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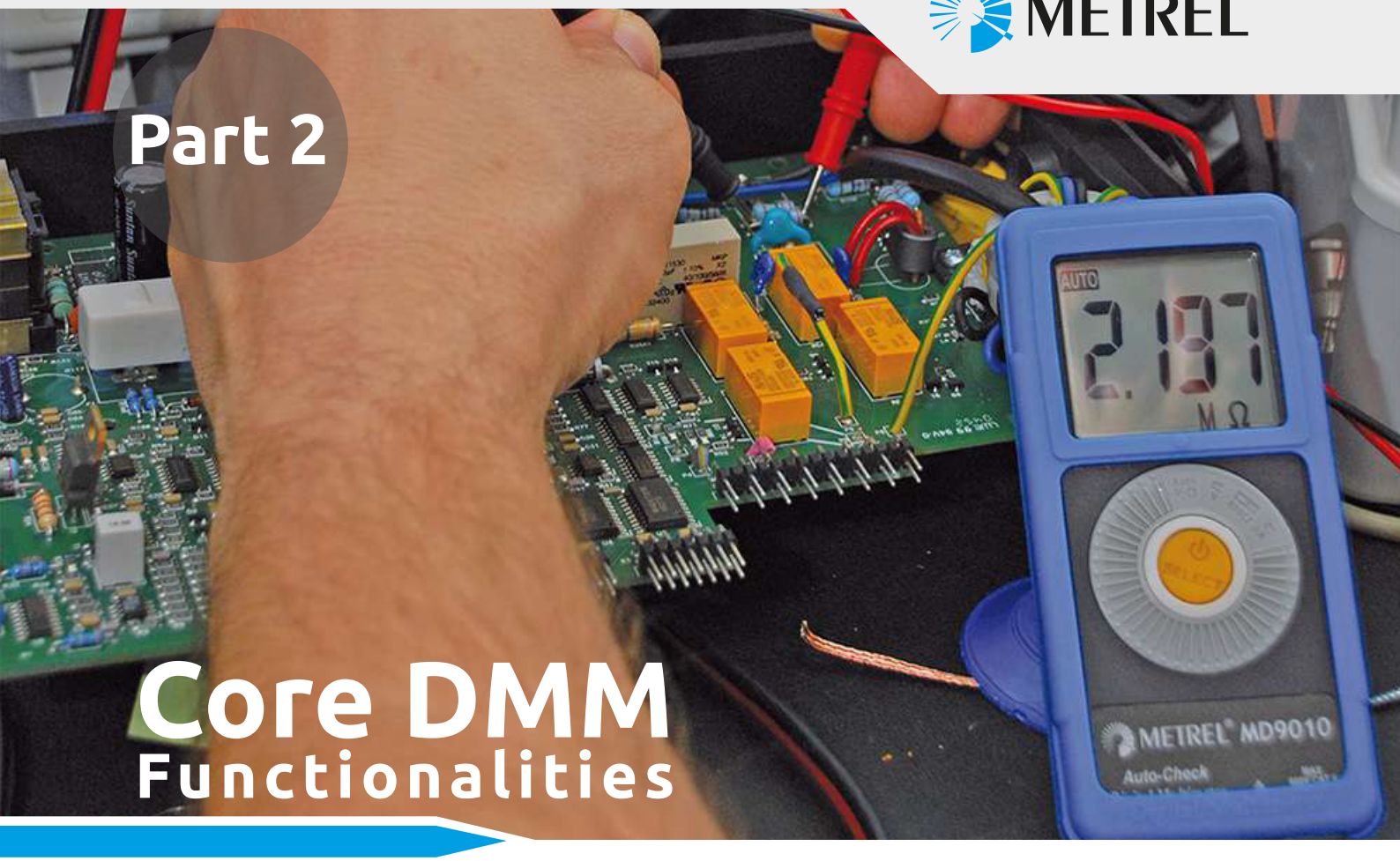

Part 2

Core DMM Functionalities

Digital Multimeter Functions & Properties 101

With the basics of resolution, accuracy and effective/RMS values explained in the previous newsletter, Part 2 covers three most important properties, pertaining to handheld multimeters. First one is power source, since this instruments are used “on the move” and autonomy/operating time is of greater importance than in instruments for more stationary testing/measuring applications. Second is connectivity, which is practically ubiquitous in this day and age of PCs and mobile devices. And last, but not least, especially due to its importance, is safety – a short explanation of most common voltage safety categories.

Batteries

Most handheld multimeters are battery powered. It makes them easy to carry and use wherever one goes, but it also makes them prone to failing at the worst possible times. Expected battery life is given as hours of ‘common’ use, which may or may not be described. It is often only useful for comparison of different models by the same manufacturer. Meters with

additional “energy-hungry” features, like insulation testing, will usually specify number of test possible with single charge. Instrument can be made to use rechargeable batteries and have an integrated charger, an external charger, or use single-use batteries only. Battery-low warning should be clear and easily understandable/readable.

Connectivity

While not the first thing one considers when choosing a handheld instrument, option to connect it to the computer can be very important. Main functionality extension is logging data directly to PC’s hard drive. If the instrument has an internal drive, the data can also be moved for further processing. Handheld multimeters are usually rather protected from elements and rarely have unprotected ports. There is usually an IR interface available, and a special accessory to connect instrument to USB port is generally needed as well as software.

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Safety

Above specified maximum measurement range or in case of improper use, both the instrument and the user may be in danger from electrical phenomena. Safety features include many elements, from proper insulating materials for the housing and shape of the terminals to exchangeable fuses. The most common hazard for the instrument is setting the multimeter to current or resistance measurement and applying leads to low-impedance voltage source. For safety towards user, instruments are most commonly specified by standard EN 61010-1 categories. They include expected working environment (defined by expected amount of energy present) and the voltage transients that the circuit must be able to sustain. Multimeters are most often specified as CAT III 1000 V and CAT IV 600 V:

- CAT III 1000 V: working voltage 1000 V in building installations, meaning work on distribution boards, circuit-breakers, wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and equipment for industrial. It can withstand a surge of 8 kV at 2 Ω source impedance or 4 kA.

- CAT IV 600 V: working voltage 600 V at source of low-level installations, like primary overcurrent protection devices and ripple control units. The specified surge protection is the same, 8 kV at 2 Ω source. Some multimeters are specified to CAT IV 1000 V, which can withstand a surge of 12 kV at 2 Ω source or 6 kA.