Motor Repair
Electrical Engineering
Maintenance

- The MotorAnalyzer-Class
  Unbeatable versatility

- MotorAnalyzer 2
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The MotorAnalyzer-Class

**MotorAnalyzer 2 | All-purpose electric motor tester**

- 11 test methods
- surge voltage up to **3000V**
- high-voltage DC up to **6000V**
- large, very well-readable color display
- innovative handy input via rotary button
- structured menu and practical functioning buttons
- fully-automatic fault analysis
- automatic switchover between the three motor connecting leads
- manual and automatic tests
- locating turn-to-turn faults
- adjusting the neutral zone
- rotary button for a quick test method selection
- integrated result storage for a subsequent transfer via USB-interface
- storing and printing of test results via PrintCom
- network or battery operation
- worldwide voltage supply 110V…250V / 47…63Hz
- low weight
- all-purpose solid case including all measuring leads “on board”

The all-purpose MotorAnalyzer 2 serves for checking electric motors and winding goods. It combines eleven different test methods within a user-friendly and mobile tester. The combination of test methods, its extremely compact design, as well as the battery operation turn the MotorAnalyzer into an ideal tool for the on-site operation, especially in difficult installation positions.

For checking a 3-phase motor the three winding connections and the motor’s cabinet are connected to the tester. This should be performed in four-wire technology for a high-precise resistance measuring. Afterwards the MotorAnalyzer analyzes the motor fully-automatically via surge-voltage, resistance, and inductivity test. For this the MotorAnalyzer automatically switches the different test methods to the four measuring points one after another via its internal relay matrix. After this the motor is also tested automatically with a high-voltage test in order to evaluate the motor’s quality quickly and clearly.

In addition to the motor test the MotorAnalyzer also assists in adjusting the brush holder at DC motors as well as in locating turn-to-turn faults.

The very compact case is sturdy and waterproof. On the right-hand side of the operating element there is a storage space. All measuring leads and test probes are stored here. Thus the operator can always access the necessary components during the measuring. For an optimum operator guidance the LEDs indicate the measuring leads that are activated for the respective measuring.
All control elements and connections are clearly arranged

Large and high-contrast color display

Scanning and storing test results in Excel®

PrintCom – filing and printing test results in Excel®

With PrintCom you can protocol and store your test results quickly and comfortably:
- scanning test results
- storing test results in Excel®
- printing test results

For detailed information please look at page 68

inspection test of a pump motor
The MotorAnalyzer-Class

MotorAnalyzer 2 | 11 test methods in one tester

1. Automatic analysis

For the automatic test of a three-phase current motor the three winding connections and the motor cabinet have to be connected to the tester. The MotorAnalyzer analyzes the motor fully automatically via the resistance, inductivity, the surge-voltage, and the high-voltage test. It checks whether the winding is ohmically or inductively symmetrical. If the deviations of the three phases among each other are too large the motor is defect. In addition the electric strength within the winding and to the motor’s cabinet is tested.

2. Surge test up to 3000V

For the inductive winding check the MotorAnalyzer generates surge pulses up to 3000V that can be continuously adjusted. The patented automatic surge voltage comparison of the windings among each other or to a reference test object provides precise statements regarding the winding’s symmetry. The MotorAnalyzer detects any nonsymmetries automatically.

3. Resistance test

The resistance test is performed with very high precision in four-wire technology. The symmetry evaluation of the three winding resistances or the comparison to a preset value is performed automatically. A temperature compensation converts the copper resistance to 20°Celsius if required. For the ambient temperature measuring an ambient temperature sensor has to be connected to the Motor Analyzer.

4. Inductivity test

The inductivity test is also performed in four-wire technology like the resistance test. The symmetry evaluation of the three winding inductivities or the comparison to a preset value is performed automatically.

5. High-voltage test DC

For the high-voltage test the MotorAnalyzer generates a very stable test voltage from 50 to 6000V DC. At the automatic test the voltage is max. 3000V and at the manual test it is max. 6000V due to the test probes. The voltage can be set manually at the rotary button. Alternatively it can also be set automatically to a programmable value. A step voltage measuring is possible as well.

6. Insulation resistance test

For the insulation resistance test the MotorAnalyzer generates a very stable test voltage from 50 to 6000V DC. At the automatic test the voltage is max. 3000V and at the manual test it is max. 6000V due to the test probes. The voltage can be set manually at the rotary button. Alternatively it can also be set automatically to a programmable value. A step voltage measuring is possible as well.
For the DAR and polarization index test the MotorAnalyzer generates a very stable test voltage from 50 to 6000V DC. The voltage can be set manually at the rotary button. Alternatively it can also be set automatically to a programmable value. The measuring time runs automatically.

The graphic display of the brush holder’s false position facilitates the adaptation of the “neutral zone” to direct current motors. Via a bar display with central point the user can directly see whether he is in the neutral zone or in which direction the brush holder needs to be turned.

By means of the induction test probe the operator locates the slots in which the turn-to-turn fault occurred. The probe also serves for measuring at the stator, an armature, or for searching the bar break at a squirrel-cage motor.

The PE-resistance test is performed with high precision in four-wire technology. It is measured with DC.

At one- or three-phase motors it is displayed during the manual rotation of the motor shaft whether the shafts rotates to the left- or right-hand side.
The MotorAnalyzer-Class

MotorAnalyzer 1 | All-purpose electric motor tester

The MotorAnalyzer is an all-purpose tester for testing electric motors and winding products. It combines ten different test methods in a user-friendly, mobile tester. The combination of test methods, its very compact design, as well as the option of a battery operation turn the MotorAnalyzer into an ideal tool for the at-site use – especially at difficult installation positions.

For checking the three-phase current motor the three winding connections as well as the motor cabinet are connected to the tester. Afterwards the MotorAnalyzer analyzes the motor automatically via the surge and resistance test. After this a high-voltage test is also performed at the motor in order to evaluate the motor’s quality quickly and clearly.

Search of a turn-to-turn fault at a stator with induction test probe

Highlights

- ten test methods
- high-voltage up to 4KV
- fully automatic fault analysis
- automatic switchover between the three motor connecting leads
- manual and automatic tests
- location of turn-to-turn-faults
- mains and/or battery operation
- low weight
- can also be supplied in a sturdy measuring box
- rotary button for a quick test method selection
- integrated result storage for a later transfer via RS232- or USB-interface
- storing and printing of test results via PrintCom
PrintCom – filing and printing test results in Excel®

With PrintCom you can protocol and store your test results quickly and comfortably:
- scanning test results
- storing test results in Excel®
- printing test results

For detailed information please look at page 68
The MotorAnalyzer-Class

MotorAnalyzer 1 | 10 test methods in one tester

For the automatic test of a three-phase current motor the three winding connections and the motor cabinet are connected to the tester. Afterwards the MotorAnalyzer analyzes the motor fully automatically via the surge and resistance test. It checks whether the winding is ohmically or inductively symmetrical. If the deviations of the three phases among each other are too large the motor is defect.

For the inductive winding check the MotorAnalyzer generates surge voltages with a low level. The patented automatic surge voltage comparison of the windings among each other or to a reference test object provides precise statements regarding the winding’s symmetry. The MotorAnalyzer detects any nonsymmetries automatically.

The resistance test is performed with high precision in four-wire technology. The symmetry evaluation of the three winding resistances or the comparison to a preset value is performed automatically. A temperature compensation converts the copper resistance to 20°Celsius if required.

For the high-voltage test the MotorAnalyzer generates a very stable test voltage from 50 to 4000V DC. The voltage can be set manually at the rotary button. Alternatively it can also be set automatically to a programmable value.
For the DAR and polarization index test the MotorAnalyzer generates a very stable test voltage from 50 to 4000V DC. The voltage can be set manually at the rotary button. Alternatively it can also be set automatically to a programmable value.

The graphic display of the brush holder’s false position facilitates the adaptation of the “neutral zone” to direct current motors. With the MotorAnalyzer it can thus be adjusted in a very user-friendly way. Via a bar display with central point the user can directly see whether he is in the neutral zone or in which direction the brush rocker needs to be turned.

For the insulation resistance test the MotorAnalyzer generates a very stable test voltage from 50 to 4000V DC. The voltage can be set manually at the rotary button. Alternatively it can also be set automatically to a programmable value. A step voltage measuring is also possible.

At one- or three-phase motors it is displayed during the manual rotation of the motor shaft whether the shafts rotates to the left- or right-hand side.

By means of the induction test probe the slots at the stator or armature are located in which the turn-to-turn fault occurred. The probe also serves for searching the bar break at a squirrel-cage motor.

The PE-resistance test is performed with high precision in four-wire technology. It is measured with DC.
# The MotorAnalyzer-Class

## MotorAnalyzer 1 and 2 | Product and accessory overview

![MotorAnalyzer 1](image1.jpg) ![MotorAnalyzer 1 portable](image2.jpg) ![MotorAnalyzer 2](image3.jpg)

<table>
<thead>
<tr>
<th>Model</th>
<th>art. no.</th>
<th>resistance</th>
<th>surge voltage</th>
<th>turn-to-turn faults</th>
<th>inductivity</th>
<th>high voltage</th>
<th>insulation resistance</th>
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<tr>
<td>MotorAnalyzer 1</td>
<td>403101</td>
<td>1mΩ–500kΩ</td>
<td>12V</td>
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<td></td>
<td>0…4KV</td>
<td>0…100GΩ</td>
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<td>0…4KV</td>
<td>0…4KV DC</td>
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<tr>
<td>MotorAnalyzer 2</td>
<td>403167</td>
<td>1mΩ–500kΩ</td>
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<td>0…6KV</td>
<td>0…6KV DC</td>
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## Test probes | measuring leads

<table>
<thead>
<tr>
<th>Test probes</th>
<th>measuring leads</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>4-wire Kelvin tongs set</td>
<td>40001100</td>
<td>○</td>
</tr>
<tr>
<td>4-wire Kelvin tongs small</td>
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<tr>
<td>4-wire Kelvin tongs medium</td>
<td>4007212</td>
<td>○</td>
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<tr>
<td>4-wire Kelvin tongs large</td>
<td>4007168</td>
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<td>Temperature sensor for the ambient temperature compensation</td>
<td>403109</td>
<td>○</td>
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<tr>
<td>Turn-to-turn fault test probe 9mm</td>
<td>403106</td>
<td>○</td>
</tr>
<tr>
<td>Turn-to-turn fault test probe 19mm</td>
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<tr>
<td>Turn-to-turn fault armature test probe</td>
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<td>Giga-Ohm measuring lead</td>
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<tr>
<td>Neutral zone measuring lead</td>
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<td>○</td>
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<tr>
<td>Rotary field test probe for stator</td>
<td>403103</td>
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<td>Rotary field test probe for motor</td>
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## Accessories

<table>
<thead>
<tr>
<th>Accessories</th>
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</thead>
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<tr>
<td>Foot switch</td>
<td>4010611</td>
</tr>
<tr>
<td>Start buttons for test probe</td>
<td>403111</td>
</tr>
<tr>
<td>Transport box for MA 1</td>
<td>403124</td>
</tr>
<tr>
<td>Netbook-holder for MA1-portable</td>
<td>403149</td>
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<tr>
<td>PrintCom PC-software</td>
<td>401671</td>
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For accessories please look at page 66
### MotorAnalyzer-Class

<table>
<thead>
<tr>
<th>Brand</th>
<th>Model</th>
<th>Art. No.</th>
<th>Voltage</th>
<th>Current</th>
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</tr>
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<td>MotorAnalyzer 2</td>
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<td>0...4000V DC</td>
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### Accessories

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
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<tbody>
<tr>
<td>foot switch</td>
<td>4010611</td>
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<td>start buttons for test probe</td>
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<td>403124</td>
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<td>Netbook-holder for MA1-portable</td>
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<tr>
<td>PrintCom PC-software</td>
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</table>

### Measuring Probes | Measuring Leads

- **four-wire measuring tips**
- **four-wire Kelvin tongs**
- **turn-to-turn fault test probe**
- **Netbook holder**

<table>
<thead>
<tr>
<th>Measuring Probes</th>
<th>Measuring Leads</th>
</tr>
</thead>
<tbody>
<tr>
<td>battery operation</td>
<td>measuring lead with test tips for the high-voltage</td>
</tr>
<tr>
<td>PE resistance</td>
<td>measuring lead with alligator clamps</td>
</tr>
<tr>
<td>sense of rotation</td>
<td>automatic test method switchover</td>
</tr>
<tr>
<td>PE resistance</td>
<td>clamps: U-V-W-body high-voltage</td>
</tr>
<tr>
<td>PE resistance</td>
<td>four-wire measuring</td>
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<tr>
<td>PE resistance</td>
<td>measuring at stator and motor</td>
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<tr>
<td>comparison assistance for the neutral zone at DC-motors</td>
<td>0...4000V DC</td>
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<tr>
<td>0...4000V DC</td>
<td>0...4000V DC</td>
</tr>
<tr>
<td>0...4000V DC</td>
<td>0...6000V DC</td>
</tr>
</tbody>
</table>

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1. For increasing the measuring accuracy at resistances below 10 Ω it is recommended to use four-wire Kelvin tongs in addition.
2. For locating the turn-to-turn fault an additional probe is required.
3. In order to measure insulation resistances above 100 GΩ more precisely an additional GigaOhm-measuring lead is recommended.
4. For connecting the DC-motor an additional measuring lead is required.
5. Switchover automatically up to 3kV. High-voltage test up to 6kV via separate test tips.
6. measuring probes | measuring leads that need to be ordered in addition

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1. included in the delivery extent
2. matrix

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![four-wire measuring tips](four-wire_measuring_tips.jpg)

![four-wire Kelvin tongs](four-wire_kelvin_tongs.jpg)

![turn-to-turn fault test probe](turn-to-turn_fault_probe.jpg)

![Netbook holder](netbook_holder.jpg)
PrintCom | Software for MotorAnalyzer, GLP1 & GLP2

**Highlights**

- importing test results during the test and from the tester’s intermediate storage
- storage of test results in the Excel® format during the production
- print of test results in Excel® via protocol samples
- several ready-made protocol samples included in the delivery extent
- freely configurable Excel® protocol samples to print test results
- different storage modes (single or collection results)
- OpenOffice®,/MS Excel® compatible software
- Windows 7® compliant

**Archive and print test results in Excel®**

PrintCom – the quickest and most comfortable way of protocolling and storing test results of MotorAnalyzer, GLP1- and GLP2-high-voltage testers.

**Importing**

The software lists imported test results well-arranged on your computer screen.

**Storing**

The test results are user-friendly stored in the Excel® format. The basis are Excel® protocol samples preconfigured by us.

PrintCom offers you to adapt the protocol to your requirements by adding additional information or by means of an individual protocol layout, for example with your logo. In the delivery extent you will already find a large variety of easily adaptable samples. Of course, you can also create completely new protocols.

**Printing**

Owing to the integration of the test results in an Excel® file you are able to print your test results directly. Thus you can impressively document the tested quality to your customer.
Connecting versions

PC
RS232 / USB

Server
Ethernet

PrintCom with MotorAnalyzer

Test Protocol

<table>
<thead>
<tr>
<th>Schalt.akteur</th>
<th>Prüflichtaufbau</th>
<th>Geprüftes Wert</th>
<th>Prüfwert</th>
<th>Prüfungsergebnis</th>
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</thead>
<tbody>
<tr>
<td>PE</td>
<td>Schaltakteur an Schaltbrett rechts</td>
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<td>0,05 Ohm</td>
<td>1A</td>
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<tr>
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<td>2 MΩ</td>
<td>50V</td>
</tr>
</tbody>
</table>

PrintCom with MotorAnalyzer
A typical task is the contacting of stripped line ends because test objects are often only equipped with line ends without a plug connection.

For contacting free line ends we can provide a wide range of clamp devices, for example for the application of stators’ winding connections. They can be equipped in two- as well as four-wire-technology.

When low resistances are to be exactly measured Kelvin clamps are used for the four-wire-measuring. The four-wire-technology compensates the transition resistances within the clamping points.

Our Kelvin clamps’ special design guarantees high contact reliability, solid clamping, and a low wear and tear in the rough testing operation. Less exacting contactings are operated with our multi-purpose clamping levers.

The contactings can be supplied as loose single contacting or integrated within a clamp block. The clamp blocks can either be assembled in a fixed position within the test cover or can be moved flexibly within the testing space to always have the optimum position for being clamped to the lines.
Examples for Kelvin clamps, clamping levers, and modular contact blocks

- Clamp block in modular design
- Kelvin clamps in small-, medium-, and large-sized design
- Kelvin contacting in one test cage with prism
- 8-times Kelvin clamps block
- 11-times clamping lever block
- 6-times four-wire contacting guide and 4-times clamping lever block
Software & Accessories

Test Pistols | Test Probes | Safety Accessories

**High-voltage**

Safety pistols are required for a safe manual high-voltage test. Depending on the test voltage level there are different models.

To achieve a particular high usability we provide test pistols with an integrated start button. Here the high-voltage test only starts after activating the button.

- **high-voltage test pistol without start button**
- **high-voltage test pistol with start button**
- **high-voltage test pistol with start through mechanical press button**

- **High-voltage test pistol up to 8KV AC/10KV DC**
- **High-voltage test pistol up to 12KV AC/15KV DC**
- **Adaptor between test object and test pistol**
- **High-voltage test probe up to 1500V safety current limited**
- **High-voltage connection lead**
**Warning - result lights**

Warning lights show whether the test object is under voltage or voltage-free.

Result lights show the total test result of the test process. Customized special displays, which can also be controlled by the tester, are also within our product range.

**Safety**

Due to safety reasons a two-hand start is used at the high-voltage test without protection cover and safety test pistols. When operating test stations the corresponding standards have to be considered.

- **Warning or result light, horizontal**
- **Warning or result light, vertical**
- **Two-hand start**
- **Two-hand start support with warning light and emergency stop**
- **Safety barrier with warning message**
- **Barrier post with warning light and emergency stop**
Rolling Tables

Rolling tables facilitate the transport of testers that can also be combined with a test cover between the test objects. A high level usability is achieved by the large, high-resistant and lockable rubber guide rollers as well as an optional push handle at the table’s front.

The rolling tables can additionally be equipped with self-closing drawer runners, in which e.g. adaptors, tools, or documentations can be stored.

- solid design made of aluminum profiles
- continuously height adjustable table plates and bottoms
- horizontal or diagonal table plate designs
- diagonal table plate with horizontal front e.g. to deposit a keyboard
- continuously height adjustable drawers with full extension
- continuously height adjustable holder for test probe
- continuously height adjustable windings for measuring leads
- integrated LED-warning light in the side rails
- delivery of assembled, directly usable rolling tables
- rolling tables and carriages of the company hera
rolling table with diagonal work plate and integrated high-voltage test

rolling table with diagonal work plate and drawer element

rolling table with diagonal work plate, drawer element and cable holders

rolling table with integrated test cover, push handle, LED-warning light in the bars and holders for cables, test pistols, and test probes

rolling table with integrated test cover, drawer element and cable holders
Black Boxes

For a regular daily check of your tester a black box is used that is connected to the tester. It is tested whether the emerging measuring values correspond to the values in the black box. If this is not the case the tester is locked. The tester can only be used again when a black box test with a proper result is performed. As we only supply digital evaluating testers this test is normally not performed with a “pass-fail-black box”. We only use one single black box and evaluate the emerging measuring values within tight tolerance limits.

Each black box consists of one connection possibility to the tester and one or several resistors and/or inductances. They can either be configured for one test method or for a combination of several test methods.

Each black box is delivered with the information on the resistance values and a calibration certificate so that the operator can set the tests properly.

Calibration resistors

For the calibration of testers precise calibration resistors are required as well. They make sure that certain test currents flow at different test methods and voltages.

The calibration resistors have a high precision as well as a high temperature and long-term stability. In order to conduct the heat that occurs at high currents or long measurements, reliably, we supply all calibration resistors for high test currents in special heat sink enclosures. In addition to these characteristics the resistors are designed low capacitively and low inductively.

All resistors for high test currents and low test voltages are designed in four-wire-technology.

All resistors are supplied with the information on the resistance values in the calibration certificate so that the corresponding conversions of the measuring values considering the resistance value are possible.