THM TESTING PRODUCT BROCHURE

THERMO-HYDRO-MECHANICAL

EDITION 2025

Made in Germany

ABOUT WILLE GEOTECHNIK

YOUR PARTNER SINCE 1990

APS Antriebs- Prüf- und Steuertechnik GmbH is a highly regarded German enterprise due to its soil, rock, asphalt, and material testing machines, which are marketed under the brand name" Wille Geotechnik".

All parts of designing, construction, manufacturing, quality-control, and delivery tests are conducted by our own qualifi d experts in our factory in Germany. In the meantime, the company has grown into a globally expanding enterprise. With our expertise we help a range of users in standard, routine challenges to highly complex investigations.

LIST OF CONTENTS

THM TESTING DEVICES

A temperature-controlled testing laboratory for soil and Rock can be used for a variety of purposes, such as studying the thermal properties of specimen, conducting experiments on specimen's behavior at different temperatures, and testing the effects of temperature on their properties under different stress regimes.

- THM Triaxial Test Systems(Static-Cyclic)
- THM Consolidation Test Devices
- THM Shear Testing Devices
- THM Hollow Cylinder Test Device
- THM Plane Strain Test Device /Biaxial Test
- Freeze-Thaw Test Device
- GAS Hydrate Triaxial Test System
- THM Rock Testing System
- "SYNCHRO CT" Triaxial Testing System
- Thermo Triaxial Cells
- True Rotable Polyaxial Rock Testing System
- High Pressure Syringe Pumps
- Wave Velocity Test Systems

MADE IN GERMANY

EXPERIENCED

THM TRIAXIAL TESTING SYSTEM

ELECTROMECHANICAL(STATIC - CYCLIC)

ISO 9001

This series of electromechanical Soil Triaxial testing systems are designed and manufactured to perform stress path Triaxial testing on soil under different temperature conditions.

It has dedicated technique for temperature controlling (3 D zone) and uses a special double wall Temperature cell (DWTC) which enables extreme precision in temperature controlling from -30 °C up to +200 C degree with a minimum temperature gradient along the length of the sample.

Optionally the temperature gradient test is available for these cells.

SCAN ME

GENERAL TECHNICAL SPECIFICATIONS

Type of load	Electromechanical
Static axial load	Up to 150 kN
Cyclic Load	Up to 20 kN
Frequency	Up to 10Hz
Confining pressur	Up to 5000kPa
Sample size(diameter)	38 mm to 100 mm
Temperature range	-30°C up to 200°C

THM /HIGH PRESSURE TRIAXIAL TESTING SYSTEM

STATIC – ELECTROMECHANICAL

This electromechanical system is constructed with high stiffness and features a precision-aligned load frame, making it suitable for high-load applications. The machine operates without the need for oil pressure and is extremely quiet, making it an absolute low-noise machine. The system offers a choice of double wall or 3D temperature-controlling techniques.

SCAN ME

GENERAL TECHNICAL SPECIFICATIONS

Static axial load	Up to 250 kN
Type of Load	Electromechanical
Confining pressur	Up to 32MPa
Sample size	38 mm to 100 mm
Temperature range	-30°C up to 200°C

TEMPERATURE CONTROLLED TRIAXIAL TESTING SYSTEM

STATIC – DYNAMIC

Reliable Test Result

This series of electromechanical Soil Triaxial testing systems are designed and manufactured to perform stress path Triaxial testing on soil under different temperature conditions.

It has dedicated technique for temperature controlling (3 D zone) and uses a special double wall Temperature cell (DWTC) which enables extreme precision in temperature controlling from -30 °C up to +200 C degree with a minimum temperature gradient along the length of the sample.

Optionally the temperature gradient test is available for these cells.

SCAN ME

GENERAL TECHNICAL SPECIFICATIONS

Static axial load	Up to 250 kN
Cyclic load	Up to 200 kN
Frequency	Up to 30Hz Cyclic
Confining pressur	Up to 5000kPa/10Hz
Sample size	38 mm to 100 mm
Temperature range	-30°C up to 200°C

ENVIRONMENTAL STATIC TRIAXIAL TESTING SYSTEM

HIGH PRESSURE SERIES

The system is config red with an active Triaxial cell made of Stainless Steel, equipped with an Easy Lock Mechanism. It is capable of performing various Axial Loads ranging from 7kN up to 100kN on samples of different sizes. The system employs a special Heat transfer method suitable for low and high-precision temperature applications.

Additionally, the device is equipped with a vertical lifting mechanism and a horizontal sliding mechanism, making it easy to handle the Triaxial cell.

SAFETY

SCAN ME

GENERAL TECHNICAL SPECIFICATIONS

Axial load	25kN / 50kN / 100kN
Confining pr ssure	Up to 20MPa
Temperature range	-20°C up to +200°C
Sample size(diameter)	Up to 70 mm

THM CONSOLIDATION TEST DEVICE

LOW AND HIGH TEMPERATURE

LOW MAINTENANCE

This fully automatic electromechanical apparatus is designed to perform Constant Rate of Strain tests at different temperature ranges on a sample while maintaining Controlled Back Pressure.

This advanced thermo-hydro-mechanical stainless steel temperature-controlled cell is a CRS cell that enables the user to simultaneously control of temperature, stress and strain and runs the test in a temperature range of -25°C up to + 200°C.

Additionally, it can perform back pressure and measure pore pressures, as well as stress and strain-controlled oedometer tests such as CRS, CL, IL, or swelling pressure tests.

SCAN ME

GENERAL TECHNICAL SPECIFICATIONS

Maximum axial load	Up to 100 kN
Max. pressure	1 / 2 / 3 / 10 / 20 kPa
Sample size(diameter)	50,47 to 112,8 mm
Sample Height	up to 50 mm
Temperature range	-25 to + 200 °C

THM SLURRY CONSOLIDATION DEVICE

LOW AND HIGH TEMPERATURE CONTROLLED

The slurry consolidation cell is used to investigate the swelling and settling behavior of sealing systems in tailings or sales pools in the mining industry.

The Slurry cell is a load frame-based cell and can be integrated into a load frame with a large stroke. The temperature of the sample is controlled from -15 °C up to +80 °C. When using tempered material, the insulating jacket must be placed around the cell.

The cell is manufactured with two load/normal stress measuring units, one for the measurement of applied stresses, and the other one at the bottom for the wall friction measurement.

SCAN ME

GENERAL TECHNICAL SPECIFICATIONS

Maximum axial load	10kN
Max. Pore pressure	Up to 300 kPa
Range of Sample size	150/200 mm 176/314 cm2
Max. settlement	200%
Sample Height	300 mm
Temperature range	-15 °C up to +80 °C

THM STATIC DIRECT SHEAR TEST APPARATUS

ECO FRIENDLY

This robust and highly stiff apparatus is including of high-quality mechanical and electronic components which produce repeatable test results, and the excellent quality makes it suitable for research and also usual test applications.

The temperature controlling system can control the temperature of the sample in the range of -20°C up to +200°C with a minimum temperature gradient along the sample.

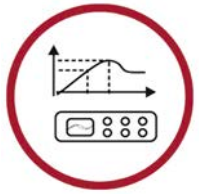
SCAN ME

GENERAL TECHNICAL SPECIFICATIONS

Load type	Electromechanical
Normal force	10 / 20 kN
Shear force	5 / 10kN
Temperature range	-20°C up to +200°C
Sample Sizes	Up to 100x100mm

THM CYCLIC DIRECT SHEAR TEST APPARATUS

STATIC-CYCLIC



Reliable Test Result

The THM Cyclic Direct shear apparatus is an automated apparatus with a very high stiffness and includes of two high quality servomotor drives for performing vertical and horizontal shear loads (static and dynamic). The precision electromechanical drive with high resolution and closed loop control rate generates closed-loop strain and stress controlled static axial load and strain and in addition stresscontrolled shear forces.

SCAN ME

GENERAL TECHNICAL SPECIFICATIONS

Load type	Electromechanical
Normal force	5 / 10 / 20 kN
Shear force	5 / 10kN
Temperature range	-20 °C up to +200 °C
Frequency	5Hz / 10 Hz
Sample Sizes	Up to 100x100mm

THM HOLLW CYLINDER TESTING SYSTEM

TEMPERATURE CONTROLLED

The Temperature Controlled Hollow Cylinder Apparatus enables the operator to apply rotational displacement and torque to a hollow cylindrical or soil specimen of soil under different temperature regimes. The cell is fully made of stainless steel with dedicated temperature controlling technique (3-D zone) and using a special double wall Temperature cell (DWTC) which enables extreme precision in temperature controlling from -30°C up to +200°C degre with minimum temperature gradient along of the length of sample.

SCAN ME

GENERAL TECHNICAL SPECIFICATIONS

Load range	Up to 20 kN
Frequency	2Hz- 5Hz – 10Hz
Torque	100 Nm / 200Nm /250 Nm
Sample Size(outer/inner)	100/60 mm or 150/100mm
Temperature range	-30°C up to 200°C

THM PLANE STRAIN TESTING SYSTEM

TEMPERATURE CONTROLLED BIAXIAL TEST

This temperature-controlled Plane strain apparatus is designed and manufactured to study mechanical properties and shear band failure of soil under a variety range of temperature regimes. It generates and controls sophisticated stress/strain paths. In the plane-strain state the deformation of the soil is considered to be approximately, zero in one direction for example the long dimension of the structure and the soil is free to deform in the other two directions.

SCAN ME

GENERAL TECHNICAL SPECIFICATIONS

Axial load	Up to 200 kN
Confining pr ssure	2000kPa / 20MPa
Sample size	120x100x40mm (LxWxH)
Testing Temperature	-20 °C up to +150 °C

FREEZE & THAW TESTING APPARATUS

ASTM D5918

The frost heave and thaw apparatus is specially designed for the ASTM Standard D5918. This standard describes the equipment, the procedure, and the interpretation of the combined frost swelling test and the CBR test after defrosting in the laboratory. The test is carried out in a special manufactured, high-strength, insulating, and deformation resistant CBR mould, made of synthetic fib r. It is used for the determination of the following parameters:

- Maximum frost heaving
- Residual heave
- Frost heave coefficient
- CBR value after the defrosting (CBRFH)

SINCE 1991

SCAN ME

GENERAL TECHNICAL SPECIFICATIONS

Height: approx	1500 mm
Width: approx	800 mm
Depth: approx	800 mm
Mariott´s bottle	1000 ml
Cooling aggregate	-10 to 100 C°

GAS HYDRATE TRIAXIAL TESTING SYSTEM

This test system is designed to study the mechanical properties of methane hydrate-bearing sediments under triaxial test conditions at low temperature and high pressure conditions. It is possible to use different hydrate formation methods with this device e.g. Excess water method, Dissolved gas method, or Excess Gas method. The system has a special heating method to prevent blockages of the methane close to injection ports.

SCAN ME

GENERAL TECHNICAL SPECIFICATIONS

Static axial load	Up to 200 kN
Confining pr ssure	Up to 50MPa
Sample size(diameter)	38mm up to 100mm
Temperature	-20°C up to + 60 °C

ROCK TRIAXIAL TESTING SYSTEM

HIGH PRESSURE / HIGH TEMPERATURE

The modular rock triaxial test system can be config red with a variety of hydraulic cylinders, power packs, different jigs, and attachments in order to perform uniaxial compressive strength, triaxial strength, post failure, bending, indirect tensile, direct tensile, fracture toughness, permeability, hydrofracturing and creep tests for rock testing systems.

The systems are able to test a range of materials from soft rock (e.g. sandstone) to hard rock for different applications in rock mechanics research e.g. Exploration and production of fossil fuels, Mining and construction, Tunneling, and Geothermal energy development.

SCAN ME

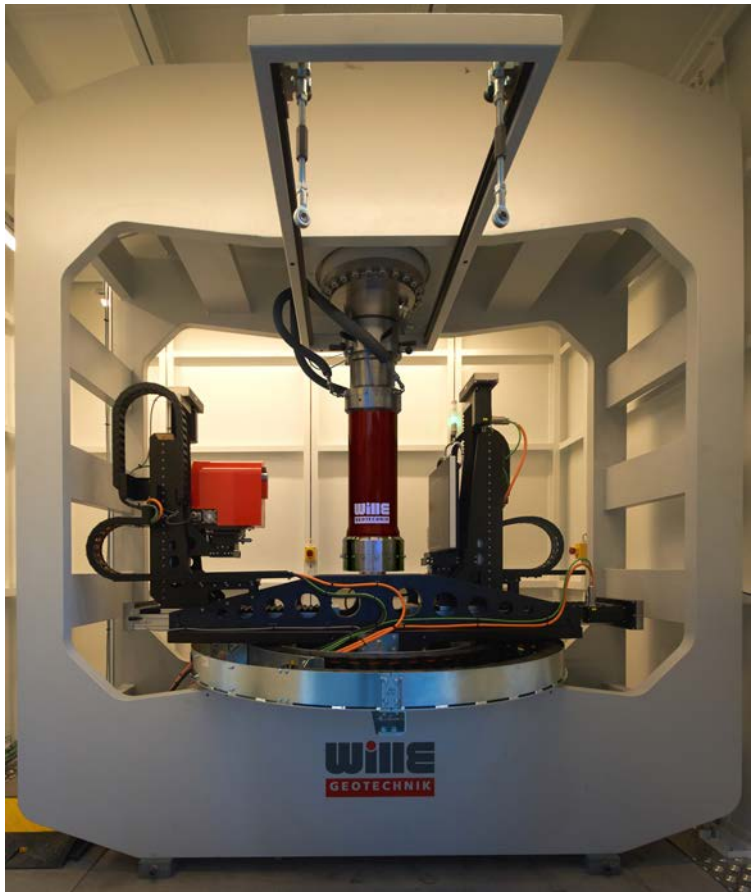
GENERAL TECHNICAL SPECIFICATIONS

Axial Load	Up to 5000 kN
Confining pressur	Up to 210 MPa
Pore pressure	Up to 210 MPa
Operation temperature	Up to 250 °C
Sample size(diameter)	Ø 25 up to 100 mm
Frame stiffness	Up to >10 X 10^9 N/m

All above technical specifications can be customised on request.

“SYNCHRO CT” TRIAXIAL TESTING SYSTEM

SIMULTANEOUS REAL-TIME CT TRIAXIAL TEST SYSTEM



X-ray transparent triaxial cell for low and high pressure tests

Sample’s porosity, crystalliza-tion and dissolution, exchange of pore fl ids, pre- and post-failure geometry, or even crack propagation can be now monitored in situ during testing, and also in a time-resolved manner.

Real time visualization of deformation of sample (consolidation, shear) and fl w process (saturation, permeability) during test Two phase fl id fl w (gas and

liquid).

High potential for upgrades (visualization systems e.g. µ-CT, AE, ERT, custom made test jigs and environmental chambers etc.)

SCAN ME

GENERAL TECHNICAL SPECIFICATIONS

Static axial load	Up to 5000 kN
Confining pressur	Up to 200 MPa
Pore media	Water, Salty water, CO2
Sample size	25 mm to 150 mm
Testing temperature	-20°C up to +200°C

HIGH PRESSURE / HIGH TEMPERATURE CELLS

The advanced series of high-pressure/ high temperature triaxial cells are designed to test cylindrical rock specimens with diameters of up to 102 mm, a length/diameter ratio of at least 2 under triaxial high pressure/ temperature conditions. The axial load can reach up to 10,000 kN.

The cell includes of variety fluid connectors and electrical feed-through lines which enables the users to configure their own testing configurations.

SAFETY

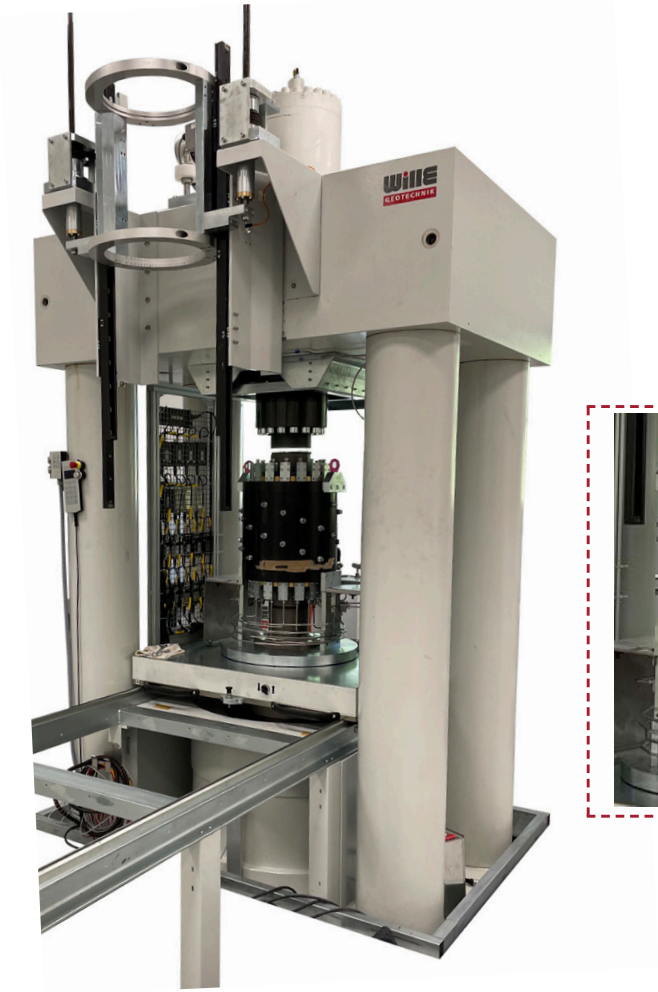
GENERAL TECHNICAL SPECIFICATIONS

Material	Stainless steel
Confining pressure	Up to 210 MPa 600MPa
Pore pressure	Up to 210 MPa
Max. sample diameter	Up to 102 mm
Max. sample height	Up to 250 mm
Operation temperature	Up to 250 °C

Note: Above technical specifications can be optimized upon request.

TRUE ROTABLE POLYAXIAL ROCK TESTING SYSTEM

THE GREAT CELL (GEO RESERVOIR EXPERIMENTAL ANALOGUE TECHNOLOGY)



By using rock samples with fracture networks and simulating depths of up to 3.5 km, the GREAT cell allows for the validation of predictions and hypotheses related to subsurface processes, such as fluid flow, rock deformation, and reservoir behavior.

One notable feature of the GREAT cell is its capability to apply rotatable confining pressure to rock samples. This means that the pressure exerted on the rock sample can be adjusted and rotated in different directions, simulating the complex stress conditions found in actual reservoirs.

APPLICATIONS:

- Geothermal reservoirs
- Hydrocarbon Extraction
- Enhanced oil recovery
- Reservoir fracking
- CO2 Sequestration
- Mantle studies
- Nuclear Waste storage

GENERAL TECHNICAL SPECIFICATIONS

Axial Load	Up to 10,000 kN
Confining pressure	Up to 100 MPa
Pore pressure	Up to 100 MPa
Operation temperature	Up to 100 °C
Sample size	Ø 250 x 250 mm height
Sample Shape	Cylindrical
Frame stiffness	Up to >10 X 10^9 N/m

All above technical specifications can be customised on request.

HIGH PRESSURE SYRING PUMPS

FOR EXTREME PRECISION AND RELIABLE TEST RESULTS

- Special designed set up of continuous syringe pumps for advanced gas hydrate triaxial test.

High pressure syringe pumps are digital microprocessor-controlled electromechanical piston pumps, which precisely generate and regulate pressure and provide flow control in a variety range for different applications. These pumps are used for applications related to the control of pressure or flow rate for various fluids and gasses in laboratory tests.

MODES OF OPERATION:

- Constant Flow
- Constant Pressure
- Continuous and step less increasing or decreasing pressure ramps
- Constant flow rates
- Constant volume condition
- Continuous constant flow and pressure(Twin pumps)
- Flow or pressure gradients (Twin pumps)

HIGH PRESSURE SYRING PUMPS

• Single pump

• Continuous twin pumps

This series of pumps are manufactured for high pressure range in testing applications which the test requires precise pressure generation and fl w control under pressure up to 4000bar with a high volume capacity. The device consists of a solid pressure cylinder with integrated spindle drive which directly pressurizes fl id or gas for the generation of pressures under closedloop control. An electronic pressure measuring facility is integrated and necessary for the operation.

ECO FRIENDLY

SCAN ME

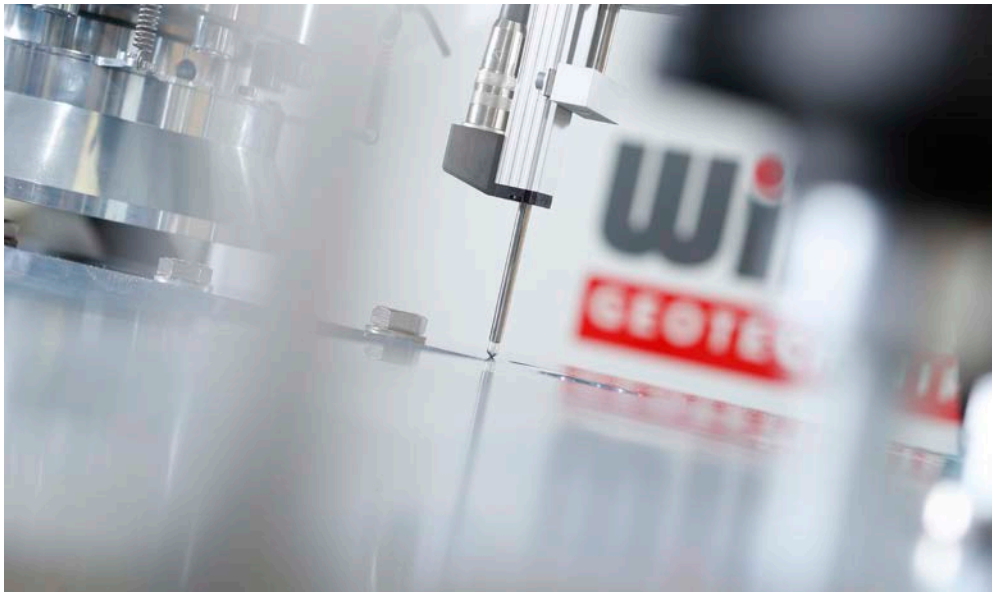
GENERAL TECHNICAL SPECIFICATIONS

Pressure range	From 10 bar up to 4000 bar
Volume range	46 ml up to 1155 ml
Material Of cylinder	Stainless Steel / Hastelloy
Pressure accuracy	0.1% F.S
Flow accuracy	0.0
Type of Media	Water, oil, gas, Co2, H2 and etc.

EXTREME PRECISION

We offer a diverse and comprehensive selection of sensors and transducers that are suitable for a variety of applications, both static and dynamic. These products are engineered to deliver high-precision measurements and can be used in conjunction with our own testing devices, as well as those manufactured by other companies.

SCAN ME



TRANSDUCERS

By incorporating precision transducers in your device, you can greatly enhance the reliability and accuracy of your testing data. The range of these products are compatible with most soil testing devices. Below you will find a concise list of the available transducers:

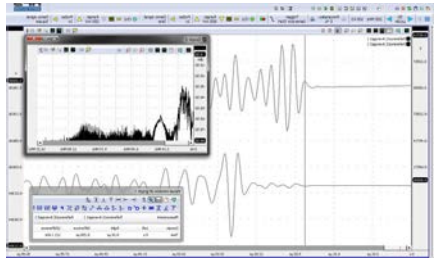
- Force sensors/ Load cells (External/Submersible)
- Local Radial Strain Transducer
- Axial Strain Transducer
- Pore / cell pressure transducer
- Mid-height Pore water pressure transduucer
- Bender element
- Temperature sensors
- Ultra low range wet-wet transducer for unsaturated tests

WAVE VELOCITY TEST SYSTEMS

- Ultrasonic Test device

- Acoustic Emission test system

- Complete system for generating, receiving,
- converting and monitoring waves
- Combined P and S (S1 & S2) transducers
- Low noise preamplifier to amplify ultrasonic signals
- Multiplexer up to 36 channels for conditioning and pulse generation
- Available for vertical and/or horizontal methods
- Real time Graphic software



- Bender element test system

GEOSYS TESTING SOFTWARE

GEOsys is a multi-functional and modular controlling and data acquisition software which is the result of close cooperation with software users all around the world. It allows for the simple programming of complex user defined test sequences via structured Windows operations via a graphic user interface. It is a controlling and data acquisition software and also has different modules to run tests according to ASTM or BS or other standards. It has a unique platform to address all testing needs, be it soil, asphalt, rock, or construction related, both dynamically and statically.

TEST MODULES

- Data Acquisition, processing and device management (DPD) Module
- Triaxial tests(Static-Dynamic)
- Hollow Cylinder Test
- Resonant column test
- Consolidation tests
- Shear Tests
- Temperature controlled tests
- Gas Hydrate Test System
- Rock Triaxial and Shear Testing systems
- Rock Polyaxial test System

SOFTWARE SERVICES

Software maintenance and upgrading

- Our dedication to customer service and satisfaction does not simply end when the purchased machinery is installed and under operation. Detailed and regular updates allow customers to benefit from the continuous development of our software, ensuring customers get the most out of our products.

Software customization

- Our expert software engineers are well trained and keen to provide efficient and professional programming in line with customer requests and requirements
- Specific testing needs are defined in close collaboration with the customer before implementation, ensuring the development of the most suitable product possible for the task at hand.
- Upon delivery, customers receive the finished test program along with the relevant documentation needed to operate their new piece of equipment efficiently.
- Our in-house software engineers are highly trained and have a great deal of experience and knowledge in this field. We pride ourselves on having well- trained and knowledgeable employees throughout our team. The answers to any questions that may arise are just a phone call away.

Software Training

- We feel it is our responsibility to offer customers comprehensive training on every aspect of our software. This training course may be held in-person at a customer's site or through an online session
- Software training is an important part of our service. Not only do we provide the testing system of the highest quality, we also offer continuous training courses to help customers use their devices to their full potential.

INSTALLATION & TRAINING

We have got over 30 years of experience in Geotechnical testing that we would like to share. We pride ourselves on our service and can guarantee smooth, successful commissioning immediately after the delivery of our testing systems. We have a great deal of experience having completed hundreds of successful installations. This success is partly due to our thorough and methodical work ethos.

This has in turn led to us implementing various tests throughout the production process, ensuring smooth installation and customer satisfaction.

- Factory acceptance test(FAT)
- Instruction Manual
- Training at Our company
- Onsite Installation and training (SAT)
- Virtual Training
- Video Training
- Machine operation after installation

SCAN ME

SERVICE DESK

We offer a full range of services for our products and systems, including procurement, commissioning and after installation services.Technical support covers all Wille Geotechik® products to new and older devices

Our networks of overseas representatives are there to help you with any enquiries in your native language during office hours. Local representatives are supported directly by our engineering department who can advise and help solve your problems. As a customer you are also able to have direct contact with the designers and manufacturers, as well as receiving all technical advice directly from experienced engineers in our company.

How to reach Service Desk Supports?

HELLO SERVICE

- Webpage supports
- Remote Access and support over the internet
- Email Support
- Telephone and Fax Support
- Onsite Support and Repairs

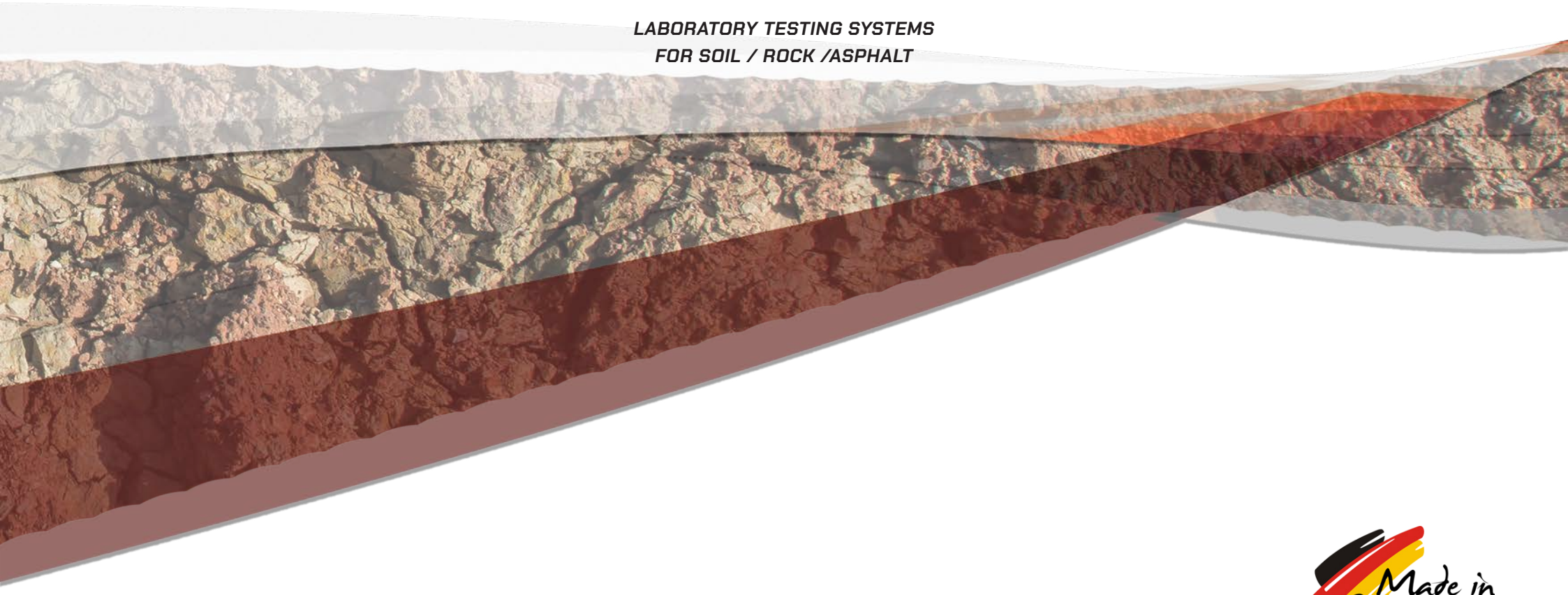
POST INSTALLATION SERVICES

There are different available services to assist you in operating your testing system in best condition after final installation at your site.

- Calibration
- Maintenance and gnspection
- Updates and upgrades
- Repairs and Spare Parts

Wille GEOTECHNIK

LABORATORY TESTING SYSTEMS
FOR SOIL / ROCK /ASPHALT



Made in Germany

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