GOSSEN METRAWATT

PROFITEST | 2
Tester for DIN VDE 0100

3-349-490-03
4/7.13

Testing of Residual-Current Protective Devices (RCCBs)

- Measurement of contact voltage without tripping the RCCB
  Contact voltage with reference to nominal residual current is measured with 1/3 of nominal residual current.
- Trip test with nominal residual current, measurement of time to trip

Special Testing for Systems and RCCBs

- Testing of systems and RCCBs
  with rising residual current and display of trip current, as well as contact voltage at the moment tripping occurs
- Testing of RCCBs
  which are suitable for pulsating DC fault current, testing is conducted with positive or negative half-waves
- Testing of RCCBs with adjustable residual current
  for the determination of contact voltage and trip current

Testing of Special RCCBs

- Selective S, type G

Testing of RCD Protection in IT Systems

CE

QUALITÄTSMANAGEMENTSYSTEM

DQS-zertifiziert nach
DIN EN ISO 9001:2000
Reg.-Nr.1262

Large Voltage and Frequency Range

An extended-range measuring system allows for use of the test instrument for all AC and three-phase systems with voltages ranging from 65 to 500 V, and frequencies from 15.4 to 420 Hz.

Loop and System Impedance Measurement

Measurement of loop and system impedance can be performed within a range of 65 to 550 V. Conversion to short-circuit current is based upon respective line voltage, as long as the measured line voltage is within the prescribed range. Short-circuit current is calculated from actual line voltage and measured impedance for line voltages outside of this range.
With a test current of 15 mA the loop impedance can also be determined after RCCBs with a nominal residual current of at least 30 mA without the RCCB being tripped.

Insulation Resistance Measurement with Nominal Voltage and Variable or Rising Test Voltage

Insulation resistance is usually measured with the nominal voltages 500 V, 250 V or 100 V.
Measurements can be performed with continuously rising voltage for the detection of weak points in insulation, as well as for the determination of response voltages for voltage limiting devices. Voltage at the device under test, any detected response or breakdown voltage, as well as insulation resistance appear at the instrument's display, and an LED indicates violation of an (adjustable) limit value.

Low-Resistance Measurements

Bonding conductor resistance and protective conductor resistance can be measured with a measuring current of ≥ 200 mA DC, automatic measuring voltage polarity reversal and selectable conduction direction. Violation of an (adjustable) limit value is signaled with an LED.

Universal Connector System

The interchangeable plug inserts and the plug-on 2-pole adapter (can be expanded to a 3-pole adapter for phase sequence measurements) allow for use of the test instrument all over the world.

Special Features

- **Display of allowable fuse types for electrical systems**
- **Start-up testing for energy consumption meters**
- **Calculation of cable lengths for common copper conductor cross-sections**
- **Measurement of biasing, leakage and circulating current up to 1 A, as well as working current to 150 A with the Clip 0100S accessory clip-on current sensor**
- **Phase sequence measurement (phase sequence, highest line-to-line voltage)**

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Display

The LCD field consists of a backlit dot matrix at which menus, possible settings, measurement results, tables, tips and error messages, as well as wiring diagrams are displayed.

Selectable Language

An appropriate language can be selected for the country in which the test instrument is used.
Several instrument versions are available which include various language combinations.

Operation

The instrument is very easy to operate with its rotary function selector switch and 5 keys. Two of the keys located at the instrument have the same functions as the keys at the test plug, which allows for convenient measuring at difficult to access locations. Wiring diagrams and online help can be displayed at the LCD for all basic functions and sub-functions.

Phase Tester

Protective conductor potential is tested by contacting the contact surface with the contact finger. If a potential difference of greater than 100 V is detected between the contact surface and the protective contact at the earthing contact plug, the PE signal lamp lights up.

Signal Lamps

Faults within the system are recognized automatically by the instrument, and are indicated by means of four lamps.

Battery or Rechargeable Battery Test and Self-Test

The battery test is performed under load. The results are displayed both numerically and with a symbol. Test patterns can be queried one after the other during the self-test, and LEDs and relays can be tested as well. The instrument is shut down automatically if the batteries are depleted. The instrument includes an integrated charge control circuit for reliable charging of NiMH or NiCd batteries.

Standard Equipment

1 **PROFITEST 2** test instrument
1 insert for earthing contact plug (PRO-Schuko)
1 two-pole measuring adapter
1 cable for expansion to three-pole adapter
2 alligator clips
1 carrying strap
1 set batteries
1 operating instructions
1 factory calibration certificate

Applicable Regulations and Standards

IEC 61010-1/ DIN EN 61010-1/ VDE 0411-1	Safety requirements for electrical equipment for measurement, control and laboratory use
IEC 61557/ EN 61557/ VDE 0413	Part 1: General requirements Part 2: Insulation resistance measuring instruments Part 3: Loop resistance measuring instruments Part 4: Instruments for the measurement or resistance at earth conductors, protective conductors and bonding conductors Part 5: Earth resistance measuring instruments Part 6: Instruments for testing for correct functioning of residual-current protective devices (RCDs) and the effectiveness of protective measures in TT and TN systems Part 7: Phase sequence indicators
VDE 0106 Part 1	Protection against electrical shock, classifications for electrical and electronic equipment
DIN EN 60529 VDE 0470-1	Test instruments and test procedures – Protection provided by enclosures (IP code)
DIN EN 61326-1 VDE 0843-20-1	Electrical equipment for measurement, control and laboratory use – EMC requirements

Nominal Ranges of Use

Voltage U_N	120 V	(108 ... 132 V)
	230 V	(196 ... 253 V)
	400 V	(340 ... 440 V)
Frequency f_N	16 2/3 Hz	(15.4 ... 18 Hz)
	50 Hz	(49.5 ... 50.5 Hz)
	60 Hz	(59.4 ... 60.6 Hz)
	200 Hz	(190 ... 210 Hz)
	400 Hz	(380 ... 420 Hz)
Overall Voltage Range	65 ... 550 V	
Overall Frequency Range	15.4 ... 420 Hz	
Waveshape	sine	
Temperature Range	0 °C ... + 40 °C	
Battery Voltage	6 ... 10 V	
Line Impedance Angle	corresponds to $\cos\varphi$ = 1 ... 0.95	
Probe Resistance	< 50 kΩ	

Characteristic Values

Function	Measured Quantity	Measuring Range (Display Range I_K)	Resolution	Input Impedance / Test Current	Nominal Range of Use	Nominal Values	Measuring Uncertainty	Intrinsic Uncertainty	Connections: Plug Insert [2]	2-Pole Adapter	3-Pole Adapter	Probe	Clip
U_{L-PE}	U_{L-PE}	0 ... 99.9 V 100 ... 500 V	0.1 V 1 V	terminal L-N-PE 500 kΩ	108 ... 253 V		±(2% rdg.+1D)	±(1% rdg.+5D) ±(1% rdg.+1D)	●	●			
		0 ... 99.9 V 100 ... 500 V	0.1 V 1 V		108 ... 500 V [6]			±(1% rdg.+5D) ±(1% rdg.+1D)					
	f	15.0 ... 99.9 Hz 100 ... 1000 Hz	0.1 Hz 1 Hz	terminal L-PE 500 kΩ	15.4 ... 420 Hz		±(0.2% rdg.+1D)	±(0.1% rdg.+1D)	●				
	$U_{3\sim}$	0 ... 99.9 V 100 ... 500(850[1]) V	0.1 V 1 V		108 ... 500 V [6]		±(3% rdg.+1D)	±(2% rdg.+1D)			●		
	U_{SONDE}	0 ... 99.9 V 100 ... 253 V	0.1 V 1 V	probe-PE 1MΩ	0 ... 253 V		±(3% rdg.+5D)	±(2% rdg.+4D)				●	
	I_L	0 ... 1 A	0.1 mA		5 mA ... 1.0 A		±(5% rdg.+5D)	±(3% rdg.+3D)					●
	$I_{AMP.}$	0 ... 99.9 A 100 ... 199 A	0.1 A 1 A		10 A ... 150 A		±(10% rdg.+5D)	±(5% rdg.+3D)					●
U_{L-N}	U_{L-N}	0 ... 99.9 V 100 ... 300 V	0.1 V 1 V	330 kΩ	108 ... 253 V		±(2% rdg.+1D)	±(1% rdg.+5D) ±(1% rdg.+1D)	●				
	f	15.0 ... 99.9 Hz 100 ... 1000 Hz	0.1 Hz 1 Hz		15.4 ... 420 Hz		±(0.2% rdg.+1D)	±(0.1% rdg.+1D)					
$I_{\Delta N}$	$U_{I\Delta N}$	0 ... 70.0 V	0.1 V	0.3 · $I_{\Delta N}$	5 ... 70 V	U_N = 120/230 V f_N = 50/60 Hz U_L = 25/50 V $I_{\Delta N}$ = 10/30/100/300/500 mA U_N [2][5] = 400 V	+10% rdg.+1D	+1% rdg.–1D ... +9% rdg.+1D	●	●		● as desired	
	R_E / $I_{\Delta N}$ = 10 mA	10 Ω ... 6.51 kΩ	10 Ω		calculated value from $U_{I\Delta N}$ / $I_{\Delta N}$								
	R_E / $I_{\Delta N}$ = 30 mA	3 Ω ... 999 Ω 1 kΩ ... 2.17 kΩ	3 Ω 10 Ω										
	R_E / $I_{\Delta N}$ = 100 mA	1Ω ... 651 Ω	1Ω										
	R_E / $I_{\Delta N}$ = 300 mA	0.3 Ω ... 99.9 Ω 100 Ω ... 217 Ω	0.3 Ω 1 Ω										
	R_E / $I_{\Delta N}$ = 500 mA	0.2 Ω ... 9.99 Ω 100 Ω ... 130 Ω	0.2 Ω 1 Ω										
	I_Δ / $I_{\Delta N}$ = 10 mA	3.0 ... 13.0 mA	0.1 mA	3.0 ... 13.0 mA	3.0 ... 13.0 mA		±(5% rdg.+1D)	±(3.5% rdg.+2D)					
	I_Δ / $I_{\Delta N}$ = 30 mA	9.0 ... 39.0 mA		9.0 ... 39.0 mA	9.0 ... 39.0 mA								
	I_Δ / $I_{\Delta N}$ = 100 mA	30 ... 130 mA	1 mA	30 ... 130 mA	30 ... 130 mA								
	I_Δ / $I_{\Delta N}$ = 300 mA	90 ... 390 mA	1 mA	90 ... 390 mA	90 ... 390 mA								
	I_Δ / $I_{\Delta N}$ = 500 mA	150 ... 650 mA	1 mA	150 ... 650 mA	150 ... 650 mA								
	$U_{I\Delta}$ / U_L = 25 V	0 ... 25.0 V	0.1 V	same as I_Δ	0 ... 25.0 V		+10% rdg.+1D	+2.5% rdg.–1D ... +9% rdg.+1 D					
	$U_{I\Delta}$ / U_L = 50 V	0 ... 50.0 V			0 ... 50.0 V								
	t_A / $I_{\Delta N}$	0 ... 1000 ms	1 ms	1.05 · $I_{\Delta N}$	0 ... 1000 ms		±4 ms	±3 ms					
Z_{Loop} Z_I	Z_{Loop} (full-waves) Z_I	0.01 ... 9.99 Ω	10 mΩ	0.83 ... 4.0 A	0.15 ... 0.49 Ω 0.50 ... 0.99 Ω 1.0 ... 9.99 Ω	U_N = 120/230 V	±(10% rdg.+2D) ±(10% rdg.+3D) ±(5% rdg.+3D)	±3 D ±(4% rdg.+3D) ±(3% rdg.+3D)	●	Z_{Loop}			
	Z_{Loop} (+/– half-waves)				0.25 ... 0.99 Ω 1.00 ...9.99 Ω	U_N [2]= 400 V/ 500 V at Z_{Loop}	±(18% rdg.+3D) ±(10% rdg.+3D)	±(6% rdg.+5D) ±(4% rdg.+3D)					
	I_K	0 A ... 999 A 1.00 kA ... 9.99 kA 10.0 kA ... 50.0 kA[3]	1 A 10 A 100 A	—	120 (108 ... 132) V 230 (196 ... 253) V 400 (340 ... 440) V	f_N = 50/60 Hz	calculated value from Z_{Loop}						
R_E	R_E (R_{ELoop} without probe)	0 ... 10 Ω 0 ... 10 Ω 0 ... 10 Ω 0 ... 100 Ω 0 ... 1 kΩ 1 kΩ ... 10 kΩ	10 mΩ 10 mΩ 10 mΩ 10 mΩ 1 Ω 1 Ω	0.83 ... 3.4 A 0.83 ... 3.4 A 0.83 ... 3.4 A 400 mA 40 mA 4 mA	0.15 Ω ... 0.49 Ω 0.5 Ω ... 0.99 Ω 1.0 Ω ...9.99 Ω 10 Ω ...99.99 Ω 100 Ω ...999 kΩ 1 kΩ ...9.999 kΩ	U_N = 120/230 V U_N = 400 V [2] f_N = 50/60 Hz	±(10% rdg.+2D) ±(10% rdg.+3D) ±(5% rdg.+3D) ±(10% rdg.+3D) ±(10% rdg.+3D) ±(10% rdg.+3D)	±3 D ±(4% rdg.+3D) ±(3% rdg.+3D) ±(3% rdg.+3D) ±(3% rdg.+3D) ±(3% rdg.+3D)	●	●		●	
R_{ISO}	R_{ISO}	0.01 ... 9.99 MΩ 10.0 ... 99.9 MΩ	10 kΩ 100 kΩ	I_K = 1.5 mA	50 kΩ ... 100 MΩ	U_N = 100 V I_N = 1 mA	±(5% rdg.+1D)	±(3% rdg.+1D)	●	●			
		0.01 ... 9.99 MΩ 10.0 ... 99.9 MΩ 100 ... 200 MΩ	10 kΩ 100 kΩ 1 MΩ			U_N = 250 V I_N = 1 mA							
		0.01 ... 9.99 MΩ 10.0 ... 99.9 MΩ 100 ... 300 MΩ	10 kΩ 100 kΩ 1 MΩ			U_N = 500 V I_N = 1 mA							
	U	25 ... 600 V–	1 V	500 kΩ	25 ... 600 V		±(3% rdg.+1D)	±(1.5% rdg.+1D)					
R_{LO}	R_{LO}	0.01 Ω ... 9.99 Ω 10.0 Ω ... 99.9 Ω	10 mΩ 100 mΩ	$I_m \geq$ 200 mA	0.1 Ω ... 6 Ω	U_0 = 4.5 V	±(4% rdg.+2D)	±(2% rdg.+2D)		●			

[1] Only for systems with measuring category II,contamination degree 2, max. 5 min
[2] U > 253 V with 2-pole adapter only
[3] 100 U_N · 1/Ω
[5] $I_{\Delta N}$ = 500 mA, max. U_N = 250 V
[6] L-PE: 300 V, L-L: 500 V

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Reference Conditions

Line Voltage	230 V ± 0.1%
Line Frequency	50 Hz ± 0.1%
Meas. Qty. Frequency	45 Hz ... 65 Hz
Meas. Qty. Waveshape	sine (deviation between RMS and rectified value ≤ 0.1%)
Line Impedance Angle	cos φ = 1
Probe Resistance	≤ 10 Ω
Battery Voltage	8 V ± 0.5 V
Ambient Temperature	+ 23 °C ± 2 K
Relative Humidity	45% ... 55%
Finger Contact	potential difference test at earth potential

Power Supply

Batteries	6 ea. 1.5 V mignon cells (alkaline manganese) per IEC-LR6 or ANSI-AA or JIS-AM3) or 6 rechargeable NiMH batteries
Number of Measurements (with one set of batteries)	
– for R_{ISO}	1 measurement – 25 s pause 1500 measurements
– for R_{LO}	automatic polarity reversal (1 measuring cycle) – 25 s pause: 1500 measurements
Battery Test	battery voltage displayed numerically and as symbol 6.0 ... 10.0 V
Battery Saving Circuit	Display illumination can be deactivated. The instrument switches itself off 15 ... 90 seconds after last key operation. ON-time can be selected by the user.
Safety Shut-Down	The instrument is switched off, or cannot be switched on, if the supply voltage drops to below a given level.
Charging Socket	Rechargeable batteries can be directly charged within the instrument by connecting the Z501D charger to the charging socket.

Overload Capacity

R_{iso}	600 V continuous
U_{L-PE}, U_{L-N}	600 V continuous
Fi, R_E, R_F	440 V continuous
Z_{Loop}, Z_i	550 V (limits the number of measurements and pause duration, a thermal protector switches the instrument off if overload should occur.)
R_{LO}	Electronic protection prevents the instrument from being switched on if interference voltage is present.
Fine-Wire Fuse Protection	3.15 A 10 s, > 5 A – fuse blows

Electrical Safety

Protection Class	II per IEC 61010-1/EN 61010-1/VDE 0411-1
Nominal Voltage	230/400 V (300/500 V)
Test Voltage	3.7 kV 50 Hz
Measuring Category	III
Contamination Factor	2
Fuses	
Terminals L and N	1 ea. fuse link M 3.15/500G 6.3 mm x 32 mm (safety fuse: FF 3.15/500G)

Electromagnetic Compatibility (EMC)

Product standard: EN 61326-1:1997
EN 61326:1997/A1:1998

Interference Emission		Class
EN 55022		A
Interference Immunity	Test Value	
EN 61000-4-2	Contact/air - 4 kV/8 kV	
EN 61000-4-3	10 V/m	
EN 61000-4-4	Mains Connection- 2 kV	

Ambient Conditions

Operating Temperature	–10 ... + 50 °C
Storage Temperature	–20 ... + 60 °C (without batteries)
Relative Humidity	max. 75%, no condensation
Elevation	max. 2000 m above sea level

Mechanical Design

Display	multiple display with dot matrix 64 x 128 pixels
Protection	housing: IP 40, test probe: IP 40 per EN 60529/DIN VDE 0470 Part 1

Extract from table on the meaning of IP codes

IP XY (1st digit X)	Protection against foreign object entry	IP XY (2nd digit Y)	Protection against the penetration of water
0	not protected	0	not protected
1	≥ 50.0 mm ∅	1	vertically falling drops
2	≥ 12.5 mm ∅	2	vertically falling drops with enclosure tilted 15°
3	≥ 2.5 mm ∅	3	spraying water
4	≥ 1.0 mm ∅	4	splashing water

Dimensions	w x l x d = 240 mm x 340 mm x 62 mm
Weight	approx. 2.5 kg with batteries

Accessories for the PROFITEST 2

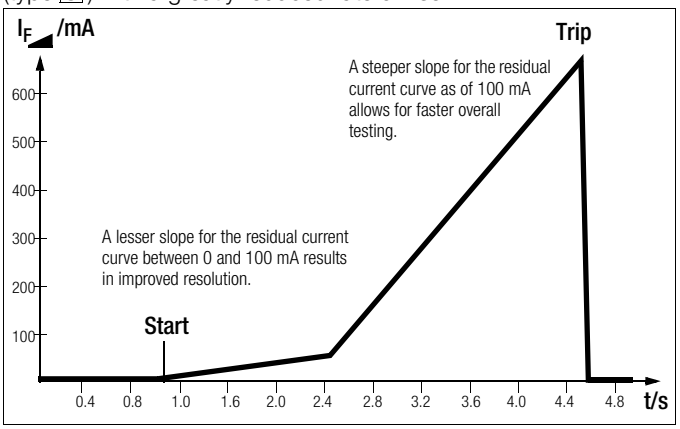
PROFITEST®DC-II

Applications

- Trip test of the DC characteristics for AC-DC sensitive RCCBs ⎓
  - for measuring trip current
  - for measuring time to trip
  - for the testing of undelayed and delayed S RCCBs
- Loop resistance measurement with a resolution of 0.01 Ω with the **PROFITEST 2** by suppressing tripping of RCCBs which are sensitive to pulsating currents.

Trip Test Operating Mode for AC-DC Sensitive RCCBs ⎓ with Rising DC Residual Current and Measurement of Trip Current

In selector switch position I_F◢, a slowly rising direct current flows via N and PE. The measurement value for current is continuously displayed. When the RCCB is tripped, the last measured current value appears. Measurement is performed for delayed RCCBs (type S) with a greatly reduced rate of rise.

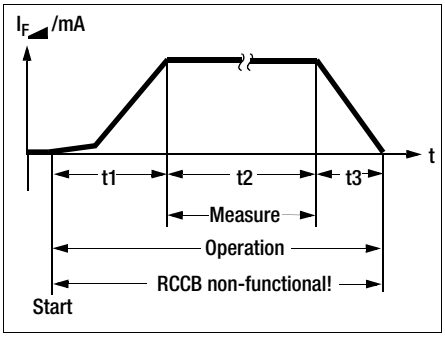


Trip Test Operating Mode for AC-DC Sensitive RCCBs with Constant DC Residual Current and Measurement of Trip Current

In the selector switch position for the respective nominal residual current, twice the nominal current flows via N and PE. Time required until RCCB tripping occurs is measured and displayed.

Loop Impedance Measurement Operating Mode with the PROFITEST 2 by means of Suppressing RCCB Tripping

The PROFITEST®DC-II allows for the measurement of loop impedance in TN systems with RCCBs which are sensitive to pulsating current (10/30/100/300/500 mA nominal residual current).



The instrument generates a DC residual current which saturates the RCCB's magnetic circuit. A measuring current is superimposed by the **PROFITEST 2** which demonstrates half-waves only of like polarity. The RCCB can no longer detect the measuring current and is not tripped during testing.

ISO Calibrator 1

Calibration adapter for quick and efficient testing of the accuracy of test instruments for insulation resistance and low-value resistors.

3-Phase Current Adapters

The A3-16, A3-32 and A3-63 three-phase current adapters are used for the convenient connection of test instruments to 5-pole CEE outlets. The three different versions have different sized plugs which correspond to 5-pole CEE outlets with current ratings of 16 A, 32 A and 63 A. Phase sequence is indicated with lamps.

Testing for the effectiveness of protective devices is accomplished via five 4 mm, contact protected jacks.

Variable Plug Set

Three contact protected, self-retaining test probes for connection to measurement cables with 4 mm banana plugs, or with contact protected plugs for connection to sockets with openings ranging from 3.5 to 12 mm, e.g. CEE or Perilex outlets etc.
The test probes also fit into, for example, the square PE jack at Perilex outlets. Maximum allowable operating voltage: 600 V per IEC 61010.

KS24 Cable Set

The KS 24 cable set consists of a 4 m extension cable with permanently attached test probe at one end, and a contact protected jack at the other end, as well as two alligator clips which can be plugged onto the test probe.

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Drum with TR50 Measurement Cable

50 m measurement cable wound onto a plastic drum. Connection to one end of the cable is accomplished with a jack which is integrated into the drum. The other end is equipped with a banana plug. The drum axle with handle can be removed for space saving storage.
Cable resistance can be compensated for in selector switch position R_{LO}.

Various Accessories

Clockwise:
TR25 reel,
SP350 earth drill,
Telearm 1 telescoping rod,
PRO-UNI and
PRO-RLO plug inserts

F2000 Carrying Pouch

The test instrument, plug inserts, measuring adapter, replacement batteries etc., can all be conveniently stored and transported with the F2000 carrying pouch.
(Outer dimensions: 380 x 310 x 200 mm)

Order Information

Designation	Type	Article Number
Basic Instruments		
Universal, protective measures test instrument for DIN VDE 0100 per EN 61557, parts 1+2+3+4+5+6+7 standard equipment see page 2	**PROFITEST 2-a**	M520W
Expansions		
Test instrument, as described on page 5, including connector cable and operating instructions	PRO*Fi* TEST DC-II [D)]	M523A
Adapter for PRO*Fi*TEST®DC-II in systems without earthing contact sockets	3-Pol-Adapter	Z523A

Designation	Type	Article Number
Plug Inserts and Adapters		
Measuring adapter for three-phase current and poly-phase systems	PRO-A3 [1)]	GTZ3214000R0001
Schuko or equivalent	PRO-Schuko [1)]	GTZ3228000R0001
For Switzerland per SEV	PRO-CH	GTZ3225000R0001
For South Africa	PRO-RSA	Z501A
With 3 connector cables for any standards	PRO-UNI	GTZ3214000R0003
With 10 m cable for PE measurements etc.	PRO-RLO	GTZ3214000R0002
5-pole three-phase current adapter for 16 A CEE outlets	A3-16	GTZ3602000R0001
5-pole three-phase current adapter for 32 A CEE outlets	A3-32	GTZ3603000R0001
5-pole three-phase current adapter for 63 A CEE outlets	A3-63	GTZ3604000R0001
Variable plug set	Z500A	Z500A
Accessories		
4 m extension cable	KS24	GTZ3201000R0001
Telescoping rod for PE measurement	Telearm 1	GTZ3232000R0001
Reel with 25 m measurement cable	TR25 Reel	GTZ3303000R0001
Drum with 50 m measurement cable	TR50 Drum	GTY1040014E34
35 cm earth drill for earth measurement	SP350 Earth Drill	GTZ3304000R0001
6 special NiM rechargeable mignon batteries with holder (1300 mAh)	Akku-Set 0100S	Z501B
Charger for recharging 0100S battery set in the **PROFITEST 2**	NA 0100S	Z501D
Clip-on current sensor for leakage current, adjustable: 1 mA … 15 A, 3% and 1 A … 150 A, 2%	CLIP 0100S [D)]	Z501E
Universal carrying pouch for PROFITEST 2	F2000 [D)]	Z700D
Carrying case	K2000	Z504K
Metal case	Z504J	Z504J
Calibration Adapters		
Calibration adapter for testing the accuracy of instruments for the measurement of insulation resistance and low-value resistors	ISO-Kalibrator 1	M662A

[D)] Data sheet available
[1)] Included with the **PROFITEST 2**

For additional information on accessories, please refer to
- *our Measuring Instruments and Testers catalogue*
- *our website www.gossenmetrawatt.com*

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