Rain gauge



- Design made in compliance to WMO
- Class A (UNI EN 17277:2020) accuracy over intensity (see PN)
- Syphon to adjust the water flow (see PN)
- Aluminum made for rugged installations
- Heated versions availability (see PN)
- Impulse output and external optional devices for 4...20 mA or Modbus outputs (XLA003.1-003.2)

A Rain gauge is a device to measure liquid rainfall amount and intensity. The device is composed of a rain collector cone and a double-chamber tipping bucket connected to a magnet. The magnet operates one reed switch, which generates impulses that can be counted by external meters. Siphon versions (DQA230.1-231.1-230.3) are equipped with a siphon placed on the cone's nozzle; it has function during heavy rain, to regulate the flow into the tip permitting all the water to fall inside the tipping bucket. This solution gives its best results where the main need is the measurement of the total amount of rain over long periods.
Class A rain gauges versions (DQA230-231-235-236) have the "Class A" class accuracy as described by the UNI EN 17277:2020 standard. It is the most accurate class for intensity measurement. For Class A accuracy achievement, a correction formula on the data acquisition system is required.

Technical Specifications

PN	DQA230	DQA231	DQA230.1	DQA231.1	DQA235	DQA236	DQA230A.3
							
Class A (UNI EN 17277:2020)	YES	YES	NO	NO	YES	YES	NO
Calibration certificate	Included for Class A		On request	On request	Included for Class A		On request
Diameter	203 mm	203 mm	203 mm	203 mm	360 mm	360 mm	203 mm
Collector area	323 cmq	323 cmq	323 cmq	323 cmq	1000 cmq	1000 cmq	323 cmq
Weight	1.3 kg	1.4 kg	1.4 kg	1.5 kg	3 kg	3.2 kg	5.5 kg

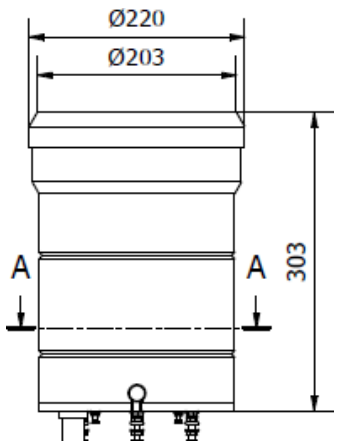
PN	DQA230	DQA231	DQA230.1	DQA231.1	DQA235	DQA236	DQA230A.3
Heater	NO	YES 24 V AC (Max 60 W)	NO	YES 24 V AC (Max 60 W)	NO	YES 24 V AC (Max 50 W)	NO
Heater operative temperature	-	>-20...4 °C	-	>-20...4 °C	-	>-40...4 °C	-
Siphone	NO	NO	YES	YES	NO	NO	SI
Accuracy	0...300 mm/h intensity 3% UNI EN 17277:2020 (using correction formula)		Accumulate rainfall amount 0...20 mm/h: ± 0.2 mm 20...240 mm/h: 1% >240 mm/h: 2%		0...300 mm/h intensity 3% UNI EN 17277:2020 (using correction formula)		Accumulate rainfall 0...250 mm/h: 1% 250…500 mm/h: 1%…7%
Max range	500 mm/h				300 mm/h		200 mm/h
Protections	Capacitor debounce circuit				Polarity reverse and transient, Capacitor debounce circuit		Reed contact individual protection
Operative temperature	0...80 °C	-20...80 °C	0...80 °C	-20...80 °C	0...80 °C	-40...80 °C	0...80 °C
Cable	Not included (DWA5xxA)						Included. L=10 m
Material	Housing: UV resistance aluminum Tipping spoon: plastic Base: plastic				Housing: aluminum Tipping spoon: stain-less steel Base: PED		Collector: copper Tip: stainless steel Base: aluminum

Common Technical Specifications

Rain gauge	Principle	Switch close/open tipping bucket (DQA230A.3 double switch)
	Design	WMO accordance
	Output	dry reed switch contact pulses (R<250Ω)
	Pulse duration	100 ms ± 50
	Output resistance	100 mΩ/ 1MΩ
	Resolution	0.2 mm (DQA230A.3 resolution 0,1 mm)
	Levelling unit	Bubble air fixed on the base
	Protection from dirtiness	Removable filter on the in-let
	Protection rate	IP66
	Data logger compatibility	E-Log, Alpha-Log



The LSI LASTEM's rain gauges have been developed taking the Class A standard as a reference (UNI EN 17277:2020 (Hydrometry - Measurement requirements and classification of rainfall intensity measuring instruments). Class A assures an accuracy over intensity of 3% within 0...300 mm/h range.



Sensor's design has been made to meet the requirements of the WMO (Guide n.8).

Classe A (UNI EN 17277:2020)

LSI Lastem produces collector rain gauges designed with the scientific support 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 shown in the Table. To fall into Class A, 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 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 fit the Class A classification when connected to Alpha-Log data logger where it is possible to set parameters obtained on the SVICA3105 calibration certificate.

Class	Maximum error (MPE)
A	± 3%
B	± 5%
C	± 5% ± 10%

LC-PrIn B. Castelli



Calibration apparatus designed and built by the WMO-CIMO Lead Center on Precipitation Intensity - Benedetto Castelli

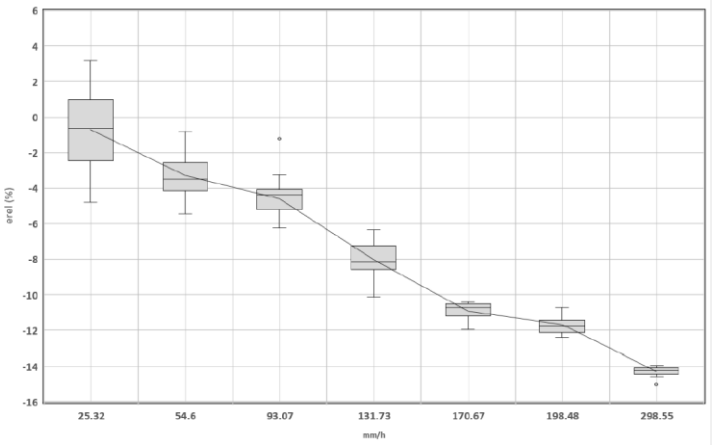
The calibration procedure is divided into 3 parts:

- verification of the balance of the tipping spoons
- quantification of the relative error between the measured and reference intensities
- interpolation of the curve of the relative errors as a function of the intensities, to obtain the 3 correction parameters (a, b and c)

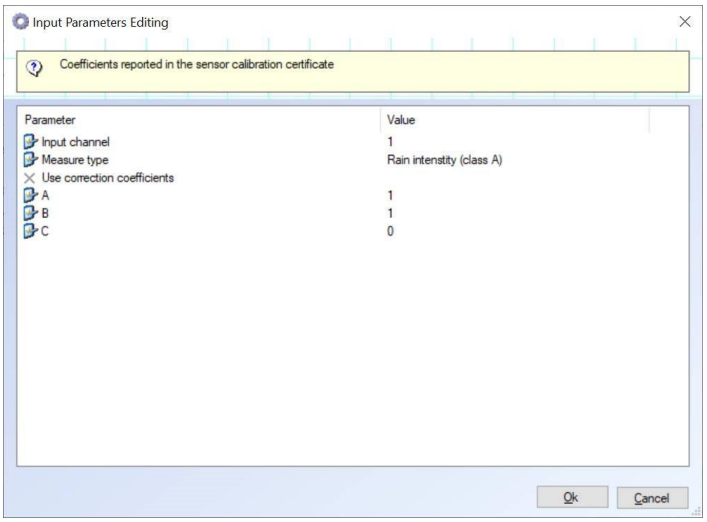
Thanks to a formula that considers the error curve applied to the data, already implemented on the data logger, it is possible to correct the measured intensity by obtaining the statistical distribution of the residual error at the various intensities, up to 300 mm/h. If the residual error is <± 3%, then the rain gauge fits Class A.

To be in Class A, the rain gauge requires:

- high level construction features
- an acquisition system with high accuracy in the measurement of time between two successive tips and with on board the calculation for data correction
- a calibration certificate that provides parameters a, b and c to be entered, via the configuration software, in the correction formula on board the data logger



a	b	c
-2.75727E-1	7.48059E-1	2.18029E+0



Curve of relative percentage errors as a function of intensity, obtained following the calibration procedure. It is possible to interpolate the curve with a power function and obtain the parameters a, b and c for the correction of the rainfall intensity data measured by the rain gauge. Each rain gauge needs its own calibration to be classified as Class A.

Alpha-Log data logger has the corrective formula for precipitation intensities on board. Following the calibration procedure, parameters a, b and c are obtained to be inserted in the 3DOM configuration software. Thanks to this setting the values recorded by the data logger are already correct and have a relative residual error <± 3% (Class A).

Accessories

	**DYA039.1**	Base plate for ground installation (DQA230-231-230.1-231.1) Compatible with DQA230A.3 using adapter DYA039.2
	DYA039.2	Adapter for DYA039.1 base when used with DQA340A.3
	**DYA040.2**	Mast-mounting device for Ø 50 mm pole (DQA230-231-230.1-231.1) Material: anodized aluminum
	DYA040.3	Mast-mounting device for Ø 50 mm pipe (DQA235-236)
	DYA040.4	Mast-mounting device for Ø 50 mm pipe (DQA230A.3)
	**DYA058**	Lateral support. Requires DYA040.2-DYA040.3
	**DWA505A**	Cable L=5 m
	DWA510A	Cable L=10 m
	DWA525A	Cable L=25 m
	MG2251.R	7 pin free female connector
	**XLA003.1**	Interface for 4-20 mA output. Input: pulse Output: 4...20 mA (with auto-reset) Power supply: 10...30 V DC (typ. 4 mA @ 12 V DC) Mounting: Din Rail Operative temperature: 40...80 °C
	XLA003.2	Interface for RS485 output. Input: pulse Output: RS485 (Modbus) Power supply: 10...30Vdc (typ. 4 mA @ 12 V DC) Mounting: Din Rail Operative temperature: 40...80 °C
	DQA220	Spare part rain gauge's plate with relay and tipping bucket for DQA230-230.1
	SPMSA1000	Spare rain gauge's upper part, complete with filter, siphon and fascia for DQA230.1 and DQA231.1
	SVICA3101	Calibration certificate according to ISO9001

LSI LASTEM Srl
Via Ex SP. 161 Dosso, 9
20049 Settala (MI)
Italy

Tel. +39 02 954141
Email info@lsi-lastem.com
www.lsi-lastem.com