

# PORTABLE ALL-ROUNDERS FOR DEMANDING MEASURING TASKS

GOSSEN METRAWATT –  
MULTIMETER PRODUCTS  
FOR A WIDE RANGE OF  
APPLICATIONS



# MULTIMETERS - PORTABLE ALL-ROUNDERS FOR DEMANDING MEASURING TASKS

The multiple measuring instrument, known as a multimeter (from lat. multus „much“ as well as in ancient Greek μέτρον métron „tool for measuring“), is an electro-technical measuring instrument that can be used for a wide range of measuring tasks in the most diverse applications. A distinction is usually made between digital and analog multimeters. Purely analog multimeters (with an analog measured value display) have played an increasingly minor role in measurement technology since the 1990s and have been replaced by digital multimeters. Besides the oscilloscope, the multimeter is one of the most important measurement and diagnostic tools in electronics and electrical engineering.

The first multimeter combined current (A), voltage (V) and resistance (Ω) as a multiple measuring instrument. It was introduced in 1922 as AVometer and produced in England. This multimeter could only be used for measuring DC voltage.

The basic feature of every multimeter is its usability as a voltage and current meter. Usually it is also convertible between DC and AC measurements. The provision of resistance measuring functions is also a common feature.



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Today, many other functions are part of the basic equipment of high-quality multimeters, among others:

- Continuity test of the wiring in electrical circuits
- Diode testing
- Transistor testing
- Temperature measurement
- Frequency measurement
- Capacitance measurement
- Humidity measurement
- Volume measurement
- Brightness measurement and much more

## TRMS, RMS or AVERAGE

Depending on the measurement accuracy requirements for special signal forms, the use of an RMS (Root Mean Square) or, even better, a TRMS (True Root Mean Square) multimeter is recommended. AVG(Average) multimeters show significant weaknesses, especially when measuring non-pure sinusoidal signals. TRMS multimeters, such as the multimeters from GOSSEN METRAWATT, include existing DC components in the calculation in addition to the actual AC waveform. Typical signal characteristics as in a phase angle control can be measured correctly.

## Selection of the Correct Measurement Category

When selecting the multimeter to be used, in addition to the necessary functionality, it is very important to consider the measurement category required for the application. Only in this way can the user of the test instrument be protected against voltage peaks, so-called transients. The measurement categories CAT I to CAT IV specify the protection in connection with the rated voltage in the application area: For example, a multimeter of category CAT III / 1000V is better protected than a multimeter of category CAT III / 600V

### Measurement Categories According to EN61010-1

Category	Definition	Examples
0	No measurement category, measurements in electrical circuits that are not directly connected to the mains	Batteries etc.
CAT II	Measurements in electrical circuits that are directly connected to the low-voltage mains	via mains plugs e.g. in office, household, laboratory applications
CAT III	Measurements in building installations	Stationary consumers, devices permanently connected to the distributor, distributor terminals
CAT IV	Measurements at power sources for low-voltage installations	Mains terminals, meters, primary overvoltage protection devices

The consistent development and improvement of multimeter technology has led to a wide range of different, very powerful devices provided by market leaders that can be used for even the most demanding test and measurement tasks.

## Calibration and Adjustment

Handheld calibrators are signal generators with a very high precision for adjustment and calibration of measuring instruments and signal converters. Dual-mode instruments are handheld calibrators and TRMS multimeters all in one. They allow for simultaneous measurement and signal generation, thus representing a complete calibration system. Automation is provided by the associated calibration software. Special multimeters, such as the METRAHIT PM PRIME, allow for the refresh rate of the digital display to be set so that the setting of potentiometers, for example, can be checked directly.

## Telecommunication Cables and Signature Analysis

Multimeters for carrying out measurements to determine the sources of faults in cable systems measure all cable and system relevant parameters such as voltage, current, resistance, insulation and loop resistance, capacitance and cable length. With special multimeters, such as the METRAHIT T-COM PLUS, a single-wire interruption or contact with an unconnected wire (capacitive unbalance) can be detected by changing polarity with the fast logarithmic bargraph display. DSL signature detection is also made possible with an optional adapter.

## Data Logger

The function of a data logger is to record and store measured values easily and over a prolonged period of time. Combined with a multimeter, this provides for a complete test and measurement system for the long-term recording of electrical systems and machines. Interfaces for the transmission of the series of measured values to a connected computer system allow for the smooth transfer of results and evaluations.

## Hybrid and electric vehicles

Energy storage systems with up to 500 V supply power to up-to-date high-voltage systems in hybrid and electric vehicles (passenger cars). In the future, the voltage level will approximately double. Technologies with operating voltages of up to 1,000 V are already in use in today's utility vehicles. The voltages used in these systems are well above the values that can be classified as harmless and require professional and regular safety checks. Special multimeters, such as the METRHIT IM E-DRIVE with measurement category 1000V CAT III as well as graphic colour displays are used in these areas for control and analysis.



## Avionics Service

In the aviation industry, high-quality multimeters with special accessories are offered as a set to provide for the required low-voltage insulation measurement and data-hold function for aircraft testing. A variety of special connection cables and adapters are required to perform the required tests in this very special application.

## Outdoor and Potentially Explosive Environments

Multimeters with intrinsically safe design and antistatic, impact-resistant housings are used to test low-resistance transitions in potentially explosive atmospheres such as contacts inside a fuel tank. A highly finished outdoor multimeter is distinguished by dust tightness, extremely rugged housing and protection against the penetration of liquids. GOSSEN METRAWATT has developed the two special multimeters METRAHIT Outdoor and METRAHIT 27EX for these applications.

## Motor Test / Short-Circuited Coils

A short circuit between turns in motors, transformers or coils leads to a reduction in performance or even to destruction. Using a high-quality universal multimeter, such as the METRAHIT IM XTRA and a special COIL Adapter XTRA, each winding can be measured and checked for damage. A surge test with 1kV surge voltage is used to reliably detect faults that only occur under operating conditions. The evaluation is done by comparing the measured values in a tabular or graphical display.

## Power Quality Analysis

The increase in so-called non-linear loads has led to a rising number of distortions in mains supply voltages. The use of multimeters in the mobile analysis of mains quality can reduce or even prevent high costs. High-quality multimeters with data logger and event recording such as METRAHIT ENERGY can be used for PQ analysis.

## ASi Bus test

For the connection of sensors and more, the AS-Interface (Actuator-Sensor-Interface), known as ASi, is a widely used protocol. Whether in industrial applications or in communication technology, in the laboratory or in the open air: with state-of-the-art technology and rugged quality, the function of the AS interface is reliably tested in the field using the addressing and diagnostic functions of special multimeter technology, such as in the METRAHIT ASI 3.0.





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