S O F T W A R E H A R D W A R E S E R V I C E

SCHATZ®-ANALYSE

- Determination of Assembly Characteristics of Bolts
- Testing of Prevailing Torque-Type Locknuts
- Practice-Oriented Checks

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Checking fastener components

The quality of the screws and nuts used in assembly has an enormous effect on the quality of screwed joints.

Performance tests are the most important type of analysis for use in assembly processes. They determine the mechanical properties and tolerances of the fastener components, in order to ensure that they fulfill their performance requirements.

SCHATZ®-ANALYSE enables you to make tests in accordance with international standards or under realistic conditions corresponding to actual assembly processes.

Determining torque versus preload force characteristics in accordance with ISO 16047

The most important type of analysis for proper performance of threaded fasteners in assembly processes is determining the relationship between torque and preload force. The ISO 16047 international standard describes a method for determining the assembly characteristics of screws and nuts. This analysis can be used to determine the tightening characteristics of mechanical fastener components.

The objective of the analysis is to determine the values of the following tightening parameters in the course of the test:
- Total friction coefficient
- Thread friction coefficient
- Friction coefficient of the head or nut bearing surface
- Preload force at the yield limit
- Breaking force

Determination of mechanical and performance properties in accordance with ISO 2320

Prevailing-torque nuts may have a plastic component that produces increased friction torque on the shank of the screw, or they may be fully deformed or deformed in a specific region in order to produce increased friction torque even when the nut is not preloaded. This prevailing torque provides important protection against accidental loss of the nut, or it can be used to prevent loosening of the nut if it is not clamped tight.

The ISO 2320 standard describes a test method and associated limits for determining the properties of prevailing-torque nuts.

Practically oriented coating analysis in accordance with VDA 235-203

The prevailing conditions in production processes are not always the same as the prevailing conditions in laboratory tests. In particular, the processes used in assembly differ with regard to rotational speed. In locations where controlled fastener assembly systems are used, screwed joints are assembled using a two-stage process. In order to check the fastener components under practical conditions, it is important for all relevant conditions to be configured or simulated as realistically as possible.

The most important factors here are:
- The fastener components
- The bearing surface under the screw head or the nut
- The angular rotation during assembly until the tightening torque is reached
- The clamping length of the fastener components and the depth of thread engagement
- The speed and sequence of the tightening process for the screwed joint

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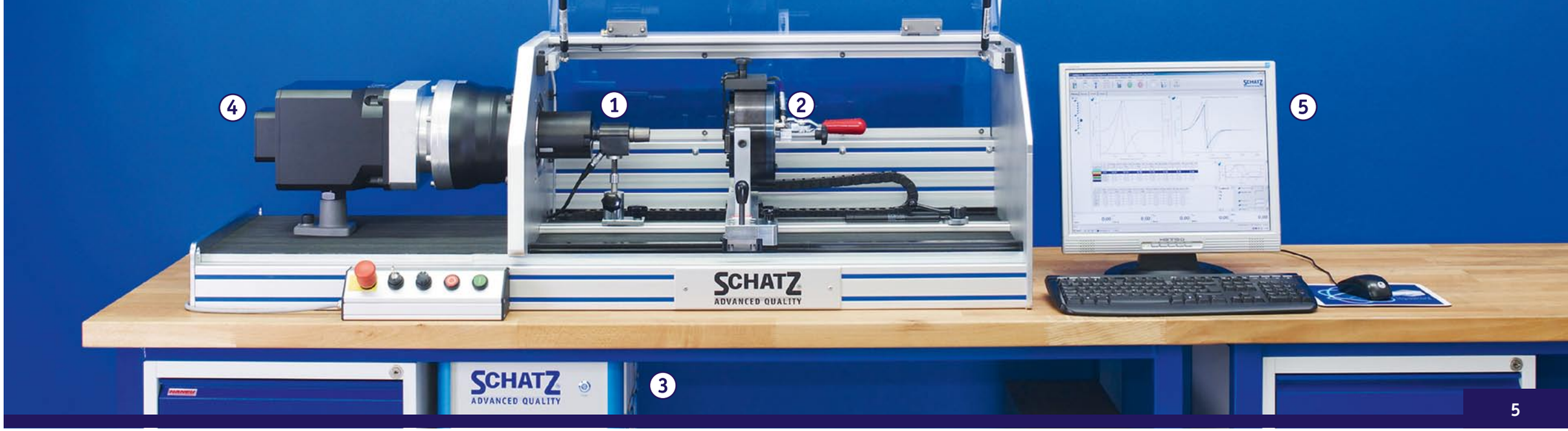

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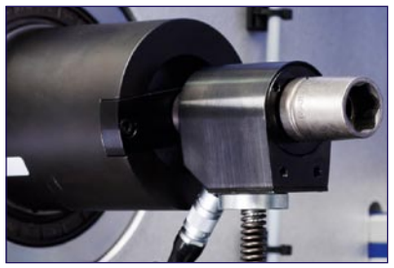
This laboratory system enables fast, accurate analyses of fastener components. Quantities such as torque, preload force and rotation angle, along with other parameters such as screw elongation or temperature and even video recording, are measured and evaluated during the assembly process.

This laboratory system can be used to test fastener components for compliance with standards or under practical conditions for use in assembly processes. The system can be configured to match your specific application scenarios.

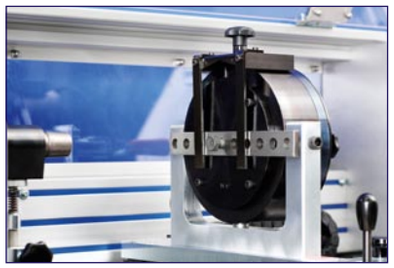
Torque / angle transducers

The shaft of the torque/angle transducer is fitted with strain gauges, and the sensor signals and supply voltage are coupled via extremely low-wear slip rings. An incremental encoder disc with 360 apertures is also fitted to the transducer shaft. It passes through a dual optical barrier sensor. The angle-pulse signal conditioning stage supplies two phase-offset signals that correspond to the direction of rotation.
Measuring ranges from 0.2 Nm to 35 kNm are available.



Preload force / thread friction torque transducer

The sensor heads of the preload force transducer and the thread friction torque transducer are fitted with strain gauges connected to a full Wheatstone bridge. The thread friction torque transducer is braced against the preload force transducer using an axial bearing, which allows the thread friction torque to be measured independently. The housing enables the use of attachments and perforated plates that allow screws and nuts of various sizes to be tested as desired.
Measuring ranges from 5 kN to 5000 kN are available.

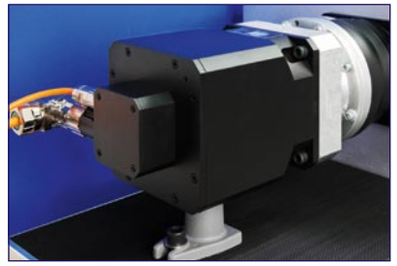


Instrument controller

This measurement and control system is a highly integrated and extremely accurate modular system for measuring analog and digital or incremental quantities. It acquires and processes the measured quantities and performs control tasks. A typical application for this system is analyzing threaded fasteners under practical conditions. Measurement and control tasks can be executed in real time, with plots of the measured quantities versus time displayed graphically in near-real time. With this measurement and control system, the tightening process can be continuously monitored on the PC screen so that it can be stopped manually if an overload situation occurs (such as thread stripping).

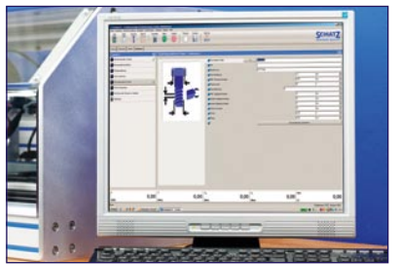
Drive motor and power unit

In combination with the available gearboxes, the DBL series of synchronous servo motors can provide torques up to 35,000 Nm at speeds up to 3,000 rpm (depending on the gearbox) for use with the horizontal test mechanism. The associated power and control unit can be powered from a three-phase AC supply with a voltage in the range of 230 to 480 V. It has the same footprint as the 5413-2777 instrument, so the two units can easily be stacked.



Software

The testXpert® analysis program provides a simple, intuitive user interface for working with complex functions. The Assistant function helps you design and generate test reports and export test results and plots. Users can easily define specific test processes using process blocks. The program also provides extensive personalization features, powerful tools for complex calculations, and versatile graphic analysis functions. Online help provides extensive support for every program feature, and integrated user management capability with individual user privilege assignment completes the elaborate functionality of this program.



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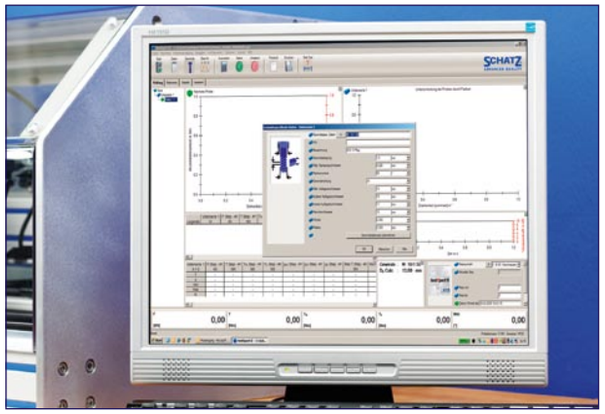
Running test sequences quickly and easily

Generate the test sequence

Generating test sequences is easy thanks to wizard assistance during test preparation. Function blocks can be simply joined together to create test sequences.

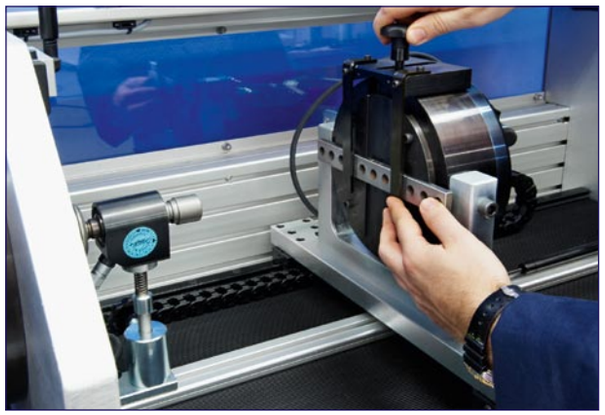
The dimensions of fastener components, which are needed to calculate the friction coefficients, are stored in the threaded fastener database.



Attach the fastener adapter

Quick-change adapters connect the fastener components to the fastener tension and friction transducer.

This lets you make measurements in a jiffy.



Connect the fastener

A series of tests can be performed quickly and efficiently. Simply connect the fastener and start the system.

When each test is completed, change to a different fastener and run the next test.

Start the system

The system begins the defined test sequence at the push of a button. The drive can be operated at different speeds during the test sequence.

Evaluating the results

The measured values and recorded curves are displayed on the screen for evaluation. Measurement sets and calculated assembly parameters are evaluated statistically and displayed in tables. This enables conformance with standards and specifications to be judged at a glance. Measurement curves provide product designers with valuable information on the behavior of fastener components during the assembly process. Friction coefficient diagrams show the relationship between torque and tension and allow the friction conditions to be seen at a glance.

A report wizard helps you generate printed test reports. Tables and charts can be shown on the document in any desired form. The document layout and logos are adapted to standard document formats. This means that the documents can be customized for each company and each customer. The testXpert® software also supports direct document transfer by e-mail, so the information is available where it's needed as quickly as possible.

Special solutions for your specific application scenarios

The SCHATZ®-ANALYSE laboratory system is manufactured and configured to suit your specific application scenario.

Testing tiny fastener components

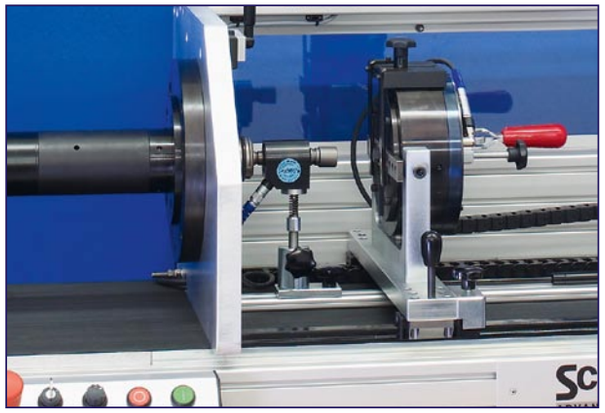
In combination with suitable transducers, the vertical test stand can be used to test extremely small fastener components. With this configuration, the laboratory system can be used to test the performance of special screws and nuts used in the aerospace industry.

Laboratory system with manipulator

Using the manipulator, the fastener tool spindle can be brought up to the original fastener in order to perform tests on the completed component. The spindle holder can be rotated and pivoted to enable testing in any installed position. The manipulator can withstand spindle torques up to 2,000 Nm.

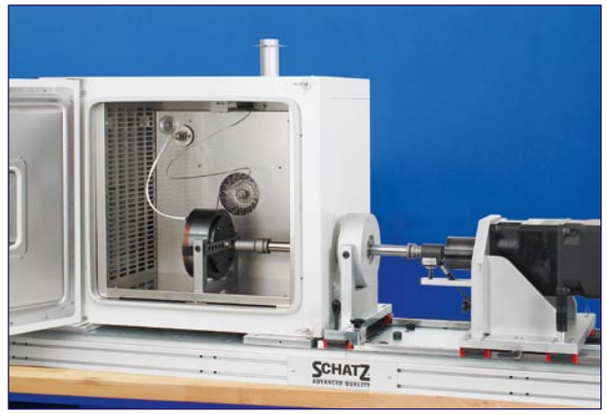
Testing under practical conditions

Fastener assembly systems taken directly from production can be controlled using SCHATZ®-ANALYSE to realistically simulate actual production conditions. Two-stage tightening processes and high tightening speeds corresponding to actual practice can be used to analyze stick-slip effects and altered friction characteristics.



Thermal characteristics of coatings

The heat chamber can be used to check whether the friction characteristics of the fastener components change when they are heated, with the result that the prevailing-torque property is lost and the fastener components can loosen due to temperature effects, despite correct assembly.



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