SPEKTER

Machinery Switchgear Tester

MST-204

The MST-204 Machinery Switchgear Tester is a measurement instrument designed for testing the effectiveness of protective measures in machines, low-voltage switchgear, and controlgear assemblies. Using the High-Voltage Adapter (HVA-204) expands the functionality of the main unit with HV AC capabilities. The Three-Phase Adapter (TPA-204) enables users to test welding equipment, portable appliances, mains cord extensions, PRCDs, EV charging cables, and more. The advanced AUTO-TEST function allows users to quickly and easily execute predefined test sequences or customer-created test plans. The built-in large memory can store measured results, which can later be transferred to PC software for creating test reports.

- Easy operation with using automatic parameter and limit control. Test limits and values are automatically set based on user input for measurement standards and Device Under Test (DUT) parameters
- The Advanced AUTO-TEST mode facilitates the easy and transparent preparation of test sequences, including instruction, test point definition, and organizational features
- A built-in HELP menu for each measurement assists the user in connecting the Device Under Test (DUT)
- The Commander remote control allows full control of the instrument from a distance
- Separated HVA-204 allows simpler usage of the MST-204 without HV AC functionality and deliveres more pocket friendly solution.
- Fully compatible with "SW-MST-204" PC software to create test reports

Machinery Switchgear

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An operator can perform measurements on the field simply by selecting appropriate standard (Machines, Switchgears, ...) and measurement function (RPE, RINS, LOOP impedance, ...). Limit values and other test parameters will be defined automatically on bases of selected standard.

KEY FEATURES

- Easy operation using automatic parameter and limit control. Test limit and values are automaticaly set based on the user input of measurement standard and Device under test parameters (DUT). Test limit values and parameters will be defined automatically
- Advanced AUTO-TEST mode allows easy and transparent test sequence preparation including instruction, test point definition and organization features
- Built in HELP menu for each of the measurement helps the user by connection of the Device under test (DUT)
- Fully compatible with "SW-MST-204" PC software to create test reports
- Graphic 4.3-inch, 480 × 272 pixels, full colour TFT LCD with touch screen for measurement values, limit values and test parameters
- Internal memory for 30.000 locations (tree memory structure, 4 levels)
- Integrated interface (USB 2.0) for transfer of measurement results to PC
- Additional four interfaces (USB 2.0) for connection of optional USB barcode scanner, USB keyboard and USB memory stick, all working in parallel
- Compact plastic housing with removable case cover
- Separate soft accessory bag for test leads and accessories
- Connection diagrams inside the case cover
- Limit values adjustable through measuring range in all functions
- Visual and acoustic warnings in case of exceeded limit value
- Adjustable acoustic signal intensity
- Real time clock for documentation of test results
- Timer-limited and continuous measurements
- Adjustable measurement times in timer-limited measurement
- Commander with START/STOP, SAVE and ENTER keys for very handy operations
- Two selectable display languages and two external keyboards supported (English and German)
- Possible assembly into 19-inch Rack Panel, 19-inch rack mount adapter available

HVA-204 STANDARD SET

- High-Voltage Adapter HVA-204 with 1.8 m fixed mains/communication cable
- HV Test Gun SP02 without “START” switch, with 2 m cable, 2 pcs
- Pedal P-204 with 3 m cable
- Soft accessory bag
- Safety instruction HVA-204 High-Voltage Adapter in English

MEASURING FUNCTIONS

- Visual Inspection
- Protective Bonding Resistance (2-wire, 4-wire) (0.2A, 10A, 25A)
- Prospective fault loop current, Loop impedance ZL/PE
- Prospective fault loop current (RCD no trip)
- Prospective fault loop current (MPCB no trip)
- Prospective short-circuit current, Line impedance, ZL/N, ZL/L
- Prospective short-circuit current (MPCB no trip)
- Prospective short-circuit current (Secundary AC/DC)
- Voltage Drop
- RCD testing (Trip time, Trip current, Uc, AUTO)
- IMD testing
- RCM testing
- Insulation resistance (UTEST 50V...1000V, ramp test)
- HV AC, voltage programmable 250V ... 5100 V
- Residual voltage
- Residual time
- Clamp load current and THD
- Clamp leakage current
- Touch current
- Voltage and THD
- Power via external clamp (S, P, Q, PF, cos j)
- Phase rotation
- Voltage PELV
- Voltage SELV
- Voltage CONTROL
- Voltage DC Supply
- Documentation and Functional Tests

MST-204 STANDARD SET

- MachinerySwitchgear Tester MST-204, basic instrument
- IEC - Schuko mains cord, 1.8 m
- IEC - CH mains cord, 2.0 m
- IEC - GB mains cord, 1.8 m
- IEC - IT mains cord, 1.8 m
- Commander CM-204, 5 m
- Test lead, both side 4 mm banana, 2.5 mm^2, yellow, 2 m
- Test lead, both side 4 mm banana, 2.5 mm^2, black, 2 m
- Test lead, both side 4 mm banana, 0.75 mm^2, blue 2 m
- Test lead, both side 4 mm banana, 0.75 mm^2, red 2 m
- Test tip 600 V CAT IV , 36 A, 3 pcs
- Crocodile clip 600 V CAT IV, 36A, 4 pcs
- Soft accessory bag
- USB cable
- User Manual booklet in English

MST-204

APPLICATIONS

- Complete safety testing of Machinery according to EN 60204-1 standard
- Complete testing of Low-voltage switchgear and controlgear assemblies according to EN 61439-1 standard
- Complete testing of ARC welding devices according to EN 609474-4 standard in combination with Three-Phase Adapter TPA-204-63A* / TPA-204-32A*
- Complete testing of three-phase and single-phase supplied portable appliances (PAT) arcoding to EN 50678/DIN VDE 0701 and EN 50699/DIN VDE 0702 standard in combination with Three-Phase Adapter TPA-204-63A* / TPA-204-32A*
- Complete testing of PRCDs according producer's instructions and in reference to EN 50678/DIN VDE 0701 and EN 50699/DIN VDE 0702 standard in combination with Three-Phase Adapter TPA-204-63A* / TPA-204-32A*
- Complete testing of mains cords and mains cord extensions according to EN 50678/DIN VDE 0701 and EN 50699/DIN VDE 0702 standard in combination with Three-Phase Adapter TPA-204-63A* / TPA-204-32A*
- Complete testing of Electric Vehicle charging cables in combination with Three-Phase Adapter TPA-204-63A* / TPA-204-32A*

* In development

High-Voltage Adapter

Software for report

REGULATIONS

Funcionallity:

- EN 60204-1 (Safety of machinery - Electrical equipment of machines: General requirements)
- EN 61439-1 (Low-voltage switchgear and controlgear assemblies: General rules)
- EN 61180 (High-voltage test techniques for low-voltage equipment)
- EN 50191 (Erection and operation of electrical test equipment)
- EN 60974-4 (Arc welding equipment: Periodic inspection and testing)
- EN 50678/DIN VDE 0701 (General procedure for verifying the effectiveness of the protective measures of electrical equipment after repair)
- EN 50699/DIN VDE 0702 (Recurrent Test of Electrical Equipment)
- EN 61557-1 (Equipment for testing, measuring or monitoring of protective measures: General requirements)
- EN 61557-2 (Insulation resistance)
- EN 61557-3 (Loop impedance)
- EN 61557-4 (Resistance of earth connection and equipotential bonding)
- EN 61557-6 (Effectiveness of RCD)
- EN 61557-7 (Phase sequence)
- EN 61557-10 (Combined measuring equipment for testing, measuring or monitoring of protective measures)
- EN 61557-11 (Effectiveness of RCM)
- EN 61557-14 (Equipment for testing the safety of electrical equipment of machinery)
- EN 61557-16 (Equipment for testing the effectiveness of the protective measures of electrical equipment and/or medical electrical equipment)

Safety:

- EN/IEC 61010-1:2010 (Third Edition) (Safety requirements for electrical equipment for measurement, control and laboratory use – General requirements)
- EN/IEC 61010-2-30:2010 (Safety requirements for electrical equipment for measurement, control and laboratory use - Particular requirements for equipment having testing or measuring circuits)
- EN/IEC 61010-31:2015 (Safety requirements for hand-held and hand-manipulated probe assemblies for electrical test and measurement)
- EN/IEC 61010-2-34:2017 and EN/IEC 61010-2-34:2021 (Safety requirements for measurement equipment for insulation resistance and test equipment for electric strength)

EMC:

- EN 61326-1:2013 (industrial environment)

MST-204

SPEKTER

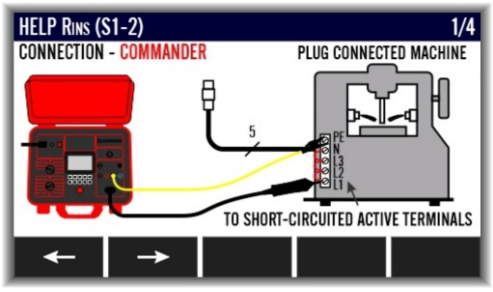
TECHNICAL SPECIFICATIONS

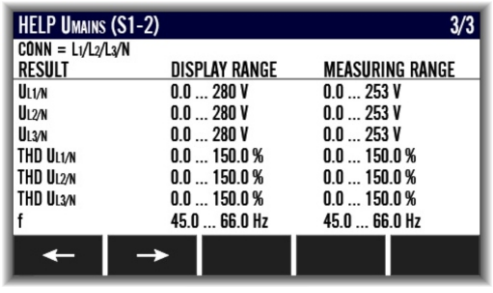
Power supply
Mains voltage: 230 V +10 %/-15 % or 240V +6 %/-10 %, 50 Hz
Max. power consumption without HVA-204: 230 VA
Max. power consumption with HVA-204: 850 VA
Measurement categories
Power supply: CAT II 300 V
Measurement terminals: CAT III 600V / CAT IV 300 V
Protection classification
Degree of protection MST-204: IP65 (closed case cover),
IP40 (open case cover, mating connectors connected to test sockets and COMMANDER connector,
IP20 (4 mm test sockets and COMMANDER connector)
Degree of protection HVA-204: IP65 (closed case cover),
IP40 (open case cover, HV test leads connected), IP20 (HV test sockets) Pollution degree: 2
Protection class MST-204: I (all test terminals are additionally double insulated acc. to IEC 61010-1 and IEC 61010-2-030)
Protection class HVA-204: I (all test terminals are additionally double insulated acc. to IEC 61010-1 and IEC 61010-2-030)
Altitude above sea level: 2000 m max.
Position: Front panel 0° (basic horizontal position) up to 90°
Mechanical characteristics
Dimensions MST-204 (L x W x H): 405 x 330 x 180 mm
Weight MST-204 (without accessories): 11.6 kg
Dimensions HVA-204 (L x W x H): 405 x 330 x 180 mm
Weight HVA-204 (without accessories): 13.1 kg
General characteristics
Display: 4.3-inch colour TFT LCD with resistive touch screen
Warnings in case of exceeded limit values: Optic and acoustic
USB device: USB 2.0 connector type B (communication to PC)
USB host: 4 pcs, USB 2.0 connector type A (connection to optional external USB keyboard, barcode scanner, USB memory stick)
Protective bonding resistance (200 mA) (2W, 4W)
Measuring range: 0.12 ... 20.00 Ω
Resolution: 0.01 Ω
Accuracy: ± (3 % rdg + 3 digits)
Open-circuit voltage: 4 ... 6 V AC, SELV, floating output
Test current: > 200 mA @ R ≤ 4 Ω
Protective bonding resistance (10 A) (2W, 4W)
Measuring range: 0.012 ... 2.000 Ω
Resolution: 0.001 Ω
Accuracy: ± (3 % rdg + 3 digits)
Open-circuit voltage: 4 ... 6 V AC, SELV, floating output
Test current: 10 A +5 A / -0 A @ R ≤ 0.3 Ω
Protective bonding resistance (25 A) (2W, 4W)
Measuring range: 0.012 ... 2.000 Ω
Resolution: 0.001 Ω
Accuracy: ± (3 % rdg + 3 digits)
Open-circuit voltage: 4 ... 6 V AC, SELV, floating output
Test current: 25 A +5 A / -3 A @ R ≤ 0.1 Ω
Line/Loop impedance (ZL/N, ZL/PE) (Standard accuracy)
Measuring range: 0.12 ... 20.00 Ω
Resolution: 0.01 Ω
Accuracy: ± (3 % rdg + 3 digits)
IPSC, IPEFC measuring range: 5.0 A ... 2.11 kA
Input voltage: 100 ... 253 V, 45 ... 66 Hz
Test current: @ 230 V ... 23 A (2 x 10 ms)
Line impedance (ZL/L) (Standard accuracy)
Measuring range: 0.12 ... 20.00 Ω
Resolution: 0.01 Ω
Accuracy: ± (3 % rdg + 3 digits)
IPSC measuring range: 5.0 A ... 2.12 kA
Input voltage: 170 ... 440 V, 45 ... 66 Hz
Test current: @ 400 V ... 40 A (2 x 10 ms)
Line/Loop impedance (ZL/N, ZL/PE) (High accuracy)
Measuring range: 0.012 ... 2.000 Ω
Resolution: 0.001 Ω
Accuracy: ± (3 % rdg + 3 digits)
IPSC, IPEFC measuring range: 50.0 A ... 21.1 kA
Input voltage: 100 ... 253 V, 45 ... 66 Hz
Test current: @ 230V ... 70 A (6 x 10 ms)
Line impedance (ZL/L) (High accuracy)
Measuring range: 0.012 ... 2.000 Ω
Resolution: 0.001 Ω
Accuracy: ± (3 % rdg + 3 digits)
IPSC measuring range: 49.2 A ... 21.2 kA
Input voltage: 170 ... 440 V, 45 ... 66 Hz
Test current: @ 400V ... 121 A (6 x 10 ms)

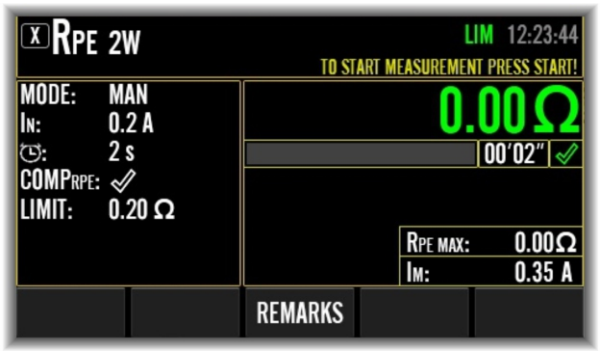
SEC IPSC impedance
Measuring range: 1.2 ... 500 Ω (test current 0.1 ... 0.4 A) 0.12 ... 100.0 Ω (test current 0.5 ... 3.0 A)
Resolution: 0.01 Ω, 0.1 Ω, 1 Ω
Accuracy: ± (5 % rdg + 3 digits)
IPSC measuring range: 0.02 A ... 83.3 A (test current 0.1 ... 0.4 A) 0.10 A ... 833 A (test current 0.5 ... 3.0 A)
Input voltage: 10 ... 100 V, DC, 45 ... 66 Hz
Test current: adjustable 0.1 ... 3.0 A
Loop impedance (ZL/PE) (RCD NO TRIP)
Measuring range: 20 ... 2000 Ω
Resolution: 1 Ω
Accuracy: ± (5 % rdg + 5 digits)
IPSC measuring range: 0.05 A ... 16 A
Input voltage: 100 ... 253 V, 45 ... 66 Hz
Test current: (9.9 mA for 40 ms, 0 mA for 40 ms) periodic
Line/Loop impedance (ZL/N, ZL/PE) (MPCB NO TRIP) (100 mA)
Measuring range: 2.0 ... 300 Ω
Resolution: 0.1 Ω, 1 Ω
Accuracy: ± (5 % rdg + 5 digits)
IPSC measuring range: 0.4 A ... 126 A
Input voltage: 100 ... 253 V, 45 ... 66 Hz
Test current: (141 mA for 40 ms, 0 mA for 40 ms) periodic
Line/Loop impedance (ZL/N, ZL/PE) (MPCB NO TRIP) (500 mA)
Measuring range: 0.16 ... 50.0 Ω
Resolution: 0.01 Ω, 0.1 Ω
Accuracy: ± (4 % rdg + 4 digits)
IPSC measuring range: 2.0 A ... 1.58 kA
Input voltage: 100 ... 253 V, 45 ... 66 Hz
Test current: (707 mA for 40 ms, 0 mA for 40 ms) periodic
Voltage drop UDELTA (ZL/N) (Standard test current)
Measuring range: -20.0 ... 20.0 %
Resolution: 0.1 %
Accuracy: ± (3 % rdg + 3 digits)
ZREF input range: 0.00 ... 20.00 Ω
UREF input range: 100 ... 253 V
Input voltage: 100 ... 253 V, 45 ... 66 Hz
Test current: @ 230 V ... 23 A (2 x 10 ms)
Voltage drop UDELTA (ZL/L) (Standard test current)
Measuring range: -20.0 ... 20.0 %
Resolution: 0.1 %
Accuracy: ± (3 % rdg + 3 digits)
ZREF input range: 0.00 ... 20.00 Ω
UREF input range: 170 ... 440 V
Input voltage: 170 ... 440 V, 45 ... 66 Hz
Test current: @ 400 V ... 40 A (2 x 10 ms)
Voltage drop UDELTA (ZL/N) (High test current)
Measuring range: -20.0 ... 20.0 %
Resolution: 0.1 %
Accuracy: ± (2 % rdg + 2 digits)
ZREF input range: 0.000 ... 2.000 Ω
UREF input range: 100 ... 253 V
Input voltage: 100 ... 253 V, 45 ... 66 Hz
Test current: @ 230 V ... 70 A (6 x 10 ms)
Voltage drop UDELTA (ZL/L) (High test current)
Measuring range: -20.0 ... 20.0 %
Resolution: 0.1 %
Accuracy: ± (2 % rdg + 2 digits)
ZREF input range: 0.000 ... 2.000 Ω
UREF input range: 170 ... 440 V
Input voltage: 170 ... 440 V, 45 ... 66 Hz
Test current: @ 400 V ... 121 A (6 x 10 ms)
RCD UF @ IΔN (Fault voltage)
Measuring range: 5 ... 110 V
Resolution: 1 V
Accuracy (IΔN = 10 mA): -0 / + (10 % rdg + 3 digits)
Accuracy (IΔN = 30 ... 1000 mA): -0 / + (8 % rdg + 3 digits)
Input voltage: 100 ... 253 V, 45 ... 66 Hz
IΔN: 10, 30, 100, 300, 500, 1000 mA
Test current: (0.33 × IΔN for 40 ms, 0 mA for 40 ms) periodic

RCDt (Trip out time)
Measuring range: 0 ... 500 ms
Measuring range (EV type): 0.1 ... 10.0 s
Resolution: 1 ms
Resolution (EV type): 0.1 s
Accuracy: ± (2 % rdg + 3 digits)
Accuracy (EV type): ± (0.2 s)
Input voltage: 100 ... 253 V, 45 ... 66 Hz
IΔN: 10, 30, 100, 300, 500, 1000 mA
Multiplier: ×1/2, ×1, ×2, ×5
RCD type: A, A-S, A-EV, B/B+, B/B+-S, B/B+-MI, F, F-EV, A-K/A-G, AC, AC-S, AC-K/AC-G
Polarity: 0 °, 180 °
RCD IΔ (Ramp)
Measuring range (AC types): 40 ... 120 % of IΔN
Measuring range (AC-S type): 40 ... 120 % of IΔN
Measuring range (A, A-S types, IΔN = 10 mA): 25 ... 220 % of IΔN
Measuring range (A, A-S types, IΔN ≥ 30 mA): 25 ... 160 % of IΔN
Measuring range (B, B-S types): 40 ... 220 % of IΔN
Resolution: 5 % of IΔN
Accuracy: ± (1 step)
Input voltage: 100 ... 253 V, 45 ... 66 Hz
IΔN: 10, 30, 100, 300, 500, 1000 mA
RCD type: A, A-S, B/B+, B/B+-S, F, A-K/A-G, AC, AC-S, AC-K/AC-G
Polarity: 0 °, 180 °
RCDAUTO (Auto sequence mode)
Test steps: depend on RCD type (refer to user manual)
Input voltage: 100 ... 253 V, 45 ... 66 Hz
IΔN: 10, 30, 100, 300, 500, 1000 mA
RCD type: A, A-S, A-EV, B/B+, B/B+-S, B/B+-MI, F, F-EV, A-K/A-G, AC, AC-S, AC-K/AC-G
IMD Test (IT systems)
Measuring range: 0.0 ... 60.0 s
Resolution: 0.1 s
Accuracy: ± (0.2 s)
Input voltage: 100 ... 253 V, DC, 45 ... 66 Hz
Loading resistor range: 5 ... 750 kΩ (in 64 steps)
RCM Test (TT/TN systems)
Measuring range: 0.0 ... 10.0 s
Resolution: 0.1 s
Accuracy: ± (0.2 s)
Input voltage: 100 ... 253 V, DC, 45 ... 66 Hz
IΔN: 10, 30, 100, 300, 500 mA
Multiplier: ×1/2, ×1
RCM type: A, B
Polarity: 0°, 180°
RINS (Insulation resistance)
Measuring range: 0.12 ... 5.00 MΩ (UTEST NOM = 50 ... 99 V) 0.12 ... 10.0 MΩ (UTEST NOM = 100 ... 249 V) 0.12 ... 25.0 MΩ (UTEST NOM = 250 ... 499 V) 0.12 ... 50.0 MΩ (UTEST NOM = 500 ... 999 V) 0.12 ... 100 MΩ (UTEST NOM = 1000 V)
Resolution: 0.01 MΩ, 0.1 MΩ, 1 MΩ
Accuracy: ± (5 % rdg + 3 digits) (0.00 ... 20.0 MΩ) ± (8 % rdg) (20.1 ... 50.0 MΩ) ± (15 % rdg) (50.1 ... 100 MΩ)
UTEST NOM: 50, 100, 250, 500, 1000 V or adjustable 50 ... 1000 V
Test voltage tolerance: (-0 ... +25 %) of UTEST NOM
Test current: > 1 mA (up to resistance UTEST NOM/1 mA)
Short-circuit current: < 2 mA
RINS (Ramp)
Measuring range: 50 ... 1200 V
Resolution: 1 V
Accuracy: ± (5 % rdg + 5 digits)
Treshold current: 1 mA
HVAC (High-Voltage Dielectric test) (with adapter HVA-204 only)
Output test voltage: 250 ... 5100 V, adjustable, floating
Output power: > 500 VA @ 5100 V
Test voltage accuracy: ± 3 % of reference value
Measuring voltage range: 240 ... 5200 V
Resolution: 1 V
Accuracy: ± 3 % rdg
Measuring current range: 0 ... 200 mA
Resolution: 1 mA
Accuracy: ± (3 % rdg + 2 digits)
Short-circuit current: > 200 mA
Measurements: No Ramp, Ramp Up, Ramp Up/Down
Modes: Burn, Trip, Pulse
Trip current mode: Apparent, Real

URES (Residual voltage)
Measuring range: 10 ... 625 V (DC voltage) 10 ... 440 V (AC voltage)
Resolution: 1 V
Accuracy: -0 / +6 V (URES < 60 V) -0 / +10 % (URES ≥ 60 V)
Input voltage: Max. 440 VRMS & 625 VPEAK, DC, 45 ... 66 Hz
Measurement modes: Standard, Linear, Non linear
Stop trigger times: 1, 5 s, adjustable 1 ... 300 s
TRES (Discharge time)
Measuring range: 0.3 ... 300.0 s
Resolution: 0.1 s
Accuracy: ± (3 % rdg + 3 digits)
Input voltage: Max. 440 VRMS & 625 VPEAK, DC, 45 ... 66 Hz
Measurement modes: Standard, Linear, Non linear
Stop trigger voltages: 60 V, adjustable 25 ... 60 V
ILOAD (with optional Clamp CC-204-1000A)
Measuring range: 0.1 ... 1000 A
Resolution: 0.1 A, 1 A
Accuracy: ± (3 % rdg + 2 digits)
Measuring range THD: 0.0 ... 150.0 % (1 ... 40th harmonic)
Measuring range frequency: 45.0 ... 66.0 Hz
ILEAKAGE (with optional Clamp CC-204-50A)
Measuring range: 0.8 ... 1000 mA
Resolution: 0.1 mA, 1 mA
Accuracy (basic): ± (3 % rdg + 2 digits)
Frequency range: 40 Hz ... 100 kHz (acc. to EN 61557-16)
ITOUCH
Measuring range: 0.12 ... 20.0 mA
Resolution: 0.01 mA, 0.1 mA
Accuracy: ± (3 % rdg + 2 digits)
Frequency range: DC ... 100 kHz (acc. to EN 61557-16)
Internal resistance: 1 kΩ
UMAINS voltage (L/N, L1/L2/L3/N)
Measuring range: 10.0 ... 253 V
Resolution: 0.1 V, 1 V
Accuracy: ± (2 % rdg + 3 digits) (10.0 ... 99.9 V) ± (2 % rdg) (100 ... 253 V)
Measuring range THD: 0.0 ... 150.0 % (1 ... 40th harmonic)
Measuring range frequency: 45.0 ... 66.0 Hz
UMAINS voltage (L1/L2/L3)
Measuring range: 10.0 ... 440 V
Resolution: 0.1 V, 1 V
Accuracy: ± (2 % rdg + 3 digits) (10.0 ... 99.9 V) ± (2 % rdg) (100 ... 400 V)
Measuring range THD: 0.0 ... 150.0 % (1 ... 40th harmonic)
Measuring range frequency: 45.0 ... 66.0 Hz
DC Supply Voltage
Measuring range: 0.0 ... 440 V
Resolution: 0.1 V, 1 V
Accuracy: ± (2 % rdg + 3 digits) (10.0 ... 99.9 V) ± (2 % rdg) (100 ... 440 V)
Measuring range URIPPLE: 0.0 ... 200 V
Resolution URIPPLE: 0.1 V, 1 V
Accuracy URIPPLE: ± (2 % rdg + 3 digits) (10.0 ... 99.9 V) ± (2 % rdg) (100 ... 200 V)
Frequency range URIPPLE: 20 ... 200 Hz







POWER 2W (Single-phase loads)
Measuring range (S, P, Q): 1.0 W/VA/var... 253 kW/kVA/kvar
Resolution: 0.1, 1 W/VA/var, 0.01, 0.1, 1 kW/kVA/kvar
Accuracy (S): ± (5 % rdg + 10 digits) (1.0 ... 100.0 VA) ± (5 % rdg + 3 digits) (101 VA ... 253 kVA)
Accuracy (P, Q): ± (7 % rdg + 10 digits) (1.0 ... 100.0 W/var) ± (7 % rdg + 3 digits) (101 W/var ... 253 kW/kvar)
Measuring range (PF): -1.00 ... 1.00
Measuring range (Cos φ): -1.00 ... 1.00
POWER 3W (Three-phase loads)
Measuring range (S, P, Q): 1.0 W/VA/var... 762 kW/kVA/kvar
Resolution: 0.1, 1 W/VA/var, 0.01, 0.1, 1 kW/kVA/kvar
Accuracy (S): ± (5 % rdg + 10 digits) (1.0 ... 100.0 VA) ± (5 % rdg + 3 digits) (101 VA ... 762 kVA)
Accuracy (P, Q): ± (7 % rdg + 10 digits) (1.0 ... 100.0 W/var) ± (7 % rdg + 3 digits) (101 W/var ... 762 kW/kvar)
Measuring range (PF): -1.00 ... 1.00
Measuring range (Cos φ): -1.00 ... 1.00
POWER 4W (Three-phase loads)
Measuring range (S, P, Q): 1.0 W/VA/var... 759 kW/kVA/kvar
Resolution: 0.1, 1 W/VA/var, 0.01, 0.1, 1 kW/kVA/kvar
Accuracy (S): ± (5 % rdg + 10 digits) (1.0 ... 100.0 VA) ± (5 % rdg + 3 digits) (101 VA ... 759 kVA)
Accuracy (P, Q): ± (7 % rdg + 10 digits) (1.0 ... 100.0 W/var) ± (7 % rdg + 3 digits) (101 W/var ... 759 kW/kvar)
Measuring range (PF): -1.00 ... 1.00
Measuring range (Cos φ): -1.00 ... 1.00
3PROTATION (L1/L2/L3)
Main result: Right / Left / Undefined
Input voltage: min. 170 V, 45 ... 66 Hz
Measuring range (UNSC): 0.0 ... 15.0 %
Resolution: 0.1 %
Accuracy: ± (3 % rdg + 5 digits)
3PROTATION (L1/L2/L3/N)
Main result: Right / Left / Undefined
Input voltage: min.100 V, 45 ... 66 Hz
Measuring range (UNSC, UZSC): 0.0 ... 15.0 %
Resolution: 0.1 %
Accuracy: ± (3 % rdg + 5 digits)
UPELV (Protective Extra Low Voltage)
Measuring range: 0.0 ... 440 V
Resolution: 0.1 V, 1 V
Accuracy: ± (2 % rdg + 3 digits) (10.0 ... 99.9 V) ± (2 % rdg) (100 ... 440 V)
USELV (Safety Extra Low Voltage)
Measuring range: 0.0 ... 440 V
Resolution: 0.1 V, 1 V
Accuracy: ± (2 % rdg + 3 digits) (10.0 ... 99.9 V) ± (2 % rdg) (100 ... 440 V)
UCONTROL (Control Voltage)
Measuring range: 0.0 ... 440 V
Resolution: 0.1 V, 1 V
Accuracy: ± (2 % rdg + 3 digits) (10.0 ... 99.9 V) ± (2 % rdg) (100 ... 440 V)

OPTIONAL ACCESSORIES

- CC-204-50A, AC current clamp up to 50 A, for leakage/load current measurements, cable equipped with three-pin round connector, current ratio 1000:1
- CC-204-1000A, AC current clamp up to 1000 A for load current measurements, cable equipped with three-pin round connector, current ratio 1000:1
- TC-204-D, Test cable with Schuko plug on one side and 3× 4-mm banana on the other side, for measurements on Schuko mains sockets, 2 m
- TC-204-CH, Test cable with Swiss SEV 1011 plug on one side and 3× 4-mm banana on the other side, for measurements on Swiss SEV 1011 mains sockets, 2 m
- TC-204-I, Test cable with Italian type L plug on one side and 3× 4-mm banana on the other side, for measurements on Italian mains sockets, 2 m
- TC-204-UK, Test cable with UK plug on one side and 3× 4-mm banana on the other side, for measurements on UK mains sockets, 2 m
- EXC-204, Extension cord, 10 m, for Commander
- ZA-204-D, Compensation adapter for compensation of test leads (Schuko socket)
- ZA-204-CH, Compensation adapter for compensation of test leads (Swiss socket)
- ZA-204-I, Compensation adapter for compensation of test leads (Italian socket)
- ZA-204-UK, Compensation adapter for compensation of test leads (UK socket)
- BCS-204, Barcode scanner 1250G
- KB-204-D, Keyboard German
- KB-204-UK, Keyboard English
- HVA-204, High-Voltage Adapter
- TPA-204-63A* (Three-Phase Adapter for test objects up to 63 A)
- TPA-204-32A* (Three-Phase Adapter for test objects up to 32 A)
- RACK-204, 19-inch Rack Panel
- TLS-204-MST, Test lead set for MachinerySwitchgear Tester MST-204, containing:
  - Test lead, both side 4 mm banana, 2.5 mm^2, yellow, 2 m
  - Test lead, both side 4 mm banana, 2.5 mm^2, black, 2 m
  - Test lead, both side 4 mm banana, 0.75 mm^2, blue, 2 m
  - Test lead, both side 4 mm banana, 0.75 mm^2, red, 2 m
  - Test lead, both side 4 mm banana, 0.75 mm^2, green, 2 m (welding equp.), 2 pcs
  - Test tip 600 V CAT IV, 36 A, 3 pcs
  - Crocodile clip 600 V CAT IV, 36 A, 4 pcs
  - Soft accessory bag
- WL-204, Warning Lamp red/green 24 VDC with 0.9 m cable
- WLC-204, Connector (male) for warning lamp (M12 / 5-pole)
- SP03, HV Test Gun with "START" switch, with 2 m cable and straight HV connector
- TLS-204-HVA, HV Test Lead Set for HVA-204 with safety cage containing:
  - HV test cable 3 m with HV connector on one end and open other end, 2 pcs
  - 9P D-sub connector (male) for example for PEDAL
  - 2 pole safety circuit cable connector (male), 2 pcs

*In development

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