GOSSEN METRAWATT

SECU**TEST** CLIP and PROFI**TEST** CLIP

Leakage Current Clamp Meters for SECU**TEST** PRO and PROFI**TEST** PRIME

3-349-887-03
1/1.17

Notes Regarding these Operating Instructions

Texts, illustrations and technical specifications have been prepared with great care. Errors can nevertheless not be entirely ruled out. The manufacturer of the leakage current clamp meter cannot accept any legal responsibility or liability for incorrect entries and their consequences!

Read these operating instructions carefully and completely before using the leakage current clamp meter!

Warnings and warning symbols in the operating instructions and on the leakage current clamp meter are intended to alert the user to risks and hazards!

Warnings and Safety Precautions

Read these operating instructions carefully and completely before using the leakage current clamp meter! They contain information and instructions which are necessary for safe operation and use of the leakage current clamp meter.

The SECUTEST CLIP / PROFITEST CLIP leakage current clamp meter has been manufactured and tested in accordance with safety regulations IEC 61557-13/-16, IEC 61010-1 and IEC 61010-2-032.
The CE conformity marking confirms compliance with the EMC and low-voltage directives.

Safety of the operator, as well as that of the leakage current clamp meter, is only assured when the device is used for its intended purpose.

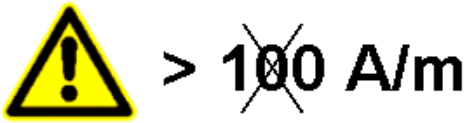
The SECUTEST CLIP / PROFITEST CLIP leakage current clamp meter may only be used by electricians, other qualified persons or accordingly trained persons for its intended purpose (see also section 2, “Terminology”)!

The following symbols draw the operator's attention to important information and instructions which are necessary for safe operation and use of the leakage current clamp meter.

This symbol is used in the operating instructions and on the leakage current clamp meter in order to warn against incorrect operation!

This symbol is used in the operating instructions in particular to warn against risks and hazards associated with incorrect operation!
Disregarding this warning symbol may result in severe or fatal injury!

This symbol is used in the operating instructions and on the leakage current clamp meter in particular to warn against risks and hazards associated with incorrect operation! Disregarding this warning symbol may result in severe or fatal injury. During use for its intended purpose, in consideration of the measuring category, the leakage current clamp meter must not enclose any uninsulated conductors.



This warning symbol on the leakage current clamp meter makes reference to sensitivity to external magnetic fields. The field strength of the interfering magnetic field may not exceed a value of 100 A/m, which corresponds to use class 1.

Opening the Instrument / Repairs

The instrument may only be opened by authorized, trained personnel in order to ensure flawless operation and to assure that the guarantee is not rendered null and void.
Even original replacement parts may only be installed by authorized, trained personnel.
If it can be ascertained that the instrument has been opened by unauthorized personnel, no guarantee claims can be honored by the manufacturer with regard to personal safety, measuring accuracy, compliance with applicable safety measures or any consequential damages.

Table of Contents

1 Applications

When used for its intended purpose, the leakage current clamp meter makes it possible to measure alternating current from 0.1 to 25 mA without interrupting any lines by closing the clamp around one or more conductors in measuring category III electrical circuits with up to 300 V between the phase conductor and ground, e.g. in building installations, or measuring category II electrical circuits with up to 600 V, e.g. at operating equipment.

2 Terminology

Leakage Current Clamp Meter

A leakage current clamp meter is a current probe for the measurement of leakage current without interrupting the current path of the measuring circuit. The meter must make it possible to measure leakage current by means of the direct measuring method or the differential current method.

The measurement results read out by the leakage current clamp meter must take frequency response of test circuit A1 into consideration in accordance with DIN EN 61010-1 (VDE 0411-1):2011, appendix A.

Evaluation of frequency response is already taken into account by the leakage current clamp meter.

Jaws
The components of the leakage current clamp meter which enclose the conductor (see figure 3, item 1).

Yoke
The part of the leakage current clamp meter which is placed around the conductor to be measured and detects the magnetic field (see figure 3, item 2).

Use for Intended Purpose
The use for which the device is suitable in accordance with the manufacturer's specifications (i.e. operating instructions).
Use for intended purpose also includes compliance with the stipulated operating and maintenance conditions, as well as consideration of foreseeable operating errors.
As a rule, normal conditions are a prerequisite for use for intended purpose because the operating instructions warn against operating the device under other than normal conditions.

Measuring Uncertainty
Measuring uncertainty is the specified difference between the value displayed by the measuring instrument (measured value) or the magnitude of the output signal and the actual value of the measured quantity in the operating range.

Intrinsic Uncertainty
Measuring error of a measuring instrument during operation under reference conditions.

Electromagnetic Compatibility
All electrical currents generate electromagnetic fields which can cause current to flow in other electrical conductors, thus resulting in interference. The European EMC directive for electromagnetic compatibility (EN 61326-1) has been implemented in order to avoid this interference or reduce it to an absolute minimum.

Electromagnetic compatibility is the ability of a piece of electrical equipment to function satisfactorily in its electromagnetic environment without impermissibly influencing this environment, which also includes other equipment.

Stray Field Sensitivity
Influence error caused by a stray magnetic field which determines the use class (DIN EN 60051-9).

Use Classes
Current probes are subdivided into 3 use classes based on sensitivity to low-frequency magnetic fields with frequencies ranging from 15 to 400 Hz. Current probes of all classes must be furnished with a framed pictograph (see figure 1) which is plainly visible to the operator, includes the corresponding symbol in accordance with DIN EN 61010-1 (VDE 0411-1):2011 and warms against exceeding the permissible limit value for external magnetic fields.

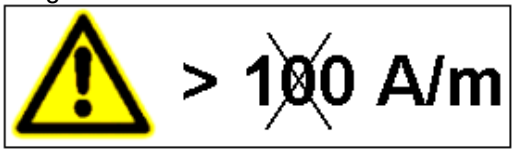


Figure 1: Warning Symbol for Maximum Permissible Field Strength of up to 100 A/m per Use Class 1

Use Class 1
Use class 1 current probes must be suitable for use in external low-frequency magnetic fields, in particular within a frequency range of 15 to 400 Hz, up to a field strength of 100 A/m. The limit value for the magnetic field must be indicated on the leakage current clamp meter by means of a plainly visible warning symbol.

Use Class 2
Use class 2 current probes must be suitable for use in external low-frequency magnetic fields, in particular within a frequency range of 15 to 400 Hz, up to a field strength of 30 A/m. The limit value for the magnetic field must be indicated on the leakage current clamp meter by means of a plainly visible warning symbol.

Use Class 3
Use class 3 current probes must be suitable for use in external low-frequency magnetic fields, in particular within a frequency range of 15 to 400 Hz, up to a field strength of 10 A/m. The limit value for the magnetic field must be indicated on the leakage current clamp meter by means of a plainly visible warning symbol.

Electrician / Qualified Person / Trained Person
Only competent persons may use and conduct measurements with leakage current clamp meters. In this sense, qualified persons include:

Electricians
An electrician is a person with suitable technical training, knowledge and experience which makes it possible to recognize and avoid the hazards associated with electricity [IEV 826-09-01, modified].

Qualified Persons
A qualified person is someone who posses the technical knowledge required for testing equipment as a result of vocational training, work experience and recent vocational activity [German Occupational Safety Law (BetrSichV)]. Qualified persons are not subject to any technical directives during the course of their testing work and may not be disadvantaged by them.

Electrically Trained Persons
An electrically trained person is someone who has been adequately trained by a electrician, thus making it possible to recognize and avoid the hazards associated with electricity [IEV 826-09-02, modified].

Field Strength

Field strength designates the strength of and **electrical**, **magnetic** or other spatially distributed field at a specified point in space. Field strength is frequently a vector and is calculated on the basis of direction and magnitude. Well-known fields include the **electrical field** and the **magnetic field**.

Electrical Field Strength

The symbol for electrical field strength is ***E*** and its unit of measure is *volts* *per* *meter* (**V / m**). It increases along with voltage **U** (V) between the charged bodies, and as distance **L** (m) between the charged bodies is reduced.

E = U / L [V / m]

Frequency Characteristics of the Human Body

Measuring setup for direct current and sinusoidal alternating current in accordance with IEC 61010-1, appendix A. This measuring circuit (low-pass) prevents the measurement of leakage current in the high-frequency range (as of roughly 1000 Hz). People react especially sensitively to the low-frequency range (below 1000 Hz).

Calibration / Adjustment

What is calibration?

Calibration involves the determination of deviation of the measuring instrument's measured value / measurement signal from the correct value of the measured quantity. An object with known values (a so-called standard) is measured by the device to this end and deviation of the measured value / measurement signal from the known value is ascertained. The results and the associated measuring uncertainty are documented in a calibration certificate.

No changes (adjustments) are made to the measuring equipment during calibration.

And thus calibration is simply the determination of the measured value's / measurement signal's deviation from the true value.

What's the purpose of calibration at regular intervals?

- It's a requirement per DIN EN ISO 9000 ff.
- It prevents hazards due to incorrect measurement results.
- It assures reproducible measurement.
- It facilitates the acceptance of test reports and measurement results.

What is adjustment?
In the field of measuring technology, **adjustment** involves configuring or balancing a piece of measuring equipment (measuring instrument, measuring adapter etc.) such that the measured or displayed value deviates as little as possible from the correct value. As a rule, adjustment is followed by calibration.

Magnetic Field Strength
Every electrical current generates a magnetic field.
The greater the amperage, the larger the magnetic field.
The symbol for magnetic field strength is ***H*** and its unit of measure is *amperes per meter* (**A / m**). Where magnetomotive force (θ) remains unchanged, field strength increases as field line length **L** (m) is reduced.

$$H = \theta / L \ [A/m]$$

Measuring Categories
Measuring current circuits are subject to loading due to the operating voltages and transient loads (overvoltage) in the circuits

to which they are connected. If the measuring current circuit is used to conduct a measurement at the mains, the transient loads can be assessed via the location within the installation at which the measurement is conducted. If the measuring current circuit is used to measure any other signal, the transient loads must be taken into consideration by the user such that they don't exceed the capabilities and limitations of the measuring instrument. Electrical circuits are subdivided into the following measuring categories: CAT I, CAT II, CAT III and CAT IV. The measuring instrument may only be used in the category for which it has been approved, or any lower categories.

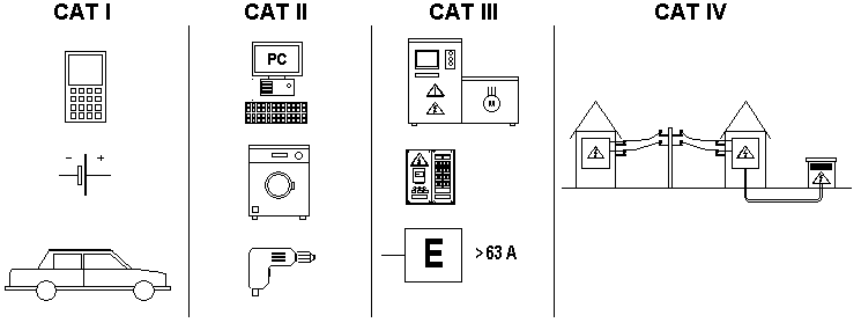


Figure 2: Measuring Categories

Examples:

CAT I:

- Battery powered devices
- Devices with electrical circuits which are internally protected against overvoltage
- Circuits which are isolated from the mains
- Electronic circuits with corresponding power supply

CAT II:

- Household appliances
- Operating equipment
- Switches, lamps, electrical outlets etc. in buildings

CAT III:

- Meters, control panels, test panels
- Machines
- High power operating equipment

CAT IV:

- Power lines used to feed buildings
- Overhead power lines, underground cables

Measuring Category I (CAT I)
Measuring category I is intended for measurements in electrical circuits which are not directly connected to the mains. Only minimal overvoltage can occur in these circuits. Examples include measurements at circuits which do not originate from the mains.

Measuring Category II (CAT II)
Measuring category II is intended for measurements in electrical circuits which are directly connected to the low-voltage mains. Overvoltage can occur in these circuits.
Examples include measurements at household appliances, portable tools and similar devices.

Measuring Category III (CAT III)
Measuring category III is intended for measurements in building installations. Considerable overvoltage can occur in these circuits.

Measuring Category IV (CAT IV)
Measuring category IV is intended for measurements at power sources for low-voltage installations. Very high overvoltage can occur in these circuits.

Reference Conditions
Influencing quantities for whose presence the measuring instrument's smallest specified or ascertained measuring uncertainties (measuring error) apply.

Protection
In accordance with IEC 364-5-51 (VDE 0100, part510), the characteristic features of the respective operating equipment must be determined by means of a protection class or a conformity test.
Electrical operating equipment must be selected and set up in consideration of external influences such that its intended operation and the reliability of the protective measures are assured.
Protection against foreign matter and dust

None	IP0X
Foreign matter > 50 mm =	IP1X
Foreign matter > 12 mm =	IP2X
Foreign matter > 2.5 mm =	IP3X
Foreign matter > 1 mm =	IP4X
No dust deposits =	IP5X
No dust ingress =	IP6X

Protection against moisture

None	IPX0
Vertically dripping =	IPX1
Dripping (15° angle) =	IPX2
Spraying water =	IPX3
Splashing water =	IPX4
Water jets =	IPX5
Powerful water jets =	IPX6
Occasional submersion (water-proof) =	IPX7
Continuous submersion (water pressure-tight) =	IPX8

Protection Categories

Options for classifying electrical devices according to type of protective measure against electric shock, which becomes active for them with priority or can become active after they are connected to an electrical system.

Protection Category I

Devices with a protective conductor. The protective measure against electric shock is based on connection of the protective conductor to the protective conductor of the electrical power

supply system. All exposed, conductive parts are connected to the protective conductor as a rule. However, if any exposed, conductive parts are not connected to the protective conductor, doubled/reinforced insulation (protective insulation) or reliable current limiting between such parts and the active parts must be implemented as protective measures against electric shock.

Protection Category II
Devices whose active parts are fully enclosed by an insulating sleeve (insulating body with double or reinforced insulation). This sleeve (body) ensures protection against electric shock for persons who touch it.
The body also includes any exposed, conductive parts.
Protection category II devices can also have a connector plug with earthing contact and a protective conductor in the connector cable, which nevertheless may not be connected to any part in the device's interior, including terminals, solder posts and the like.

Protection Category III
Devices for which exclusively protective extra-low voltage is used.

Pollution Degree

Pollution involves the accumulation of solid, liquid or gaseous (ionized gases) foreign matter, which can result in reduced dielectric strength or surface resistance. Pollution degrees have been established for the ascertainment of clearances:

Pollution Degree 1

No pollution, or strictly dry, non-conductive pollution occurs. This pollution has no impact.

Pollution Degree 2

Usually only non-conductive pollution occurs. Occasional, temporary conductivity must nevertheless be reckoned with which is caused by dew. This pollution degree is applicable in laboratories, industrial environments etc.

Pollution Degree 3

Conductive pollution accumulates or dry, non-conductive pollution occurs, which becomes conductive due to expected condensation. Under these conditions devices are usually protected against direct exposure to sunlight, precipitation and wind pressure, although neither temperature nor humidity are regulated. This pollution degree is applicable at construction sites, in heavy industry, in maritime applications etc.

3 Operation

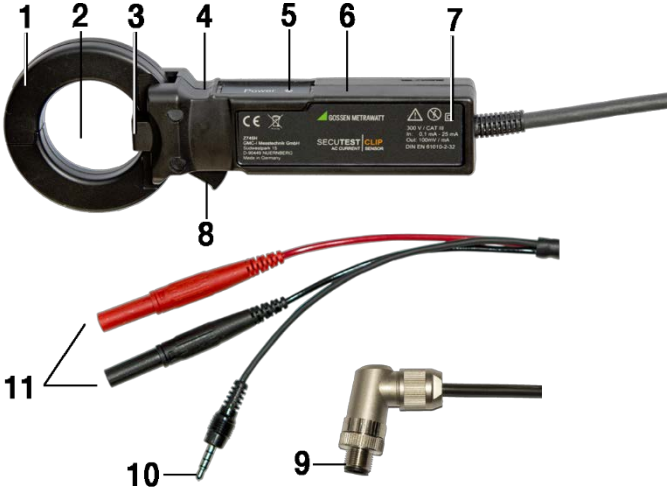


Figure 3

1 Jaws (current probe)
2 Yoke
3 Safety collar
4 Recessed grip
5 Power LED: lights up when supplied with power from the interconnected test instrument
6 Handle
7 Serial plate
8 Jaw release button
9 **PROFITEST CLIP (Z506H)**:
Connector plug for connection to supply power from the PROFITEST PRIME test instrument
10 **SECUTEST CLIP (Z745H)**:
Jack plug for supply power from the SECUTEST PRO or SECULIFE ST BASE test instrument (service plug socket)
11 **SECUTEST CLIP (Z745H)**:
Connector plugs (signal output) for connection to the voltage measurement input at the SECUTEST PRO or SECULIFE ST BASE test instrument (COM and V sockets)

Safety Precautions

Warnings and warning symbols on the leakage current clamp meter and in these operating instructions are intended in particular to alert the user to risks and hazards! See also section entitled “Warnings and Safety Precautions”!

General Preparation for Measurement

- The corresponding safety measures for the prevention of electric shock must be observed!
- The leakage current clamp meter must be intact, clean and dry.
- If the leakage current clamp meter has been subjected to severe temperature fluctuation which has caused the precipitation of a layer of moisture, it must be allowed to become sufficiently acclimatized prior to use!
- It must be possible to close the jaws of the leakage current clamp meter (see figure 4, item 1) without exerting force. The metal lamellae (see figure 4, item 2) must not be bent or damaged!
- Be aware of any influences caused by stray fields!

- Neither the clamp housing in its entirety nor the connector cables with plugs may be damaged.

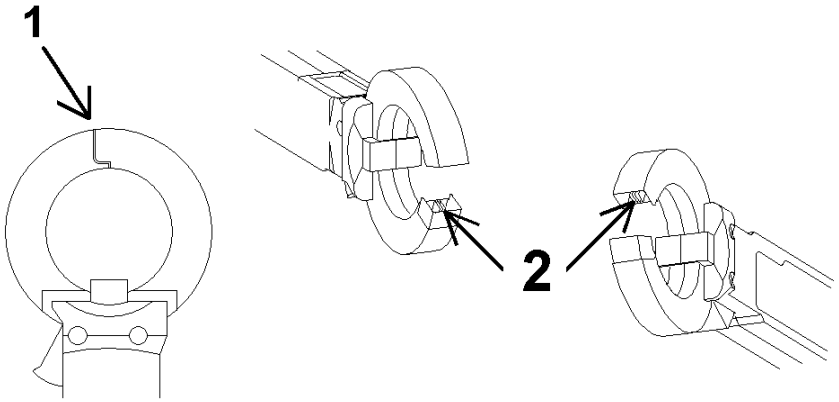


Figure 4

1 Closed jaws of the leakage current clamp meter
2 High-quality, sensitive metal lamellae

Connecting the Leakage Current Clamp Meter to a Test Instrument
The leakage current clamp meter must always be connected to the (voltage) measurement input of a measuring instrument first, before it's closed around a current-carrying conductor!

Checking for Influence from Stray Fields
Before conducting a measurement, possible external influences must first be checked with connected leakage current clamp meter, but without enclosing a conductor. The measured value displayed by the measuring instrument must be less than specified intrinsic uncertainty. If this is not the case, the measurement must be performed at another location with less powerful magnetic fields.

Example: Close the leakage current clamp meter around the conductor or conductors to be measured. **Attention**: The jaws of the leakage current clamp meter must be fully closed! Make sure that current is not yet flowing through the conductor. Normally, no current should be displayed in this state.

Enclosing the Conductor(s)

Before leakage current is measured, the conductor(s) must first be enclosed by the leakage current clamp meter. It's permissible to enclose the following: PE or L+N (single-phase), or L1+L2+L3+N (3-phase)
The jaw release button (see figure 3, item 7), must be pressed to this end.

Caution!

- The fingers must not extend beyond the recessed grip (see figure 3, item 4)! Safety clearance to the current-conducting cable is otherwise not maintained!

- When enclosing the conductor, it must be ensured that conductor is as close as possible to the middle of the yoke (see figure 3, item 2), and that the jaws do not pinch any conductors!

- When closing the clamp, the jaws (see figure 4, item 1) must close without exerting force, because the metal lamellae (see figure 4, item 2) might otherwise be damaged.

- If the leakage current clamp meter is not fully closed, erroneous measurements result.

- External influences may have an impact on measurement results, thus also causing erroneous measurements!

- The enclosed conductors should not lie loosely within the yoke, and should instead be tightly bound together and/or twisted. Erroneous measurements may otherwise result.

Performing Measurements

If all of the preparations for measurement with the leakage current clamp meter described in this section have been observed and complied with, current measurement can be properly conducted.

Removing the Leakage Current Clamp Meter

In order to rule out possible hazards, the leakage current clamp meter must always be removed from the current-carrying conductor(s) first! Only then is it permissible to remove the leakage current clamp meter's plug from the measuring instrument!

4 Connection Examples

The operating instructions for the test instruments include connection examples for the respective leakage current clamp meters.

Transformation Ratio
When using the SECUTEST CLIP / PROFITEST CLIP, the transformation ratio parameter at the test instrument must be set to 100:1 or 100 mV:1 mA, or to AT3 adapter.

General connection examples for differential current measurement and for direct measurement are shown on the following pages.

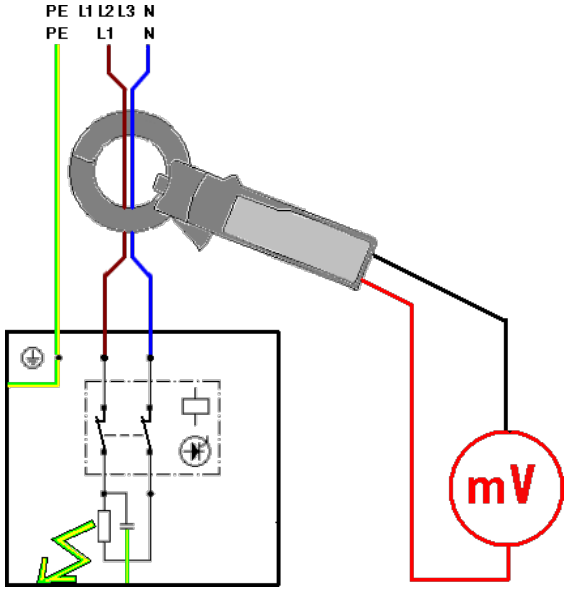


Figure 5: Differential Current Measuring Method
Parallel ground connections have no effect on the measurement results.

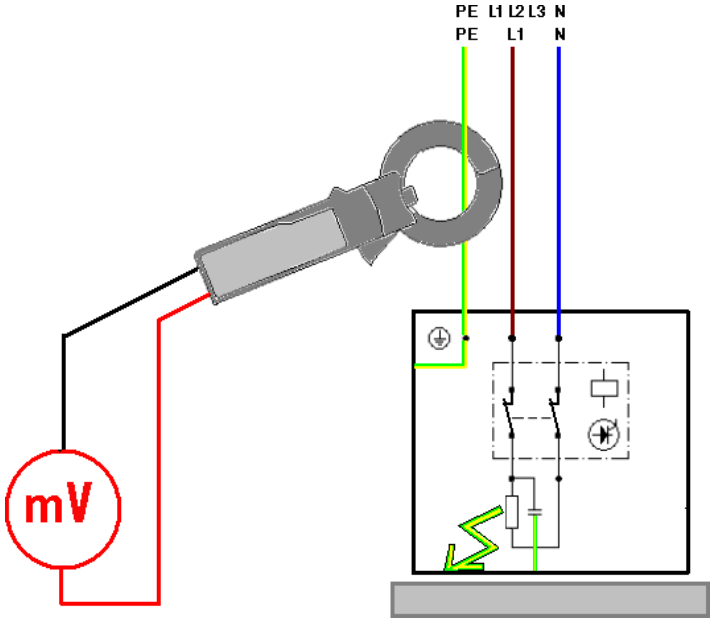


Figure 6: Direct Measuring Method
The device under test is insulated and must not have any parallel ground connections!

5 Calibration

The leakage current clamp meter must be calibrated at regular intervals by the manufacturer or a service center authorized by the manufacturer. Annual calibration is recommended. If the device is handled carefully, is used only infrequently and is subjected to periodic testing at regular intervals, a qualified electrician can stipulate a calibration interval of up to three years on his or her own authority.

6 Care and Maintenance

The leakage current clamp meter does not require any special maintenance.
It may only be cleaned when disconnected!

Caution!

- In exceptional cases, the sensitive metal lamellae in the jaws of the leakage current clamp meter can be carefully cleaned with a fine, soft, dry brush. Never touch the metal lamellae with hard tools!

- Do not use harsh cleansers or solvents for cleaning!
- The leakage current clamp meter may only be used and stored in dry condition!
- The leakage current clamp meter must be carefully checked before each use in order to assure safe operation!

7 Guarantee

The manufacturer guarantees error-free materials and workmanship of the SECUTEST CLIP / PROFITEST CLIP leakage current clamp meter for a period of 12 months assuming is has been used for its intended purpose only, under the specified operating and storage conditions.

8 Return and Environmentally Sound Disposal

The instrument is a category 9 product (monitoring and control instrument) in accordance with ElektroG (German electrical and electronic device law). This device is subject to the RoHS directive. Furthermore, we make reference to the fact that the current status in this regard can be accessed on the Internet at www.gossenmetrawatt.com by entering the search term WEEE.

We identify our electrical and electronic devices in accordance with WEEE 2012/19/EU and ElektroG using the symbol shown at the right per DIN EN 50419.
These devices may not be disposed of with the trash.
Please contact our service department regarding the return of old devices (see address on back cover).

9 Technical Data

Measuring Conditions

Measuring range	
SECUTEST CLIP:	0.1 mA ... 25 mA AC
PROFITEST CLIP:	0.1 mA ... 10 mA AC
Voltage output	100 mV/mA
Frequency / intrinsic uncertainty	50 Hz ... 5 kHz: 5% rdg. 5 kHz ... 1 MHz: 10% rdg. (cut-off frequency: 1 kHz)
Measuring error	20%

Reference Conditions

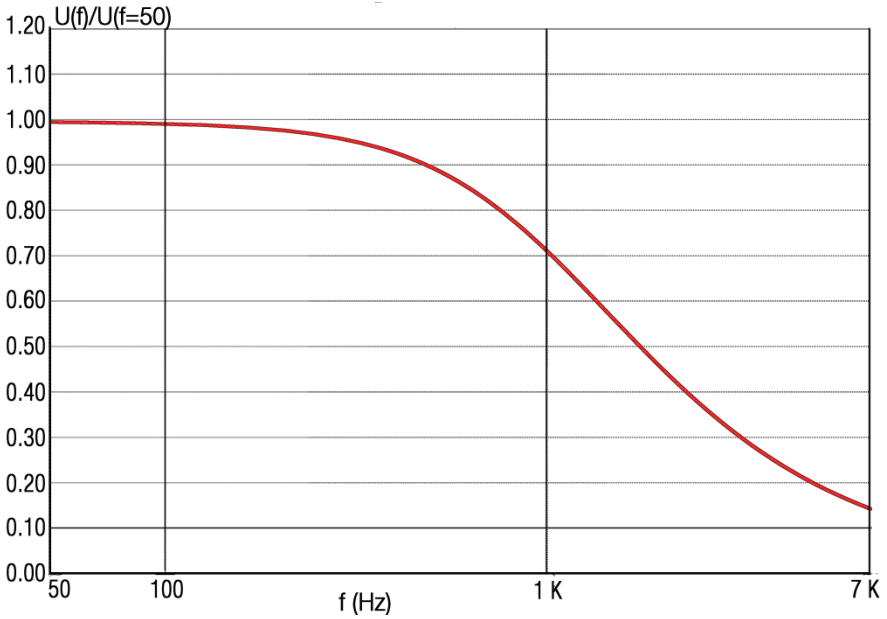
Temperature	21 °C ... 25 °C
Humidity	45% ... 55%
Waveform	Sinusoidal

Overload Capacity

Max. input current	30 A AC_{TRMS} continuous

Influencing Quantities and Influence Error

Influencing quantity / sphere of influence	Influence error ± …% rdg.
Change of position ± 30°	1%
Change to supply voltage of ± 0.25 V	± 2.5%
Temperature fluctuation: 0 °C … +35 °C	Max. ± 0.3%
DUT current: 0 … 30 A	± 2.5%
Low-frequency magnetic fields: 30 A/m	± 15%
Frequency response of the output signal	Per curve, see below



Relative Magnitude (dB)= 20 log U(f)/U(f=50 Hz)

Electrical Safety

Protection category	II (protective insulation by means of continuous double or reinforced insulation)
Pollution degree	2
Measuring category per EN 61010	CAT III 300 V, CAT II 600 V
Electromagnetic compatibility	EN 61326-1
Protection	IP 40

Mechanical Data

Outside dimensions	62 x 28 x 172 mm
Clamp yoke	40 mm
Jaw opening	25 mm
Connector cable	1.8 m
Measurement connections	**SECUTEST CLIP:** two 4 mm contact-protected plugs, black/red **PROFITEST CLIP:** via M12 plug to PROFITEST PRIME

Supply power	5 V DC
	SECUTEST CLIP: via 3.5 mm jack plug for connection to SECUTEST PRO / SECULIFE ST
BASE	
	PROFITEST CLIP: via vM12 plug to PROFITEST PRIME
Weight	Approx. 200 g

Ambient Conditions

Operating temperature	-10 °C to +45 °C
Storage temperature	-25 to +60 °C
Relative humidity	Max. 80%, condensation is ruled out

Applicable Regulations and Standards

IEC61010-1/EN61010-1/VDE0411-1
Safety requirements for electrical equipment for measurement, control and laboratory use – general requirements

EN61010-2-032
Particular requirements for hand-held and hand-manipulated current sensors for electrical test and measurement

DIN EN 61326-1/VDE 0843-20-1
Electrical equipment for measurement, control and laboratory use
– EMC requirements – Part 1: General requirements

EN 60529/VDE 0470-1
Test instruments and test procedures
Degrees of protection provided by enclosures (IP code)

10 Product Support

If required please contact:

GMC-I Messtechnik GmbH
Product Support Hotline
Phone +49-911-8602-0
Fax: +49 911 8602-709
e-mail: support@gossenmetrawatt.com

11 Repair and Replacement Parts Service, Calibration Center* and Rental Instrument Service

If required please contact:

GMC-I Service GmbH
Service Center
Thomas-Mann-Str. 20
90471 Nürnberg, Germany
Phone: +49 911 817718-0
Fax: +49 911 817718-253
e-mail: service@gossenmetrawatt.com
www.gmci-service.com

This address is only valid in Germany. Please contact our representatives or subsidiaries for service in other countries.

* Calibration Laboratory for Electrical Quantities
D–K–15080, accredited per DIN EN ISO/IEC 17025

Accredited quantities: direct voltage, direct current value, direct current resistance, alternating voltage, alternating current value, AC active power, AC apparent power, DC power, capacitance, frequency and temperature

Competent Partner
GMC-I Messtechnik GmbH is certified per DIN EN ISO 9001.

Our DAKKS calibration laboratory is accredited by the Deutsche Akkreditierungsstelle GmbH (national accreditation body for the Federal Republic of Germany) under registration number D–K–15080 in accordance with DIN EN ISO/IEC 17025. We offer a complete range of expertise in the field of metrology: from test reports and proprietary calibration certificates right on up to DAKKS calibration certificates. Our spectrum of offerings is rounded out with free test equipment management.
Our DAKKS calibration laboratory is part of our service department. If errors are discovered during calibration, our specialized personnel are capable of completing repairs using original replacement parts.

As a full service calibration laboratory, we can calibrate instruments from other manufacturers as well.

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