

EN

# SPS ELECTRONIC CUSTOMISED TEST SYSTEMS



**THE WHOLE RANGE OF  
SAFETY TEST TECHNOLOGY**



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## Welcome to SPS electronic

We are the technology-loving experts for electric testing equipment from the heart of Germany. We develop our products from the conviction to only offer the best quality. In doing so, we have always been oriented towards typical German values, such as reliability, accuracy and perfection – in every area. From product development via customer advice to individual support. In short, with SPS electronic you are always on the safe side.

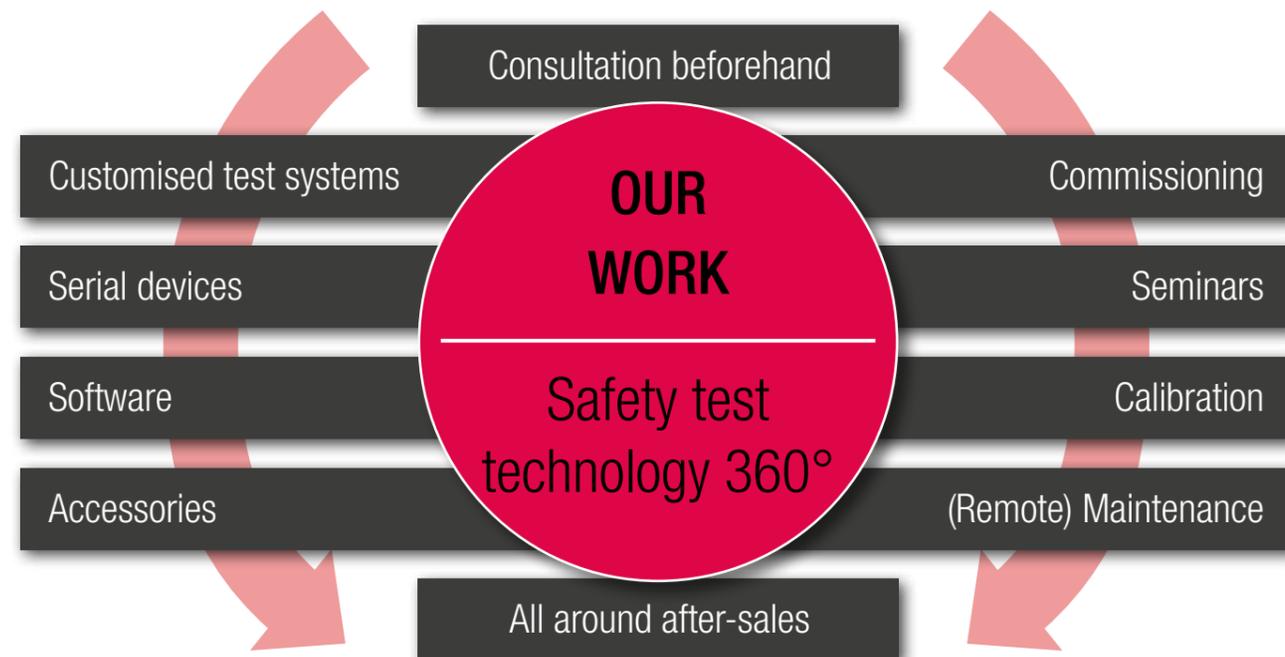
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## Our work – safety testing 360°

At SPS electronic you will find an all in all offer of safety test technology and everything that goes with it.



For 40 years, SPS electronic has designed and produced test technology in the field of electric safety, selling it worldwide. In doing so, our main focus is on providing **safety and function testers** as well as a wide selection of suitable **accessories**. Always at the latest state of the art and, of course, in best quality.

But apart from the continuous extension and further development of our product range, we are specialised in developing **test and checking systems** that are individually tailored to customer requirements. Thus, we also look after implementation apart from planning.

And it goes without saying that this takes place with highest claims. Because no matter what test problem you face – we will always find a solution.

We round off our product range with a reliable **full service**. This includes, for example, our comprehensive advice prior and after the purchase, the installation as well as the repair of appliances, if necessary. And this even applies when it is a third-party product. Furthermore, we offer worldwide **training courses and seminars** as well as comprehensive **online support**, covering all topics – from mere product use to safe handling of the test technology.

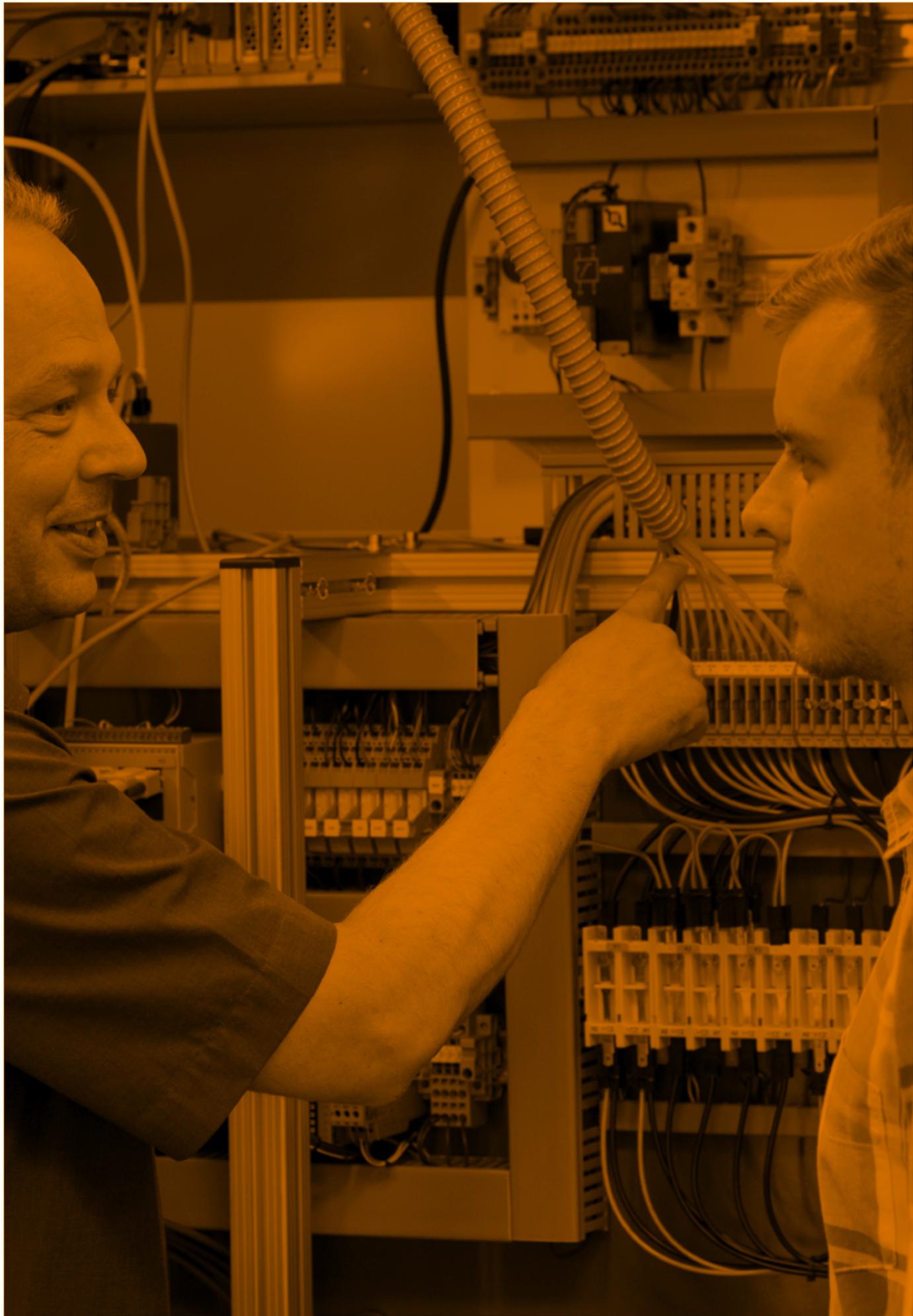
## True German Quality – This is **SPS electronic**



Headquarters in Schwäbisch Hall

## Good things can be so close at hand – Our **distribution and service center:**





# TEST SYSTEMS

With our products we normally offer a suitable solution for all tasks in electrical safety testing. However, it can happen that very special requirements apply to a particular test task. Be it in terms of the sequence of parameters to be tested, the conditions under which it shall be tested or also the kind in which the approval of the test finally takes place. Here we are also glad to help you – with special solutions which are fully coordinated with your individual needs and the desired requirements. You can learn more about this on the next pages.



# When there is a testing task, there is always a solution.

And, at best, it comes from the experts for electric safety test technology: SPS electronic.

We would not be experts if we did not know everything about electric safety tests. Therefore we have the possibility to respond quickly and coherently even to new questions: in the form of customer-specific test systems, supporting you in your work and making it easier. Just put us to the test – what can we do for you?

## A TEST SYSTEM – WHAT DOES THAT MEAN?

In a test system, different components from the field of electric test technology are combined with each other and thus summarised to an independent test system. That can mean that a whole production line comes into being on which various electric safety tests are carried out on several stations. Even automated, if it is desired. But it can also mean to develop first-time a safety test for a special, completely new product, where appropriate. The opportunities for that are almost unlimited.

## FOR WHOM AND IN WHICH CASE DO TEST SYSTEMS COME INTO CONSIDERATION?

Test systems come into consideration for everyone who is not satisfied with the standardised procedures for electric safety testing. This might have different reasons. For example, if safety testing has not been applied in the required manner yet. This is often the case with a new or also a very exotic product. Or particular test parameters are required, for example whenever a product must also function underwater or in other extreme situations. No matter how unusual a customer wish is – we will find a solution.

## FOR WHICH INDUSTRIES, APPLICATIONS AND APPLIANCES CAN TEST SYSTEMS BE REALISED?

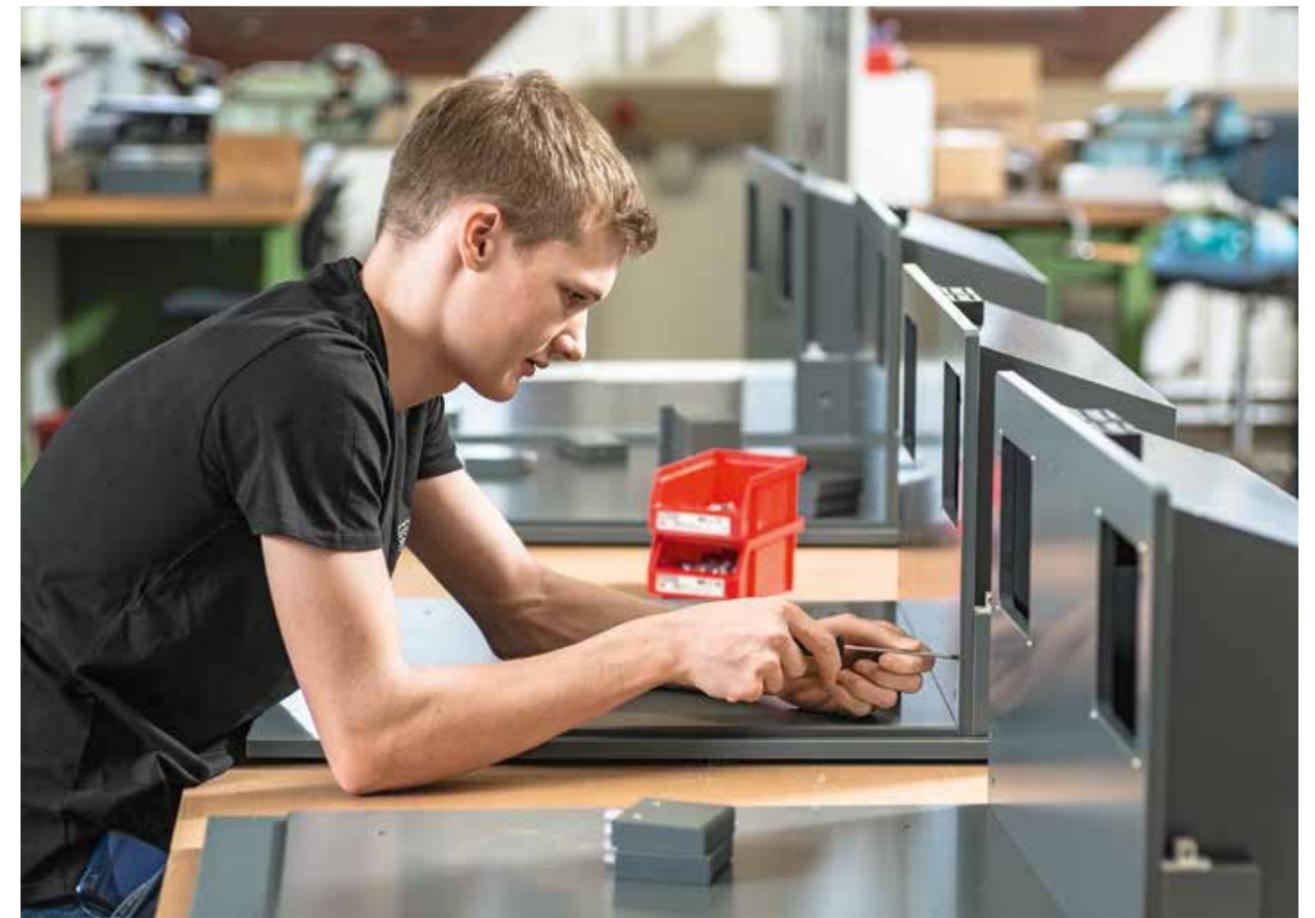
Our individual test systems are used in almost all industries dealing with electric technology. Because once current is flowing within an appliance, it must be ensured that safety is guaranteed for the user at any time. In the process, it is rather unimportant whether it is about household appliances, lightings, tools, motors or even medical equipment. What is essential is always the type of carrying out the test.

## THE KEY TEST PARAMETERS ARE YOUR WISHES.

The advantages of an individual test system are clearly obvious. Because it is especially designed to solve your day-to-day problems at the best. You would like to know whether a test system is also possible for you? Then please contact us. We will jointly analyse your task and develop a set of specifications. Then we will look after the development, realisation and commissioning of the system. On request, you and your employees will then get a comprehensive training and introduction, and we will, of course, continue to provide you with technical support. It almost sounds too simple, doesn't it?

## OUR TEST SYSTEMS CERTAINLY OFFER YOU MANY ADVANTAGES:

- + Individual problem solutions
- + Controllable via software
- + Complete integration into existing systems, on request
- + Comprehensive after-sales support



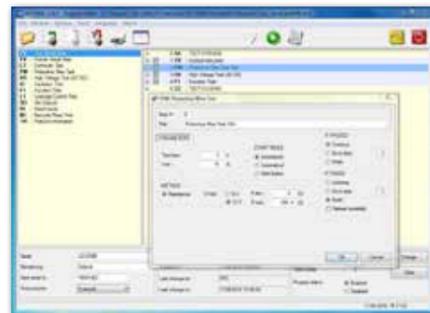
# Customised test systems – and everything related

We inspire our customers with the almost unlimited combination possibilities of functions, test methods and components.

## Safety and function tests

- Ground bond tests
- High voltage tests
- Insulation tests
- Leakage current tests
- Surge test
- Partial discharge test
- Resistance measurement
- Current power measurement
- Leakage test
- ...

## Software



- + Creation of test plans
- + Tests
- + Browsing of test protocols
- + Network connection
- + Data exchange with IT-systems



## Interfaces / DUT connection



...and many more!

## Workplace design



# Individual test solutions – according to your needs

Our test systems can be flexibly adapted to your requirements and thus be optimally integrated into your production. Three areas of application can generally be distinguished:

## MANUAL TEST STATIONS



From small quantities...

At a manual test station, testing begins when your employee has entered the DUT into the test system and contacted the test connection. The start of the test may take place in various ways:

- **Test with inevitable contact protection:** Testing begins once the protective housing has been closed.
- **Test without inevitable contact protection:** Testing begins at activation of a two-hand start.
- **Test without inevitable contact protection – light curtain:** Testing begins at activation of a start button. The light curtain must not be interrupted during the process.

A red warning lamp signals that the DUT carries live voltage and must not be touched. The test system visualizes the result after the fully automatic continuous testing sequence.

## SEMI-AUTOMATIC TEST STATIONS



...up to...

Semi-automatic operation combines a fully automatic process with manual interventions. For example, an employee can insert the DUT into a test cluster and start the test procedure. The test system or an additional control then checks all necessary cylinder movements for contacting the DUT and starts the testing sequence.

## FULLY-AUTOMATIC TEST STATIONS

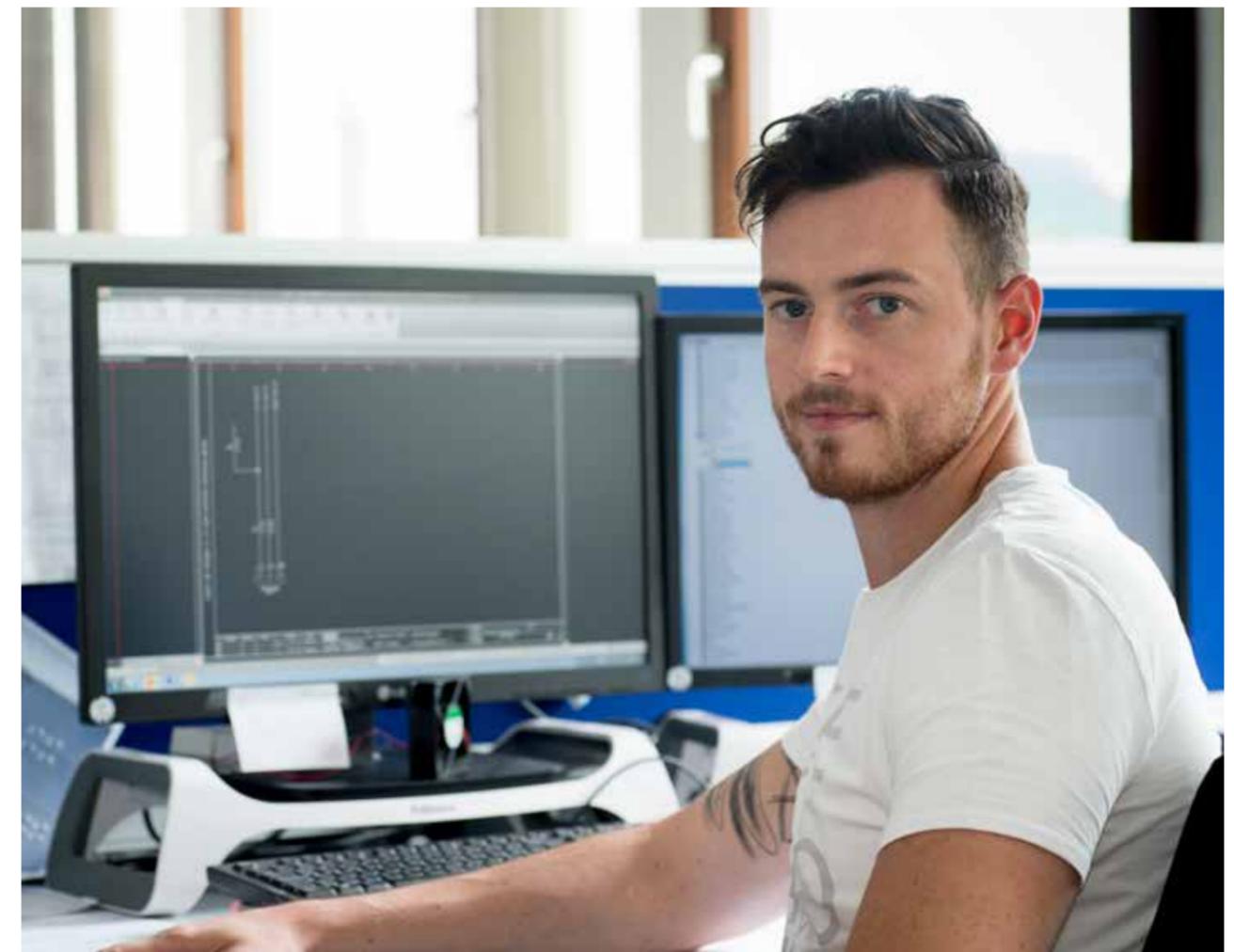


...high volumes!

If the test system is integrated into a fully automatic production line or production facility, testing takes place automatically, without manual intervention. The test system will generally work in one of the two listed modes:

**Mode 1:** The test system is fully remote controlled by a system control. The superordinate control specifies all test parameters or chooses the testing sequence set in the test system. Contacting and all mechanical processes are carried out by the system control. As soon as the system control has prepared testing, it starts the test system. At the end of testing, it transfers the test results back to the system control.

**Mode 2:** The test system controls all mechanical processes in the test cell via a bus system. The test system additionally communicates with a system control and an ERP system.





# REFERENCES

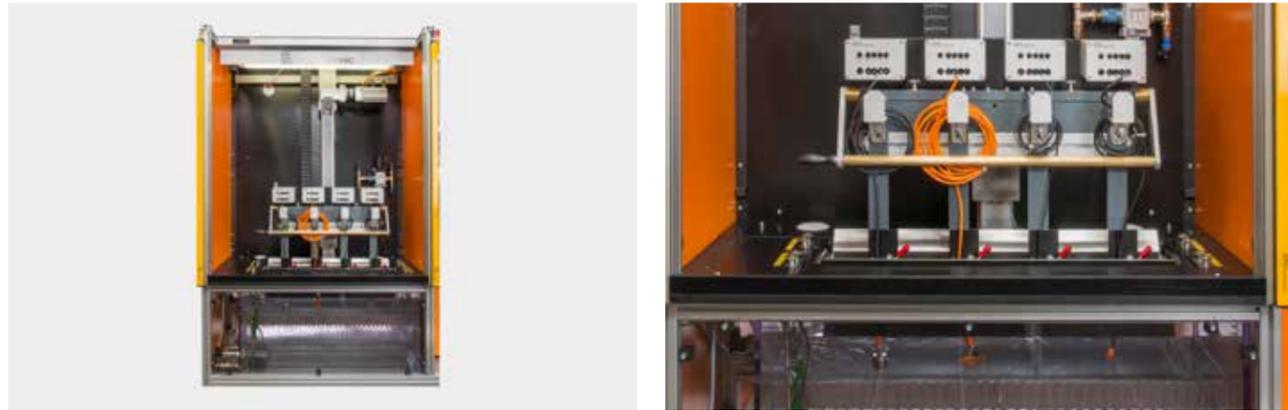
These solutions would not have been possible without the know-how of SPS electronic. On the following pages you will find an excerpt of the customised test systems we have already implemented for our customers. Let our references convince you.



# CUSTOMISED

Industry: Electrical industry

## High voltage test in a water bath for position sensors of the protection classes I, II and III



### Task

The customer wanted to implement automated, highly flexible testing of its various products. It should be possible to test more than 100 different products on a test system. To cope with rising volumes, more products should be tested with a single mounting. A test had to be carried out in a water bath to guarantee 100% insulation of the casing.

### Solution

A high voltage test system with water bath was developed. The product is completely tested by immersing it in the water bath. The immersion depth is variable and precisely adjustable using a stepper motor to cover all product versions (even in the future). The water level is automatically regulated. The contamination of the water bath was counteracted by a recirculation pump in conjunction with an UV clarifier. The safety is ensured by a light curtain. Up to four DUT that are mounted on pneumatic line terminals can be automatically tested at the same time. Single and multiple tests are possible. Drying of the DUT was directly integrated and occurs via a specially developed „air-vent system“.

An arbitrary number of test programs can be stored in the test system PC. This allows the customer to independently write new test programs when developing new products. However, for products with identical data, it is also possible to use the same test program, which is then allocated to the respective DUT over the product list. The test results are stored automatically in XML or Access format on an arbitrary place on the network.

A separate test dummy is used to check the functionality of the test system fully automatically. During the daily start of the test system, the testing personnel is asked to include this dummy and start the corresponding program. The test system does not allow further testing without a passed dummy test.

### Advantages

- + Turnkey solution including DUT support, adaptation and workplace design
- + Simple, intuitive operation for semiskilled personnel
- + The DUT needs to be connected only once, then the whole test process occurs automatically
- + In network operation, all test data is automatically saved at the specified location / database
- + Long service life and service-friendly design
- + All values and settings can be made using software
- + Automatic dummy test
- + Workplace safety according to EN 50191
- + Great flexibility in scope of testing and DUT versions
- + Simple handling
- + Simple mounting
- + Multiple testing

### Specifications

- High voltage test AC 500 V – 5,500 V
- Release current from 0.1 mA to 100 mA
- Short circuit current > 200 mA

# CUSTOMISED

Industry: Electrical industry

## Test system for power distribution units with up to 24 outlets



### Task

The task was to examine the variety of different power distributors at a test station. Both the number of outlets (24 pieces), and the different types of outlets must be contacted and checked. The different types of outlets from the connector plug should be examined.

### Solution

Using a sophisticated switching matrix, the various outlets and their number can be safely tested. By means of sensors, it is checked whether all outlets have been contacted and checked against the DUT data stored on the network after the DUT was identified by the bar code. The various connection options can be tested using a variety of adapter cables. Protective earth conductor and high voltage tests are performed following the continuity test of the terminal / connector to the various outlets. Each connection line to each outlet is checked here. The safety of the testing personnel is ensured by a safety light curtain.

An arbitrary number of test programs can be stored in the test system PC. This allows the customer to independently write new test programs when developing new products. However, for products with identical data, it is also possible to use the same test program, which is then allocated to the respective DUT over the product list. The test results are stored automatically in XML or Access format on an arbitrary place on the network.

A separate test dummy is used to check the functionality of the test system fully automatically. During the daily start of the test system, the testing personnel is asked to include this dummy and start the corresponding program. The test system does not allow further testing without a passed dummy test.

### Advantages

- + Turnkey solution including DUT support, adaptation and workplace design
- + Simple, intuitive operation for semiskilled personnel
- + The DUT needs to be connected only once, then the whole test process occurs automatically
- + In network operation, all test data is automatically saved at the specified location / database
- + Long service life and service-friendly design
- + Short cycle times through efficient workplace design with light curtain
- + All values and settings can be made using software
- + Automatic dummy test
- + Workplace safety according to EN 50191
- + Automatic wiring test of the entire DUT
- + Automatic short-circuit / high voltage test of all terminals of the DUT

### Specifications

- Continuity test of all connections via I/O signals
- Protective earth conductor test AC up to 30 A
- High voltage test AC up to 5,500 V
- High voltage test DC up to 6,000 V / 2-3 mA



# CUSTOMISED

Industry: Electrical industry

## Test system for 1-4-pin RCCB up to 250 A



### Task

The customer's wish was to test a one-to-four-pin RCCB for its function with a high current of up to 250 A. The problem here was to allow the operator to also intervene manually, without compromising his or her safety. There should also be no problem in testing the products, which differ in number of pins, breaking current, size and add-on devices.

### Solution

Based on these requirements, a standing workstation, which was equipped with a special test cage to protect the user was developed. This was in turn designed so that the operator can also manually operate the product to be tested using a special tool. The operator can therefore make adjustments and changes to the product during the function test. The RCCBs are tested with a current of up to 250 A AC, wherein the shut-down time is determined for each contact path. The various contact paths can be connected. In addition, the pilot contacts are detected. The current is adjusted manually using a control knob as this is a purely manual workstation. The operator can read the set current on a digital display instrument. The rest of the system is computer-controlled and realtime data is processed. Different test adapters allow testing of the different RCCBs.

An arbitrary number of test programs can be stored in the test system PC. This allows the customer to independently write new test programs when developing new products. However, for products with identical data, it is also possible to use the same test program, which is then allocated to the respective DUT over the product list. The test results are stored automatically in XML or Access format on an arbitrary place on the network.

A separate test dummy is used to check the functionality of the test system fully automatically. During the daily start of the test system, the testing personnel is asked to include this dummy and start the corresponding program. The test system does not allow further testing without a passed dummy test.

### Advantages

- + Turnkey solution including DUT support, adaptation and workplace design
- + Simple, intuitive operation for semiskilled personnel
- + The DUT needs to be connected only once, then the whole test process occurs automatically
- + In network operation, all test data is automatically saved at the specified location / database
- + Long service life and service-friendly design
- + All values and settings can be made using software
- + Automatic dummy test
- + Workplace safety according to EN 50191
- + In addition to automatic tests, the operator can also manually intervene during the function test, without compromising his or her safety.
- + Testing of different products with a current of up to 250 A AC
- + Despite manual setting options, the test system is PC-controlled and has realtime data processing
- + Different test adapters and an extensive switching matrix allow the testing of different products and the addition of different numbers of contact paths

### Specifications

- Manually adjustable power source
- Function test with power from 0 to 250 A AC
- Manually adjustable power source
- Determining the shut-down time for each contact path
- Additional detection by pilot contacts
- The various contact paths can be connected to the power supply

# CUSTOMISED

Industry: Electrical industry

## Test system for power strips with a maximum of 12 Schuko sockets



### Task

It was necessary to develop a test system to automatically test the power strips with different numbers of sockets, which are positioned differently and also have different functions (e.g. master-slave).

### Solution

In order to test the large number of different DUT, a test hood was used, in which up to twelve socket adapters with interchangeable head can be used for different types of connectors and can be flexibly positioned. It is also possible to integrate an actuator for the power strip switch. The test hood will be developed and supplied by the customer.

After closing the test hood, automatic contact is established between one and twelve sockets via pneumatic cylinders. During the test, the switch integrated in the power strip can be automatically actuated via two additional cylinders to check the function of the switch. The protective earth conductors of all sockets, the high dielectric strength and function are tested. Moreover, a load is connected to the first socket of master-slave power strips to check the switching on of additional sockets.

The easy-to-use PC software allows storage of an arbitrary number of test programs, so that the necessary scope of testing and the test data can be adjusted for each DUT. However, for products with similarly mounted DUT, it is also possible to use the same test program, which is then allocated to the respective DUT over the product list. By coding in different parts of the DUT contact, it is checked with the software whether the settings of the test hood match with the selected test program. The test results are automatically stored in XML or Access format.

A separate test dummy is used to check the functionality of the test system. The test system does not allow further testing without a passed dummy test.

### Advantages

- + Turnkey solution including DUT support, adaptation and workplace design
- + Simple, intuitive operation for semiskilled personnel
- + The DUT needs to be connected only once, then the whole test process occurs automatically
- + In network operation, all test data is automatically saved at the specified location / database
- + Long service life and service-friendly design
- + All values and settings can be made using software
- + Automatic dummy test
- + Workplace safety according to EN 50191
- + Simple retooling for a large number of different DUT types

### Specifications

- Continuity test 24 V
- Protective earth conductor test 10 A - 30 A at the 12 PE terminals of the sockets and the housing
- High voltage test AC 5,500 V / 2.99 mA
- High voltage test DC 6,000 V / 3.99 mA (safety-current-limited)
- Insulation test DC 6,000 V
- Function test single-phase to check all connections and the master-slave function
- Switch actuation



# CUSTOMISED

Industry: Electrical industry

## Test system for commercial kitchens up to 600 A



### Task

The existing test stations were supposed to be modernised in the first place. Besides the improvement of processes, it also includes the complete documentation of the test data. Moreover, our customer preferred a single connection of the DUT. Following this, all tests should occur automatically. The large currents up to 600 A require the use of suitable switching elements, plug connectors and cables.

### Solution

A PC-controlled test system was developed for the safety test according to IEC / EN 60335. The function tests consist essentially of current and power measurements.

Attention had to be paid to the high leakage currents of up to several 100 A in both the safety tests and the function tests. These leakage currents cannot be avoided in heaters with a high output. The workplace is designed in accordance with EN 50191 and thus, protects the testing personnel. The whole test equipment, including the PC are housed in a cabinet with the dimensions 3 x 19" / 42 HU in a space-saving manner. The transmitter and the switching elements for connection of the individual tests are also here.

### Advantages

- + Turnkey solution including DUT support, adaptation and workplace design
- + Simple, intuitive operation for semiskilled personnel
- + The DUT needs to be connected only once, then the whole test process occurs automatically
- + In network operation, all test data is automatically saved at the specified location / database
- + Long service life and service-friendly design
- + All values and settings can be made using software
- + Automatic dummy test
- + Workplace safety according to EN 50191
- + Automatic test program selection
- + Full integration in the existing production line

### Specifications

- Protective earth conductor test from 10 A to 30 A max. 0.4 Ω
- Insulation test DC 500 V / 50 MΩ
- High voltage test DC 1,500 V / 4 mA
- Function test from 0 to 600 V / max. 600 A in 4 ranges
- Leakage current test from 0 to 10 mA / 0 to 50 mA / 0 to 500 mA / 0 to 2,000 mA
- 12 connectable and assessable PT 100 sensors

# CUSTOMISED

Industry: Electrical industry

## Test system for el. brakes and connector sockets



### Task

Electrical brakes and connector sockets are essential components for the automation technology. Particularly high requirements are made in the medical field on surgical robots. Electrical brakes and connector sockets with torque up to 400 Nm are to be function-tested. As the brakes are also in part used in surgical robots with several arms lying one behind the other, these must hold the position very precisely. Therefore the requirement for the angular resolution is very high especially in the static test.

The following parameters must be acquired:

- Torque test including inlet of the DUT
- Switching time measurement
- Air range measurement
- Air gap measurement
- Housing temperature measurement
- Winding temperature calculation
- Winding resistance measurement
- Static test

### Solution

To ensure a flexible DUT pick-up, with which all possible designs and sizes can be picked up, two 4-jaw chucks have been used. Depending on the type of DUT, the customer can use his own adapters or clamp the DUT directly. The output side can be adjusted with a linear unit. This way the system can be adapted to the width of the DUT. In addition, a simple insertion of the DUT is ensured. When testing series the first DUT can be positioned by hand respectively. In the case of further DUT these positionings are carried out automatically and thus very quickly. In addition, the air gap can be adjusted fully automatically. Depending on the type of DUT, the rotation of the output side can be allowed or blocked. To ensure a high angular resolution rotary encoders with 19 bit resolution (524288 increments) each were used on the drive and on the output side.

### Advantages

- + Future-oriented solution by using a standard PC
- + Highest precision of the measuring technique for medical use
- + Programmable, electronic supply 0 – 300 V AC / DC
- + Turnkey solution including workplace design
- + Simple, intuitive operation for trained personnel
- + In network mode, all test data is automatically stored in the desired location / database
- + Long service life and service friendly setup
- + All values and settings are possible via software
- + Workplace safety according to EN 50191

### Specifications

- Various flexibly adjustable test steps and evaluation options
- Testing of different sizes and DUT types
- Supply voltage from 0 – 300 V AC and DC
- Test parameter:
  - Torque measurement via torque measurement shaft up to 500 Nm
  - Angular resolution with 524288 increments
  - Switching times
  - Air gap measurement
  - Housing temperature measurement
  - Winding temperature measurement
  - Resistance measurement of windings



# CUSTOMISED

Industry: Electrical industry

## Test system for safety magnets



### Task

In order to achieve the shortest possible testing time, a simple loading and contacting of the very small test connector was necessary. In doing so, the different positions of cylinders, as well as the performance of the test piece, had to be captured. Furthermore, it had to be verified by the measuring spring tension whether the right spring was fitted during assembly. Test pieces that failed the test were intended to be removed by operator control, while checked and passed pieces were to be clearly labelled.

### Solution

A reduction of testing time is achieved by means of a rotary plate with two testing stations. The DUT can thus be replaced at one station, while testing is taking place at the other. Loading is manual, the subsequent testing is fully automatic.

In order to protect the user, the rotation of the plate is secured by a light curtain. This allows for further reduction in cycle time, because no protective doors need to be closed and reopened. Actual testing is secured with an enclosure.

Cylinder stroke can be very precisely measured by means of a laser sensor. Measuring spring tension takes place via a force sensor. The function current can be set via an adjustable source.

Once a test piece has passed testing, marking is carried out via a center punch. A faulty test piece is signalled to the user via the software, as well as warning lights. Further testing can only take place after removal of the faulty piece. The removal of faulty pieces is registered via a sensor; this serves to avoid interchanging faulty and operable test pieces.

### Advantages

- + Short testing time due to rotary plate
- + Fully automatic process after manual loading
- + Removal of faulty pieces is registered automatically
- + Low personnel expenditure for testing
- + Simple, intuitive operation for trained personnel

### Technical specifications

- High voltage testing up to 800 V between coil and enclosure
- Testing of spring tension up to 10 N via force sensor with a measurement accuracy of 0.2 % of the final value
- Activation for functional testing via setting current at up to 2 A
- Capture of lifting motion via laser sensor with a repeatability of 4 µm

# CUSTOMISED

Industry: Electrical Industry

## Test system for current sensors



### Task

In order to achieve the shortest possible cycle times of less than 30 seconds, the current sensors should be contacted fully automatically after placement by hand. If a faulty DUT is detected, it should be ejected automatically. Since different versions of the current sensors are tested on one system, the test adapter must be exchangeable in less than 5 minutes. After the exchange, it must be checked whether the suitable adapter has been installed for the respective DUT.

### Solution

By using a rotary indexing table with three test stations, it was not only possible to build an extremely space-saving system, the test time was also minimized to a maximum of 30 seconds per DUT. The user is protected from the movement of the turntable by a protective housing in combination with two-hand operation. This avoids unintentional intervention and the risk of crushing.

#### Station 1

Manual insertion of the DUT and correct positioning via a centering bolt. By actuating the two-hand control, the DUT proceeds to the next station.

#### Station 2

The DUT is contacted fully automatically with current loops and a function as well as a hipot test is carried out. By actuating the two-hand control again, the DUT proceeds to the next station.

#### Station 3

If a DUT is detected as faulty, it is automatically sorted out in station 3 via a gripper. The "Passed"-DUT proceed to the first station where they can be removed and labelled by the user.

### Advantages

- + Space-saving design by using a rotary indexing table
- + Short testing times
- + Fully automatic sequence after manual loading
- + Low personnel expenditure
- + Simple, intuitive operation

### Specifications

- Function test up to 3,200 A DC
- High voltage test AC up to 5,500 V / 100 mA
- Recording of the primary current via current transformer and multimeter
- Recording of the secondary current via multimeter
- Testing can take place with different polarity



# CUSTOMISED

Industry: Electrical industry

## Test system for soldering irons



### Task

Soldering irons and soldering stations with several hundred watts of power are developing into increasingly complex devices. In order to ensure consistent quality, these must be tested for safety and function after production. Since the customer has a large number of different products, a contacting unit that is as flexible as possible is required. The voltage supply of the different test objects should be provided by the test system.

### Solution

The turnkey test system consists of the test technology, PC technology with software and DUT fixture. By using a mobile test table, a maximum flexibility in the production of the customer could be guaranteed.

A pneumatic contacting unit as well as a contact plate guarantee the contacting of different DUT without any modification of the system. After actuating the 2-hand operation, the high-voltage test starts fully automatically.

The freely programmable compact tester KT 1886 provides all safety and function tests. A fully electronic, programmable source supplies the DUT with all voltages and frequencies known worldwide.

### Advantages

- + Programmable electronic source 50 – 260 V AC / DC max. 13 A AC
- + Long operating time and service-friendly design
- + Parameters and settings can be changed at any time via the software
- + Workplace safety according to EN 50191
- + Short cycle times with safety current-limited testing technology
- + Simple, intuitive operation for trained personnel
- + The DUT only needs to be connected once, then the rest of the test sequence is automatic
- + In network operation, all test data is automatically stored at the desired location / database

### Specifications

- Ground bond test AC 0 – 30 A
- High voltage test AC 100 – 5,500 V
- High voltage test DC 100 – 6,000 V
- Continuity test 24 V DC / 600 mA
- Insulation test DC 100 – 6,000 V

### Function test

- Current 0 – 13 A
- Voltage 0 – 270 V
- Power 0 – 4,000 W

# CUSTOMISED

Industry: Electrical Industry

## Test system for cables



### Task

The cable test system is designed to test assembled cables for continuity and interruption of the individual wires within a few seconds. If a PE-core is present, it should be tested with a high-current PE test. The insulation of the cores against each other should be tested with a high voltage or insulation test. Due to different cable types, a contacting unit that is as flexible as possible is required.

### Solution

An aluminium frame was developed with testing technology in the substructure and a large test bay above. Since the DUT have a length of 20 to 45 m (65 to 147 ft.), it is possible to hang the cable on the test table. A light curtain mounted at the front of the test system ensures the protection of the user.

In order to be able to test different cable types, two company-specific interfaces as well as two connections for high voltage test probes from SPS electronic were installed.

For cables with open wire ends, two interfaces with pneumatic line clamps were integrated. These allow easy connection of wires with different cross-sections from 0.5 - 2.5 mm<sup>2</sup>.

By scanning an article number, the test program is started and displayed how the cable to be tested must be connected. The light curtain is activated by a non-contact sensor button. The continuity-, insulation- and high voltage tests are then started and carried out within a few seconds. The tester receives the status messages (good or error) on the built-in monitor or is informed via an acoustic signal.

Once the test is completed, the test result is automatically uploaded to the company's own ERP-system. It is possible to store any number of test programs on the system PC or on the company's own server. These different test programs contain the test scope as well as the respective test data of the DUT.

### Advantages

- + Turnkey solution including DUT fixture, adaptation and workstation design
- + Simple and intuitive operation for trained personnel
- + The DUT has to be connected only once, then the entire test sequence is performed automatically
- + In network operation, all test data and results are automatically stored at the desired location (server / database)
- + Robust test system for daily use in production
- + Service-friendly design
- + Short cycle times through efficient workplace design with light curtain
- + Convenient testing software DAT 3805
- + Workplace safety according to EN 50191
- + Maximum flexibility through various connection options
- + Test system observable from all sides through plexiglass walls
- + Automatic dummy test

### Specifications

- Continuity test with 24 V DC via IO - interface
- Ground bond test 0 – 30 A
- Insulation test DC 100 – 6,000 V
- Insulation resistance measurement 0.25 MΩ – 1 GΩ (voltage dependent)
- High voltage test AC 100 – 5,500 V (0 – 100 mA)
- High voltage test DC 100 – 6,000 V (0 – 100 mA)



# CUSTOMISED

Industry: Electric motors

## Final test bench for brushless servomotors



### Task

The aim of the final test bench was to enable the customer to test different motor sizes and output classes. The partly heavy weight of the motors made top loading using a crane necessary, in addition to the normal mounting from the front. In addition to the safety and function tests, vibration measurement must also be performed. Another difficulty was the large number of different connector plugs and different sensor systems.

### Solution

Easy-to-use PC software and a sophisticated switching matrix allowed the testing of all of the different motor sizes and output classes. Over a network connection, the different motors are identified and assigned using a bar code scanner and the corresponding test program is loaded. The test results are stored under the serial number with operator's name, date and the test results on the server. All of the different sizes in the test system can be contacted due to the different DUT supports. Operation with up to six different types of sensors is possible. Vibration is measured on the two bearing flanges. For this purpose, the testing cabin was hermetically sealed, but provided with an opening to the top. This is used for the desired crane loading. In addition to the protective earth conductor test, the high voltage test was performed between the different potentials such as winding, housing, sensor and the thermal sensor. Other tests performed are the EMC voltage test, winding resistance test and the function test at different target rpms. Operation of the motors with and without sensor is possible here. Sensors are also checked (number of lines, level, etc.)

An arbitrary number of test programs can be stored in the test system PC. This allows the customer to independently write new test programs when developing new products. However, for products with identical data, it is also possible to use the same test program, which is then allocated to the respective DUT over the product list. The test results are stored automatically in XML or Access format on an arbitrary place on the network.

A separate test dummy is used to check the functionality of the test system fully automatically. During the daily start of the test system, the testing personnel is asked to include this dummy and start the corresponding program. The test system does not allow any further testing without a passed dummy test.

### Advantages

- + Turnkey solution including DUT support, adaptation and workplace design
- + Simple, intuitive operation for semiskilled personnel
- + The DUT needs to be connected only once, then the whole test process occurs automatically
- + In network operation, all test data is automatically saved at the specified location / database
- + Long service life and service-friendly design
- + All values and settings can be made using software
- + Automatic dummy test
- + Workplace safety according to EN 50191
- + Full integration in the existing production line
- + Compact design for production areas with less space
- + Suitable for crane loading
- + Safety and function test including vibration measurement for various motors and only one-time connection

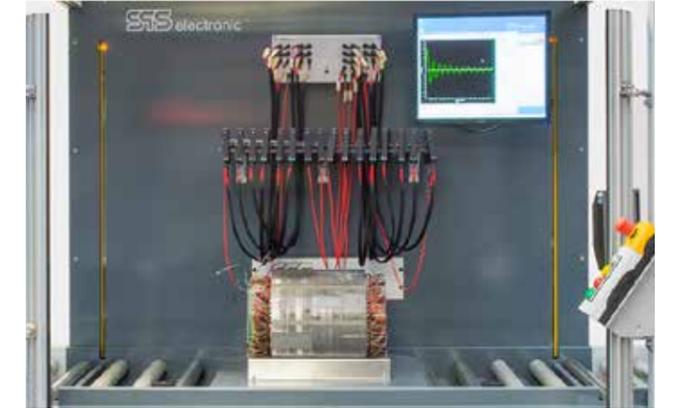
### Specifications

- Protective earth conductor test AC from 10 to 30 A
- High voltage test AC up to 5,500 V
- High voltage test DC up to 6,000 V
- Resistance test
- Measurement of the EMC voltage
- Vibration test
- Sensor test
- Function test at different rpms

# CUSTOMISED

Industry: Electric motors

## Test systems for 1-, 2- and 3-phase stators



### Task

Our customer's wish was to automate the existing test facilities and reduce the cycle time. At the same time, the depth of testing should be improved and the quality assured. The operation should be as easy as possible, so as to allow working of unskilled assistants. Highest level of safety for the employees was another requirement.

### Solution

Therefore, a computer-controlled test system with a matrix for 3-phase motors with a maximum of 4 speed levels was developed. The matrix with the high voltage relay allows the combination of safety test with low-ohm function measurements. The extended standard software DAT was used for controlling. The safety of the personnel is guaranteed by an approved light curtain (on 3 sides) with deflection mirror.

An arbitrary number of test programs can be stored in the test system PC. This allows the customer to independently write new test programs when developing new products. However, for products with identical data, it is also possible to use the same test program, which is then allocated to the respective DUT over the product list. The test results are stored automatically in XML or Access format on an arbitrary place on the network.

A separate test dummy is used to check the functionality of the test system fully automatically. During the daily start of the test system, the testing personnel is asked to include this dummy and start the corresponding program. The test system does not allow any further testing without a passed dummy test.

### Advantages

- + Turnkey solution including DUT support, adaptation and workplace design
- + Simple, intuitive operation for semiskilled personnel
- + The DUT needs to be connected only once, then the whole test process occurs automatically
- + In network operation, all test data is automatically saved at the specified location / database
- + Long service life and service-friendly design
- + Short cycle times through efficient workplace design with light curtain
- + All values and settings can be made using software
- + Automatic dummy test
- + Workplace safety according to EN 50191

### Specifications

- High voltage test with 5,500 V: Windings – Housing – Sensors
- Resistance measurement: Windings – Sensors
- Withstanding voltage test up to 6,000 V
- Rotating magnetic field monitoring using sensors

# CUSTOMISED

Industry: Electric motors

## Test systems for motors 3 x 400 V / 63 A / 50 Hz



### Task

The requirement was a turnkey solution including workplace design and programmable power source. For the stalling test, the DUT must be mechanically held in place by applying large forces on the shaft. Moreover, high power must be supplied to the DUT, which should be programmable over the entire range from the PC. In addition, the system should easily be integrated into the existing production lines worldwide.

### Solution

The high power required by the DUT required appropriate structures for the mechanical set-up. Therefore, a workplace design with 3 automatic doors, which move upwards, was chosen. This allowed saving much space, which was of great importance for the integration into existing production lines. The test equipment was set up, separated from the workplace. The power supplies were very high due to the high performance. The heavy DUT come in the testing area with the help of workpiece carriers and are then electrically connected by hand. For stalling measurement, the motor shaft is automatically fixed. The PC controls the freely programmable test processes with the standard software DAT. The following tests are available:

- Protective earth conductor test
- High voltage (phase, body, sensors etc.)
- Insulation resistance
- Winding resistance
- Withstanding voltage test
- 1/3 phase no-load test
- Stall current test with mechanical stalling of the shaft
- Brake test

The „PASS“ result is put out together with the motor data to a label printer. This label is also the seal of quality. An arbitrary number of test programs can be stored in the test system PC. This allows the customer to independently write new test programs when developing new products. However, for products with identical data it is also possible to use the same test program, which is then allocated to the respective DUT over the product list. The test results are stored automatically in XML or Access format on an arbitrary place on the network.

A separate test dummy is used to check the functionality of the test system fully automatically. During the daily start of the test system, the testing personnel is asked to include this dummy and start the corresponding program. The test system does not allow further testing without a passed dummy test.

### Advantages

- + Turnkey solution including DUT support, adaptation and workplace design
- + Simple, intuitive operation for semiskilled personnel
- + The DUT needs to be connected only once, then the whole test process occurs automatically
- + In network operation, all test data is automatically saved at the specified location / database
- + Long service life and service-friendly design
- + All values and settings can be made using software
- + Automatic dummy test
- + Workplace safety according to EN 50191
- + Automatic test program selection
- + Short cycle time due to optimum workplace design with 3 automatic doors that move up
- + Less space required due to the 3 automatic doors
- + Programmable source for 3-phase DUT of high power
- + Simple retooling for different types of motors

### Specifications

- 3-phase sources 0 – 690 V at 32 A / 0 – 100 V at 50 A
- 12-pin terminal panel for different motors and connections
- Resistance measurement: Motor winding and sensors
- High voltage test AC up to 5,500 V
- Insulation test up to 2 GΩ
- Power measurement by power analyser [P, U, I, cos φ, rpm]
- Withstanding voltage test for all motor windings

# CUSTOMISED

Industry: Electric motors

## Test system for pedelec motors



### Task

There is to be the possibility to carry out a fully automatic complete function test of the e-bike motors including communication and programming. The load simulation is to be made via a frequency controlled synchronous motor with a very accurate measurement resolution of the torques and number of revolutions to detect the smallest friction torques in the planetary gear of the DUT. In addition, the technology has to be installed in the production with minimum space requirements in a compact unit (including belt connection).

### Solution

On the basis of the test specifications and development documents, a flexible divided concept of the test devices and the mechanical contacting was selected. The system consists of a 19" mobile ESD test cabinet and a mobile adapter with belt connection. The adapter is docked to the test cabinet via a modular plug-in system. Thus it is possible to operate the test cabinet with different adapters.

The mechanical contacting is made fully automatically via an integrated control of all actuators in the adapter. For maintenance purposes, all actuators can be controlled via touch panel. Individual movements as well as complete sequences of the contacting can be run.

The regulation of the load machine was carried out as a dynamic PID control circuit with a torque measuring shaft.

### Advantages

- + Highly dynamic motor test system
- + Flexible test solution by means of adapter concept
- + Complete automatic test in one station
- + Ergonomic handling due to direct belt connection

### Specifications

- Dynamic load simulation on both pedal outputs, each with up to 80 Nm
- Speed range 0 – 200 Rev./min
- Power measurement up to 2 kW
- Torque measurement 0 – 100 Nm
- Frequency generator for tachometer simulation
- QR code vision sensors for device identification
- Touch panel for actuator control
- CAN communication with programming of the DUT



# CUSTOMISED

Industry: Electric motors

## Test system for stators



### Task

Two test stations were required in order to test the stators before and after impregnating. Two almost identical test stations were set up for this purpose in order to be able to use both stations for both types of tests during peak times. A high level of flexibility was required due to the large variety of DUT.

Furthermore, the following tests were necessary:

- Identification of the north and south poles by means of a polarity check
- Fast testing times
- High flexibility due to a large variety of DUT
- Partial discharge test in the production environment
- Pressure testing of the cooling device in the stator

### Solution

Due to the required flexibility, the test system was developed with an universal DUT interface, which made it possible to contact all existing DUT without needing to convert the test station. A solution with a pneumatic clamping system was selected because a short testing time was crucial.

Furthermore, test adapters were developed for the polarity test, which can easily be inserted in the DUT and as a result of their high-voltage withstand strength, do not need to be removed during the test.

A special software tailored to the customers' requirements was programmed in order to guarantee the high level of flexibility. It is easy to create test sequences at the test station and file them in the company network. The correct test sequence is automatically loaded from the company network by the test station with a simple scan of the barcode attached to the DUT and is filled with the correct parameters from a database. Personal safety has priority and is guaranteed by means of a test cover with clamping protection.

A specially developed verification box is used to automatically check the test station at the start. If the verification test is not successful, the test station will not permit any further test.

### Advantages

- + Turn-key solution including workplace design, adaptation and software
- + Automatic testing after an one-time connection of the DUT
- + Easy and intuitive operation for trained personnel
- + Test sequences can be created on the test system and filled with parameters from the company network
- + Easy integration in the production line
- + Service-friendly design
- + Short cycle times

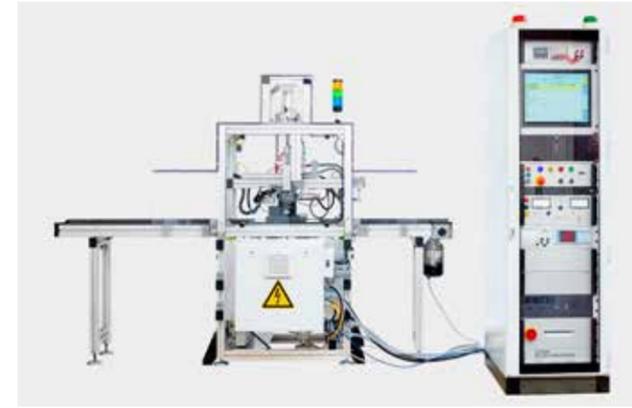
### Specifications

- Ground bond test
- Insulation resistance measurement: Windings – Housing – Sensors
- High-voltage-test AC/DC: Windings – Housing – Sensors
- 3-phase resistance measurement
- Resistance measurement of the individual sensors
- Surge voltage test
- Partial discharge testing in the case of surge voltage test and high voltage test
- Polarity test
- Leak test

# CUSTOMISED

Industry: Electric motors

## Test system for washing machine motors



### Task

Motors for household appliances must be tested for function and safety before installation. In order to be able to test the high volumes, a system that is as robust, efficient and fast as possible is required.

### Solution

A system was developed as a belt superstructure to ensure integration into the production process. The test technology is housed in a mobile 19"-ESD-test cabinet. The contacting is fully automatic via specially developed interfaces and adaptations.

By scanning an RFID code on the workpiece carrier of the DUT, the correct test program is selected from the database and started automatically.

- Measurement of ambient temperature and winding temperature
- Resistance measurement of the windings including temperature compensation
- Ground bond measurement between housing and ground bond connection
- Insulation resistance test against housing
- High voltage test AC / DC between windings and housing; ramp freely adjustable
- Freewheel test with current consumption, voltage, power and speed measurement
- Start-up test with a load machine with current consumption, voltage, power and speed measurement
- Load simulation during nominal speed with current consumption, voltage, power and speed measurement

### Advantages

- + Fully automatic test system
- + The DUT are moved into the test system and the test sequence is started automatically
- + Parameters and settings can be changed at any time via the software
- + Workplace safety according to EN 50191
- + Complete integration into the production line as well as data connection to a superordinate system

### Specifications

- Insulation resistance test DC 100 – 6,000 V
- High voltage test AC 100 – 5,500 V
- High voltage test DC 100 – 6,000 V
- Ground bond test 0 – 30 A
- Resistance measurement 0 – 20 kOhm
- Sensors for temperature compensation



# CUSTOMISED

Industry: Automotive industry / E-Mobility

## Test cabin for e-axes



### Task

Stators and e-axes for electric sports cars must be checked for function and safety before installation. In order to be able to test small stators up to complete electric axes, the largest possible test station is required. A complete pre-series test should be realized in this way.

### Solution

A test system with a double-leaf safety door was developed. The fully insulated interior offers sufficient space for all kinds of DUT. The safety test technology is housed in a mobile 19"-ESD test cabinet. The contacting is done via test adapters with interfaces for winding and temperature sensors. By scanning a DMC code attached to the DUT, the correct test program is selected automatically from the database.

By closing the door and pressing the start button, the test program is started and runs fully automatically.

- Measurement of the ambient temperature (and the winding temperature if necessary)
- Resistance measurement of the windings including symmetry analysis and temperature compensation to 20 °C
- Resistance measurement of the temperature sensors including temperature compensation to 20 °C
- Inductance measurement of the windings including symmetry analysis
- Insulation resistance test of the 3 phases against housing
- High voltage test AC / DC between the 3 phases and housing; Ramp freely adjustable
- Surge test including partial discharge measurement and rotor alignment
- Potential equalization measurement at 5 freely selectable points

### Advantages

- + Simple, intuitive operation for trained personnel
- + The DUT only needs to be connected once, the whole test sequence is then performed automatically
- + Parameters and settings can be changed at any time via the software
- + Workplace safety according to EN 50191
- + Large test chamber for test specimens including assembly trolley with high weight / large external dimensions

### Specifications

- Surge test up to 6,000 V DC
- Partial discharge measurement during HV and surge test
- Partial discharge measurement according to IEC
- Insulation resistance test DC 100 – 6,000 V
- High voltage test AC 100 – 5,500 V
- High voltage test DC 100 – 6,000 V
- Sensor for temperature compensation
- Internal dimensions test station (HxWxD) 2,000 x 1,600 x 1,800 mm  
76.7 x 62.9 x 70.8 in.

# CUSTOMISED

Industry: Automotive industry / E-Mobility

## EOL tester for BDU subassemblies (end of line)



### Task

The main requirement for this test system for the automotive industry was to cover the relevant statutory tests. At the same time, it should be easy for the user to operate, as many of these systems should be operated in various emerging markets. Maximum ease of use combined with high comfort and safety were our customer's preferences.

### Solution

The test system was mounted along with the complete DUT support on a rack. This enables transportation of the entire mechanism as a unit, thereby waiving reassembly at the site. Once the system is installed, it can be operated immediately after being switched on. A light curtain, which is activated automatically when the test program is booted, has been provided for ensuring the safety of operators. The testing area was designed very spaciouly to allow convenient placement. The contacting of the DUT is automatically, pneumatically performed after booting the test program. Using the PC control, the test data can be automatically downloaded and the results stored again. On a large „OK / DEFECTIVE“ display, the user can immediately decide on what to do with the product. In case of fault, it must first be acknowledged before the product can be removed. This step can be password-protected if preferred, so that the operator must inform the responsible supervisor to ensure that the product is rejected as defective. Besides the required safety tests, the current shunt and the Hall sensor were also tested. Upon successful testing, the poka-yoke flap is knocked off.

An arbitrary number of test programs can be stored in the test system PC. This allows the customer to independently write new test programs when developing new products. However, for products with identical data, it is also possible to use the same test program, which is then allocated to the respective DUT over the product list. The test results are stored automatically in XML or Access format on an arbitrary place on the network.

A separate test dummy is used to check the functionality of the test system fully automatically. During the daily start of the test system, the testing personnel is asked to include this dummy and start the corresponding program. The test system does not allow any further testing without a passed dummy test.

### Advantages

- + Turnkey solution including DUT support, adaptation and workplace design
- + Simple, intuitive operation for semiskilled personnel
- + The DUT needs to be connected only once, then the whole test process occurs automatically
- + In network operation, all test data is automatically saved at the specified location / database
- + Long service life and service-friendly design
- + Short cycle times through efficient workplace design with light curtain
- + All values and settings can be made using software
- + Automatic dummy test
- + Workplace safety according to EN 50191
- + The test system and the complete test support are mounted together on a rack so that the compact unit can be connected immediately to the mains supply
- + Spacious testing area for comfortable working on the DUT

### Specifications

- Insulation resistance test DC 100 – 4,000 V, safety-current-limited
- High voltage test DC 100 – 4,000 V, safety-current-limited
- Measurement of contact resistances < 100 µΩ
- Testing of current shunt and Hall sensor
- Knocking off the poka-yoke flap upon successful testing
- PC-controlled test system with database connection



# CUSTOMISED

Industry: Automotive industry / E-Mobility

## Test system for electric motor cables



### Task

The requirement of this system in the automotive industry was to verify various cables with up to 10 cores and different connectors for electric motors. Despite the small distances between the individual terminal lugs, a high voltage test up to 5,500 V AC and 6,000 V DC was supposed to be possible here.

### Solution

Various connector plugs were produced for the various types of circuits. Via interchangeable transfer fields the appropriate test adapters for the most varied motor cables could be connected. The signals are transmitted via high current and spring contact probes. The arrangement is such that there are no flashovers in the connector plug during the high voltage test. This was accomplished via special insulations of the contact pins. Besides the high voltage test, a resistance test was also conducted with 4-wire technique. All tests are automatically performed after connecting the cable once. To protect the user, the system was equipped with a light curtain.

An arbitrary number of test programs can be stored in the test system PC. This allows the customer to independently write new test programs when developing new products. However, for products with identical data, it is also possible to use the same test program, which is then allocated to the respective DUT over the product list. The test results are stored automatically in XML or Access format on an arbitrary place on the network.

A separate test dummy is used to check the functionality of the test system fully automatically. During the daily start of the test system, the testing personnel is asked to include this dummy and start the corresponding program. The test system does not allow any further testing without a passed dummy test.

### Advantages

- + Turnkey solution including DUT support, adaptation and workplace design
- + Simple, intuitive operation for semiskilled personnel
- + The DUT needs to be connected only once, then the whole test process occurs automatically
- + In network operation, all test data is automatically saved at the specified location / database
- + Long service life and service-friendly design
- + Short cycle times through efficient workplace design with light curtain
- + All values and settings can be made using software
- + Automatic dummy test
- + Workplace safety according to EN 50191
- + The various change adapters can be connected to several types of cables
- + High-precision resistance measurement with 4-wire technique

### Specifications

- Resistance test 2 mΩ – 200 kΩ in 4-wire technique
- High voltage test AC 5,500 V
- High voltage test DC 6,000 V / 100 mA
- Insulation resistance test up to 1.2 GΩ

# CUSTOMISED

Industry: Automotive industry / E-Mobility

## Test system for asynchronous motors



### Task

Electric motors of mild hybrid vehicles shall be tested under as realistic conditions as possible. Besides different statistic and dynamic function tests, the 3-phase asynchronous motor, as well as the inverter, shall be cooled down to -20 °C and heated up to +70 °C afterwards. Thus, the demands on motors that can occur during operation of an electric / hybrid vehicle are simulated.

The test system is to be used in the analysis for persistent tests which are not possible in production due to low cycle times.

### Solution

To be able to test the motor, inverter and the end product (motor+inverter) separately, three single test stations were developed and combined in one compact system.

#### Motor test station:

The inlaid motor is operated by a 48 V inverter in different load-points and is tested whilst. The carried out tests include voltage measurement, current measurement up to 500 A at maximum,  $\cos \phi$  calculation (ratio between reactive power Q and apparent power S), performance calculation and the locked-rotor test. Here, the rotor is blocked with the help of a servo motor and a low voltage is applied to determine the short-circuit current of the motor.

#### Inverter station:

Inverter is connected to a motor simulation as well as to the cooling cycle of the system for the first time. Besides a voltage and current measurement up to 400 mA at maximum, a performance calculation and the correct communication of the CAN interface are tested.

#### Whole system station:

The DUT (inverter+motor) is connected to the 48 V supply and the cooling cycle. A load machine is connected to a pulley wheel and the complete test proceeds fully automatically. During testing and in addition to the load tests, an environment simulation is carried out where the DUT is cooled down to -20 °C and heated up to +70 °C afterwards. Thus, the DUT is tested under conditions as close to reality as possible. An automatic discharge per software follows to guarantee the personnel's security.

### Advantages

- + Test under "real" conditions
- + Compact combination of three test stations
- + Fully automatic test process after connection
- + Easy and intuitive operation
- + Easily possible to expand for future DUT
- + Maximum of flexibility due to a generous construction of all components
- + Possibility of expansion by further interfaces and work piece carriers
- + Possibility to configure tests for all three DUT components
- + DUT of different manufacturers can be tested on one system

### Specifications

- Current measurement up to 500 A
- Persistent test with a cooling/heating cycle from -20 °C up to +70 °C
- Possibility to adjust load points over load machine (+/- 120 Nm, +/- 3000 U/min)
- Numerous interfaces of communication
- Electronically regulated voltage and current sources: +/- 385 A as well as 0-60 V



# CUSTOMISED

Industry: Automotive industry / E-Mobility

## Test system for electric motors



### Task

Since the area of application is the prototype workshop of a well-known sports car manufacturer, the test system must be able to test various prototypes of electric motors, some with very different component characteristics. A maximum of flexibility was therefore crucial.

### Solution

In order to ensure maximum flexibility, the contacting of the very different DUT is done by hand. For particularly heavy DUT, the test system can be equipped with a crane. The design allows for motors up to a weight of 500 kg / 1,200 lbs.

By scanning a DMC code, the appropriate test program for the DUT is automatically loaded. When the start button is pressed, the light curtain is activated and the further test steps run fully automatically.

A light curtain was used to protect the user. This makes it possible to shorten the cycle time, as no safety door has to be closed and opened again. In case of faulty DUT, the user does not have to open a safety door to remove the corresponding DUT.

At the end of the test, a PDF protocol with the test results is generated to simplify further evaluation.

### Advantages

- + Turnkey solution including DUT fixture, adaptation and workplace design
- + Simple and intuitive operation for trained personnel
- + The DUT only has to be connected once, the rest of the test sequence is automatic
- + Parameters and settings can be changed at any time via the software
- + Automatic dummy test
- + Workplace safety according to EN 50191
- + Large test chamber for DUT with high weight / large external dimensions

### Specifications

- Surge test up to 6,000 V
- Partial discharge measurement during HV- and surge test
- Insulation resistance test at 6,000 V DC
- High voltage test AC 500 – 5,500 V
- High voltage test DC 500 – 6,000 V
- Potential equalization measurement 0 – 20 A / 0 – 40 V DC
- Resistance measurement 2 mΩ – 200 kΩ (with temperature compensation)
- Alignment of a rotor for the surge test 0 – 20 A / 0 – 40 V DC



## IT'S ALL ABOUT EMOBILITY!

### TEST TECHNOLOGY FOR MOTORS, POWERTRAIN, CABLES & PLUGS

Energy-efficient vehicles with electric drives are on the advance and pose new challenges for automobile manufacturers and suppliers alike.

The new electrical components with extremely high currents and voltages pose a considerable danger not only for the user, but also for the safety forces in the event of an accident. This makes it all the more important to subject the individual components of an electric vehicle to a thorough electrical safety test before they leave production.

In the past, cars were uninteresting for SPS electronic because there was no dangerous voltage. Electric cars, on the other hand, require testing – not only the car itself, but also accessories such as the charging station, batteries, wiring harnesses etc. Due to the increased voltages in the electric car (from 12 volts to up to 800 volts), the requirements for electrical safety and functional testing have increased considerably. What is completely new for the automotive industry is already widely

used technology for SPS electronic. Thanks to its long-term expertise, SPS electronic is able to competently advise its customers all the way from project planning to acceptance.

The comprehensive, worldwide service is controlled from the branch Twist (Northern Germany), while the development and production mainly takes place in the main factory Schwäbisch Hall. Due to the high capacity utilization, parts of the production could also be outsourced to the Czech subsidiary Chomutov in the past years. In fact, sales growth in this business segment is already in the mid-double-digit range and is continuing to rise.

This development requires not only internal preparation of professional profiles for new tasks, but also the creation of numerous new jobs.

For more specific information on this topic visit:  
[emobility.spselectronic.com](http://emobility.spselectronic.com)

# CUSTOMISED

Industry: Medical technology

## Test system for high frequency surgery devices and lithotripsy systems



### Task

A test system that allows automatic testing of a large number of different DUT had to be developed. Each DUT must be connected only once to avoid faults and to keep the test duration as short as possible.

### Solution

In order to cover the large number of different DUT, a test system with various connection options was developed, so that, for example, 5 user parts can be successively checked in the medical leakage current test, without having to replug them. In addition, protective earth conductor tests, high voltage tests, insulation tests and function tests are possible, without having to replug the DUT. Personnel safety is ensured by a light curtain that protects three sides of the testing area using deflecting mirrors. This makes it possible to insert or remove the DUT from the side.

A special requirement was that the DUT had to be operated by the test personnel during the function test. To this end, a special text view step was added, in which the working voltage remains switched on even upon interruption of the light curtain.

The test system PC software allows storage of an arbitrary number of test programs, so that the necessary scope of testing and the test data can be adjusted for each DUT. However, for products with similarly mounted DUT, it is also possible to use the same test program, which is then allocated to the respective DUT over the product list. Referring to the accompanying documents, the correct test program is selected by scanning a bar code. The test results are stored automatically in XML or Access format on an arbitrary place on the network.

A separate test dummy is used to check the functionality of the test system fully automatically. During start of the test system, the testing personnel is asked to include this dummy and start the corresponding program. The test system does not allow further testing without a passed dummy test.

### Advantages

- + Turnkey solution including DUT support, adaptation and workplace design
- + Simple, intuitive operation for semiskilled personnel
- + The DUT needs to be connected only once, then the whole test process occurs automatically
- + In network operation, all test data is automatically saved at the specified location / database
- + Long service life and service-friendly design
- + All values and settings can be made using software
- + Automatic dummy test
- + Workplace safety according to EN 50191
- + Automatic test program selection
- + High testing depth

### Specifications

- Protective earth conductor test 10 A – 30 A test pin or special housing connection
- Insulation test 4 kV with a matrix that can be freely interconnected over 8 points
- High voltage test AC 5,500 V / High voltage test DC 6,000 V / 100 mA (non-safety-current-limited) with a matrix that can be freely interconnected over 8 points
- Function test single-phase (measuring ranges between 10 A and 20 A) with recording the voltage, current, power and  $\cos \phi$
- Earth leakage current test, contact current test, patient leakage current test (5 user parts) with fault simulation, current ranges 10 mA, 1 mA and 0.1 mA, automatic zero correction for patient leakage current test in 0.1 mA range

# CUSTOMISED

Industry: Medical technology

## Test system for surgical instruments



### Task

To obtain a reproducible test with a short test duration, the customer's manual test station should be replaced by an automated test system. The high number of versions to be tested must be considered. When contacting, it should also be noted that the DUT work in a very fine manner. Thus, contacting must be automatic without damaging the DUT. Nevertheless, a safe contact with low transition resistance must be achieved.

### Solution

Referring to the accompanying documents, the correct test program is selected by scanning a bar code, so that the real test can also be performed by semi-skilled staff. Electrical continuity is checked with up to two continuity tests per instrument. The insulation between the electrodes and the integrity of the plastic wrap are checked by applying a high voltage. To test the wrap, the entire DUT is inserted into a narrow metal pipe. This metal pipe acts as a potential for the high voltage test.

It is possible to cover the high number of versions using various test adapters that are also adjustable in their length. Contacting is partially by spring contact pins and by pneumatic pins in case of hypersensitive DUT; these pins are also used to fix the DUT.

The test system PC software allows storage of an arbitrary number of test programs, so that the necessary scope of testing and the test data can be specified for each DUT. However, for products with similarly mounted DUT, it is also possible to use the same test program, which is then allocated to the respective DUT over the product list. The test results are stored automatically in XML or Access format on an arbitrary place on the network.

Up to ten DUT can be inserted into the test adapter at once. They are tested in parallel in the high voltage test. If an error occurs, they are individually retested to select the defective DUT. Following this, the testing personnel is asked to remove the defective instruments, which is automatically controlled by a further step. By performing a 4-wire measurement, the correct contacting of the DUT is monitored in the high voltage test.

A light curtain was used to protect the user. Thus, it is possible to shorten the cycle time further as no safety door must be closed and and reopened. In the selection of faulty DUT, the user has to intervene several times to remove the corresponding DUT in case of failure, and therefore would have to open the safety door repeatedly.

A separate test dummy is used to check the functionality of the test system fully automatically. During the daily start of the test system, the testing personnel is asked to include this dummy and start the corresponding program. The test system does not allow further testing without a passed dummy test.

### Advantages

- + Turnkey solution including DUT support, adaptation and workplace design
- + Simple, intuitive operation for semiskilled personnel
- + The DUT needs to be connected only once, then the whole test process occurs automatically
- + In network operation, all test data is automatically saved at the specified location / database
- + Long service life and service-friendly design
- + Short cycle times through efficient workplace design with light curtain
- + All values and settings can be made using software
- + Automatic dummy test
- + Workplace safety according to EN 50191
- + Automatic test program selection
- + Simple and quick retooling for different versions
- + Short test duration by parallel testing of up to ten DUT and use of a light curtain for securing the area
- + 100% process safety by 4-wire technique in the high voltage test

### Specifications

- High voltage test AC 5,500 V / High voltage test DC 6,000 V / 100 mA (non-safety-current-limited) in 4-wire technique
- Continuity test 5 V

# CUSTOMISED

Industry: Luminaires

## Test system for ex-proof linear fluorescent luminaires



### Task

The outdated manual test stations of our customers should be replaced by modern test systems that are automated as far as possible. High flexibility and quick refitting to mains-operated and battery-operated linear fluorescent luminaires was important there. In addition to process safety, documentation of the test was an essential requirement. The whole concept must meet the stringent requirements for explosion-proof products.

### Solution

In cooperation with our customers, a PC-controlled test system was developed. The workplace design was a key factor in the process. Handling as well as the cycle time could be optimised by the use of an approved safety light curtain. The system was equipped with several original luminaires for the function test. Thus, real test conditions were created. The luminaires were stored in a drawer beneath the workplace, thus allowing easy and quick replacement at any time.

The standard software DAT not only controls the testing process but also guides the user through the entire process. The PC software DAT is a complete WINDOWS-based quality system. Anyone, who can turn on a PC will be able to operate the tester.

The function test is carried out by measuring the power consumption following the safety tests in accordance with the globally valid standards (IEC, EN, UL, VDE etc.) Following this, subjective tests of any kind are possible.

An arbitrary number of test programs can be stored in the test system PC. This allows the customer to independently write new test programs when developing new products. However, for products with identical data, it is also possible to use the same test program, which is then allocated to the respective DUTs over the product list. The test results are stored automatically in XML or Access format on an arbitrary place on the network.

A separate test dummy is used to check the functionality of the test system fully automatically. During the daily start of the test system, the testing personnel is asked to include this dummy and start the corresponding program. The test system does not allow further testing without a passed dummy test.

### Advantages

- + Turnkey solution including DUT support, adaptation and workplace design
- + Simple, intuitive operation for semiskilled personnel
- + The DUT needs to be connected only once, then the whole test process occurs automatically
- + In network operation, all test data is automatically saved at the specified location / database
- + Long service life and service-friendly design
- + Short cycle times through efficient workplace design with light curtain
- + All values and settings can be made using software
- + Automatic dummy test
- + Workplace safety according to EN 50191
- + Original luminaires for the function test

### Specifications

- Protective earth conductor test from 10 A to 30 A max. 0.4  $\Omega$
- High voltage test DC 250 V – 4,000 V / 4 mA
- Function test AC 0 – 300 V / 1 kVA, 10 Hz to 80 Hz

# CUSTOMISED

Industry: Luminaires

## LED light test system



### Task

For the final test of lightings electrical safety and function test systems are needed to meet the new requirements of the LED technology and are also prepared for the innovations in future. Only with the use of standard components these requirements can be met.

### Solution

The techniques of LED lights and light bulbs are completely different. Therefore the requirements for the test technology in terms of the function are also completely different. Safety-related a LED light presents itself identical to a light with old lamps (light bulb or neon tube) – the test requirements have not changed. For lights of protection class I an insulation measurement and a ground bond (PE) test is necessary. Additionally insulation measurements to interfaces or for the power supply may be needed. The requirements for the function test have however changed significantly. Due to the high efficiency currents and outputs are considerably lower. Clocked power supplies of the LED lights stress the mains by means of apparent currents. Therefore it is necessary to measure the phase angle between current and voltage. Through the technology of the LED technology it has meanwhile become very easy and affordable to remote control lights. Already today there are several interfaces available (DALI, DSI, 0 – 10 V etc.) and it can surely be expected that future innovations will open many more possibilities. By using the standard compact tester KT 1885B with a special extension for LED lights in conjunction with a separate standard PC (or laptop) all required criteria are met. The freely programmable compact tester provides all conceivable safety and function tests and this at a very favourable price. The PC with standard software is only connected via Ethernet (LAN) with the test systems and can be replaced any time. Should any new software applications for the LED interfaces become standard, an extension of the software is easy and cost efficient. In the special LED extension the control interfaces and switch-overs to the DUT find space. Here is enough space for extensions when new technologies become accepted. The concept is complemented by a simple control panel and a (usually customer-specific) connection panel. The future is guaranteed – with the latest test technology of SPS electronic for modern LED technology.

### Advantages

- + Future-oriented solution by using a separate standard PC with standard test technique
- + Simulation standard interfaces DALI, DSI and 0 – 10 V, extensible anytime with additional interfaces
- + Programmable, electronic supply 0 – 300 V AC / DC
- + Turnkey solution including work station design
- + Simple, intuitive operation for semiskilled personnel
- + Single connection of DUT, test process occurs automatically
- + In network operation, all test data is automatically saved at the specific location / database
- + Long service life and service-friendly design
- + All values and settings are available via software
- + Short cycle times with safety current limited testing technology

### Technical data

- Ground bond (PE) test AC 1 – 30 A / 0 – 10  $\Omega$
- Insulation test DC 100 – 6,000 V / 0.25 M $\Omega$  – 10 G $\Omega$
- High voltage test AC 100 – 5,500 V / 0 – 3 mA
- High voltage test DC 100 – 6,000 V / 0 – 10 mA
- Continuity test DC 24 V / 0 – 600 mA
- Resistance measurement 0 – 1,000  $\Omega$
- Current measurement (AC und DC) 0 – 16 A
- Voltage measurement (AC and DC) 0 – 300 V
- Effective power measurement 0 – 4,000 W
- Reactive power measurement 0 – 4,000 VAR
- Apparent power measurement 0 – 4,000 VA
- Cos  $\phi$  measurement -1 to +1
- Leakage current measurement 10 – 270 V / 0 – 10 mA
- Interface simulation: DALI, DSI, 0 – 10 V, more optionally



# CUSTOMISED

Industry: Luminaires

## Test system for PX-LED spotlights



### Task

Especially with explosion-proof products an intensive quality assurance is absolutely necessary. Therefore, the explosion-proof luminaires have to be submitted to a safety and function test. For a new product of our customer a fully automatic test system was to be developed to be integrated directly into the production line. Important thereby was a high flexibility and a quick conversion. In addition to process reliability the documentation of the test was an essential requirement. The entire concept has to meet the high requirements for explosion-protected products. As it is intended to use the test system directly in the production line the focus was also on workplace design.

### Solution

In cooperation with our customers a PC controlled test system was developed. An important factor thereby was the workplace design. By using a safety curtain with approval the handling and thus also the cycle time could be optimised. The standard software DAT not only controls the test sequence but also guides the user through the entire process. The PC software DAT is a complete quality system based on Windows. Anyone who can turn on a PC will be able to operate the tester.

After the safety tests according to the worldwide applicable standards (IEC, EN, UL, VDE etc.) the functional test is carried out by measuring the current consumption. Subsequently subjective tests of any kind are possible additionally.

Any number of test programmes can be stored in the test system PC. This allows the customer to create new test programmes independently when developing new products. For products with identical data it is however also possible to use the same test programme which will then be assigned to the respective DUT via the product list. The test results are automatically stored in the format XML or Access at any location in the network.

Via a separate test dummy the functionality of the test system is tested fully automatically. When starting the test system daily the tester is requested to connect this dummy and to start the corresponding programme. Without a correct dummy test the test system does not allow any further tests.

### Advantages

- + Turnkey solution including DUT holding fixture, adaptation and workplace design
- + Simple, intuitive operation for semi-skilled personnel
- + The DUT must be connected only once, then the entire test sequence is performed automatically
- + In the network mode all test data are automatically stored in the desired location / database
- + Long service life and service-friendly setup
- + Short cycle times through efficient workplace design
- + All values and settings are possible via the software
- + Automatic dummy test
- + Workplace protection according to EN 50191
- + Original illuminants for the function test

### Specifications

- PE conductor test 10 A to 30 A / max. 0.4  $\Omega$
- High voltage test AC 250 V – 5,000 V / 3 mA
- High voltage test DC 250 V – 4,000 V / 4 mA
- Function test AC 0 – 300 V / 1 kVA, 10 Hz to 80 Hz

# CUSTOMISED

Industry: Household appliances

## Test system for determining the energy efficiency rating of refrigerator / freezer combo units



### Task

The elaborate long-term measurements to determine the energy efficiency rating supposed to be automated. It was imperative that the applicable standards are complied with. All results must be documented in a clearly understandable way. The concept should also be future-oriented and meet the highest metrology requirements. In the past, it has been shown that new requirements result from new technologies, such as LED technology. The measurement of standby power consumption with the least currents is also a recent requirement.

### Solution

Laptops were used for the PC-controlled system. High-precision measuring instruments are available for recording the electrical parameters. The entire layout was designed as 3-phase since high-power household appliances are powered by 3 phases. A programmable, 3-phase source was used to supply power to the DUT. In addition to the electric measuring instruments, there are still 50 channels for temperature measurements. The emergency power supply ensures uninterrupted recording of data over longer periods of time.

### Advantages

- + In network operation, all test data is automatically saved at the specified location / database
- + Long service life and service-friendly design
- + All values and settings can be made using software
- + Workplace safety according to EN 50191
- + Customised hardware and software solution
- + For single and 3-phase DUT
- + Power range from a few mW to several kW
- + High measurement accuracy
- + PC-controlled with laptops
- + Fully automatic long-term test without monitoring personnel

### Specifications

- Function test 1/3-phase
- Controlled output voltage
- Measurement of the nominal power and "standby" power consumption [0.1 mW – x kW]
- Temperature measurements (PT100, thermal elements)
- Measurements over mains supply analysers [P, U, F, VA, cos  $\phi$ ]



# CUSTOMISED

Industry: Household appliances

## Test system for coffee machines



### Task

For several years fully-automatic coffee machines are found not any more only in the professional sector. Not only restaurants and coffee houses use coffee machines but often these machines can be found in private households. As a result the number of units has risen significantly. Small and high-performance fully automatic coffee machines are produced in large quantities for the international market. Through the worldwide use the test technique must be able to meet all standards with the aid of the software. Also with regard to the different mains voltages, mains frequencies and national plug connectors the system must be flexible. The workstation must comply with the EN 50191, additionally all test data have to be gathered with a PC and stored permanently. A regular dummy test is to be ensured.

### Solution

By using the standard compact tester KT 1885B, with a special extension for coffee machines and combined with a separate standard PC (or laptop), all required criteria are met. The freely programmable compact tester provides all possible safety and function tests – at a very reasonable price.

The PC with standard software is only connected via Ethernet (LAN) with the test systems and can be replaced at any time. A separate connection desk allows the connection of many international standard plug connectors and offers room for future extensions. Two-hand operation and ground bond conductor pin find room in the test rack. The dummy also placed in the test rack is available for daily dummy tests.

### Advantages

- + Future-oriented solution through the use of separate standard PC with standard test technique
- + Programmable, electronic supply
- + Turnkey solution including workplace design with separate connection desk
- + Simple, intuitive operation for trained personnel
- + The DUT must only be connected once, then the entire test sequence is performed automatically
- + In the network mode all test data are automatically stored in the desired location / database
- + Long service life and service-friendly setup
- + All values and settings are possible via software
- + Workplace safety according to EN 50191
- + Short cycle times with safety-current limited test technique according to EN 50191
- + Automatic dummy test

### Specifications

#### Safety test:

- Ground bond conductor test AC 1 – 30 A / 0 – 10  $\Omega$
- Insulation test DC 100 – 6,000 V / 0.25 M $\Omega$ - 10 G $\Omega$
- High voltage test AC 100 – 5,500 V / 0 – 3 mA
- High voltage test DC 100 – 6,000 V / 0 – 10 mA

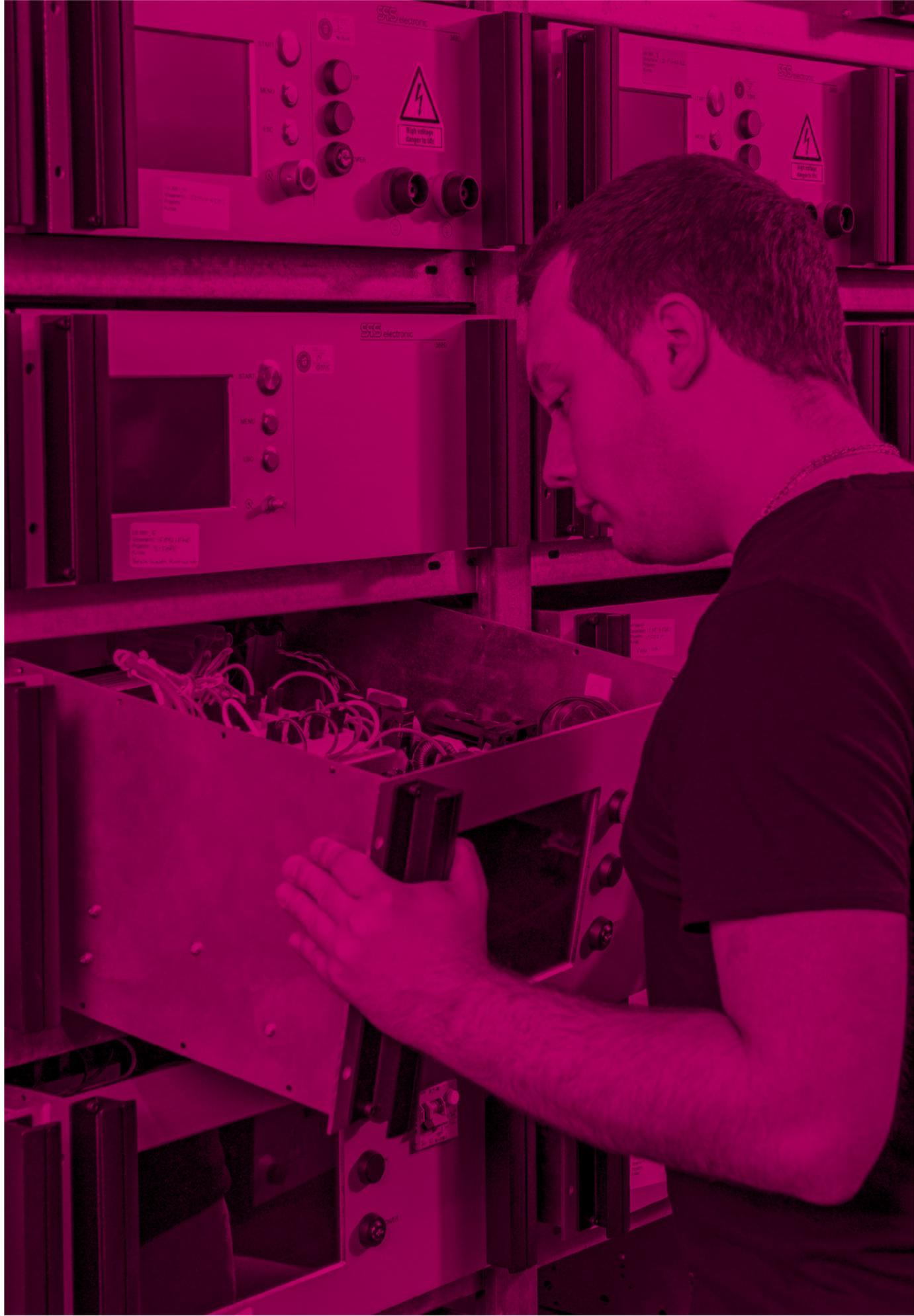
#### Function test:

- Continuity test DC 24 V / 0-600 mA
- Resistance measurement 0 – 1,000  $\Omega$
- Current measurement (AC and DC) 0 – 16 A
- Voltage measurement (AC and DC) 0 – 300 V
- Effective power measurement 0 – 4,000 W
- Reactive power measurement 0 – 4,000 VAR
- Apparent power measurement 0 – 4,000 VA
- Cos  $\phi$  measurement -1 to +1
- Equivalent leakage current measurement 10 – 270 V / 0 – 10 mA

Can't get enough?

Further references can be found on  
[www.spselectronic.com](http://www.spselectronic.com)





# SERIAL DEVICES & ACCESSORIES



# Psssst! Did you know....

The proven test technology of SPS electronic is not only available in customised test systems, but also in our serial devices and a large selection of suitable accessories.



## Multifunction safety testers

Our multifunction safety testers combine up to 18 test types in one compact device. Whichever electrical safety test you have to perform, you will always make the right choice.



## Surge testers

So that you do not get wound up in production: With our surge testers it is possible to detect winding shorts and insulation faults in windings.



## Hipot testers

For the testing of electrical insulation properties and the dielectric strength of electrical equipment of protection classes I and II.



## Ground bond testers

For the ground bond- and continuity test on devices of protection class I – be it intermediate tests or those at the end of the line.



## Partial discharge testers

Detect quality defects on windings before they have an impact – no problem with our partial discharge testers.



## Insulation testers

Our insulation testers are the first choice whenever the insulation of an electric appliance shall be tested safely and conforming to standards.



## High voltage relays

Various high voltage relays which can switch voltages up to 5,000 V AC or 10,000 V AC in combination with high currents.



## Test verification boxes

To test all serial devices and test systems with regard to their functional capability.



## DUT enclosures and cages

We stock test cages in which safety features such as a light curtain are integrated ex factory. This offers highest safety and a convenient access to the DUT.



## High voltage test probes

To carry out a safe high voltage test. Available in various versions and cable lengths with start signal.



## High voltage connectors

Multi-pin connectors for voltages up to 10,000 V AC.



## Connection and control panels

To control and operate your testing processes. Available in different versions.



## Universal test sockets

Universal test socket adjusted to various plugs and country standards. Especially durable and robust



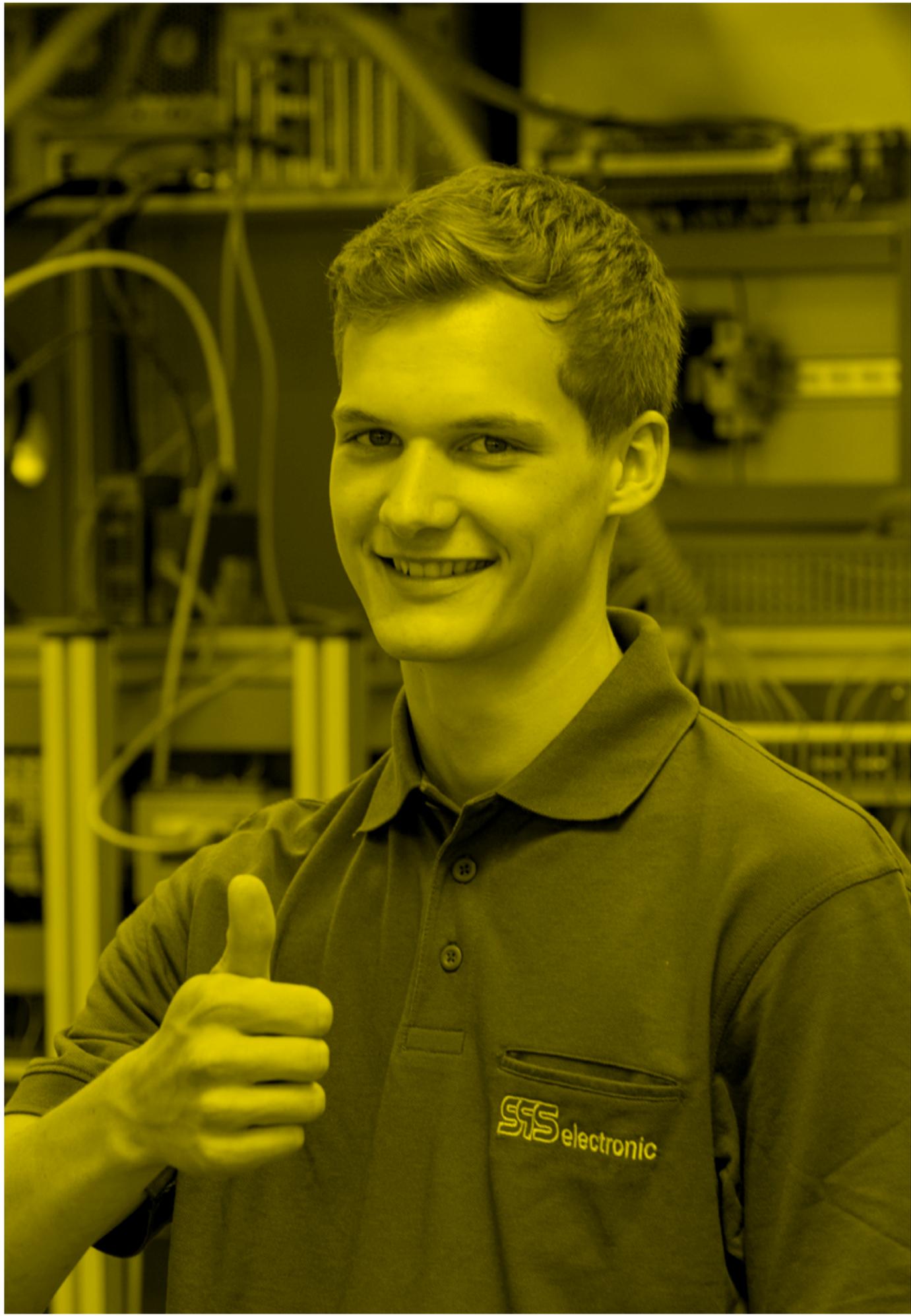
## Ground bond test probes

Available with integrated start button and with different cable lengths.



## ...and much more

more serial devices and even more accessories can be found at [www.spselectronic.com](http://www.spselectronic.com)



# SERVICE

## Our Service – Everything from a single source!

When it comes to service we do it thoroughly. The products we offer come with the appropriate advice and support – before and after purchasing. Do you have a question? Need a replacement part or support? Call one of our experienced team members: **+49 791 20 212 327**



### Regular firmware updates

All testers from SPS electronic always come with up-to-date software. We provide you with regular firmware updates to stay on the cutting edge of technology also in the course of operation of the device. You can download the latest version on our website: [www.spselectronic.com](http://www.spselectronic.com)



### Service for unit on loan

No loss of time – even if your equipment and systems are under repair or maintenance. Numerous loaners are available from the product range of SPS electronic for the duration of the repair of your equipment. Whether they are hipot testers, insulation testers, ground bond testers, leakage current testers or multifunctional units. We also provide a trial unit if you are unsure about the new unit you want to buy. Just let us know about it!



### OEM spare parts service

Using our OEM spare parts ensures optimum performance and maximum service life of your equipment. We at SPS electronic supply you with the spare parts for all device types and generations worldwide. Common spare parts are immediately available from stock. Should we not have something in stock, we will produce or procure it as quickly as possible.



### After-sales support

We start exactly there, where others give up! And that is why our service does not end with the purchase of one of our units. We want you to have long-term satisfaction with us and our products. Especially for this purpose, we have a large service team that is always on-hand with technical advice and support.



# SERVICE CENTER

## +49 791 20 212 327



### On-site service

We are at your service wherever you need us! The optimum support provided by our service technicians restores the operation of your devices and customised systems. Our customer-focused field service is tailored to your needs, so as to consistently meet your technical requirements. We will work out the repair and maintenance plan jointly with you, so as to keep the downtime of your systems and equipment at a minimum.



### Seminars and training programs

Get the best from your testers! The effectiveness of your equipment and customised systems not only depends on the technology but also its proper handling. We offer training programs that focus on the issues, needs and testing tasks of our customers. We first analyse the training needs together with you and then specifically design the contents according to your requirements. Thus, you get to know your safety tester in a practical and application-oriented way.



### Remote service

Our service is also remotely available as an alternative to our on-site support. This saves considerable time and significantly reduces the cost especially when it comes to sites that are far away.



### Calibration and maintenance

The annual calibration of the testers is an essential prerequisite for the assured quality and is a requirement to be met by any company as part of the control of inspection, measuring and test equipment. We calibrate your safety testers – either directly at your location or in our premises. Thanks to our large service network, our numerous subsidiaries and our partners, we are represented worldwide and always close to you.

# The special extra – the calibration service of SPS electronic

Because a calibration is not just a calibration,  
customers worldwide rely on our expertise.

## IF A „SIMPLE“ CALIBRATION IS NOT SUFFICIENT: DAKKS CALIBRATION ACCORDING TO DIN EN ISO / IEC 17025

We are very pleased to have recently received the official accreditation certificate and the certificate for our calibration laboratory in Twist from the DAkkS (Deutsche Akkreditierungsstelle / national accreditation body for the Federal Republic of Germany). This means that we are retroactively authorized to offer accredited calibrations according to DIN EN ISO / IEC 17025 since November 2019 (a competence that only very few laboratories can provide). The final accreditation was preceded by about 5 years of preparation and a lengthy accreditation process – a period of time which, last but not least, makes clear the great importance of this success.

## WHAT ARE THE CHARACTERISTICS OF A DAKKS CALIBRATION?

DAkkS calibration certificates are valid at any time, internationally and without further valid proof of traceable measurement results. They are issued with standards whose traceability is guaranteed by DAkkS certificates or calibration certificates issued by PTB laboratories. DAkkS calibration certificates can only be issued by the accredited calibration laboratories within the scope of the accredited measured quantities. This ensures that high quality calibration is guaranteed by regular external assessment and re-accreditation, traceable standards, precisely defined environmental conditions and specially trained personnel.

## WHAT IS THE DIFFERENCE BETWEEN A DAKKS AND A TRACEABLE FACTORY CALIBRATION?

The main difference lies in the evaluation of the measurement results: A factory calibration includes the evaluation of

the results without consideration of the measurement uncertainty on the basis of the specifications published in standards, guidelines or by the manufacturer. The DAkkS, on the other hand, provides for an evaluation of results exclusively on the basis of the actual values determined and the associated measurement uncertainties, i.e. all influencing variables occurring during calibration, such as the accuracy of measuring equipment, temperature, type of connection, device-specific parameters, resolution, tolerance limits etc., are taken into account. The results are evaluated by the customer and the usability for the required measuring process is determined.

## WHICH IS THE RIGHT CALIBRATION FOR ME?

The DAkkS calibration according to DIN EN ISO / IEC 17025 becomes necessary if special requirements demand it. This procedure has no influence on the traceability of the measured variables. Both the measured variables of the factory calibration and those of the DAkkS calibration can be represented equally.

Factory calibration certificates are issued with standards that are subject to regular test equipment monitoring, the traceability of the standards used is ensured by regular test equipment monitoring.

When recalibrating test equipment, which in turn serve as standards for monitoring other measuring and test equipment, a DAkkS calibration should always be used because of the assured traceability to national standards.

## You are not sure which calibration you need?

Contact us – our experts will be happy to provide you with detailed and competent advice: **+49 791 20 212 327**

The image shows a DAkkS accreditation certificate for SPS electronic GmbH. The certificate is issued by the Deutsche Akkreditierungsstelle GmbH (DAkkS), the German Accreditation Body. It confirms that SPS electronic GmbH, located at Boschstraße 15, 49767 Twist, has the competence according to DIN EN ISO / IEC 17025:2018 to perform calibrations in the following areas: Electrical measurement quantities, DC and low-frequency measurement quantities, DC voltage, DC intensity, DC resistance, AC voltage, AC intensity, and High voltage measurement quantities. The certificate is valid in connection with the notification of 21.11.2019 with the accreditation number D-K-20497-01. The registration number of the certificate is D-K-20497-01-00. The certificate is signed by Dr. Heike Manke, Department Head, on 21.11.2019 in Berlin.

**DAkkS**  
Deutsche  
Akkreditierungsstelle

**German Accreditation Body**

Deutsche Akkreditierungsstelle GmbH

Beliehene gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV  
Unterzeichnerin der Multilateralen Abkommen  
von EA, ILAC und IAF zur gegenseitigen Anerkennung

Signatory of the multilateral agreements of EA, ILAC  
and IAF on mutual recognition

**Akkreditierung**  **Accreditation**

Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Kalibrierlaboratorium

**SPS electronic GmbH**  
Boschstraße 15, 49767 Twist

The German Accreditation Body hereby confirms that  
the calibration laboratory SPS electronic GmbH,  
Boschstraße 15, 49767 Twist

die Kompetenz nach DIN EN ISO/IEC 17025:2018 besitzt, Kalibrierungen in folgenden Bereichen  
durchzuführen:

has the competence according to DIN EN ISO / IEC  
17025:2018 to perform calibrations in the following  
areas:

**Elektrische Messgrößen**  
Gleichstrom- und Niederfrequenzmessgrößen

- Gleichspannung
- Gleichstromstärke
- Gleichstromwiderstand
- Wechselspannung
- Wechselstromstärke
- Hochspannungsmessgrößen

Electrical measurands  
DC and low-frequency measurands  
DC voltage  
DC intensity  
DC resistance  
AC voltage  
AC intensity  
High voltage measurands

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 21.11.2019 mit der  
Akkreditierungsnummer D-K-20497-01. Sie besteht aus diesem Deckblatt, der Rückseite des  
Deckblatts und der folgenden Anlage mit insgesamt 9 Seiten.

The accreditation certificate is only valid in connection  
with the notification of 21.11.2019 with the accredi-  
tation number D-K-20497-01. It consists of this cover  
sheet, the back of the cover sheet and the following  
annex with 9 pages in total.

Registrierungsnummer der Urkunde: **D-K-20497-01-00**

Registration number of the certificate:  
**D-K-20497-01-00**

Berlin, 21.11.2019

Im Auftrag Dr. Heike Manke  
Abteilungsleiterin

Siehe Hinweise auf der Rückseite

**SPS electronic GmbH – Headquarters**

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74523 Schwäbisch Hall

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