

TECHNICAL DATA SHEET

Test device for windings & motors

MTC2 R7

Revision 4.3, valid from August 2023

All values and accuracy specifications are valid at 22 °C room temperature, after 30 min warm-up phase¹⁾ and max. 40 %rH.

The MTC2 R7 is THE digital surge voltage tester for testing inductive devices under test such as three-phase stators, single-phase stators, transformers, motors, armatures and individual coils.

The measurement technology sets a new benchmark in accuracy, reproducibility and speed. The area of application includes workshops as well as production and laboratories. It is controlled via a built-in PC with Windows operating system.

Standard model MTC2 R7 (6 kV, 12 kV and 15 kV versions)

ELECTRICAL SPECIFICATIONS

Included test methods	Surge voltage Insulation test High voltage test DC Resistance test with temperature compensation Inductance test (optional) Capacity test (optional) Rotary field test (optional)
Supply voltage	100 – 250 V AC
Mains frequency	47 – 63 Hz
No load current consumption	c. 150 W, fuse T4A

MECHANICAL SPECIFICATIONS

Options	Table version incl. supporting feet and solid handle for tilting and carrying the test device 19" rack version incl. mounting kit for installation in a 19" cabinet 19" rack version in a trolley case with wheels
Operating environment	Operating temperature 5 – 40 °C / 41 – 104 °F, designed for a relative humidity of 0 – 80 %rH Without condensation!
Storage	Storage temperature -10 – 60 °C / 14 – 140 °F, designed for a relative humidity of 0 – 90 %rH Without condensation!
Dimensions	Table version: 500 x 430 x 222 mm (B x T x H) 19" rack version 6 HM: 448 x 430 x 267 mm (B x T x H) 19" rack version in trolley case with wheels: 565 x 585 x 331 mm (B x T x H)
Color	RAL 7035
IP protection class	IP 30
Noise emissions	< 40 dB (up to approx. 25 °C room temperature) ≥ 50 dB (above approx. 25 °C room temperature) ²⁾
Weights	6 kV version c. 21 kg / c. 46.3 lbs. 12 kV, 15 kV versions c. 25 kg / c. 55.1 lbs. 19" rack version in trolley case with wheels additionally c. 8,5 kg / c. 18.7 lbs.

1) Three hours of storage at room temperature, followed by 30 minutes of warm-up.

2) The fan speed is determined by the internal device temperature. If the test cycle time is very high, noise emissions may increase even under normal test conditions (e.g. 22 °C).

GENERAL SPECIFICATIONS	
Display	15.6" color graphic display, Resolution 1920 x 1080 pixels, display behind scratch-resistant glass
Data input	PCAP - capacitive touch display behind scratch-resistant glass, mouse and keyboard.
Test plan storage	More than 50.000 test plans
Test result storage	More than 5.000.000 test results
Test connections	standard device ALL CONNECTIONS ON THE RIGHT SIDE! MTC2 6 kV : 9 x safety mounting sockets MTC2 12 kV and 15 kV : 9 pole high voltage connection socket 4-wire connection matrix : 4 x windings, 1 x stator/motor housing (optional extension to 8 x windings, 1 x stator/motor housing) Sub-D socket : Optional accessory connection Sub-D plug : Room temperature sensor connection, radiation pyrometer 4 – 20 mA ready
Test connections	19" rack mount version + desktop device + heavy-duty case ALL CONNECTIONS ON THE REAR! MTC2 6kV : 9 x safety mounting sockets (optional multipole industrial connector) MTC2 12 kV and 15 kV : 9 pole high voltage connection socket 4-wire connection matrix : 4 x windings, 1 x stator/motor housing (optional extension to 8 x windings, 1 x stator/motor housing) Sub-D socket : Optional accessory connection Sub-D plug : Room temperature sensor connection, radiation pyrometer 4 – 20 mA ready
Safety	Key switch Password protection when accessing test parameters 2-channel CAT IV safety relay for external safety limit switch, e.g. for emergency stop and/or test cover etc. Emergency stop on the front Protective earth conductor monitoring, whether the mains supply is correctly connected to ground (PE monitoring)
Display interfaces	2 x DisplayPort for additional external monitors ¹⁾²⁾
Communication interfaces	4 x USB 3.1 ¹⁾ 2 x LAN 1 Gbit ¹⁾
Memory	16 GB
Processor	Intel i3
Hard drive	256 GB M.2 SSD
Operating system	Windows 10® 21H2 Win11® Expected to be available from Q3/2023 (Microsoft has not yet released a Win11 version for industry use)
Standard interfaces	Outputs : Result light, warning light ¹⁾ Inputs : Foot switch (only for table version) : Control plug (only for 19" rack version) : Two-hand start (optional)
PLC I/O remote control interface Only for desktop device and 19" rack version	Outputs : GO, NOGO, Test in progress, Ready/Status : 8 x freely configurable outputs 4 V, max. 100 mA per output, max. 1 A at all outputs simultaneously in total, not potential-free Inputs : Start : 4 x freely configurable inputs 24 V, not potential-free
Adjustment/Calibration	Adjustment via software without the need to open the test device. Remote calibration via SmartCalibration.
Software usability	All entries are checked by plausibility control. This is intended to prevent incorrect inputs. The operator can display detailed help (explanations) for each input. Optimized for touch operation.
Front panel labeling language	DE, EN
Language of software	DE, EN, FR (optional), IT (optional), ES (optional)
Waiting time startup (boot)	c. 1.2 min (usually performed only once after unpacking or when the PC has been completely shut down)
Waiting time on/off	c. 20 s
Development and production	Made in Germany – Premium Quality – Made in Sauerland
Certificates and compliance with standards	CE compliant, 2014/35/EU, 2014/30EU, 2011/65/EU, EN61010-1:2011-07, EN61326-1:2013-07

- 1) For table version, all connections are located on the right side. For 19" rack version, all connections are located on the rear side of the device.
2) The connected monitor must support 1920*1080 Full-HD resolution.

Surge voltage test MTC2 R7

GENERAL SPECIFICATIONS

Test voltage	MTC2 6 kV : 200 – 6000 V MTC2 12 kV : 500 – 12000 V MTC2 15 kV : 500 – 15000 V Not potential-free
Resolution	1 V
Voltage setting	Adjustable in steps of 1 V
Voltage control	Automatic electronic voltage control
Accuracy of adjustment	±2 % of the set value
Repetition rate	5 – 10 Hz 30 – 50 Hz (optional) ¹⁾
Measurement points	The integrated matrix automatically switches between the winding connections to be tested.

SURGE CIRCUIT

Surge capacity	100 nF optional 200 nF ^{2) 3)}
Voltage rise time	100 – 500 ns, according to IEC 60034-18-41
Surge current	max. 800 A @ 100 nF max. 1600 A @ 100 nF (optional) ²⁾
Surge energy	MTC2 6kV : 1.8 J @ 100 nF 3.6 J @ 200 nF MTC2 12kV : 7.1 J @ 100 nF 14.4 J @ 200 nF MTC2 15kV : 11.25 J @ 100 nF 22.5 J @ 200 nF

VOLTAGE MEASUREMENT

Logging	Test voltage logging in the test device Test voltage logging directly at the device under test (optional) ⁴⁾
Measurement accuracy	±5 % of measured value, up to 50 % max. possible test voltage ±2.5 % of measured value from 50 % max. possible test voltage
Sample rate	125 MS/s
Resolution	16 Bit

EVALUATION

EAR	
Measurement range	0 – 100 %
Correlation	
Measurement range	0 – 100 %
Tolerance range	
Measurement range	0 – 100 %
Peak to Peak	
Measurement range	0 – 100 %
Comparison	
Measurement range	0 – 100 %

PARTIAL DISCHARGE TEST

Measurement signal detection	Antenna or decoupling in the test leads ⁵⁾
Measurement frequency	😊
Detection of partial discharge	mV
Evaluation	Inception and extinction voltages according to IEC 61934 and DIN EN 60034-18-41

- 1) The repetition rate is dependent on the test voltage setting. The higher the voltage, the lower the repetition rate.
- 2) Options 200 nF and 1600 A cannot be combined.
- 3) The 200 nF option cuts the repetition rate in half.
- 4) The optional VoltageAnalyzer must be ordered separately.
- 5) The capacitive decoupling involves a physically given attenuation which can negatively influence the sensitivity of the partial discharge measurement.

Insulation resistance test MTC2 R7

TEST VOLTAGE

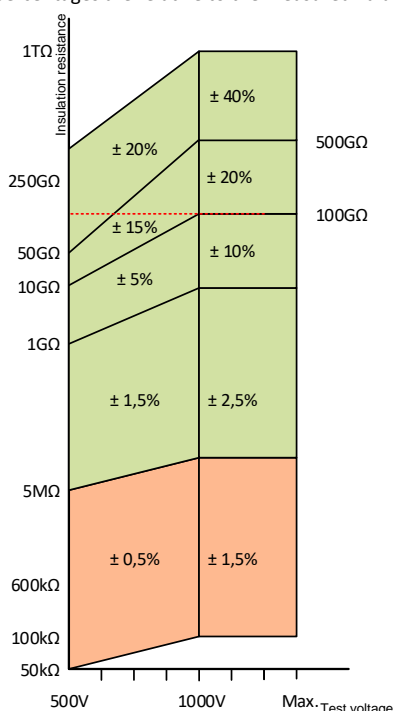
Test voltage	MTC2 6 kV : 200 – 6000 V DC MTC2 12 kV : 200 – 12000 V DC MTC2 15 kV : 200 – 15000 V DC not potential-free
Resolution	0.1 V
Voltage setting	Adjustable in steps of 1 V
Step voltage	Increase of the test voltage in definable steps.
Voltage control	Automatic electronic constant voltage control with undervoltage monitoring
Test voltage setting	Approx. 5 - 10 V higher than the preset value, from idle to full load
Measurement accuracy	±0.5 % of measured value

TEST CURRENT

Test current	MTC2 6 kV : max. 9 mA MTC2 12 kV : max. 3 mA MTC2 15 kV : max. 3 mA
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RESISTANCE

Measurement accuracy Depending on the selected test voltage and the insulation resistance to be measured (see diagram). The percentages are relative to the measured values.



EVALUATION

Lower resistance limit $I_{SO_{Rmin}}$	100 kΩ – 500 GΩ can be set as desired, measured values equal to or greater than this limit = GO
Polarisationsindex PI	0,1 ... 5 can be set as desired, measured values equal to or greater than this limit = GO
Dielectric Absorption Ratio DAR	
Minimum current I_{min}	1 μA – max. test current can be set as desired. If the test current during the test is less than the preset value, the test result is invalid. This feature is used to check for proper contacting. The function can be deactivated.
Undervoltage	If the test voltage during the test is lower than the preset value or the preset value is not reached, the normative condition regarding the level of the test voltage is not fulfilled. The test result is therefore invalid.
Test current monitoring	The test current is continuously monitored and compared to an adjustable upper limit value. The upper limit value can be set separately for the duration of the voltage ramp and the subsequent test time. When the limit value is exceeded, the insulation resistance test is cancelled.

GENERAL SPECIFICATIONS

Test timer	0 – 600 s in steps of 0.1 s
Ramp timer	0 – 60 s in steps of 0.1 s
Measurement technology U & I	The last measured value is used for evaluation of the insulation resistance.
Temperature compensation	Temperature compensation of insulation resistances possible according to IEEE-43.
Integrierter Entladewiderstand	MTC2 6kV : 6 MΩ MTC2 12kV : 15 MΩ MTC2 15kV : 15 MΩ Logging of the discharge process.
Residual voltage monitoring	The test (or test step) is considered to be completed only when the output voltage has fallen below 50 V.
Measurement points	The integrated matrix automatically connects between the winding connections to be tested and the body connection (laminated core).

High voltage test DC MTC2 R7

TEST VOLTAGE

Test voltage	MTC2 6 kV : 200 – 6000 V DC MTC2 12 kV : 200 – 12000 V DC MTC2 15 kV : 200 – 15000 V DC Not potential-free
Resolution	0,1 V
Voltage setting	Adjustable in steps of 1 V
Voltage control	Automatic electronic constant voltage control with undervoltage monitoring
Setting the test voltage	Approx. 5 – 10 V higher than the set value, from idle to full load
Measurement accuracy	±0,5 % of measured value

TEST CURRENT

Test current	MTC2 6 kV : 9 mA MTC2 12 kV : 3 mA MTC2 15 kV : 3 mA
Resolution	1 µA
Measurement accuracy	±2 % of measured value
Measurement range	1 µA – max. test current

EVALUATION

Upper current limit I_{max}	>0 – max. test current, measured values equal to or less than this limit are GO
Minimum current I_{min}	1 µA- max. test current can be entered freely. If the test current during the test falls below the preset value, the test result is invalid. This feature is used to perform a contact check. It can be disabled.
Undervoltage	If the test voltage during the test is lower than the preset value or the preset value is not met, the normative condition concerning the level of the test voltage is not fulfilled. The test result is therefore invalid.

GENERAL SPECIFICATIONS

Test timer	0 – 600 s in steps of 0.1 s
Rampentimer	0 – 60 s in steps of 0.1 s
Built-in discharging resistor	MTC2 6 kV : 6 MΩ MTC2 12 kV : 15 MΩ MTC2 15 kV : 15 MΩ Logging of the discharging process.
Residual voltage monitoring	The test (or a test step) is considered to be completed only when the output voltage has fallen below 50 V.
Measurement points	The integrated matrix automatically connects between the winding connections to be tested and the frame connection (laminated core).

Resistance test MTC2 R7

TEST VOLTAGE

Test voltage Max. 10 V DC (The magnitude of the test voltage depends on the device under test)

TEST CURRENT

Test Current Max. 3 A (The magnitude of the test current depends on the device under test)
KTY thermocouple test: 1 mA constant current source (optional)

RESISTANCE

Measurement method	Four-wire technology
Measurement range 1	1 mΩ – 999 mΩ
Resolution	1 μΩ
Measurement accuracy	±0.5 % of measurement value
Measurement range 2	1 Ω – 999 Ω
Resolution	1 mΩ
Measurement accuracy	±0,1 % of measurement value
Measurement range 3	1 kΩ – 999 kΩ
Resolution	1 Ω
Measurement accuracy	±1.5 % of measurement value
Measurement range KTY (81-84)	500 Ω – 3 kΩ
Resolution	1 Ω
Measurement accuracy	±2 % of measurement value
Stabilizing time	0.3 – 20 s automatic
Measurement points	The built-in matrix automatically performs the resistance test between the winding connections to be tested.

EVALUATION

Upper & lower limit	Resistances within these tolerance limits are GO ±-tolerance in % of preset value
Scattering range	<p>Variant 1: Calculation of the scattering range as the ratio of the range to the mean value in %.</p> $\frac{(R_{max} - R_{min})}{\bar{R}} \cdot 100\% \quad \bar{R} = \frac{1}{n} \sum_{i=1}^n R_i$ <p>Variant 2: Scattering range as ratio of the difference of the maximum deviation from the mean value to the mean value in %.</p> $\frac{(R_{max\Delta\bar{R}} - \bar{R})}{\bar{R}} \cdot 100\% \quad \bar{R} = \frac{1}{n} \sum_{i=1}^n R_i$

Inductance test MTC2 R7

TEST VOLTAGE

Test voltage Max. 4,5 V_{rms} AC (The magnitude of the test voltage depends on the device under test)

TEST CURRENT

Test current Max. 500 mA (The magnitude of the test current depends on the device under test)

INDUCTANCE

Measurement method	Four-wire technology
Measurement range	1 μH – 500 mH
Resolution	0.1 μH
Measurement accuracy	At 50 Hz ±5 % of measured value
Measurement frequency	50, 60 Hz (The selected measurement frequency can have an effect on the measurement accuracy)
Measurement points	The built-in matrix automatically connects between the winding connections to be tested.

EVALUATION

Upper & lower limit	Inductances within these tolerance limits are GO ±-tolerance in % of preset value
Scattering range	<p>Variant 1: Calculation of the scattering range as the ratio of the range to the mean value in %.</p> $\frac{(L_{max} - L_{min})}{\bar{L}} \cdot 100\% \quad \bar{L} = \frac{1}{n} \sum_{i=1}^n L_i$ <p>Variant 2: Scattering range as ratio of the difference of the maximum deviation from the mean value to the mean value in %.</p> $\frac{(L_{max\Delta\bar{L}} - \bar{L})}{\bar{L}} \cdot 100\% \quad \bar{L} = \frac{1}{n} \sum_{i=1}^n L_i$

Capacity test MTC2 R7

TEST VOLTAGE

Test voltage Max. 8 V_{rms} AC (The magnitude of the test voltage depends on the device under test)

TEST CURRENT

Test current Max. 500 mA (The magnitude of the test current depends on the device under test)

CAPACITANCE

Measurement method	Four-wire technology ¹⁾
Measurement range	1 nF – 100 µF
Resolution	0.1 nF
Measurement accuracy	Up to 1 µF and 4000 Hz : ±5 % of the measured value From 1 µF and 50 Hz : ±10 % of the measured value
Measurement frequency	4000 Hz up to 1 µF, switchover to 50 Hz is done automatically for measured values >1 µF (The selected measurement frequency can have an effect on the measurement accuracy)
Measurement points	The built-in matrix automatically connects between the winding connections to be tested and the frame connection (laminated core). ¹⁾

EVALUATION

Upper & lower limit Capacities within the tolerance limits are GO
±-tolerance in % of the preset value

- 1) Four-wire measurement is available only when measuring at the measuring terminals 1, 2, 3 and 4 (in case of expansion to 8 terminals also at terminals 5, 6, 7 and 8).
If the measurement is also to be made via the body conductor (from the winding to the laminated core), the measurement is carried out as a two-wire measurement. However, the test is then less accurate and no longer corresponds to the specified technical data.

Glossary

Adjustment	Correction of a measurement value if the calibration showed too large a deviation.
DUT	Abbreviation for test object (D evice U nder T est)
Calibration	Regular annual inspection and documentation of the deviation compared to the reference value.
Condensation	Condensation means that moisture is produced at the inside or at the outside of the testing device. This must be avoided under all circumstances.
Contact check	The contact check monitors whether the device under test is correctly connected to the test device.
GO	Short for "OK" (pass)
Limit (lower)	This is a value that must not be fallen below.
Limit (upper)	This is a value that must not be exceeded.
Measuring accuracy	The measuring accuracy refers to the measured value.
Mean value	Mean value is calculated for DC voltages. It is the calculated mean of a number of measured values.
NO GO	Short for "not OK" (fail)
rF in %	Relative humidity describes the proportion of water vapor contained in the air in relation to the maximum amount of water vapor that the air can absorb at the same temperature. It is expressed as a percentage. A relative humidity of 100 % means that the air is fully saturated with water vapor, while a relative humidity of 0 % means that no water vapor is contained in the air.
RMS value	The RMS value is detected quickly and precisely following the exact mathematical definition. This is independent from the distortion of the sine signal. This is why SCHLEICH units always show the <i>true RMS value</i> .
Safety inputs	The device is released via two safety inputs. This function is defined as two-circuit.
SmartCalibration	Fast, reliable, and patent-pending calibration procedure from SCHLEICH, for performing the annually recurring calibration.

More information

More Information

For further information please visit our homepage www.schleich.com

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