 GB (FAT32 limited). A USB flash drive(XLA010) can be connected continuously to store data or can be connected only to download them from the internal memory.
Pluvi-ONE stores and send data in ASCII format.

Data communication

Pluvi-ONE can work with the following communication modes:
- GPRS/3G modem
- Ethernet (included)
- UHF radio
- Wi-Fi
- Satellite
- Modbus RTU protocol over RS485 opto-isolated port.

Data destinations can be programmed to one or more independent FTP servers.

Rate of communication

Pluvi-ONE can adjust its data communication rate to FTP servers as function of the changing status of measurements. Example: it is possible to increase the communication rate when the rain intensity is more than a programmable value (read "Early warning alarms" paragraph).

Communication channel priority

Pluvi-ONE can be connected to two communication devices (satellite and terrestrial) at the same time, and chose the best communication option according to signal availability.

Real time measurements

Apart from stored data, Pluvi-ONE can perform the following real-time measurements:
- Current and Running Min/ Max/Ave/SD (for Rain intensity, Temperature, RH, water level, Storm front distance)
- Current and Running total (for rain)

Running is the statistical or total value over a time span data to current time. Newest data delete the oldest data.

Real time measurements are available on the following outputs:
- RS232 (LSI LASTEM's proprietary protocol)
- RS485 (Modbus-RTU)
- On local display
- Available for instant messaging systems (see "Telegram" paragraph)

Local communication to PC

Pluvi-ONE can be connected to a local PC for data downloading and system configuration, using the following modes:
- Ethernet port
- Wi-Fi (using DEA556 optional module on USB port)
- Ethernet port

Early warning alarms (Telegram, FTP, digital outputs)

Pluvi-ONE generates alarm information with the following modes:
- FTP
- Telegram protocol,
- Local digital outputs (see "Local digital outputs" paragraph)

Alarm logics are user's programmable over the following:
- Thresholds over instant or running values
- Difference between Min&Max values within a time span
- Faulty rain measurement (see "Redundancy of rain data" paragraph)
- System status

Delay and hysteresis are user's programmable.

Telegram

Telegram is an APP on mobile devices. It is a instant messaging service delivered non profit by Telegram LLC.

This allows inquiry and receive relevant information from Pluvi-ONE, such as configuration, real time measurements, and stored data. It is also possible to program Pluvi-ONE to send alarms (read "Early warning alarms" paragraph) to one or a group of Telegram users. Each user can inquiry information to Pluvi-ONE.

Local digital outputs

Pluvi-ONE has three digital outputs to power and trigger external devices (as modem, sensor, camera, siren, etc.) using programmable logics:
- Early warning alarms (read "Early warning alarms")
- Timer

Power to the outputs is equal to the main power supply value received by the system less 0,5 V, in any case, maximum output is 12 V. (example: when Pluvi-ONE receives 9V, the power to each outputs is 8,5 V. When main power supply is 24 V, power to each outputs is 12 V).

External siren

Pluvi-ONE system can be equipped with an optional siren (DFA200) mounted on the ELUnnn enclosure. Pluvi-ONE triggers the siren using its local digital output and its alarm logics (see "Early warning alarm" paragraph).

Configuration

Pluvi-ONE configuration file is produced by a PC program (3DOM) and is saved into a FTP server (managed by LSI LASTEM, or managed by the user). Pluvi-ONE is programmed to check this FTP server and download the latest configuration file available. The file can also be saved on a USB drive and uploaded by the instrument's USB port.

Remote firmware update

Pluvi-ONE can update its firmware when connected to the Internet. New firmware updates are available on the LSI LASTEM FTP server. Pluvi-ONE periodically checks if a new release is available and downloads it from the server to its memory. Firmware update can also be performed locally by USB drive.

Clock adjustment

Internal clock (accuracy 1 min/ month) can be adjusted by NTP (Network Time Protocol) when Pluvi-ONE is connected to the Internet.

Peripherals

Pluvi-ONE is equipped with the following:

N.2 RS232 ports (modem, local PC, GPS, sensors with serial output)

N.1 RS485 opto-isolated (Modbus MASTER/SLAVE)

N.2 USB ports (Pen drive, Wi-Fi adapter, additional RS232/485 ports)

N.1 Ethernet port (Local/Remote communication, IP Camera)

Local display

Pluvi-ONE is equipped with a backlit LCD display (4x20 chrs), which can be read from the outside without opening its box (ELU001/002 enclosures only).
The following information are available:

- Real time measurements (see "Real time measurements" paragraph)
- Last 10 alarms and Error events
- Communication statistics
- System/reset date/time
- Battery status
- IP address
- System and memory status
- Actuator status
- Etc.

Camera

Pluvi-ONE can be equipped with an optional IP camera (DEA???) to send images to an addressed FTP site.
The camera powering cycle to increase/decrease the acquisition frame can be programmed according several logics (read "Local digital outputs" paragraph). This reduces the overall power consumption and data communication costs.

Power supply

Pluvi-ONE runs on 6÷30 Vdc. Pluvi-ONE can charge, from solar panel or mains, one Pb battery using its integrated battery regulator. LSI LASTEM supplies IP65 enclosures with power supply options:

- ELU001: Solar power supply with integrated 4 W solar panel and 9 Ah battery.
- ELU002: Power supply from mains with integrated power unit and 9 Ah battery.
- ELU004: Solar power supply using external solar panel and bigger battery. Includes room for 15-40 Ah battery and configuration for 50 W solar panel.
- ELU003: Double power supply system from mains and solar panel. Includes power unit from mains, 9 Ah battery, room for additional battery 15 ÷ -40 Ah and configuration for 50 W solar panel.

See "Accessories" paragraph.

Power consumption and battery life

Pluvi-ONE data logger power consumption: average < 1 mA (display off)

Power consumption (using 3G modem, rain sensor only).

	Power consumption (average)
1 com/day	40 mW
1 com/hr	450 mW

Battery life (in days)

	Battery options		
	9 Ah	**15 Ah**	**40 Ah**
1 com/ day	100	200	400
1 com/ hr	7	14	30

Power autonomy in days (using 3G modem, rain sensor only, starting from full battery charge and without sun).

Software

Pluvi-ONE includes the 3DOM PC program. 3DOM perform the following tasks:

- Pluvi-ONE system setup
- Upload setup file to FTP server or USB pen driver ready to be uploaded by PluviONE when connected to Internet.
- Upload setup file to PluviONE by Ethernet port.
- Download (in manual or automatic mode) data from a specific FTP server (where Pluvi-ONE sent its data) and save it in TXT file or GIDAS-SQL data base. When data are saved on the GIDAS-SQL data base they can be available for their management using other LSI LASTEM's programs.

Code	Description
	Pluvi-ONE data controller
ELP001	Pluvi-ONE data controller. 400 MB internal memory, 6-30 Vdc power supply. Built-in barometer. Complete with 3DOM software
XLA010	USB-drive 8 GB (industrial grade)

Pluvi-ONE Data controller

Pulse Inptus (Rain gauge inputs)	*Inputs number*	N.2
	Inputs mode	Redundancy modes: - N.2 single relay reeds from two rain gauges - One rain gauge with double reed relay system
	Power supply	Limited to 1 mA for relay reed
	Input type	Open collector with 3.3 V pullup resistance (positive input)
	Max input frequency	480 KHz
	Linearization	Yes
	Protections	- 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
Serial-digital Input (Temperature sensor input)	*Type*	Serial bus type
	Principle	Pt100
	Range	-40÷80 °
	Resolution	0.01°C
	Accuracy	±0.1 °C @ 0 °C
Serial-digital Input (RH% sensor input)	*Type*	Serial bus type
	Range	0÷100 % RH
	Resolution	0.1 % RH
	Accuracy	±1.5 % RH (@5÷95%)
	Protections	- 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
Pt100 Input (Temperature sensor input)	*Principle*	Pt100 3 wires
	Range	-40÷70 °C
	Resolution	0.1°C
	Accuracy	±0.25 °C
	Protections	- 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

continued

Lightning Input	*Measurement*	Distance from storm front
	Range	5÷40 km, divided into n.15 steps: 0, 5, 6, 8, 10, 12, 14, 17, 20, 24, 27, 31, 34, 37, 40 km
	Sensitivity	Electrostatic discharges ground-cloud or in-between clouds
Analogue Input (Water level sensor input)	*Range*	0/4÷20 mA
	Mode	Water level sensor
	Resolution	< 0.01 mA
	Accuracy	±0.03 mA
	Protections	- 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
Internal Measurement (Barometric Pressure)	*Range*	300÷1100 hPa
	Resolution	Typ. 0.084 hPa
	Accuracy	± 0,15 hPa (@ 25°C, 750 hPa) ± 0,25 hPa (-20÷85 °C, 300÷1100 hPa)
	Long term stability	±1 hPa/yr.
Internal Measurement (Power)	*Mode*	Battery or power supply level
	Type	Voltage
SDI-12 input	*Type*	V1.1 compliant

	Protections	- Opto-insulation
		- Inversion polarity (12 V – Gnd) from external power supply
		- 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
		- DATA-SDI12 line protection with gas discharger and digital insulation:
		  - 1-2 kA surge capability tested with 8/20 µS pulse as defined by IEC 61000-4-5
		  - Conforms to ITU-T K12, IEC 1000-4-5
		  - Data lines 4000 V peak isolation, 560 V peak VIORM

RS485 Input/output	*Input numb*	N.1
	Mode	- Connection to sensor (Modbus RTU Master protocol) - Connection to SCADA/PLC systems (Modbus RTU Slave protocol)
	Protections	- 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 - Data lines 4000 V peak isolation, 560 V peak VIORM - Power supply 3 kVdc isolation capability

continued

RS232 Input/output	*Inputs numb.*	N.2
	Mode	- Connection to digital-serial sensors - Connection to GPS receiver - Connection to communication systems (2G/3G modem, radio)
	Protections	- 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
Power Outputs	*Outputs numb.*	N.3
	Type	Solid-state for 10.5 V communication output
	Max tension	0.6 A each output, 1.0 A together
	Mode	- External sensors power supply - Communication system power supply - Alarm - Timer (date/time or cycles)
	Power capability	400 W peak pulse at 10/1000 µs waveform. Repetition rate (duty cycle): 0.01%.
	Protections	- 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 - Protection for over-circuit and over-current
Memory	*Type*	Three levels storage system for greater reliability: 1) 8/16 MB on Flash chip LSI LASTEM file system 2) 400 MB on Flash chip with UBIFS file system 3) Up to 32 GB on USB memory stick with FAT32 file system
User interface	*Display*	4 lines x 20 char.
	Keyboard	M.4 buttons
	Leds	Diagnostic about: - 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
	Filter	Noise filtering for 50/60 Hz
Data Transmission	*Modem*	External 2G/3G modem (connection to RS232 port)
	Router	3G/4G router (connection to Ethernet port)
	Radio	Low power consumption radio (connection to RS232 port)

continued

Linux computer	*Type*	Linux based internal computer with open and end-user extensible architecture
	Power modes	- always ON (always connected to Internet) - automatic power ON (awake for data transmission only, best energy performance)
	Linux kernel	V. 2.6.35, Debian Wheezy distribution
	Ethernet	Ethernet 10/100 Mbps
	USB ports	Nr. 2 USB ports, Host, Type-A connector
	Flash memory	2 GB Flash with UBIFS file system
	RAM	128 MB
Watch dog Power supply	*Type*	Dual/redundant watch dog system
	Power supply	6÷30 Vdc
	Inputs	Separate inputs from 6÷30 Vdc power supply: - From solar panel (13.8 Vdc), 1.85 A max current - From battery/main power supply
	Peak pulse power capability	400 W peak pulse at 10/1000 µs waveform, Repetition rate (duty cycle): 0.01 %
	Battery charge	17 V
	Protections	- 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
Environmental limits	*Operating temperature*	-30÷60 °C.
	Operating humidity	10÷99 % RH, not condensing
	Storage temperature	-40÷80 °C
Physics	*Weight*	600 g
	Dimensions	160x125x50 mm
	Mounting	DIN mounting rail 35 mm

Sales Kit

Pluvi-ONE: Rain monitoring and early warning system

KIT 1.0

Pluvi-ONE system, power supply from solar panel, option with double power: solar and main

KIT 1.1

Pluvi-ONE system. Power supply from main power supply

Code	Description	KIT 1.0	KIT 1.1
	Pluvi-ONE data controller		
ELP001	Pluvi-ONE data controller, complete with 3DOM program	●	●
XLA010	USB-drive 8 GB (industrial grade)	●	●
	IP65 enclosures		
ELU001	Pluvi-ONE enclosure with transparent window for display reading. Including: - Tiltable 4 W solar panel - 9 Ah battery - Arm for fixing enclosure, rain gauge and temperature+RH sensor on pole diam. 50 mm	●	
ELU002	Pluvi-ONE enclosure. Including: - Power supply 110-230 Vac->12 Vdc battery charger - 2 Ah backup battery - External IP66 connectors for sensors - Mounting for pole diam. 50 mm		●
ELU003	Pluvi-ONE enclosure. Including: - Power supply 110-230 Vac->12 Vdc battery charger - 2 Ah backup battery - External IP66 connectors for sensors - Mounting for pole diam. 50 mm Setup for: - 15-40 Ah battery - 50 W solar panel		Note 1
ELU004	Pluvi-ONE enclosure. Including - External IP66 connectors for sensors - Mounting for pole diam. 50 mm Setup for: - 15-40 Ah battery - 50 W solar panel	Note 2	
	50 W solar panel for ELU003-004	Note 2	Note 1
DYA102	50 W solar panel, complete with installation arm for pole 45÷65 mm pole		
	Extra batteries for ELU003-004	Note 2	Note 1
MG0558	Pb15 Ah battery	Opt.	Opt.
MG0560	Pb40 Ah battery	●	Opt.
	Pole H.1 m		
DYA005	Mast H=1m. Ø 50 mm	●	●
	Tripod for concrete installation	Note 3	Note 3
DYA020	Tripod	●	●
DYA020.1	Set of n.3 anchoring bolt for DYA020 base	●	●
	Tripod for ground installation	Note 3	Note 3
DYA021	Tripod for ground installation		
DYA023	Set of n. 3 pickets		
	Rain gauge	Note 4	Note 4
DQA230#C	Rain gauge 0,2 mm resolution. Calibration certificate included	●	●
DQA231#C	Rain gauge, 0,2 mm resolution with heater (needs ULU002-003 enclosure). Calibration certificate included	Opt.	Opt.
DQA230.1#C	Rain gauge 0,2 mm resolution. With siphone. Calibration certificate included	Opt.	Opt.
DQA231.1#C	Rain gauge 0,2 mm resolution. With siphone and heater. Calibration certificate included	Opt.	Opt.
DQA232#C	Rain gauge 0,1 mm resolution. Calibration certificate included	Opt.	Opt.
DQA233#C	Rain gauge, 0,1 mm resolution with heater (needs ULU002-003 enclosure). Calibration certificate included	Opt.	Opt.
DQA232.1#C	Rain gauge 0,1 mm resolution. With siphone. Calibration certificate included	Opt.	Opt.
DQA233.1#C	Rain gauge 0,1 mm resolution. With siphone and heater. Calibration certificate included	Opt.	Opt.

continued

Code	Description	KIT 1.0	KIT 1.1
DWA505.1	Cable for rain gauge L = 5 m with IP66 female connector to ELUnnn enclosure	●	●
	Assembling for a second rain gauge installation		
DYA058	Lateral bar for mounting another rain gauge on the same ELU001/002 assembling	Opt.	Opt.
DYA040.1	Tripod for fixing second rain gauge on DYA058 bar	Opt.	Opt.
	Modem	Note 5	Note 5
DEA718.1	2G modem, completes with RS232 cable, antenna	Opt.	Opt.
DEA718.2	3G modem, complete with RS232 cable, antenna	Opt.	Opt.
DEC006	High gain antenna, completes with cable and mounting accessories to pole 50 mm diameter	Opt.	Opt.
	WiFi module	Note 6	Note 6
DEA556	WiFi module completes with installation accessories	Opt.	Opt.
	Satellite communication system	Note 7	Note 7
DEA560	Satellite system, completes with antenna and installation accessories	Opt.	Opt.
	GPS module	Note 8	Note 8
DFA215	GPS module. RS232 output	Opt.	Opt.
	Camera	Note 9	Note 9
CAM016	IP camera completes with installation accessories	Opt.	Opt.
	Alarm siren	Note 10	Note 10
DFA200	Siren, acoustic&visual alarm, complete with installation accessories	Opt.	Opt.
	Additional sensors		
	Temperature and Relative Humidity sensor		
DMA672.4	Thermohygometer with cable and IP66 female connector to ELUnnn enclosure	Opt.	Opt.
DYA233	Radiant screen for DMA672.3	Opt.	Opt.
	Storm front sensor		
DQA601	Storm from sensor to measure lightning activity distance, completes with installation accessories	Opt.	Opt.
	Water level sensor (piezometric)	Note 11	Note 11
DQC101.N	Piezometric water level sensor	Opt.	Opt.
	Water level sensor (ultra-sonic)	Note 12	Note 12
DQL003	Ultra-sonic water level sensor. Range 0,25÷5 m		
DQL005	Ultra-sonic water level sensor. Range 0,4÷8 m		
DQL006	Ultra-sonic water level sensor. Range 0,6÷15 m		
	Water level sensor (radar)	Note 12	Note 12
DQL008	Radar water level sensor		

Note 1 Required where the system is working using mainly the main power supply, but where is it possible to have long interruptions of the electricity service. This enclosure has the capability to receive bigger batteries (15 or 40 Ah) and 50 W solar panel for extra safety.
Note 2 Required when extra power supply is needed. It can be the case of high power consumption from external equipment and/or sites where often low sunshine availability occurs.
Note 3 It is possible to fix the pole on a tripod placed on the ground directly (using DYA021+DYA023 tripod) or by mean of a concrete plinth (using DYA020+DYA20.1 tripod).
Note 4 Select the rain gauge model according to the requirements. Attention, heater version can only work with main power supply. Only models without siphone can be classified as “Class A” rain gauge.
Note 5 Select the modem version according to the requirements.
Note 6 WiFi module can be connected as the same time with GPRS modem. Pluvi-ONE will select the preferable way to send data to server.
Note 7 Satellite module can be connected as the same time with GPRS modem. Pluvi-ONE will select the preferable way to send data to server.
Note 8 GPS module is connected to RS232 port.
Note 9 Camera is connected to Ethernet port.
Note 10 Alarm siren is connected to actuated power output.
Note 11 Piezometric water level sensor can have different submergible cable lengths. The “N” after the PN is referring to the cable length (example DQC101.10 = cable L = 10 m).
Note 12 Select the water level according to the requirements.

Code	Description
	IP65 enclosures for Pluvi-ONE data controller
ELU001	Pluvi-ONE enclosure with transparent window for display reading. Including: - Tiltable 4 W solar panel - 9 Ah battery - External IP66 connectors for sensors - Arm for fixing enclosure, rain gauge and temperature+RH sensor on pole diam. 50 mm Setup for: - External siren - Modem
ELU002	Pluvi-ONE enclosure with trasparent window for display reading. Including: - Power supply 110-230 Vac->12 Vdc battery charger - 9 Ah battery - External IP66 connectors for sensors - Arm for fixing enclosure, rain gauge and temperature+RH sensor on pole diam. 50 mm Setup for: - Heated rain gauge - External siren - Modem
ELU003	Pluvi-ONE enclosure. Including: - Power supply 110-230 Vac->12 Vdc battery charger - 2 Ah backup battery - External IP66 connectors for sensors - Mounting for pole diam. 50 mm Setup for: - 15 or 40 Ah battery - 50 W solar panel - Heated rain gauge - External siren
ELU0014	Pluvi-ONE enclosure. Including - External IP66 connectors for sensors - Mounting for pole diam. 50 mm Setup for: - 15 or 40 Ah battery - 50 W solar panel - External siren -Modem
	50 W Solar panel
DYA102	50 W solar panel. Complete with arm for installation on dia. 45-65 mm pole
	Pole
DYA005	Mast H=1m. Ø 50 mm
	Tripod for concrete installation
DYA020	Tripod
DYA020.1	Set of n.3 anchoring bolt for DYA020 base
	Tripod for ground installation
DYA021	Tripod for ground installation
DYA023	Set of n. 3 pickets
	Arm for rain gauge on lateral side or on top of pole
DYA058	Lateral arm for second rain gauge on pole
DYA040.2	Arm to fix second rain gauge on DYA058 arm or on top of diam.50 mm poles
	Alarm siren
DFA200	Siren, acoustic&visual alarm, complete with installation accessories
	Camera
CAM016	IP camera

continued

Code	Description
	Modem
DEA718.2	2G modem, complete with antenna
DEA718.3	3G modem, complete with antenna
	WiFi module
DEA556	WiFi module, complete with installation accessories
	Satellite communication system
DEA560	Satellite system
	GPS module
DFA215	GPS module, complete with installation accessories

	DQA 230 #C	DQA 230.1 #C	DQA 231 #C	DQA 231.1 #C	DQA 232 #C	DQA 232.1 #C	DQA 233 #C	DQA 233.1 #C
Siphon	No	Yes	No	Yes	No	Yes	No	Yes
Resolution	0,2 mm	0,2 mm	0,2 mm	0,2 mm	0,1 mm	0,1 mm	0,1 mm	0,1 mm
Heater	No	No	Yes	Yes	No	No	Yes	Yes

	DWA505.1	Cable for rain gauge L = 5 m with IP66 female connector for ELUnnn enclosure
		Temperature+RH sensor
	**DMA672.4**	Temperature+RH sensor Cable L = 1 m with IP66 female connector for ELUnnn enclosure Temperature sensitive element: Pt100 1/3 DIN Temperature range: -30÷70°C Temperature accuracy: 0,1°C RH% sensitive element: thin capacitive film RH% range: 0-100% RH% accuracy: ±1,5% RH (@5÷95%)
	DYA233	Radiant screen for DMA672.1 fixed on the Pluvi-ONE
		Storm front sensor
	**DQA601**	Storm from sensor to measure lightning activity distance Franklin Lightning Sensor with distance estimation up to 40 km in 14 steps, embedded Disturber rejection algorithm & auto antenna tuning
		Water level sensor (piezometric)
	DQC101	Water level sensor Principle: Piezometric type Range: 0÷10 m Accuracy: < 0,5% Full scale (IEC60770) Cable: options 15÷60 m
		Water level sensor (ultra-sonic)
	**DQL004**	Water level sensor Principle: Ultra-sonic (70 kHz) Range: 0,25÷5 m Accuracy: ± 1 cm (+18÷30°C, 860÷1060 hPa)
	DQL005	Water level sensor Principle: Ultra-sonic (70 kHz) Range: 0,4÷8 m Accuracy: ± 1 cm (+18÷30°C, 860÷1060 hPa)
	DQL006	Water level sensor. Water level sensor Principle: Ultra-sonic (70 kHz) Range: 0,6÷15 m Accuracy: ± 1 cm (+18÷30°C, 860÷1060 hPa)
	DYA004	Lateral support for diam.50 mm pipe
		Water level sensor (radar)
	DQL008	Water level sensor. Range 0÷8 m

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