

Current Measurement Probe Terms

Accuracy — measurement accuracy of a probe, expressed as a percent of reading plus a constant. Example: at 1 % $\pm$ 0.1 A, a 100 A reading is accurate to $\pm$ 1.1 A (98.9 to 101.1 A).

Note: add your meter's accuracy to the probe's for overall accuracy.

Aperture size (jaw opening) — the maximum conductor diameter, or busbar cross-section, that the probe's jaw or fixed window can accept. Sets the largest conductor the probe can clamp around.

Bandwidth — range of frequencies within which performance, with respect to some characteristic, falls within specified limits.

CAT rating (measurement category) — IEC 61010 classification of where a probe may be safely used, based on transient overvoltage exposure. CAT II (circuits connected to outlets), CAT III (fixed installation / distribution), CAT IV (origin of installation / service entrance). Always stated with a working voltage — e.g., 600 V CAT III (*see Working voltage*).

Common mode voltage — voltage that, at a given location, appears equally and in phase from each signal conductor to ground.

Crest factor — ratio of crest (peak, maximum) value to root-mean-square (rms) value.

Current range — range of measurable currents. Measurements below the minimum are often possible, but with increased error.

Current transformer (CT) — a transformer whose secondary output current is proportional to the current in the conductor (the primary), scaled by the turns ratio (*see Transformation ratio*). The clamped conductor forms a single-turn primary. AC only.

Fall time — the time for the output to fall from 90% to 10% of its amplitude in response to a step change in current (*compare with Rise time*).

Frequency range — the range of frequencies over which currents can be measured.

Hall effect — the production in a conductor or semiconductor of an electric field proportional to the vector product of the current density and the magnetic flux density.

Hall-effect probe — a probe that uses the Hall effect to sense magnetic flux, enabling measurement of both DC and AC current.

Harmonic — a sinusoidal component of a periodic wave or quantity having a frequency that is an integral multiple of the fundamental frequency.

Input impedance — the impedance looking into the device, measured between its input terminals under operating conditions.

Integrator — a circuit (analog or digital) that integrates a Rogowski coil's di/dt output to recover a signal proportional to the actual current. Because a Rogowski coil responds to the rate of change of current, an integrator is required to read true current amplitude (*see Rogowski coil*).

IP rating (ingress protection) — IEC 60529 code for a probe's sealing against solids and water. First digit: solid/dust ingress (0–6); second digit: water ingress (0–9). Example: IP54 = dust-protected and splash-resistant.

Iron core (split-core probe) — a probe whose laminated ferromagnetic core clamps around the conductor to concentrate magnetic flux. Gives high sensitivity and good low-frequency response, but can saturate at high current; the basis of conventional CT clamps (*compare with Rogowski coil*).

Load impedance — input impedance of the meter connected to the current probe. Refer to your meter specifications.

Noise — unwanted electrical signals that produce undesirable effects in the circuits in which they occur.

Open secondary voltage — voltage at the output when a probe is clamped on a conductor and the meter (load) is not connected to the probe. **DANGER — Do not clamp a current probe without a load connected to it; high voltage may be present!**

Output signal — the probe output proportional to the measured current, delivered either as a scaled current (e.g., 1000:1, or mA/A — into a low-impedance ammeter or burden; typical of iron-core CT clamps) or as a scaled voltage (mV/A — into a high-impedance input such as an oscilloscope or DMM; typical of Hall-effect and Rogowski probes).

Output terminals — the connector that carries the probe output to the meter. Common types: 4 mm safety banana (shrouded, touch-safe, color-coded); BNC (bayonet coax — common on scope and voltage-output probes); and proprietary Chauvin Arnoux® terminations used on AEMC® power quality (PowerPad®) and power logging (PEL) instruments.

Overload — loading in excess of the normal rating of the current probe.

Phase shift — phase angle shift between the current measured and the probe output.

Position sensitivity — the change in reading caused by the conductor's position within the jaw or aperture rather than being centered, expressed as a percent error. Centering the conductor minimizes it (*compare with Aperture size*).

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Response curve — a plot of probe output (amplitude, and often phase) versus frequency, showing the flat region and the roll-off that bound the usable measurement band (*see Bandwidth, Phase shift*).

Rise time — the time for the output to rise from 10% to 90% of its final value in response to a step change in current (*compare with Fall time*).

Rogowski coil — an air-core (coreless) current probe — a flexible winding wrapped around the conductor. With no core to saturate, it measures very high currents and fits tight spaces. It responds to the rate of change of current (di/dt), and its output is integrated to recover the waveform. AC only (*compare with Iron core*).

Saturation — the condition in which a magnetic core can no longer carry additional flux, so the output no longer increases proportionally with current (loss of accuracy). Iron-core probes saturate at high current; air-core Rogowski coils do not (*see Iron core, Rogowski coil*).

Transformation ratio — the ratio between the current measured and the probe output current. Typical ratios: 400:1, 2000:1, 3000:5. Example: at 1000:1, 500 A measured gives 500 mA out.

Working voltage — maximum voltage rating of the conductor being measured.

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