



**SCHLEICH**  
Advanced Test Technologies

EncoderAnalyzer  
Dynamic-MotorAnalyzer

Power

Start

Test A B On

ME

MU

MI

MP



Umax 700Vrms

Umax 30Vrms

Umax 30Vrms

Umax 30Vrms

4.00  
3.00  
2.00  
1.00  
0.00  
-1.00  
-2.00  
-3.00  
-4.00



## Motor Repair Electrical Engineering Maintenance



■ The EncoderAnalyzer-Class  
Facilitate complicated things



■ EncoderAnalyzer |  
Tester for checking shaft encoders ..... 48

# The EncoderAnalyzer-Class

## EncoderAnalyzer | Tester for checking shaft encoders



Ethernet

### Highlights

- encoder analysis without special know-how!
- automatic check of all encoder signals
- checking all signal pulses per revolution
- determining the pulse quantity per revolution
- checking all 90°-phase shiftings between the signals per revolution
- automatic check of all signal voltages per revolution
- sense of rotation and number of rotations of the rotary encoder
- angle fault test per revolution
- angle balance of rotary encoders
- storing the angle offset in the rotary encoder via the data interface
- measuring the EMF at all three motor phases to balance resolvers or Hall elements
- evaluation of the three commutator signals
- measuring the motor-EMF via three 700Veff-channels in the slowing down and standardization to 1000Upm
- measuring module with 6 or 12 high-speed measuring channels
- integrated, adjustable voltage supply for the encoders
- integrated reference signal source for resolvers
- Windows®-software for evaluating the measuring signals of the measuring module
- graphic display of all measuring signals on the screen
- database for different encoder models, arranged according to manufacturer and type
- multilingual operator interface
- worldwide voltage supply 110V...250V/47...63Hz

The EncoderAnalyzer is THE tester for checking shaft encoders at electric motors.

Modern engines are often equipped with rotary encoders. There is a huge variety of rotary encoders and thus the exact check is complicated for the operator. This is especially valid for the electric motor repair but also for the analysis in the production. This complex check is not possible without special measuring technology.

In this area the EncoderAnalyzer provides valuable services. It facilitates the encoder test extremely. It supplies voltage to the rotary encoder and measures all signals. Afterwards it also evaluates them automatically. As result you receive a clear GO or NO GO.

### These rotary encoders and sensor systems can be checked

#### 6-channel EncoderAnalyzer

- rectangular incremental signal encoder with A, /A, B, /B, N, /N, U, /U, V, /V, W, /W
- sine-cosine-encoder with sin, /sin, cos, /cos, N, /N
- Hall-elements with A, /A, B, /B, N, /N
- Hall-elements with U, /U, V, /V, W, /W
- commutator signals / block commutator
- multi-turn absolute value encoder with SSI- and Hiperface-interface

#### 12-channel EncoderAnalyzer

- the same rotary encoders like mentioned at the 6-channel EncoderAnalyzer
- resolvers
- optionally 3-phase motor current measuring in the running operation

12-channel EncoderAnalyzer with 3-high-volt inputs  
additional measuring options

- the same rotary encoders like mentioned at the 12-channel EncoderAnalyzer
- EMF-voltage measuring up to 700V
- resolver balance in relation to the motor-EMF
- optionally: programming of the angle offset in the rotary encoder
- 3-phase motor current measuring in the running operation

### Functioning principle

The EncoderAnalyzer consists of two components: the measuring module and the analysis software that is to be installed on a PC.

The measuring module performs the measurements. For this it detects many million measuring values during one revolution of the rotary encoder and transfers them to the PC. The communication between the measuring module and the PC is done via a Gigabit-Ethernet connection. The measuring values are automatically analyzed via the analysis software. At the end of the analysis the software shows the result on the screen. For a better understanding the faults of the defect rotary encoder can also be displayed in a chart like at an oscilloscope.

The test results are stored in a database. A detailed test report can be printed if required.

### Connecting the rotary encoder

The rotary encoder to be tested is connected to the measuring module via a measuring lead. For connecting the measuring leads there are up to two measuring sockets available at the measuring module's front. The quantity of measuring sockets depends on the ordered options. The EncoderAnalyzer with all 12 measuring channels features 2 measuring sockets.

A voltage supply of 3...30V for the rotary encoder is also integrated in the EncoderAnalyzer. The operator sets the voltage level and the maximum allowed current consumption to the rotary encoder type via software input. During the test the EncoderAnalyzer measures the current consumption for checking purposes. If the preset maximum values is exceeded the voltage supply switches off immediately.



Measuring socket MU for:

- three high-volt measuring inputs

Measuring socket MI for:

- three current measuring inputs for current tongs

Measuring socket MP for:

- resolver

Measuring socket ME for:

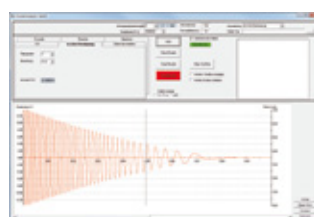
- rectangular incremental signal encoder
- sine-cosine-encoder
- Hall-elements
- commutator signals / block commutator
- encoder voltage supply
- communication and programming interface

### Analysis software

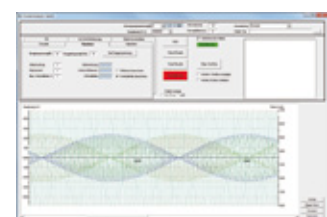
The quick, intelligent measuring technology and the user-friendly, intuitional analysis software are perfectly combined to each other. Only a few setting clicks and selections are sufficient for configuring the test for the connected rotary encoder type.

The comprehensive evaluations lead to clear, understandable results. A special detailed knowledge is not necessary when using the analysis software. Support is given via software for connecting and evaluating the rotary encoder.

In addition to the rotary encoder analysis the software also enormously supports the operation regarding the angle balancing of the rotary encoder. No matter if the rotary encoder has to be balanced via a mechanical turning or only the angle offset has to be detected the software supports the operator graphically regarding the balancing. Depending on the rotary encoder type and the EncoderAnalyzer's features the offset angle can also be written in the rotary encoder at the end.



EMF-measuring



resolver signal

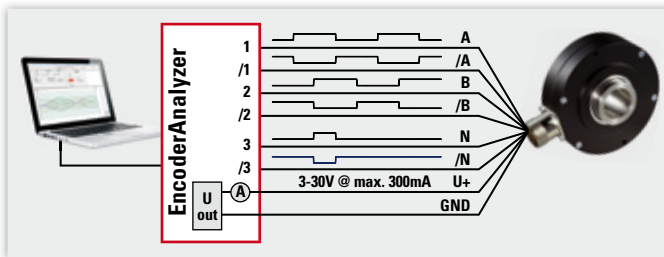


# The EncoderAnalyzer-Class

## EncoderAnalyzer | Tester for checking shaft encoders

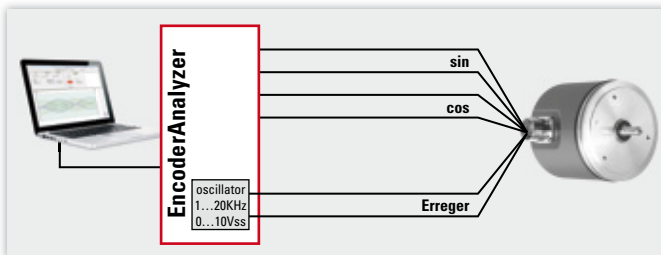
### Example: incremental rotary encoder

The EncoderAnalyzer supplies the rotary encoder with voltage and measures the signals. The signals can come from an optical or also Hall-element encoder.



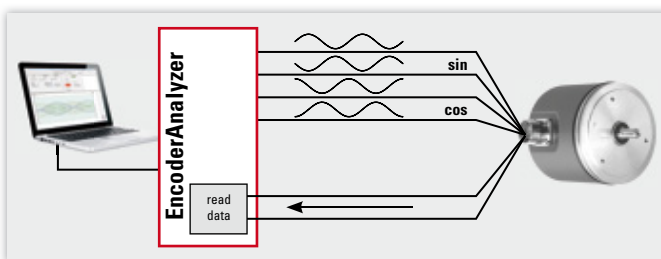
### Example: resolver

The EncoderAnalyzer generates the exciter signal and measures the Sin&Cos-signal. Based on these three signals it determines the angle position and the angle offset and accuracy as well if possible.



### Example: multi-turn-absolute value encoder

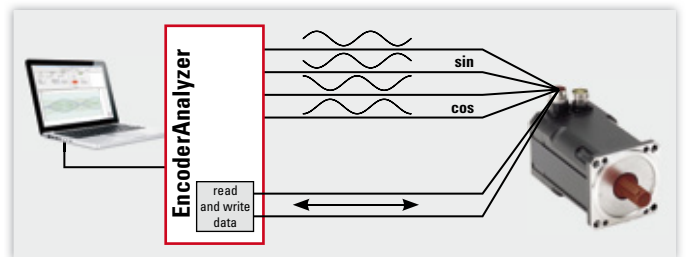
The EncoderAnalyzer supplies the rotary encoder with voltage and measures the Sin&Cos-signals. In addition it also scans the absolute position via the data channel. This is done via different interface protocols like e.g. Hiperface or SSI.



For the exact motor control the frequency converter requires the armature's exact angle position in the later operation. It receives this angle position from the rotary encoder. However for this the rotary encoder needs to measure the armature's position exactly to the position of the magnetic orientation of the stator field. For this the rotary encoder has to be connected and adjusted high-precisely to the armature's shaft during the assembly. This is mechanically difficult or sometimes not possible with the

requested accuracy. Thus a trick is used: the faulty angle position is determined in form of an offset angle and the frequency converter is informed on this fault position. Special rotary encoders are used as storing locations for the offset angle. For this task these encoders feature an internal electronic storage to store offset angles. In the later operation the variable frequency device will scan this offset angle at first after the switch-on and correct its control electronics with it. In doing so the mechanical assembly fault is electronically corrected.

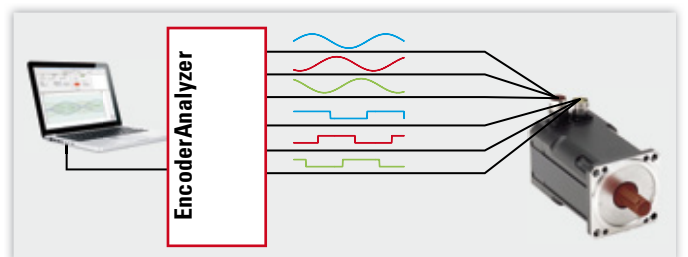
For this the EncoderAnalyzer has the option of measuring the angle offset at some rotary motor encoder combinations and store it in the rotary encoder. Unfortunately this function is not possible at all products as this kind of information storage is not published from some manufacturers.



### Example: evaluating the commutation signals

The EncoderAnalyzer supplies the Hall-elements with voltage and measures the commutation signals. In addition it also measures the voltage at the winding. This is the precondition for determining the signals' correct phase shifting to the motor voltage.

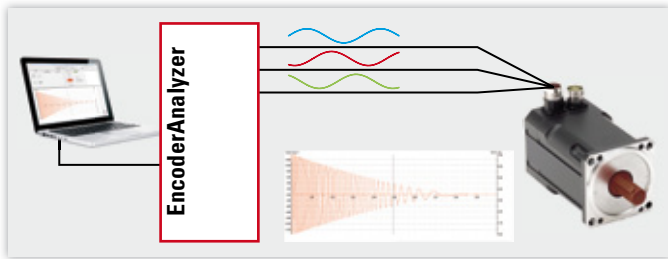
In order to measure the voltage of the motor the motor's shaft has to be driven mechanically. Thus the motor becomes the generator.



The EncoderAnalyzer can also be extended by the Dynamic MotorAnalyzer, see page 54

**Example: evaluating the EMF in the slowing down-process**

The EncoderAnalyzer measures the generated voltage at a slowing down synchronous machine. The voltage that changes during this in its amplitude and frequency is converted to a voltage value of 1000Upm by the analysis software. The voltage level at 1000Upm is an indication of the quality of the magnet or the complete motor.



equipped with foam material. It ensures that the laptop is safely pushed against the docking station at closed case cover.

All components and the laptop charging cable are stored in this case. The case also offers storing space for the measuring leads. The EncoderAnalyzer and the laptop are supplied with mains voltage via a central mains socket.

As additional accessory a useful shoulder strap is available. With this strap the EncoderAnalyzer can be comfortably carried on the shoulder.



**Cabinet versions**



**Desktop cabinet with up to four measuring connections at the front**

This EncoderAnalyzer is supplied via an external power supply. The connection for the LAN-cable to the PC is at the rear.



**Portable cabinet with EncoderAnalyzer including four measuring connections and integrated laptop**

The high-quality laptop operates with a Windows® operating system. The WLAN-compatible laptop features a low-reflection display. It is connected to the EncoderAnalyzer via a docking station. Owing to this station the high-quality laptop can be taken off the case and used for other tasks. It is secured and locked on the docking station via a key. In addition the case features an safety lock to protect its valuable content. The case's top is

**Test station for rotary encoders**

The EncoderAnalyzer needs to have a rotating shaft in order to be able to test rotary encoders. This might be performed directly via the drive motor that is assembled to the rotary encoder.

If, however, the rotary encoder is to be checked slackly it has to be assembled on a small test station. Via a small motor the rotary encoder is driven on the test station afterwards.

A test with constant rotary speed as well as the setting of different angles can be required. Both are possible with the EncoderAnalyzer test station. For this the analysis software contacts the motor via an USB interface directly. The harmonic interaction between the motor control and the rotary encoder measuring is ideally given in this way.



Test bench with drive motor and encoder. The Encoder is installed on an exchange adaptor.

