PARATRONIC
Eau Environnement Risques Naturels

TECHNICAL INSTRUCTIONS

Entreprise certifiée ISO 9001

French manufacturer

PLV 400 & PLV 1000 RAIN GAUGES

RAIN GAUGE SETTING PROCEDURES

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1 TIPPING VALUE

The tipping value is linked with the rain gauge collection surface area (400 or 1000 cm²), the pulse resolution (1/10 or 2/10 of mm), and the rainfall.

The tipping value is calculated as follows:
(tipping value) = (theoretical tipping value) – (tail error)

Theoretical tipping value:

Type	Area in cm²	ml or g for tipping
PLV 400 2/10 mm	400	8
PLV 1000 1/10 mm	1000	10
PLV 1000 2/10 mm	1000	20

A tipping-bucket rain gauge is “accurate” for a given rainfall. Therefore, the user must define the rainfall for which the greatest measurement precision is required.

Indeed, the most important uncertainty factor is the so-called “tail” error. It is due to the water continuing to fall into a bucket while it is tipping. This error increases in importance as the rainfall increases.
The tail error is dependent on the tipping frequency. It always results in excess water in the bucket.

The tail error is approximately equal to:

Tipping per hour	0 t/hr	300 t/hr	750 t/hr	1000 t/hr	1500 t/hr
Error (positive)	0%	5%	8%	15%	25%

Over 1500 tips per hour, the tips can become erratic and the measurement is no longer meaningful.

Reducing the amount of water required to tip the buckets makes it possible to shift the point of best precision to a higher tipping frequency. On the other hand, it increases the error for lower frequencies. The best compromise should be defined according to the installation locations and users’ applications.

Note 1 : Example: for a 400 2/10 rain gauge and for a rainfall of 200 mm/h, the tail error is approximately 1.2 ml. Bucket tipping should be set to 6.8 ml to cancel out the error.

Note 2 : Shifting the point of best precision does not remove the need to limit to 1500 tips per hour.

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2 SETTING THE TIPPING VALUE

Before the tipping value setting is checked, the value itself needs to be defined.
Refer to the previous section.

Procedure:

1. Clean the bucket and funnel thoroughly without pressing on the bucket tipping axis.
2. Position the bucket support plate horizontally. The inclination of the bucket unit impacts the results.
3. Place the 'drip-breaker' rod in the funnel.
4. Pour water into the funnel to cause some tipping in order to weigh down the buckets with residual water (water remaining in the buckets after tipping).
5. Make the bucket tip while checking the quantity of water used. The water used can be measured by volume or by weight using a syringe, a graduated flask or scales, etc.
6. Based on the results, correct using the bucket stop setting screws. Tighten to reduce the quantity, loosen to increase it.
7. Repeat the inspection and setting operations until the correct calibration has been obtained.
8. Once the settings are complete, lock the positions with lock nuts and varnish.

Note 1 : Modifying the settings may result in unexpected changes (the changes may be excessive, or markedly insufficient, or even the opposite of the expected result). This is generally due to a warped bucket axis or the presence of water or, more rarely, of grease in the bearings or water droplets between the buckets and their mounts.
In this case, it may be necessary to disassemble the buckets by unscrewing the axis to rectify the problem.
In this case, it is necessary to perform an ILS setting check. Refer to the section "Setting the tipping axis".

Note 2 : If the imbalance between the bucket settings is too great, rebalance them by adjusting the counterweight screw at the bottom of the mechanism.

3 SETTING THE TIPPING AXIS

To set the axis of rotation, the following two criteria must be taken into account:

1. The right and left parts of the axis should provide enough play for the bucket to tip freely, without any friction.

2. Regardless of the positioning of the bucket on the axis play, the distance between the magnet and the ILS contact should enable a single, brief contact to be made during tipping.

If the distance is insufficient, this generates a risk of the contact remaining closed or of double pulses when the bucket rebounds.

If the distance is too great, this generates a risk of the contact remaining open or of pulse loss.

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