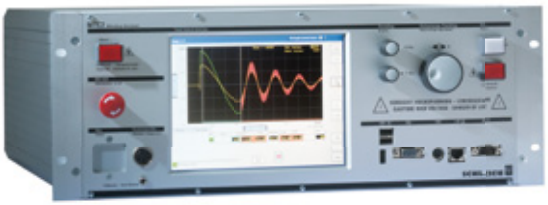

EMERGENCY
STOP

Production
Series Production
Development



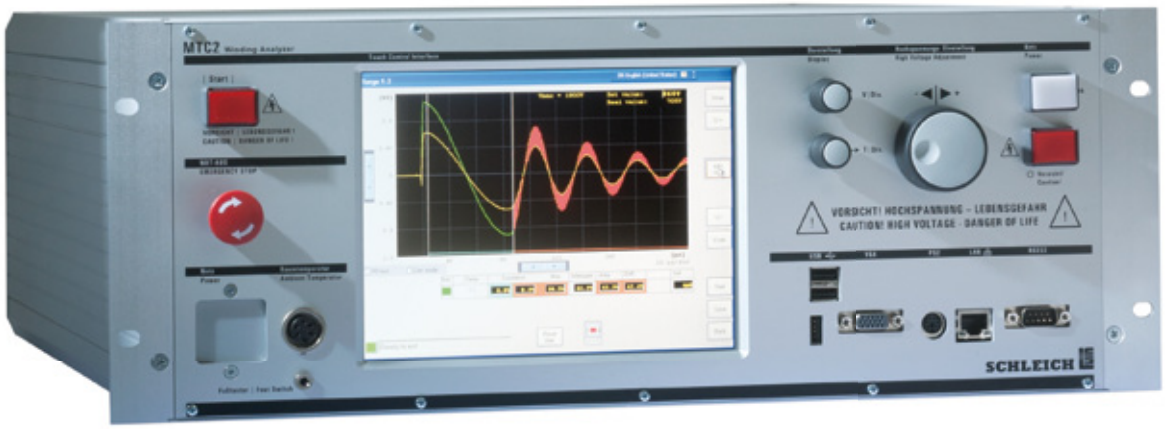
The MTC2-Class
Perfection in production

MTC2 | All-purpose winding tester

The 6th tester generation from the innovation leader

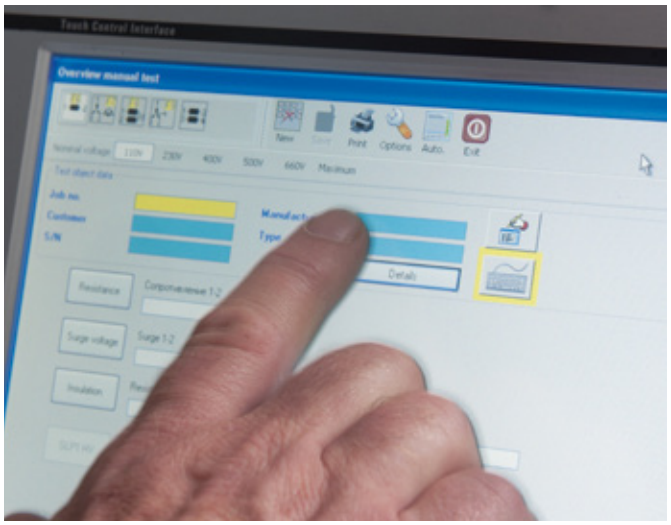
Made in Germany

RS232
USB
Ethernet
I/O
PLC
Print



Highlights

- digital surge-voltage test with patented evaluation
- surge-voltage with 100nF/200nF and up to 1500A surge-current (depending on the tester)
- partial discharge analysis for a standard-compliant detection of special insulating faults
- resistance measuring in four-wire technology with temperature compensation
- insulation resistance test with automatic PI-measuring
- inductivity test
- fully-automatic switchover between the different test methods
- four winding connections (windings + star point) plus frame connection
- optimized for the repair operation
- automatically running test with automated GO-/NO GO-comparison
- integrated armature test assistant, automatic armature adaptor and armature booster
- remote controlling an AC-high-voltage tester and scanning the test results
- integrated PC with Windows®
- simple operation via touch screen or mouse and keyboard
- option for remote maintenance and remote calibration
- data base for numerous test programs and test results
- storing test results including motor type plate data and surge graphs
- meets the IEEE requirements



intuitional operation via large touch display

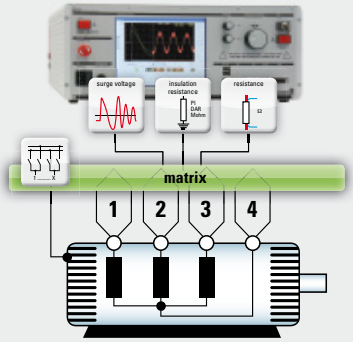
Testers of the MTC2-Class test windings at for example generators, three-phase stators, one-phase stators, transformers, armatures, and motors.

They feature a manual as well as an automatic operating mode. The manual mode can be ideally used for repair and maintenance tests. For these tests the manual auto test function does a very good job. The auto test supports the inexperienced operator in making a clear statement regarding the motor's fault.

In the automatic mode the complete test processes run independently. The test programs are prepared manually for each type to be tested in a very simply way. Thus the MTC2 can also be used for fully-automatic production tests.

Unique on the market:
The automatic test method switchover up to 50000V

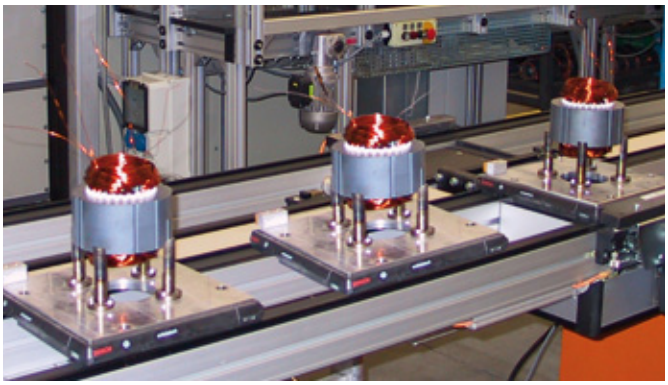
Connecting scheme of the four-wire measuring leads with a connected motor



There are the following measuring paths:
1 <-> 2 · 1 <-> 3 · 2 <-> 3
1 <-> 4 · 2 <-> 4 · 3 <-> 4
The test leads are switched to the different connections based on a relay matrix in the tester.

Depending on the tester's design the MTC2 features up to four connections for connecting the winding to the tester. Each MTC2-design also provides an additional connection for connecting the test object's cabinet.

The integrated, unique automatic test method and measuring lead switchover offers the comfort of switching the test methods to the different test leads. At a tester with four connections and a test object with accessible star point connection you are able to measuring each phase individually. This increases the test's sensitivity compared to competitive products to a multiple times.

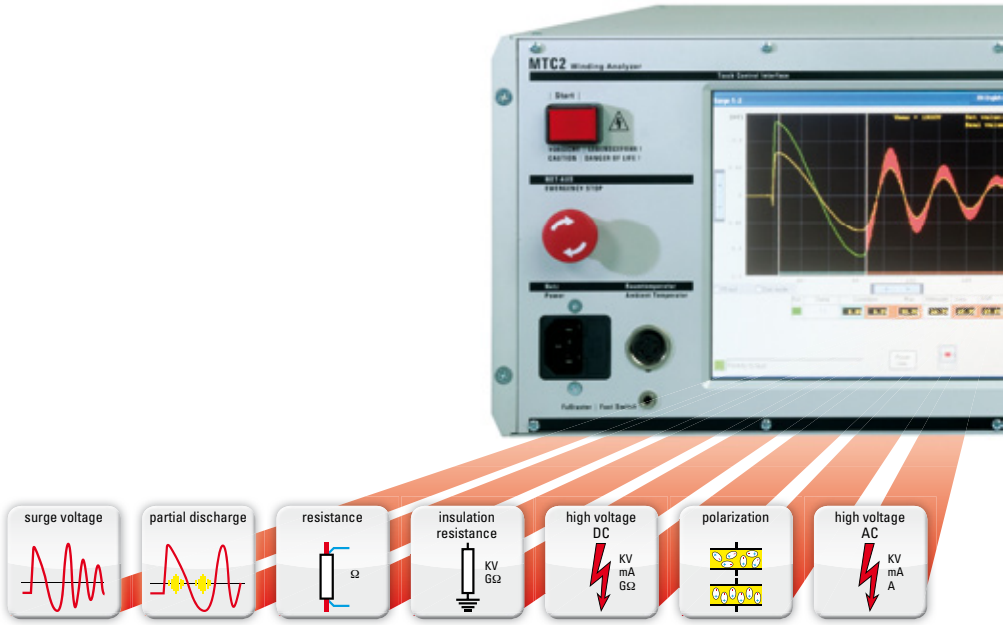


Railway drive with MTC2

Test software please look at page 106

The MTC2-Class

SCHLEICH-MODULAR-CONCEPT



Configure your tester on your own – the SCHLEICH-MODULAR-CONCEPT makes this possible

The testers of the MTC2-Class feature the Windows®-PC-control, the measuring technology, the graphic-LCD display with touch operation, intuitional operating and measuring software, the data bases and several interfaces.

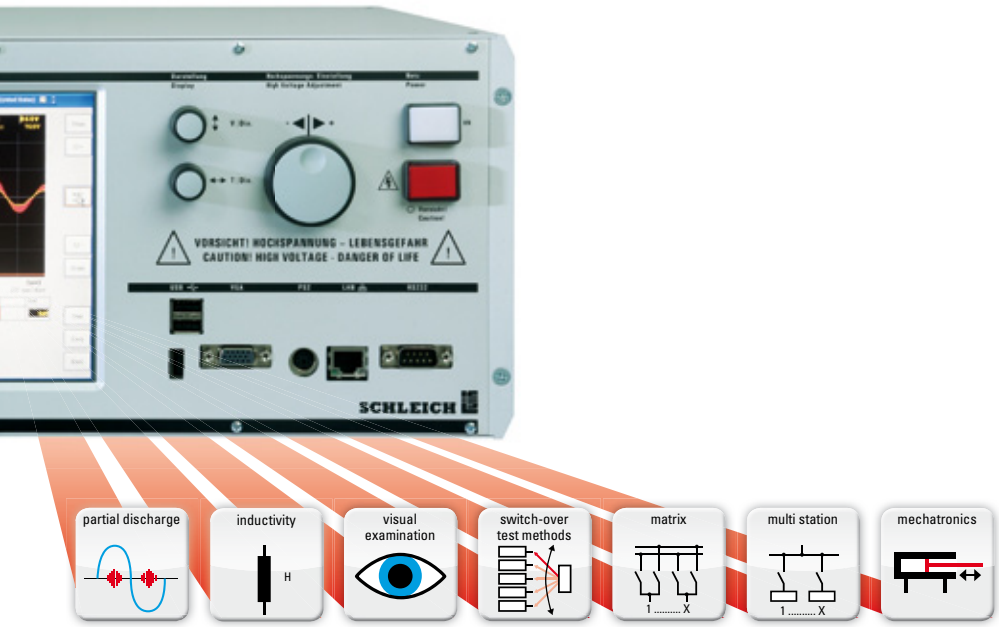
Based on the SCHLEICH-MODULAR-CONCEPT the MTC2-testers offer numerous options of combining and integrating different test methods. You can select the test method, necessary for your test task out of a large pool of test options.

Whether only one or several test methods – you determine the configuration. Your MTC2 can be configured for example as pure surge tester. For a more complex test task you might require a combination of all test methods. The SCHLEICH-MODULAR-CONCEPT of the MTC2-Class allows configuring the tester that corresponds to all your tasks. This is not done by integrating several single testers into one very big test rack but by integrating all tests into one compact modular cabinet concept. The cabinet's size is related to the design and size of the different tests.

This impressive flexibility gives you a considerable functional and economic advantage. Each tester comprises the experience of thousands of installations. At SCHLEICH this experience is realized consequently, with passion and without any compromises for you.

This is "customer based technology".

For more details regarding the individual test methods please look at page 136 and in the internet www.schleich.com



Surge voltage

test voltage ranges	500V…50000V
test voltage ranges	8
surge capacity	100nF (22 nF depending on the model)
surge current	max. 800A…1500A – depending on the model
rise time	100ns…300ns – depending on the model
partial discharge	available as option

Partial discharge surge voltage

test voltage ranges	6000V…50000V
measuring	Gigahertz with antenna or PD-coupler

Insulation resistance

test voltage ranges	500V…50000V
test current ranges	up to 3mA
resistance ranges	up to 10GΩ
polarization index	yes

Resistance measuring

resistance ranges	<1mΩ…100KΩ
test current ranges	up to 3A
four-wire technology	yes
temperature compensation	yes

High-voltage DC

test voltage ranges	500V…50000V
test current ranges	up to 3mA
resistance ranges	up to 10GΩ
polarization index	yes

High-voltage AC

test voltages ranges	3000V…6000V – depending on the model
test current ranges	up to 100mA
partial discharge	available as an option

Partial discharge high-voltage AC

test voltage ranges	3000V…6000V
measuring	Gigahertz with antenna or PD-coupler

Visual test

visual test with confirmation	standard
number of test steps	arbitrary

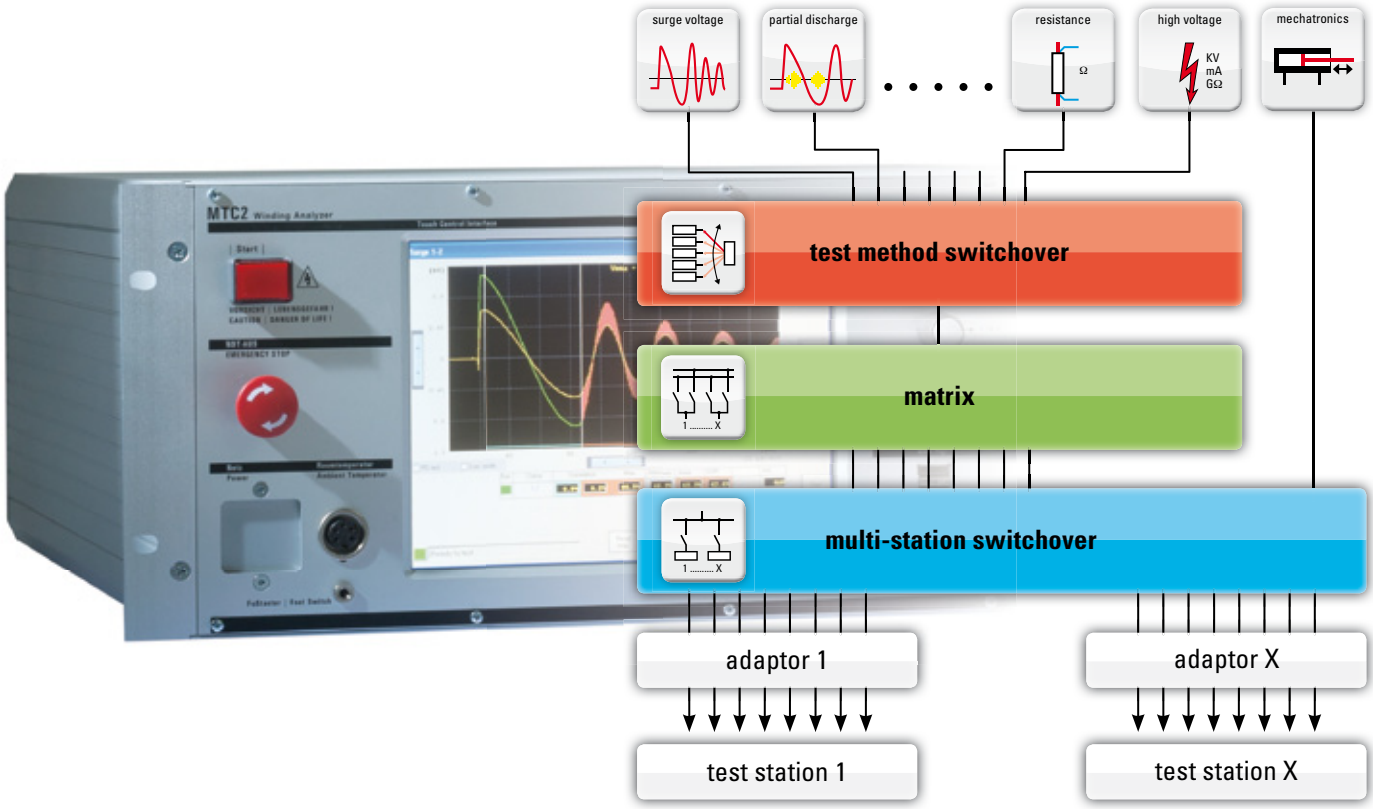
Mechatronics

digital inputs	32, 64, 96, 128 – depending on the model
digital outputs	32, 64, 96, 128 – depending on the model

Test Method Switchover, Matrices, Multi-Station Switchover and Mechatronics

SCHLEICH test technology proves itself in the daily operation. The aim has to be to perform a test as fast and efficient as possible. Only this creates a high utility.

In order to save time, the operator connects all connections of the test object by means of a contacting adaptor. Afterwards the tester automatically performs all tests between all connections. The operator does not have to re-clamp any leads. This is realized by the automatic test method switchover that is typical for SCHLEICH.



Many motors often feature more than three connections. Here it makes sense and it is more efficient to connect all connections of the test object to the tester. Afterwards the tester performs all tests fully-automatically between all connecting points. This is more effective than performing respective partial tests at one part of the winding. The switchover between the different connections is realized via flexible switchover matrices.

It is obvious that test objects with many connections require more time for connecting and disconnecting than test objects with only one connecting cable. In order to gain time in these cases we often realize dual and multi-station systems. In one station it is loaded and unloaded and at the same time it is tested in the other stations. In this way very economic results can be achieved also at complex and comprehensive tests.

Test method switchover

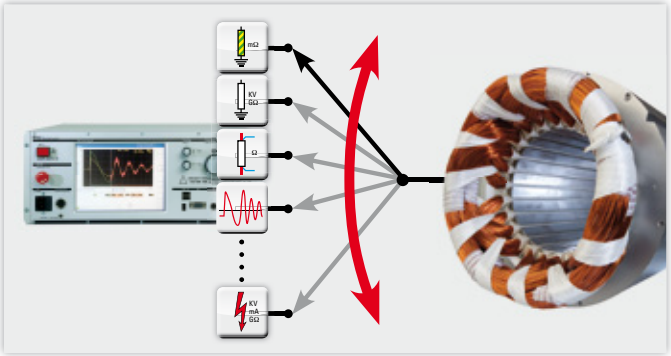
Compliant to type and extent of the test methods we provide a number of switchovers. They guarantee a fast and automatic change between the different test methods.

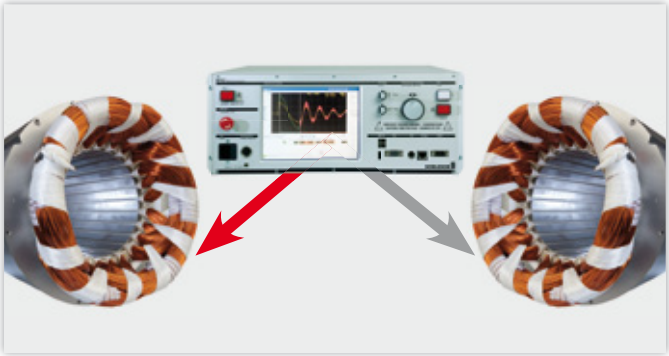
As the voltage differences between the test methods might be very high the safety has top priority when dealing with switchovers. A resistance test with 3V has to be switched to the test object as reliably as a high-voltage test with 6000V – to protect the test object and, of course, the operator as well. There are no compromises. For switchovers and matrices we only use umpteen thousands of times proven, top-quality parts of our own production or from well-known German manufacturers.

Station switchover

Instead of using two or more testers a station switchover is sometimes an economic alternative.

High safety demands are made for station switchovers. Simultaneously to a running test at one station the other station is discharged and charged again. During this process the operator inevitably touches the clamps and connecting leads. An electrical hazard of the operator has of course to be avoided in any case. For this the measuring leads to the stations in which no test runs at this moment have to be safely separated. Furthermore it is recommended to ground the connections to the test object additionally.





Matrices

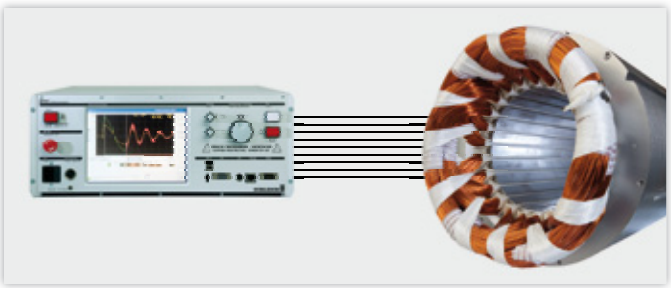
For almost every task we offer the corresponding relay matrix. Matrices vary in the number of connections and the height of the test voltage that is to be switched. A matrix has to switch and separate 6000V as reliably as millivolt signals. Our engineers have developed the matrices exactly for this situation.

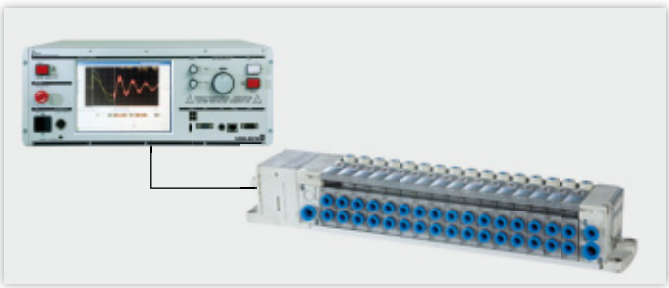
Matrices are designed for two- and four-wire-applications. They can be strung together to arbitrarily increase the quantity of connections. Matrices with more than 100 connecting points are no rarity. Also, at the test method switchover only the best quality is used for matrices.

Mechatronics | Script control

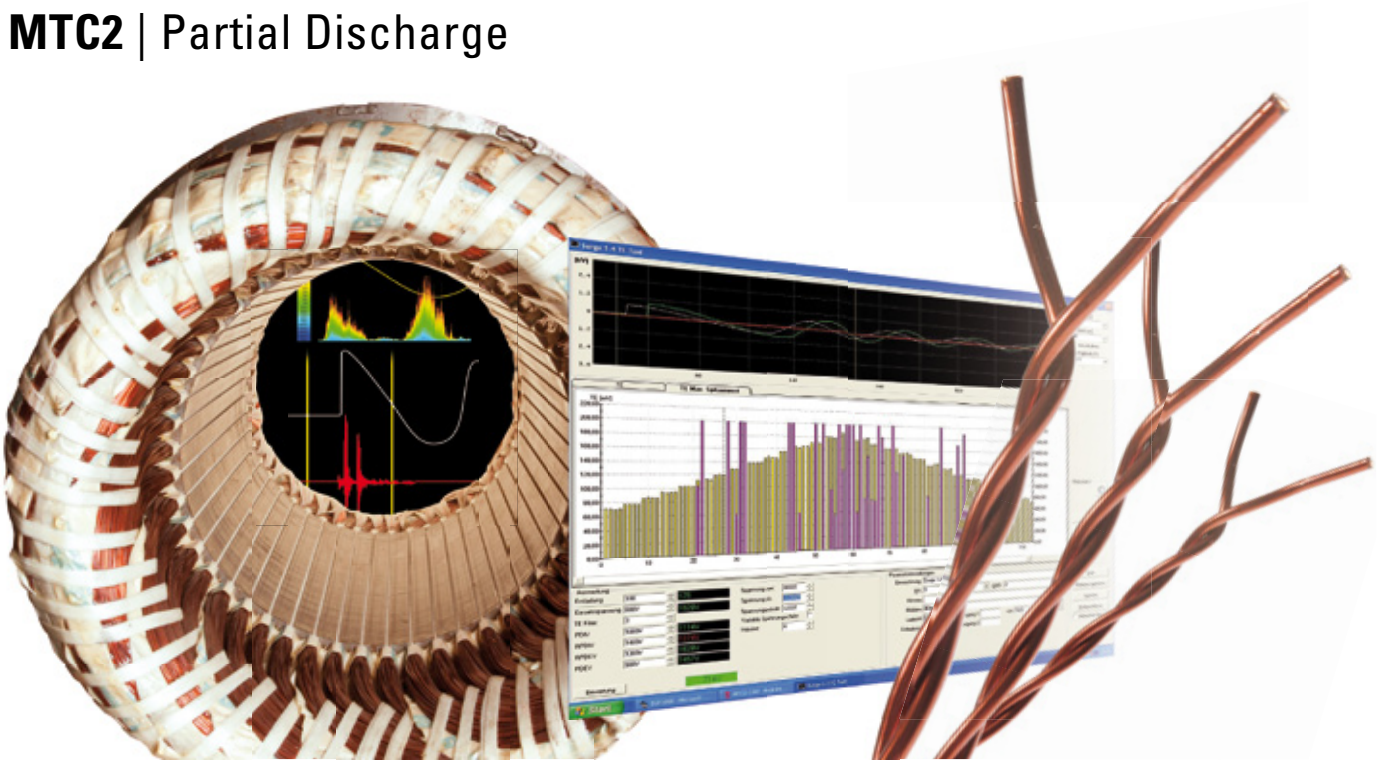
Besides the hardware, the software also offers an enormous flexibility. Owing to the integrated script commands additional PLC functions can be realized in the tester. Entries can be queried, outputs be set and logical links be generated – just like with a PLC.

The huge advantage is the direct control of mechatronic functional processes. You can activate valves, read limit switches, evaluate measuring values yourself and much more. Thus the tester is able to generate additional functional processes before, during and after the test. This is perfect for own test setups or also for the integration in an automatic production.





MTC2 | Partial Discharge

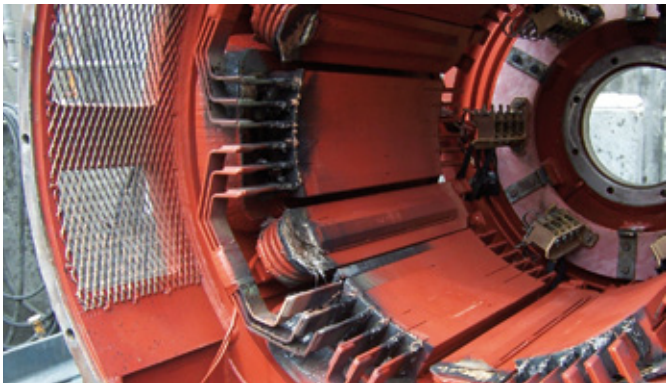


Highlights

- determining the inception and extinction voltage according to IEC 61934
- very high reproducibility owing to special filter technology
- special coupling technology for measuring completely assembled motors
- extremely free of any disturbances due to special high-frequent filter technology
- no shielding of the test area necessary
- partial discharge test up to 25KV
- qualification of
  - enameled copper wire (twisted pair)
  - enamel-insulation
  - impregnation procedure

The partial discharge test serves for checking the winding quality of winding goods. The test can be performed in combination with the high-voltage test (sine) as well as with the surge test. The main aspect is detecting any quality faults at windings that cannot be detected with the conventional high-voltage test or surge test.

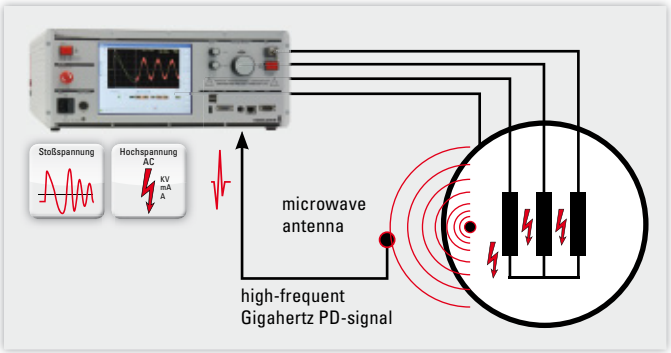
Owing to the coupling technology combined with a high-frequent filter technology the system is extremely free of any disturbances. Thus it can be very well used directly on-site or in the production.



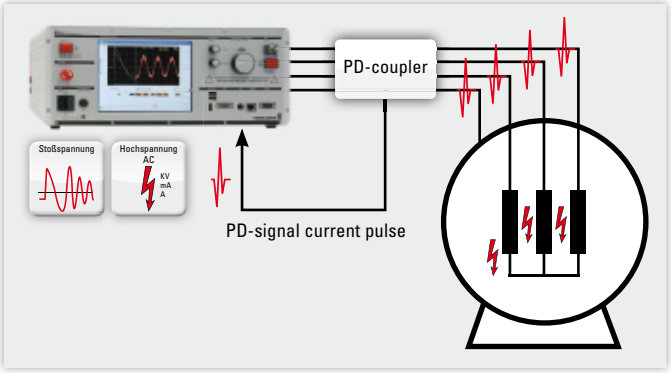
defect stator

Assembly and connections

The partial discharge measuring (filtering and analysis) is completely integrated in the MTC2. Only the uncoupling (measuring) of the actual partial discharge signal is performed outside the tester. This is necessary for an ideal adaption to the respective measuring situation. The test at an open stator winding or at a completely assembled motor is no problem for the MTC2.



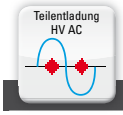
The partial discharge measuring at an open stator winding is performed via a highly sensitive measuring antenna which is put inside the test object or in its direct surrounding.



The measuring at a completely assembled motor cannot be performed via an antenna as the high-frequent signals are shielded by the closed motor cabinet. In these cases the measuring is performed via a special coupler which is grinded in the measuring lead.

The antenna as well as the coupler can be optionally connected to the MTC2. Thus you are well equipped for every test application.

The combination of these two measuring methods for a partial discharge test in one tester is unique on the market.

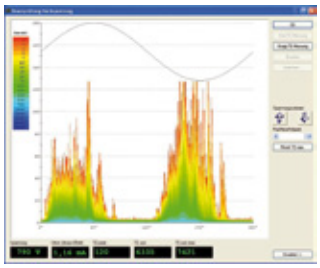


Partial discharge test at HV-AC

The test is performed fully-automatically via a previously set test sequence. A ramp function is run in which the test voltage is continuously increased. As soon as the first partial discharges occur this voltage is stored as PDIV (inception voltage).

Now the voltage is reduced again until the partial discharge completely disappears. This point is detected as PDEV (extinction voltage) and also stored. Due to preferably short test times in the production the partial discharge's intensity can also be determined at a preset voltage. Thus it can be distinguished between "GO" and "NO GO" within milliseconds.

It addition it is also possible to perform the test manually. Here the operator continuously increases the voltage while monitoring the partial discharge signal.



Partial discharge test in the manual operation

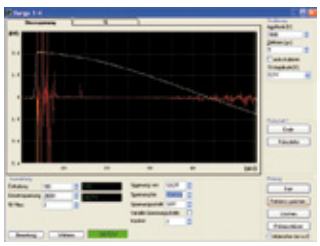
Partial discharge test at surge voltage

The test is performed either manually or automatically. In the manual mode the operator increases the voltage continuously while monitoring the partial discharge signal.

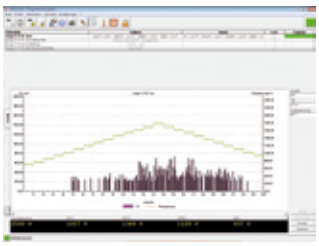
Via a test sequence the automatic operation fully-automatically provides an analysis of all three phases. The following values are determined per phase: PDIV (inception voltage), PDEV (extinction voltage), RPDIV (repeating inception voltage), and RPDEV (repeating extinction voltage).

Here it is also not necessary to run the complete ramp. If it has to be distinguished quickly between GO and NO GO in the production it can be operated with a preset test voltage.

All results are automatically stored and protocolled.



Surge voltage pulse with 150ms, rise time, and PD-effects



Automatic process of the PD-test according to the standards


STYLE UL 3239 VW-1

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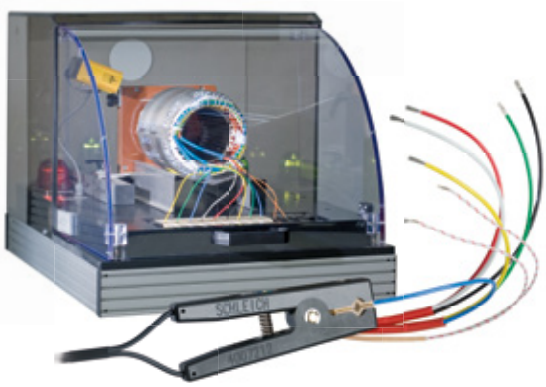
Production
Series Production
Development



Accessories

Test Covers and **Test Cages**

EN 50191 VDE 0104

Our test covers and cages ensure the operator's safety. According to the valid standards we protect the operator either via an inevitable protection against contact or via a light curtain. The test covers are standard-compliant and equipped with two-circuit safety switches according to the latest state of the art technology.

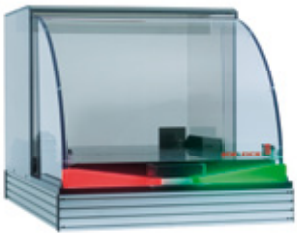
The basic setup consists of a solid dimensionally stable Aluminum frame which can also easily take up heavier weights. Within the frame there is enough space for plug connectors or special parts. The transparent cover parts consist of fracture-proof Lexan.

The test cages are taken from our standard product range in accordance to your test task or can be especially developed and manufactured at our site. We supply the standard single and double covers as pure tabletop models or with underframes. However, they can also be assembled directly on a rolling container tester.

Single covers

Single cover model 0

- up to 6KV HV AC
- dimensions (w x l x h): 260 x 400 x 280 mm
- small and compact



Single cover model 1

- up to 12KV HV AC
- dimensions (w x l x h): 546 x 775 x 520 mm
- integrated result-LED-strips
- options: automatic opening and closing, locking, widening

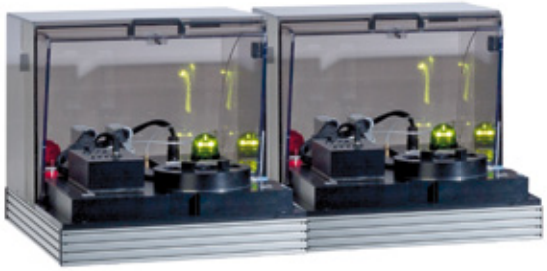
Single cover model 10

- up to 12KV HV AC
- dimensions (w x l x h): 935 x 880 x 585 mm
- options: automatic opening and closing, locking, widening

Test desk with sliding cover

- up to 6KV HV AC
- dimensions (w x l x h):
  desk small 1200 x 800 x 920 mm
  cover small 495 x 700 x 500 mm
  desk large 2000 x 800 x 920 mm
  cover large 895 x 700 x 650 mm
- option: locking

Double covers



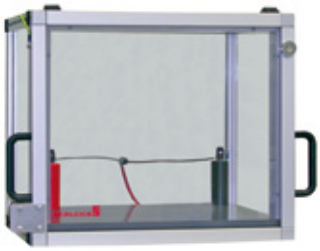
double cover model 1

- up to 12KV HV AC
- dimensions (w x l x h): 546 x 775 x 520 mm
- integrated result-LED-strips
- options: automatic opening, locking, widening

double cover model 3

- up to 6KV HV AC
- dimensions (w x l x h): 800 x 588 x 445 mm
- perfect ball bearing guide
- with locking
- 2 integrated result lights
- option: widening

High-voltage test cages



test cage 30KV

test cage for material tests
up to 40KV

high-voltage test station up to
40KV with GLP2

high-voltage test station up to
20KV for electronic components
integrated in a 19" cabinet

Customized project solutions

test cage with light curtain in one
project solution

single test cover model 1 and working table
with lateral depositing rack

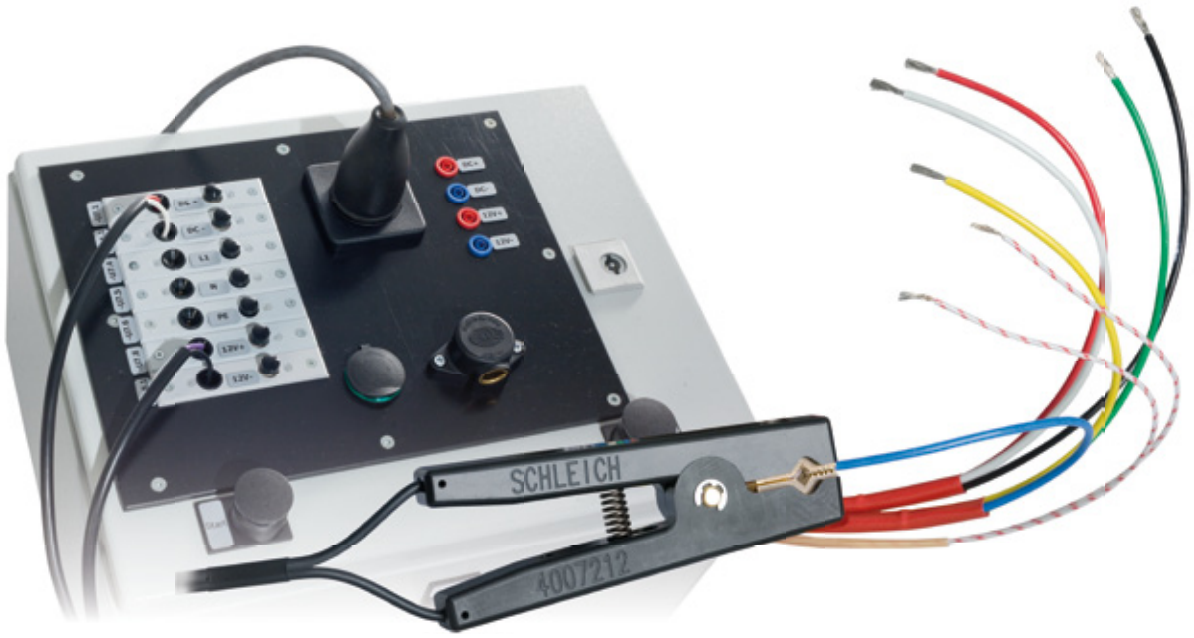
double test cover assembled at a
19" cabinet

large test cage with front door and
extending table

large test cage with conveyor belt, light curtain,
and pneumatic controlled doors at the side

large test cage with light curtain

Lead Contactings



Highlights

- various standard contactings
- mechanical solid and persistent design
- four-wire contactings – Kelvin clamps
- customized solutions based on our standard solutions
- fast exchange of consumables

A typical task is the contacting of stripped line ends because test objects are often only equipped with line ends without a plug connection.

For contacting free line ends we can provide a wide range of clamp devices, for example for the application of stators' winding connections. They can be equipped in two- as well as four-wire-technology.

When low resistances are to be exactly measured Kelvin clamps are used for the four-wire-measurement. The four-wire-technology compensates the transition resistances within the clamping points.

Our Kelvin clamps' special design guarantees high contact reliability, solid clamping, and a low wear and tear in the rough testing operation. Less exacting contactings are operated with our multi-purpose clamping levers.

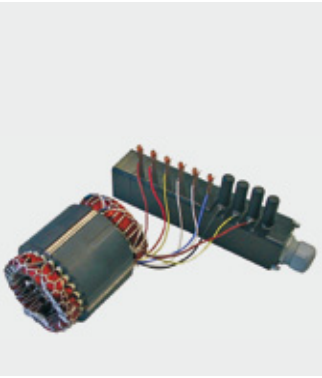
The contactings can be supplied as loose single contacting or integrated within a clamp block. The clamp blocks can either be assembled in a fixed position within the test cover or can be moved flexibly within the testing space to always have the optimum position for being clamped to the lines.

Examples for Kelvin clamps, clamping levers and modular contact blocks

clamp block in modular design

clamp block in modular design

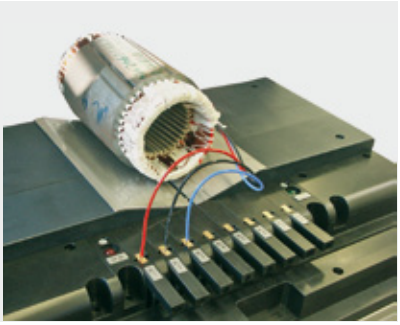
11-times clamping lever block



6-times four-wire-contacting guide and 4-times clamping lever block

Kelvin clamps in small-, medium- and large-sized design

8-times Kelvin clamps block



Kelvin contacting in one test cage with prism

Pneumatic contactings

Pneumatic terminal blocks are also simple and quick contacting possibilities. The line ends are put in the hole of the terminal block as deep as possible until a clamping mechanism automatically clamps the line end. At the end of the test the terminal blocks can be automatically released so that the lines are immediately free.

The contactings can be supplied either as loose single contacting or integrated within a clamp block.

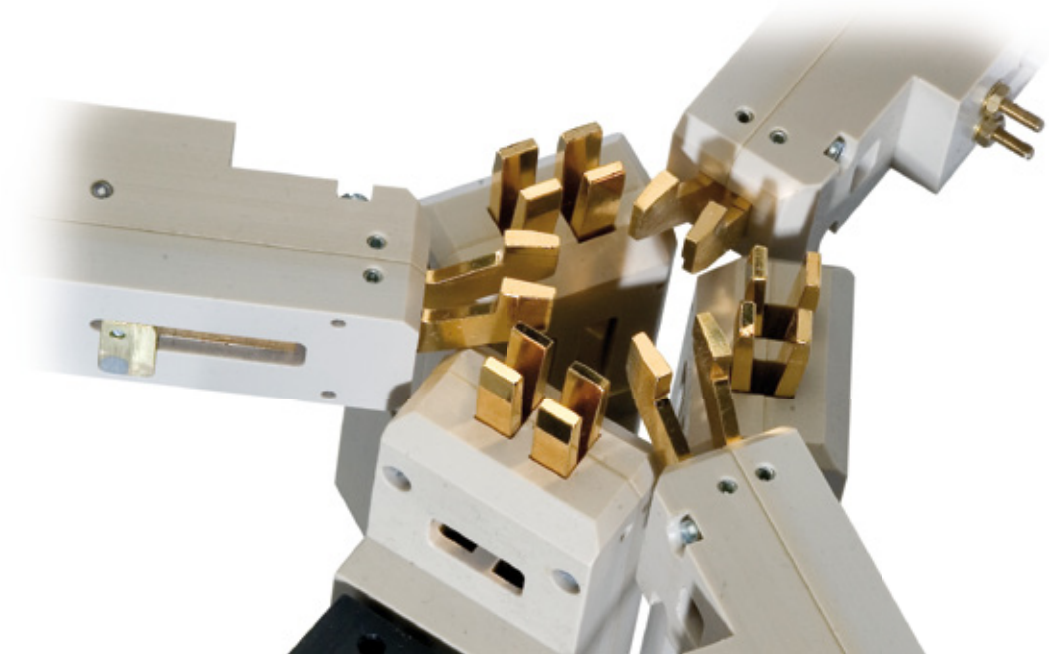
combination of pneumatic clamps with socket and start button in one control unit

single loose pneumatic clamp in two-wire-technology

stackable pneumatic clamps in four-wire-technology for a modular setup

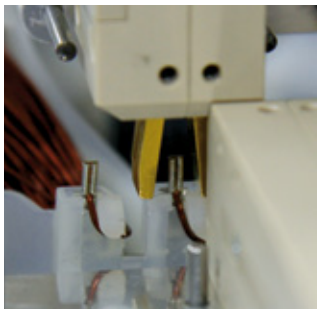
connection box with pneumatic clamps in two-wire-technology

Special Contactings



Highlights

- mechanical solid and persistent design
- two- or four-wire-contactings
- high-current contactings
- special solutions for the manual contacting
- special solutions for automatic production lines
- contactings for handling systems
- swingingly installed Kelvin clamps for a position-tolerant automatic contacting
- springy contact pins in two- and four-wire-technology
- motor terminal board plugs in two- and four-wire-technology
- quick change of consumables



contacting of contact pins via Kelvin clamps

contacting with pneumatic Kelvin clamps

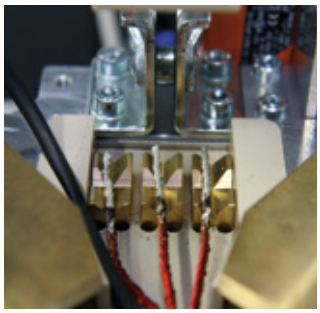
Special contactings

One of SCHLEICH's special strength lies in the mechanical adaption of test objects and their special contactings. The tester and the mechanics are manufactured according to your test task's requirements. For this we often use very small, pneumatically controlled Kelvin clamps or springy contactings of our modular kit.

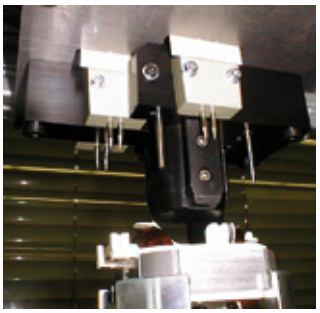
The contactings are directly designed at our 3D-CAD-working stations at our site. Modern CNC-machines in our mechanics department guarantee the production of professional and favorably-priced components.

simple contacting on a pallet

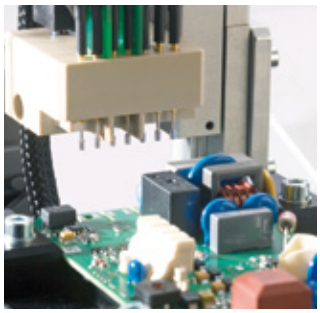
special solution of a lead contacting



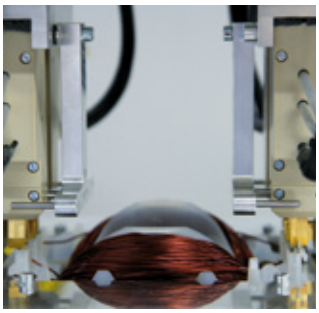
contacting of motor connecting strands with centering prisms



contacting of a test object from above



contacting of a PCB with springy contact pins



contacting of contact pins with Kelvin clamps

Motor terminal board plugs

Every motor manufacturer knows the problem of the time-consuming contacting of a motor terminal board. But the motor cannot be tested without a corresponding contacting. In order to save a lot of time here SCHLEICH has different contacting methods in its product range.

To achieve a more user-friendly and time-consuming contacting of the motor terminal board we developed a special motor terminal board plug which spans each threaded pin of the motor terminal board with collet chucks and thus contacts it safely. After having connected the plug to the bolts of the terminal board a clamping lever locks the collet chucks. The enclosure contactings are also integrated in our motor terminal board plugs.

We manufacture our terminal board plugs for any quantity of connecting bolts as well as for different dimensions. For the exact measurement of very low resistances we provide motor terminal board plugs also in four-wire-technology which is unique in the world.

loose motor terminal board Kelvin clamps

motor terminal board plug in two- or four-wire-technology