Dynamic MotorAnalyzer
Online Monitoring

Made in Germany

Expect more.
The Dynamic MotorAnalyzer – perfection in every detail

The dynamic motor analysis allows testing a running motor in its working environment. Electric parameters are measured and other mechanical parameters are calculated. The aim is to receive an analysis of the electric motor, its mains supply, and its loading conditions based on 6 electric measuring values.

The Dynamic MotorAnalyzer is the ideal tool for this. It is a great extension to our winding testers MotorAnalyzer 2 and MTC2.

**KEY-FACTS**

- All in one-motor analysis
- Motor analysis without special knowledge
- Mains supply analysis
- Analysis of motor supply at VFD-operation
- Analysis of the motor’s operation parameters
- Determination of the mechanical performance characteristics and torque
- Analysis of load and efficiency
- Analysis of under- and overload
- Spectral analysis to detect rotor problems
- Energy balance analysis
- Analysis of energy costs with amortization calculation and payback time
- Long-term analysis with data recorder function and event logging
- Trend analysis based on historic data
- All measuring signals and calculations are displayed similar to an oscilloscope
- Possibility to combine the Dynamic MotorAnalyzer with the EncoderAnalyzer
- Extensive protocol printing
- SQL-data base for motors, sorted by manufacturer and type
- SQL-data base for saving all settings and measured values
- Motor voltage measuring range up to 700Veff
- Motor current measuring range from 5…5000Aeff
- Numerous current clamps and Rogowski current sensors can be connected
- Battery-operation possible
- Multilingual, modern user interface
- Worldwide voltage supply 90V…250V/47…63Hz

Further informations: www.schleich.com/en/dynamic-motoranalyzer
Motor analysis without special know-how

A typical application showing the use of the Dynamic MotorAnalyzer:
It often happens that motors become hot during operation.
This may be caused by various reasons. It may be due to the mains
power supply, the motor itself, or its load. So the question arises:
"Is it a mechanical or an electrical problem?"

It is often difficult to find the reason for the fault, as the motor is
often installed in a difficult position to access. It is often easier to
access the motor’s input lead. The electric parameters can be
measured here; however, commercial multimeters are not able to
do this. They are too slow and do not detect dynamic processes.
Without appropriate measuring technology, as e.g. the Dynamic
MotorAnalyzer from SCHLEICH, the operator is not able to find the
origin of the problem at the electric motor.

The SCHLEICH Dynamic MotorAnalyzer provides the needed
technology in facilitating the motor check- without requesting
special knowledge from the operator.
The Dynamic MotorAnalyzer – Outstanding technology, robustly packed

The Dynamic MotorAnalyzer consists of the measuring module and the analysis software on the PC. Both components are installed as one unit in the measuring case.

The measuring module performs the measurements. For this it detects millions of measuring values per second at the running electric motor and transfers them to the PC. The communication between the measuring module and the PC is done with a high-speed Gigabit-connection.

The software analyzes the measured values in real-time and indicates the results. At the end of a test you receive the analysis result. The results are displayed in two ways: the numerical values are listed and through a graphical display that is quick and easy to understand.

The test results are then stored in a safe, modern SQL-data base and detailed reports can be generated if required.

Measuring socket MU
- 3 high-voltage measuring inputs for voltage measurements

Measuring socket MP
- 3 low-voltage measuring inputs for voltage measurements at a measuring box integrated in a cabinet
- 3 current measuring inputs for current measurements at a measuring box integrated in a cabinet
- optionally further measuring connections for the EncoderAnalyzer evaluation (in case the EncoderAnalyzer software has also been purchased)

Measuring socket ME
- measuring connection for further sensors as e.g. r.p.m. counter, temperature sensor, digital and analog measuring inputs and so on
- optionally further measuring connections for the EncoderAnalyzer evaluation (in case the EncoderAnalyzer software has also been purchased)

Mains supply
Power on

Indication loading procedure battery

Button ON-OFF measuring module
## Technical data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains supply</td>
<td>90…250V / 47…63Hz</td>
</tr>
<tr>
<td>Ultrabook-PC</td>
<td>4G RAM, 500G-harddisc</td>
</tr>
<tr>
<td>Operating system</td>
<td>Win7 Professional® or higher, multilingual</td>
</tr>
<tr>
<td>CPU</td>
<td>at least Core i5</td>
</tr>
<tr>
<td>Dimensions (W x D x H)</td>
<td>415 x 325 x 170mm + measuring leads</td>
</tr>
<tr>
<td>Weight</td>
<td>5kg</td>
</tr>
<tr>
<td>Protection class</td>
<td>Protection against dust and splashing water</td>
</tr>
<tr>
<td>Electrical connections</td>
<td>all perfectly protected by implementation in the case</td>
</tr>
<tr>
<td>Part no.</td>
<td>403300</td>
</tr>
</tbody>
</table>

### Docking station

- Removable laptop
  - Win7 Professional® operating system
  - 4 GB RAM
  - 500 GB HDD
  - Core i5

Made in Germany
Discovering energy-saving potentials

Due to its variety of application fields, the Dynamic MotorAnalyzer completely covers all analyzing tasks, no matter if short- or long-term measurement, mains analysis, motor analysis, load analysis or annual energy costs calculation...

All these characteristics allow you to detect potentials for saving energy and to make the right decisions regarding cost savings.

The energy efficiency of large systems is the sum of many single components. The electric motor is one of the consumer’s which make up a large share of the total consumption. At industrial plants it often occurs that the energy consumption of electric motors is more than 60% of the total consumption. Generating heat or the electrical lightning rather plays a tangential role.

Thus the electric motor offers significant potential for saving energy. Therefore it makes sense to find efficient solutions in this range first.

Further informations: www.schleich.com/en/dynamic-motoranalyzer
The electric motor’s efficiency depends on many general conditions. If possible, all conditions should be met, to achieve optimal energy consumption.

The optimization measures focus on the following points:

- **Performance factor as closely as possible to 1**
  Performance factors (cos Φ) in the range of 0.97...0.98 are good.

- **Use motors with high efficiency**
  Often the change to an IE3 or IE4 motor already pays off within 1-5 years for motors with long operating times.

- **If possible, operate motors always in the nominal range**
  Oversized motors are operated at bad performance factors and the acquisition costs are too high.

- **Even load profiles**
  If possible, too high load peaks shall be avoided.

- **Use VFDs, if motor is operated with a lower one than nominal load**
  If load peaks cannot be reduced, the use of a VFD makes sense, to operate the motor at the maximum power point.

- **If possible, assure a good mains quality**
  An asymmetric or fluctuating mains supply often influences the motor in a negative way.

- **Reduce losses in leads**
  Supply leads to large systems should be as short as possible and, if appropriate, the next bigger lead cross-section should be considered necessary for technical reasons. At longer operating times this can already pay off after 1-5 years.

- **Reduce motor leakage currents against PE**
  The motor insulation should be checked and maintained in regular intervals

- **Maintenance- and life cycle management | LCC-Life Cycle Costs**
  To make optimum use of the plant, a reasonable, preventive maintenance is very important. Although this has no direct influence on the energy costs, the life cycle costs may be arbitrarily reduced by this. LCC consist of energy-, acquisition-, operating-, and maintenance costs. In this context, maintenance should not mean repair. By reasonable, preventive maintenance high repair- and breakdown costs can be avoided. Also in this case the Dynamic MotorAnalyzer, in combination with other SCHLEICH testers, offers valuable services.
Measurements

Performing a measurement

The motor to be tested is connected to the motor lead by means of voltage measurement connections and current clamps.

The Dynamic MotorAnalyzer offers you an automatic phase balance. If you accidentally connect a phase in a wrong way, you don’t have to disconnect or re-clamp the measuring lead. The Dynamic MotorAnalyzer performs a connection control and adapts itself correspondingly.

Due to the 5A measuring range, the current can also be easily measured by current transformers on the secondary side. For this, only the transformation ratio has to be entered. Afterwards the software re-calculates the measured values accordingly.

Measurement at motors with current transformer

With the Dynamic MotorAnalyzer the user is also able to perform measurements at a load test rig. At this torque-/speed characteristics can be determined. For this, the Dynamic MotorAnalyzer is equipped with additional measuring inputs. Via these inputs, from a torque measuring shaft, the torque—and the speed signal as well as the temperature can be captured. In combination with the electrical input parameters the system reliably delivers all information about the motor.

Depending on the configuration of your test bench, the Dynamic MotorAnalyzer is also able to control and monitor the test bench. Thus, the Dynamic MotorAnalyzer is also ideally suited for upgrading already existing test benches.

Test bench for electric motors

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Voltage measurements at electric motors with high operational voltages are often performed with the help of voltage transformers. Here the Dynamic MotorAnalyzer is able to measure the voltage on the voltage transformer’s secondary side. For this, only the transformation ratio and the type of transformer have to be entered. Afterwards the software re-calculates the measured values accordingly.

Other configurations of voltage transformer connections are also measurable.

**Additional measuring leads**

The Dynamic MotorAnalyzer also offers additional analog and digital inputs. Via software, they can be easily and quickly configured for a variety of measuring signals. Thus, in combination with the electrical parameters, also motor temperatures, oscillations, flow volumes or pump pressures can be measured and analyzed without any problems. The aim is, to provide the operator an overall picture of the system.
The analysis software

The quick, intelligent measuring technology and the user-friendly, analysis software are perfectly combined. Only a few setting clicks and selections are required for configuring the test for the connected motor.

The input of name plate details and possible further parameters is only required in case the results shall be printed after the measurements, as they are necessary later for searching in the database.

The comprehensive evaluations lead to clear, understandable results. Specialized knowledge is not necessary when using the analysis software. The software calculates all electrical and mechanical data based on the 6 electrical values.

No other comparable tester offers, in combination with the EncoderAnalyzer’s functionality, such a variety of analyses. The variety of evaluations is really impressive but still easy to understand. The modern user interface is clearly arranged and not overcharged with Windows®-windows.

SCHLEICH sets new standards for innovative test technology!

Dynamic motor analysis and its opportunities

The electric motor is supplied with 3-phase current from the energy supplier or from a VFD (variable frequency drive). The three-phase voltages have to meet certain requirements so that the electric motor is properly working and according its specifications. In case bigger deviations exist, this leads to a wrong operating condition, which regularly results in overheating.

The electric motor consumes current, depending on the mains, its qualitative condition and load conditions. The current contains an enormous variety of information, which is evaluated by the Dynamic MotorAnalyzer. Thus it is possible to determine the motor speed or to inspect rotor problems.

The precise multiplication of voltage and current is the instantaneous power which is consumed by the motor. This might sound trivial, but also this measurement has to lead to correct results although a VFD is used. To meet these requirements, the Dynamic MotorAnalyzer is able to increase its sampling rate to up to 2.5 million measurements per second.

Analyzing the mains supply

The mains quality—from energy supplier or VFD—decisively influence the motor’s operational performance. No matter whether over- or under voltage, if asymmetry between phases or a too high harmonic content- all these facts negatively influences the electric motor and leads to reduced performance. That is why the following measurements and analyses regarding mains supply are performed at phases L1, L2 and L3:

- Minimum, maximum and average values of the voltage rms (root mean square)
- Minimum and maximum voltage peak value
- Minimum, maximum and average value of mains frequency
- Minimum, maximum and average value of phase angles between phases
- Minimum, maximum and average value of voltage asymmetry between phases
- Harmonics analysis up to the 50th harmonic incl. graphical display
- Distortion factor, Total harmonic distortion (THD) and performance reduction factor
- NEMA reduction factors
- Symmetric components
- Graphical voltage display at mains- and VFD operation
- Graphical voltage display of fundamental and the 3rd harmonic during VFD operation

Further informations: www.schleich.com/en/dynamic-motoranalyzer
The motor’s current and the relation between voltage and motor current provide information on the motor’s condition and the load conditions. From the measured values, the software filters and analyzes this information and presented, even to inexperienced operators, in an easy and understandable way. The following measurements and analyses regarding motor current in phases L1, L2 and L3 are performed:

- Minimum, maximum and average values of the current rms (root mean square)
- Minimum and maximum voltage peak value
- Minimum, maximum and average value of current asymmetry between phases
- Harmonics analysis up to the 50th harmonic incl. graphical display
- Distortion factor, Total harmonic distortion (THD) and performance reduction factor
- Symmetry of impedances
- Vectorial total current
- Eccentricity in air gap
- Determination of speed from current
- Speed course at motors with VFD operation
- Inspection of squirrel cage motors regarding broken bars
- Graphical current display at mains- and VFD operation

Based on voltage supply and the motor current further operational parameters are determined. These are:

- Minimum, maximum and average values of Cos ϕ in the phases
- Minimum, maximum and average values of the performance factor in the phases
- Electrical power, active power and reactive power
- Torque estimation and torque ripple
- Torque spectrum
- Overload peak detection
- Torque measurement with measuring shaft
- Utilization or %over- %under load
- Efficiency
- Motor temperature
- Various types of mechanical motor problems
- Vibration measurement in X-, Y- and Z direction
- Motor start-up measurement
- Determination of energy costs
- Determination of profitability costs at improved efficiency

### Analyzing the motor’s current consumption

### Analyzing the load and running conditions
The analysis software

**Short-term measurement**

The measurement is performed similar as with a multimeter and is often only of short duration. The measuring period can last from few minutes to hours.

On request the measurements can be directly saved in the data base with all performed analyses. Also an extensive protocol printout is possible.

**Transient analysis**

Transients are extraordinary measured values as e.g. voltage-, current- or torque peaks. Transients may be the reason for motor problems or may help to detect them. The Dynamic MotorAnalyzer is configured in that way, that it measures continuously and inspects the measured values for transients at the same time. As soon as a transient has been detected, the Dynamic MotorAnalyzer starts to record the measured values and displays them in a graphical way. A typical transient measurement is e.g. the motor start-up.

**Long-term measurement**

For a longer observation, measurements may also be carried out for several days. Long-term measurements can either be performed continuously or triggered, based on certain, adjustable events. Extraordinary events are called transients and can be e.g. voltage-, current- or torque peaks. When such an event occurs, the long-term measurement is started and automatically stopped after a predefined time period. By this method, the measured results are reduced only to the extraordinary events.

The saved long-term measurements can be loaded again and analyzed afterwards-in principle, as if the measurement is still currently running.

Further informations: www.schleich.com/en/dynamic-motoranalyzer
The data base – everything at a glance

All test results, not only the measured values of single oscillations but also the values calculated from them, like e.g. the rms, are stored in the data base. To be able to search for the motors quickly and efficiently, many additional search criteria can be entered. The modern data base is based on Microsoft® SQL. Not only the motor test data but also the test results can be arbitrarily exchanged between several Dynamic MotorAnalyzers.

MotorData-Analyzer – special software for centralized storage and analysis

If you have further SCHLEICH testers, as e.g. the EncoderAnalyzer, MotorAnalyzer 2, the surge voltage tester MTC2 or the high-voltage tester GLP1-g in use, you can store all test results together in one central data base. The centralized data storage and evaluation happens by means of the software “MotorData-Analyzer”. Based on the measured values from all testers, the “MotorData-Analyzer” provides you with detailed information about the electric motor’s condition and its attachment parts.

The “MotorData-Analyzer” is a powerful tool, which allows you to always have an overview of all motors from your or your customer’s production. No matter whether e.g. insulation resistances, surge voltage strength, current consumption, load peaks, harmonic content of the mains supply, resolver evaluation and more—all measured values are available at a glance.

Historical trends and the course estimation of future measured values as e.g. the polarization index (PI), provided by the software, allow you to make clear statements regarding preventive maintenance and repair. It is the aim, to integrate maintenance into the production flow at an early stage and without problems and not to wait until the motor’s complete failure. That is why the software automatically reminds you of the next maintenance works.

Furthermore it generates various kinds of reports for documentary purposes.
## Das Zubehör

**MotorData-Analyzer-Software**
- Software for central analyzing and storing of all motors, encoders and test results
- Part no. 403307

**Encoder Analyzer**
- Software for EncoderAnalyzer measurements
- Part no. 403304

**TeamViewer-software**
- Tester’s remote-control by SCHLEICH in case of service/support
- Fast support
- Safe and verified connection
- Part no. 40031248

**Current clamps**
- Part no. 4033100

- **Quantity** | 3
- **Measuring range switchable** | 5A/100A
- **Lead length** | 2 m
- **Part no.** | 4033100

**Current clamps Rogowski**
- Part no. 4033102

- **Quantity** | 3
- **Measuring range switchable** | 6A/60A/600A
- **Lead length** | 2 m
- **Part no.** | 4033102

**Software for external speed measurement**
- Part no. 403308

**Software for motor temperature measurement**
- Part no. 403310

- **Hiperface and SSI are registered trademarks of the SICK AG**
- **Endat is a registered trademark of the Dr. Johannes Heidenhain GmbH**

Further informations: www.schleich.com/en/dynamic-motoranalyzer
Measuring lead MU with alligator clamps

Lead length 3 m
Part no. 403291

Note: measuring leads may only be used in combination with EncoderAnalyzer software 403304.

Measuring lead with free lead ends

Lead length 3 m
Part no. 403290

Note: may only be used in combination with software 403310.

Measuring lead MP 19-pole

Lead length 2 m
Part no. 4032200

Note: measuring leads may only be used in combination with EncoderAnalyzer software 403304.

Current clamps Rogowski

Quantity 3
Measuring range 5000 A
Lead length 2 m
Part no. 4033104

Measuring lead ME 28-pole

Lead length 2 m
Part no. 4032300

Note: measuring leads may only be used in combination with EncoderAnalyzer software 403304.

Measuring lead MP for resolver

Lead length 2 m
Part no. 4032201

Note: measuring leads may only be used in combination with EncoderAnalyzer software 403304.

Temperature probe for measuring the motor temperature

Lead length 5 m
Part no. 403311

Note: may only be used in combination with software 403310.

Manual rpm counter

For contact free speed measurement

Lead length 5 m
Part no. 403309

Note: may only be used in combination with software 403308.
Expect more!

Take advantage from our many years of experience and comprehensive know-how in the applications of electric motors- and winding testing as well as in the electric safety- and function testing. Whether single testers, combination testers or complex test systems – with SCHLEICH you found the perfect partner at your side.

**Electric motors- and winding testers**

- MotorAnalyzer 1+2: Multi-purpose testers for electric motors and windings
- MTC2: Multi-purpose winding testers
- EncoderAnalyzer: Testers for checking shaft encoders
- Dynamic MotorAnalyzer: Online Monitoring
- MTC3: Multi-purpose winding testers
- GLP2: Multi-purpose motor testers
- Bonding machines

**Electrical safety- and function testers**

- Handheld: Mobile multi-purpose testers
- GLP1: Safety- and functional testers
- GLP2: Safety- and functional testers
- GLP3: Multi-purpose Windows®-testers

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