What is the accuracy of my measuring equipment?

Electrical measuring devices are more and more sophisticated; a basic electrical energy meter most often provides, in addition to the energy reading, a real-time display of the behaviour of the power network (voltage, current, power).

The accuracy of an electrical measurement, which in the past concerned only energy - the main item in an electricity bill - today concerns all of the electrical parameters of a network.

There are three standards of reference used to characterize the accuracy of the electrical measurement:

Standard of reference	Instrument concerned	Accuracy classes	Scope concerned
EN 50470-1 EN 50470-3	Electricity meters	A, B, C ou D	Measuring instrument only (Concerns the accuracy of the energy readings)
IEC 62053-21 IEC 62053-22	MID electricity meters (for billing purposes)	0.2S, 0.5S, 1, 2	Measuring instrument only (Concerns the accuracy of the energy readings)
IEC 61557-12	Power meter	For active energy: 0.2, 0.5, 1, 2 For active power: 0.1, 0.2, 0.5, 1, 2, 2.5	Measuring instrument only and whole measuring system (Concerns the accuracy of any electrical quantity)

What you should know:

There are differences in the designation of the classes between the EN 50470-X standards and the IEC 62053-X standards; however, by analogy, it can be held that class A and class 2, class 1 and class B, class 0.5S and class C, and class 0.2S and class D are equivalent.

The accuracy class indicates a maximum measurement uncertainty, in other words a maximum percentage of error, in a specified range of variation of the current and under specified environmental conditions. Typically, an active energy meter for a maximum current of 45A, such as the Ulys MD45, is in accuracy class 1: its accuracy will not be worse than 1% in a range extending from 5% In to Imax, or 0.25A to 45A (In = 5A, Imax = 45A).

The accuracy class so stated concerns the accuracy of the measuring instrument alone, such as a direct reading meter; if there are other elements in the measurement system (such as current or voltage sensors if an indirect-reading measuring instrument is used), refer to the FAQ "What is the accuracy of my measuring system?".

What is the accuracy of my measuring system?

For connections to high-power networks, or to connect to other circuits without opening the wiring, the measuring instruments are connected to current sensors; their presence in the measurement loop affects the accuracy of the measurement.

In the context of the association of a measuring instrument with sensors, the IEC 61557-12 standard indicates recommended CTs and gives the resulting classes:

For example:

- With a Ulys TT meter (class 1), we can choose a TCR (classes 0.5, 1, or 3 depending on the power in use)
- Similarly, with an Enerium 100 power meter in class 0.5, the same TCR can be used if the power in use is limited to the rated power corresponding to class 0.5
- With an Enerium 300 power meter in class 0.2, it will be preferable to use a class 0.2S CT of the JVS line

Beyond this, as the standard indicates:

Performance class of the power or energy metering and monitoring device without external sensors	Class of the recommended associated sensor	Total combined uncertainty
0,2	0.2 or more	0.5%
0,5	0.5 or more	1%
1	1 or more	2%

The association of an electrical network metering and monitoring device with external current and/or voltage sensors constitutes a complete system. ***The performance class of the system depends on the classes of the sensor and of the metering and monitoring device.***

However, the performance class of a system is applicable only if the intrinsic uncertainty of the sensor is within the limits of its performance class. Again, the latter is not equivalent to the unique performance class of the metering and monitoring device.

Special attention must be paid to power and energy measurements, because the measurements are very sensitive to the phase error of the sensor when the power factor is different from unity: a phase error of 20 minutes adds 1% error to the measurement of the active power with a power factor of 0.5.

For this reason, if a better performance class is required, we strongly recommend using class 0.2S or class 0.5S sensors to measure power or energy.

This is because the class of class "S" sensors is defined over a much larger range (from 20% to 120% rather than the 100% to 120% of the ordinary classes).