MTE

Meter Test Equipment

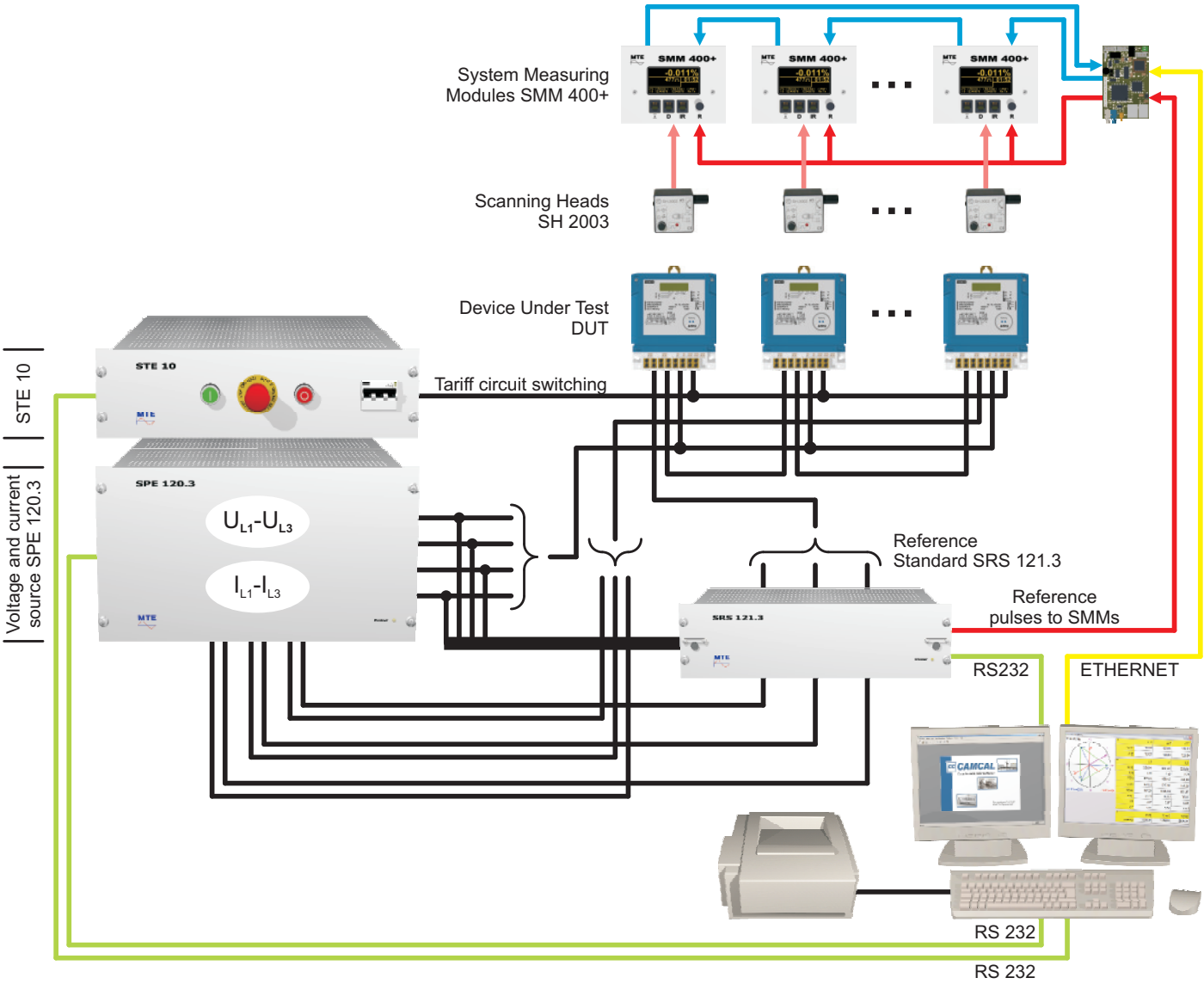
MTE's stationary Meter Test Systems

System Overview

The individual system components of a MTE meter test system such as a fully electronic voltage and current power source, a reference meter, an error evaluation system, as well as a meter test rack or gantry system are modulary developed and can be combined in any order. This modular design gives flexibility and enables MTE to provide the optimal customer orientated solution for each single or three phase meter test system the customer requires to meet the changing needs of the metering world.
Innovative, economical, modular meter test systems enable the user to measure and check meters with high precision.

Meter test systems are available for testing of single and three phase meters with or without closed I-P links.
Meter test systems are available with fixed meter racks or with gantries and moveable trolleys to fulfill different requirements of production and test capacities.
MTE Meter test systems are controlled by CAMCAL® for WINDOWS an easy to use and intuitive software package which is available in different languages.

Configuration of a standard meter test system MTE-S



SPE System, three phase power source

The SPE System is an electronic voltage- and current power source and a meter supply unit (phantom load) for testing electricity meters or for testing other devices which use current or voltage.

The cabinet is equipped with the following components:

- Control unit STE 10
- Power source SPE 120.3 with digital voltage and current amplifier
- Digital electronic reference meter SRS 121.3 or other types (Option)
- Voltage and current ranges:
  Voltage: 30 V up to 300 V
  Current: 1 mA up to 120 A or
  1 mA up to 200 A
- Output power: 300 VA or 600 VA per phase
- Power efficiency: > 85 %

PSP System, single up to three phase power sources

The PSP System is an electronic voltage- and current power source and a meter supply unit (phantom load) for testing electricity meters or for testing other devices which use current or voltage.

The cabinet is equipped with the following components:

- Control unit STE 10
- One up to three power sources PSP 10 with digital voltage and current amplifier
- Digital electronic reference meter SRS 121.3 or other types (Option)
- Voltage and current ranges:
  Voltage: 30 V up to 300 V
  Current: 1 mA up to 120 A
- Output power per phase:
  Voltage: 800 VA
  Current: 1200 VA
- Power efficiency: > 85 %

ZVE System, single up to three phase power sources

The ZVE Power Source was specially designed for use as an electro technical current and voltage generator in Meter Test Systems and also in other automatic test systems.

The power source creates the current and voltages - the phantom load - required for measuring the meters. The network as generated by the ZVE system is completely distinct from that of the mains power supply. The generated values are, consequently, practically independent of the quality of the public power supply.

The ZVE system is composed, in general terms, of the following principal units:

- One up to three Voltage power sources PSU 10
- One up to three Current power sources PSI 10
- Control unit STE 10
- Digital electronic reference meter SRS 121.3 or other types (Option)
- Voltage and current ranges:
  Voltage: 30 V up to 300 V
  Current: 1 mA up to 120 A or
  1 mA up to 200 A
- Output power per phase:
  Voltage: 1000 VA / 2000 VA / 4000 VA
  Current: 1000 VA / 2000 VA / 4000 VA
- Power efficiency: > 85 %

Stationary Reference Standards

The electronic system reference standards in 0.05 % or 0.02 % accuracy, are precision measurement units for all AC values, which are used in the measurement of energy. The wide measurement range and the high precision are the main characteristics of the reference standards.

SRS 121.3, accuracy 0.05 %
available in two versions:
Current range: 1 mA ... 120 A or 1 mA ... 200 A

SRS 400.3, accuracy 0.02 %
Current range: 1 mA ... 120 A

SRS 200.3, accuracy 0.02 %
Current range: 1 mA ... 200 A

PRS 400.3 Portable Reference Standard

The PRS 400.3 reference standard of the modular system is based on the well-known digital measurement value retrieval, fast analogue-digital conversion and calculation of the values using fast signal processors. As opposed to the past, reference standards are not only used as standards for meter testing in a stationary meter test installation, but are also now predominantly used in the field for the measurement of all main parameters.

K2006 Comparator

The K2006 is a high accuracy comparator of accuracy class 0.01, especially suitable for use in metrological institutes and high precision measuring laboratories.

Its ability to compare directly to an external DC reference allows easy traceability to national standards.

Comparators are regularly used for checking of reference standard meters, for the calibration of precision current and voltage sources and for the verification of electrical standard measurements and electricity test systems.

Error evaluation systems

The modular Evaluation System **SMM 400 performs error calculation**, testing of emitting contacts and communication to tariff device units to the meter under test.

Four different versions covering customer´s requirements are available:

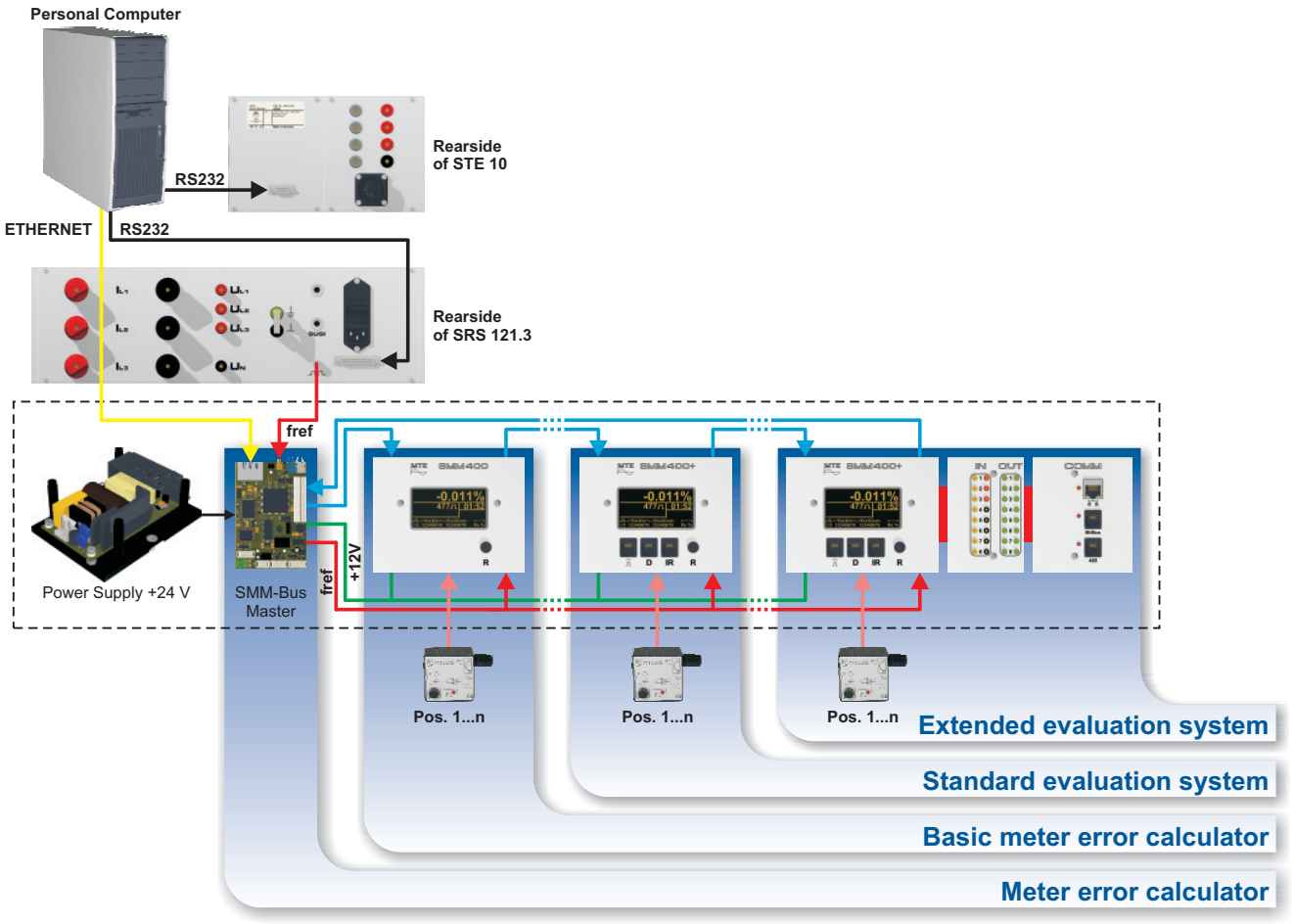
- **Meter error calculator** with SMM 400 bus-master without error display
- **Basic meter error calculator** with SMM 400 bus-master and SMM 400 error calculator module
- **Standard evaluation system** with SMM 400+ bus-master and SMM 400+ system evaluation module
- **Extended evaluation system** with SMM 400 Bus-Master, SMM 400+ system evaluation module and addition IN/OUT module for 8 in- and 8 outputs and or COMM communication module

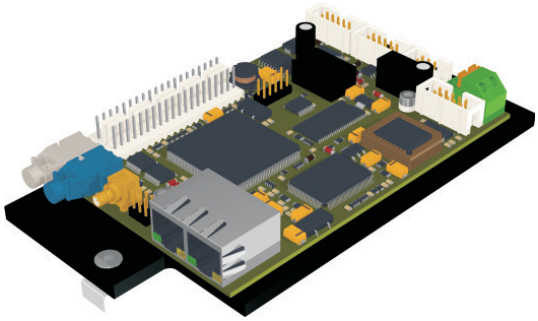
Functions display and interfaces

- Meter error measurement with scanning head
- Meter error measurement of emitting contacts
- Impulse generator
- Graphic meter error display
- Reset button
- Communication interfaces RS 232, RS 485, CL, M-Bus and ETHERNET

Options

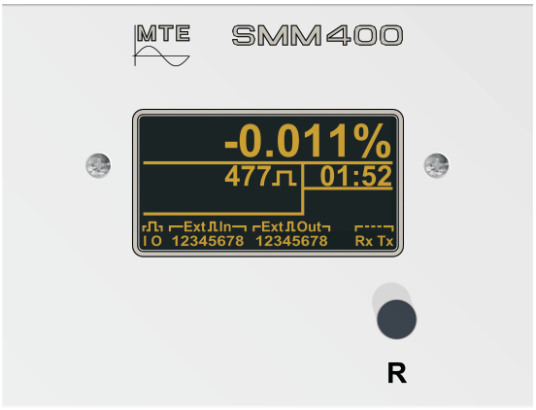
- **IN/OUT** module for 8 in- and 8 pulse outputs and 10-30 VDC supply for S0 inputs
- **COMM** module with ETHERNET, M-Bus and RS 485 interfaces



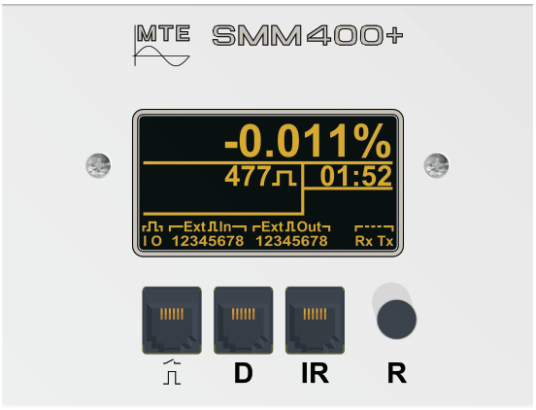


SMM 400 Bus-Master provides the interface between personal computer (via ETHERNET) and the system modules over RS 485-Ringbus.

The SMM 400 Bus-Master is equipped with an error calculator for 10 meter position and 10 direct inputs for scanning head pluses.



SMM 400 is a one channel error calculator with one input on the rear side for scanning head pulse from SH 2003 or SH 11. A reset-button allows a restart of the measurement. The meter error is shown on full graphic OLED display.



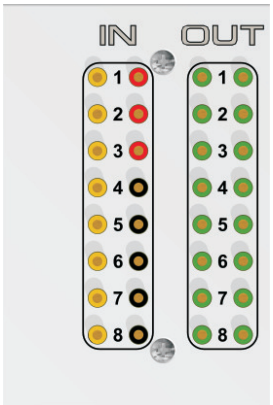
SMM 400+ Meter Evaluation Module with full graphic OLED display, reset-button and 2 scanning head pulse inputs is the perfect solution to test modern meters.

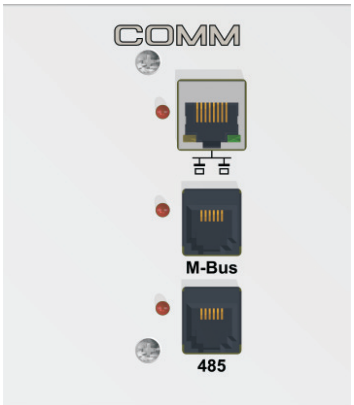
The sockets are used for:

Socket : IN – and OUT of fast and slow pulses

Socket D: Serial interface RS 232 and 20mA - current loop interface (CS)

Socket IR: Serial infrared interface e.g. for readout of tariff devices with optical communication head OKK.





The module **IN/OUT** is equipped with the following In- / Outputs:

- 8 Pulse inputs (IN) for testing of meter emitting contacts
- 8 Plus outputs (OUT) send pre-defined pulse to the meter under test

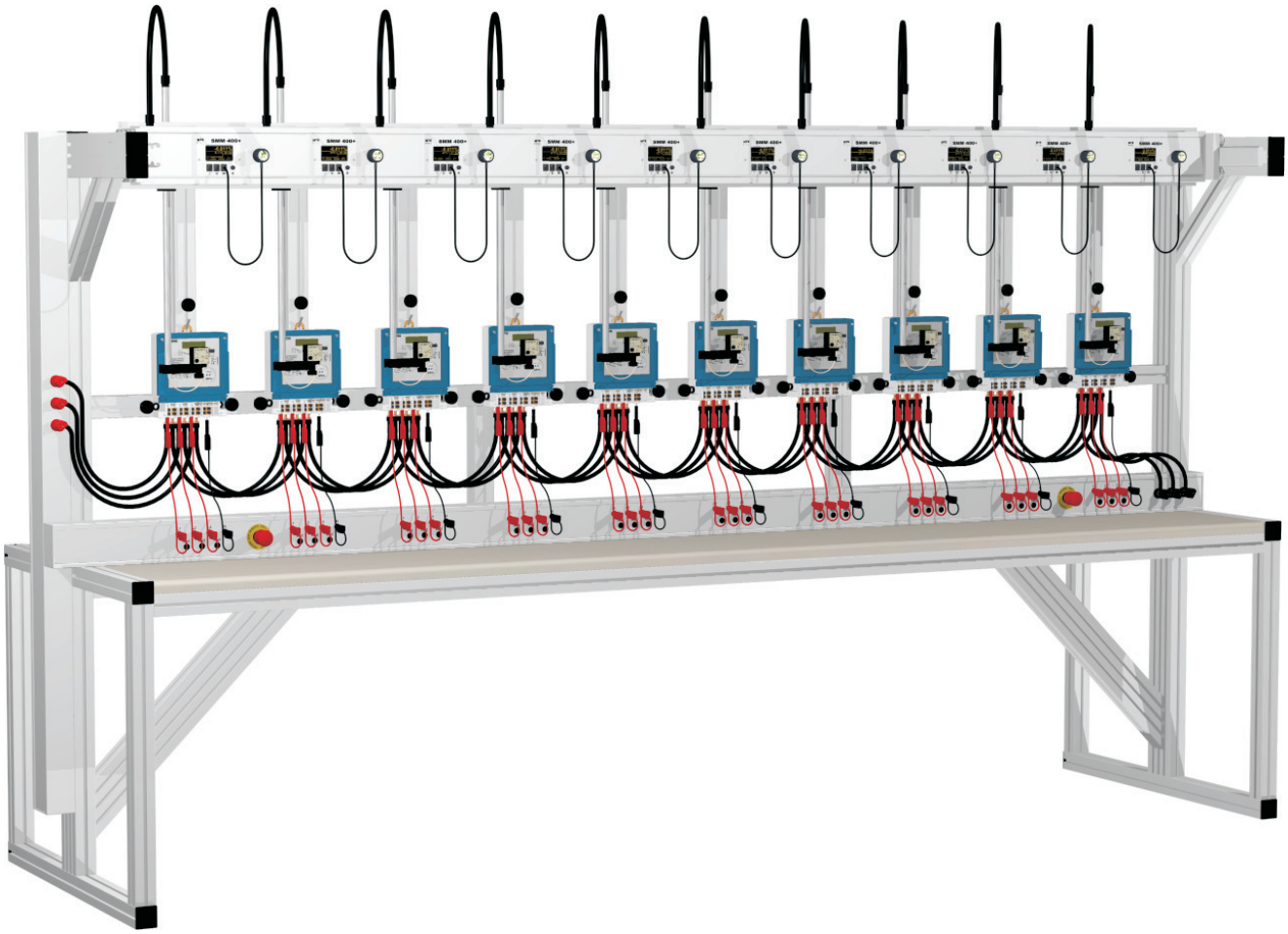
The module **COMM** is equipped with the following interfaces:

- ETHERNET
- M-Bus interface
- RS 485 interface

Meter test racks

The meter test racks are made of robust aluminimum profiles. The rack consists of a working table, equipped with attachments for single- or three phase meters. Each meter position is equipped with an error evaluation system, safety sockets for the connection of the measuring voltage and lateral movable scanning head carriages with depth and height adjustments for the scanning heads.

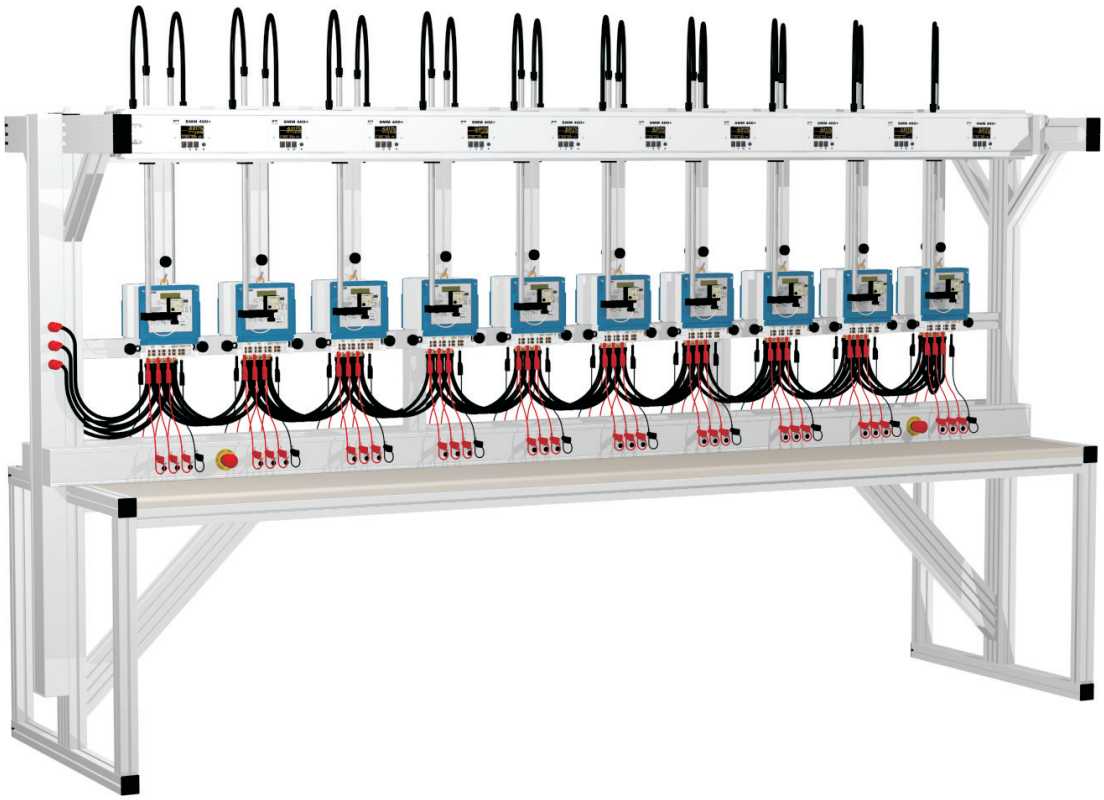
Thanks to the modular design structure of the meter test racks, special versions can be adapted easily with regard to the number of measurement positions, mechanical arrangements and technical specifications according to customer needs.



The picture shows a meter test rack with 10 measurement positions. By request different options can be offered to the meter test system:

- Several quick connection devices according to IEC- or ANSI standards are available, which allow fast suspension and connection of meters
- Relay outputs for tariff control
- Hand held terminal with or without barcode reader
- Tariff readout system, etc.

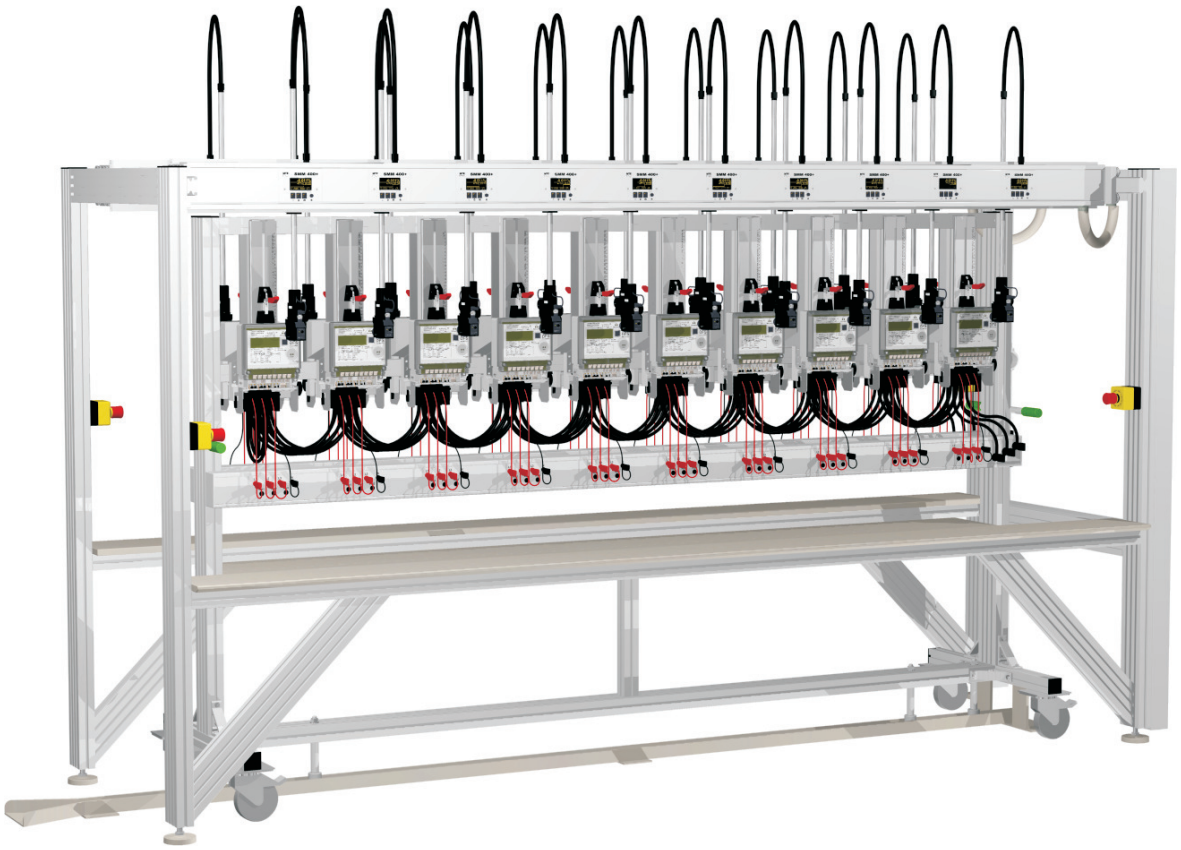
The picture shows a meter test rack with total 20 measurement positions in one row of ten on the front and one row of ten on the rear side.



The picture shows a meter test rack for 5 ANSI meters with quick connection devices QCD Form S and isolation current transformers ICT 2.3

Gantry Systems and Isolation Test

Gantry systems are generally used, if test and calibration of single and three phase meters with a high throughput are required. Whilst the fully automatic test of the meters with a trolley in the gantry system is running , a second trolley can be used in parallel to perform the assembly, preheating and if required meter isolation test.



The suspension rack for the isolation can accomodate up to 5 meters. The devices under test are connected via quick connetion devices on a conductive aluminium plate by means of a tilting support frame, the status of the device under test can be determined.

VXL Landis & Gyr Ltd., Calcutta, India, Six meter test systems

Each of the six test system consists of an electronic power source type ZVE with 4000 VA output power in voltage and current and each test system consists of six meter test racks with 26 positions, providing VXL Landis & Gyr Ltd with a total capacity of 936 positions for single-phase meters.

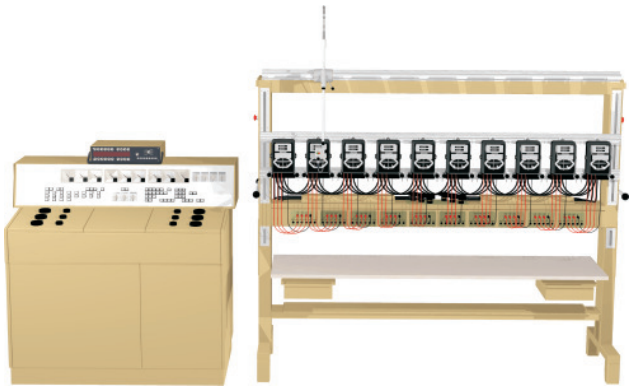
ENEL, Italy, Meter test system for three-phase meters

The photo shows a customized test system for ENEL meters. The test system is divided into three sections. In the left section the meters are assembled, in the middle section the meters are tested. Once tested they are removed from the test system in the right section therefore providing a continuous flow of assembled and tested meters.

ELSTER, Hungary, Meter test system for 80 single-phase meters

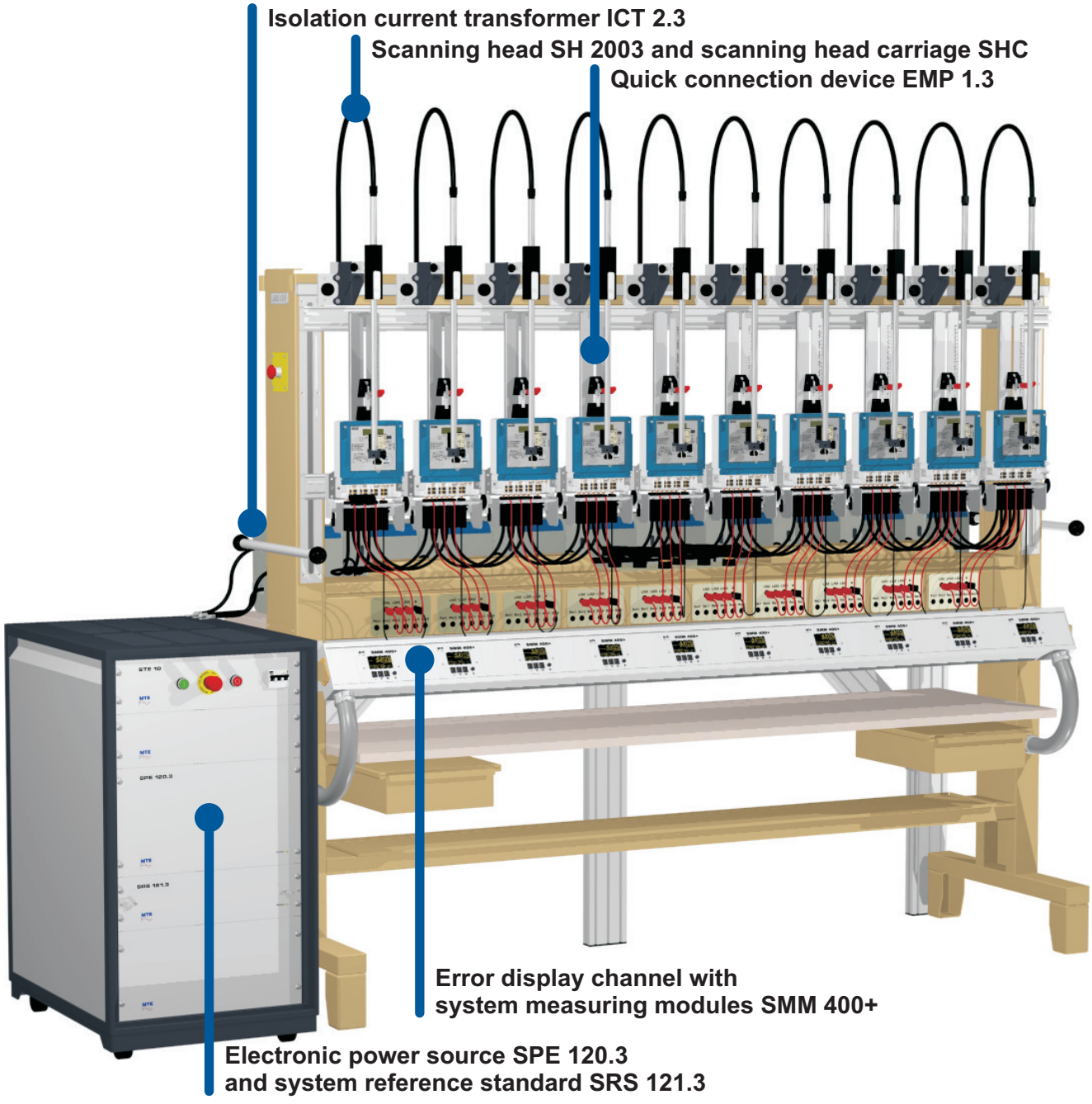
The meters are mounted on the front and the back of the trolleys in two rows. This customized and compact construction allows testing of 80 single-phase meters in tight floor space conditions.

Modernization of existing test systems



For customers already using MTE´s test systems for a long time it is of importance to have the option to utilize the well known technology also in the future. MTE has taken this issue serious in providing solutions to gradually replace existing systems with modern components.

The example shows a Landis & Gyr test system ETALOGYR 6001 which was modernized in order to meet the constantly increasing requirements of meters and meter testing.

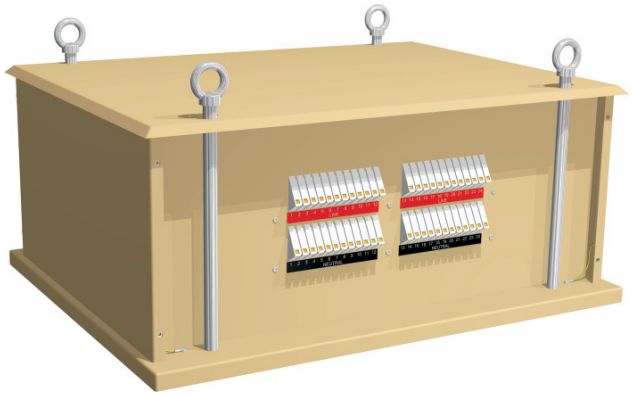


Test requirements with closed I-P links

If the meters under test do not allow for opening of the I-P links, then there is an unwanted connection between voltage and current path at every meter position.

Because of these connections, the line (input) and load (output) of each current measurement element are forced to be at the same potential, an effective short-circuit path exists across the current measuring circuit of every meter under test, causing a large measurement error. It is therefore not possible to test multiple meters with closed I-P connections on a conventional meter test installation without additional facilities. To be able to test these types of meters, galvanic isolation must be provided between the current and voltage circuits of each meter under test. This isolation must ensure that the closed I-P links in the meters do not cause these unwanted short-circuits and the resultant measurement errors. With single phase meters, galvanic isolation can theoretically be carried out using either voltage or current isolation transformers.

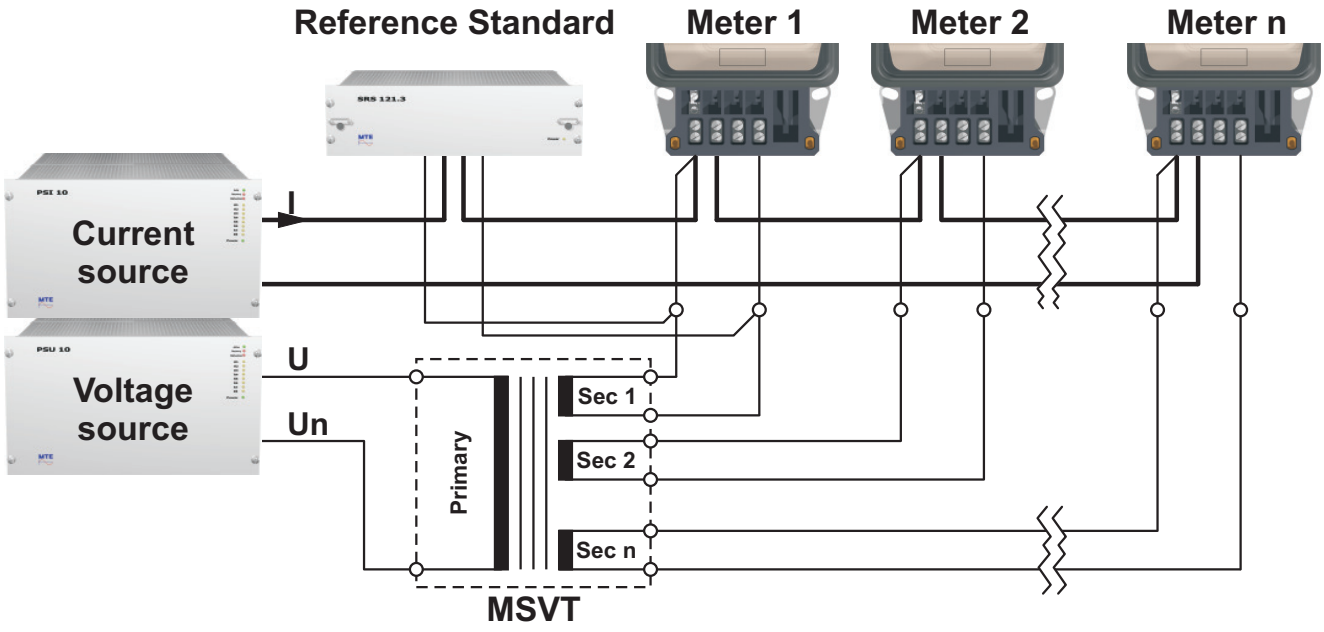
In this case, a connected I-P link does not cause a short-circuit, as this connection is now made on the secondary side of the transformer, thus avoiding any direct connection with the other meters in the circuit.



Voltage isolation for testing single-phase meters

For the testing of multiple single-phase meters with fixed/closed links between the voltage and current path (I-P links), galvanic isolation must be provided at each test position.

In practice this is normally done by connecting the voltage circuit of every meter under test, through a high accuracy voltage transformer. For cost reasons a voltage transformer with several galvanically isolated secondary windings is used.



Testing of three phase meters with closed IP-links

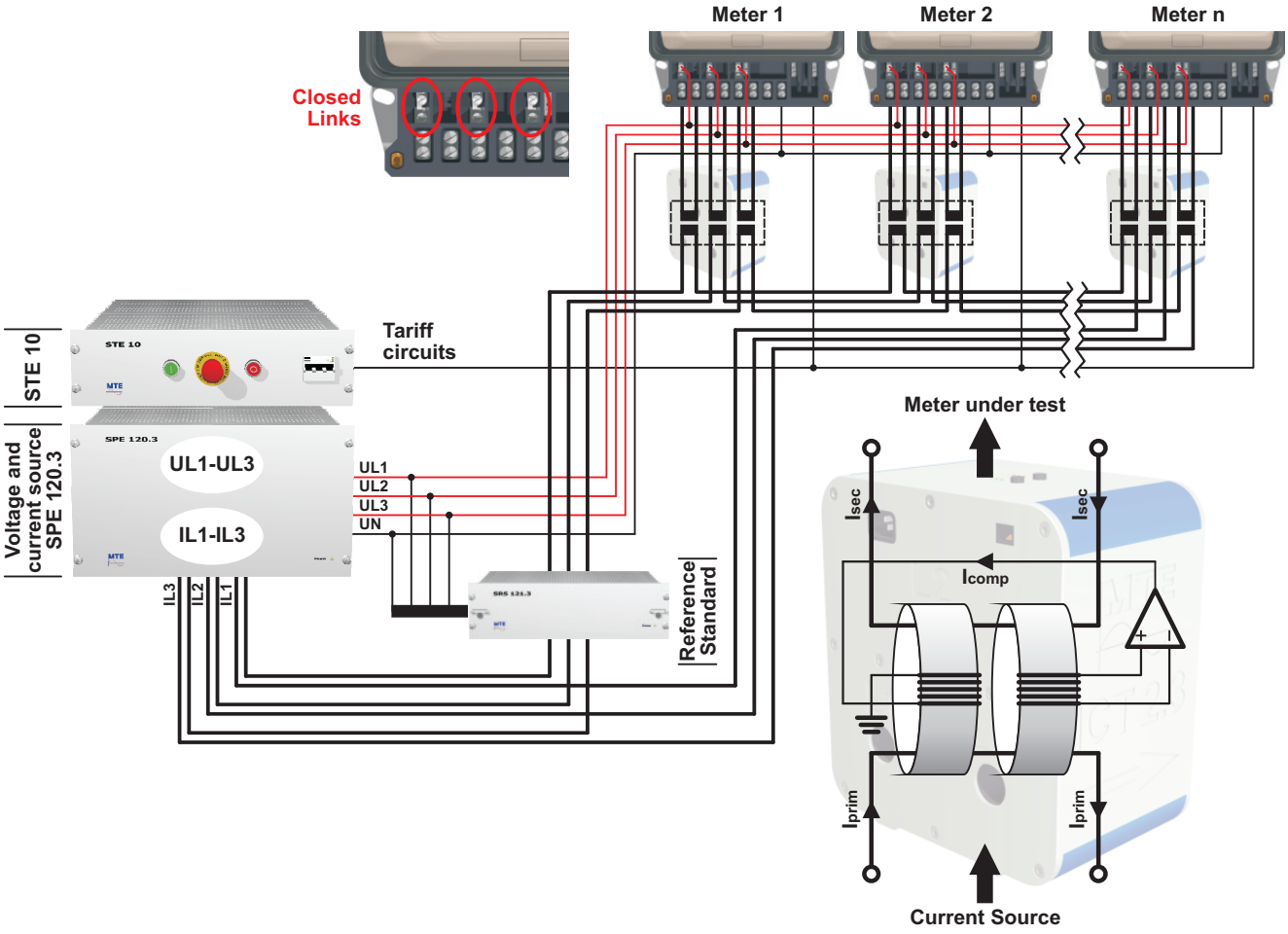
Current isolation for testing of multi-phase meters

The ICT 2.3 three-phase Isolation Current Transformer is used on multi position test benches for testing three-phase meters with closed links between the current and voltage measuring circuits (IP-links). Electronic meters with closed links are becoming increasingly common.

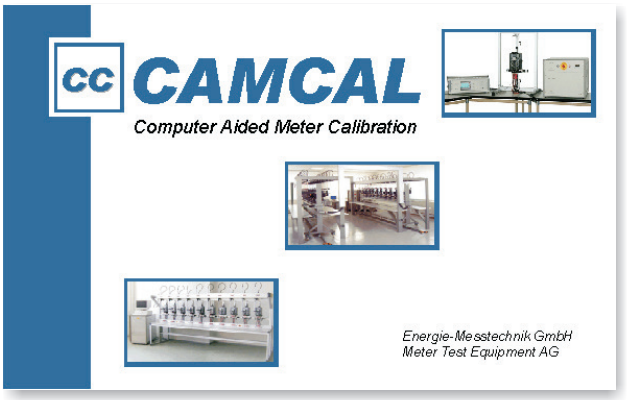
While testing meters with fix closed IP-links, unwanted connections between voltage and current path at each test position will cause significant accuracy reduction.

In this case transformers in the current circuit are required to decouple the voltage from the current path.

To achieve complete decoupling the test installation needs to be fitted with one current transformer per phase for each test position.



CAMCAL® for WINDOWS is a comprehensive software package designed to fulfil the requirements of the modern meter testing environment but also provides the flexibility to easily incorporate future meter testing requirements.



CAMCAL® for WINDOWS software allows the control of both static and portable meter test equipment, including the recording and evaluation of meter and measurement data.

CAMCAL® for WINDOWS software can be used throughout the meter test environment.

Tests can be carried out for simple or highly complex meters in accordance with the customer requirements and national / international test and calibration regulations (e.g. PTB, IEC, ANSI).

The user interface of the basic version shows all essential information required, therefore making the system easily understandable to operators with limited technical knowledge.

Advantages of CAMCAL® for Windows

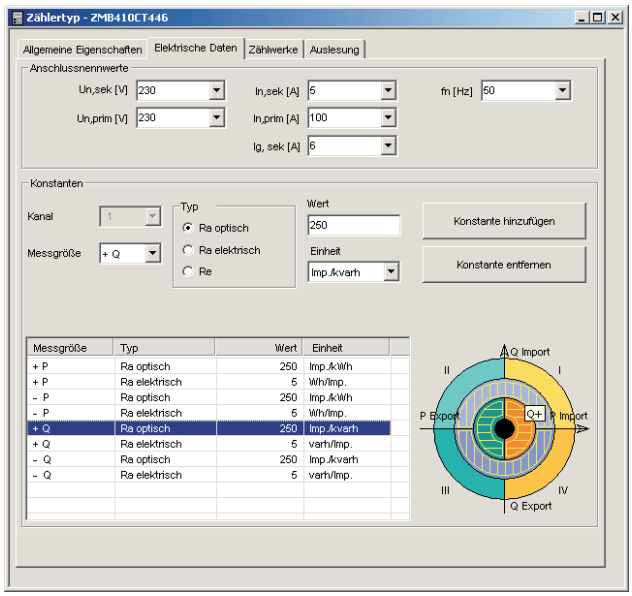
- User-friendly operation
- Database for meters and test sequences
- Fully-automatic test sequences for meter testing
- Transparent evaluation and presentation of results and statistics
- Suitable for use with various hardware combinations
- Modular system allows the integration of customer specific applications
- Operator interface available in several languages

Meter type description

The meter type description contains the electrical and functional definitions of meters under test (connection values, constants, registers, ...).

For the tariff device communication, a communication module is assigned to the meter types.

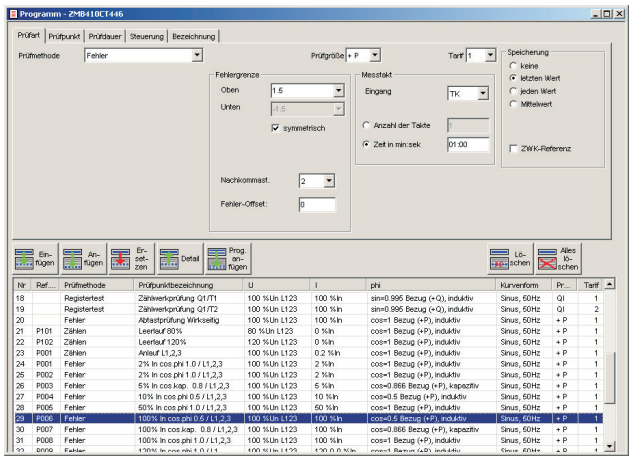
This defines the data to be selected or programmed plus the dispatching commands, adaptable by the customer, makes the fully automatic examination of high-functional meters and tariff devices possible.



The basic version supports the communication protocol in accordance with that described in the IEC 62056-21 Mode C standard. As an additional option the communication protocol is prepared according to dlms / COSEM.

Test sequence

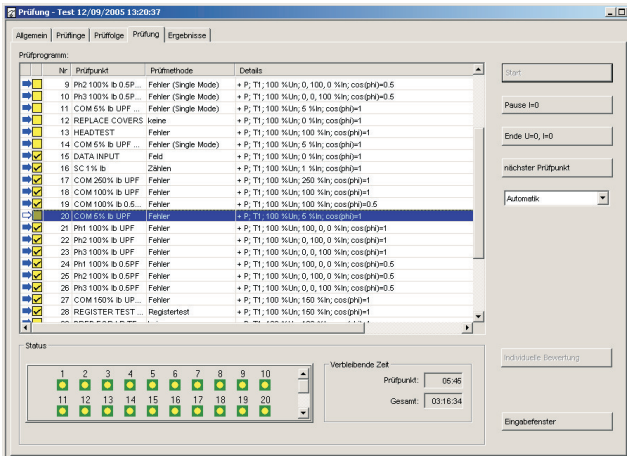
A test sequence describes the order and content of the various test steps in a sequence. For each test step the desired test quantities (current, voltage, phase angle, frequency, …) are specified.



In addition to the respective test method (e.g. error measurement, register tests, …) each checkpoint can be linked with control commands. Control commands display for instance instructions to the operator, switching of tariff relays or dispatching of commands e.g. to adjust time, …

Meter testing

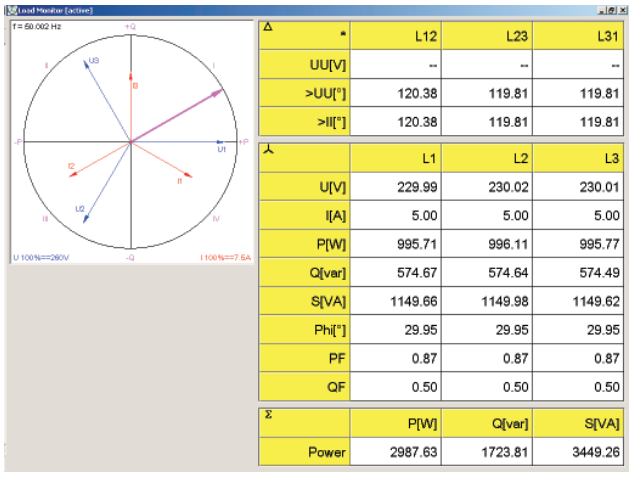
The user allocates to each active measurement position a meter type and selects a test sequence. Subsequently the user will comfortably be guided through the test. The actual status of the test and active test point is clearly indicated at all times.



It is possible to display simultaneously the actual test values and/or results in their own windows using large, easily visible fonts.

Results

After executing an automatic test sequence all saved results are available for further data processing, such as creating an individual test report or export to Excel tables. The results can also be viewed and evaluated directly using several sort criteria in the database.



Δ	L12	L23	L31
UU[V]	--	--	--
>UU[°]	120.38	119.81	119.81
>II[°]	120.38	119.81	119.81

⅄	L1	L2	L3
U[V]	229.99	230.02	230.01
I[A]	5.00	5.00	5.00
P[W]	995.71	996.11	995.77
Q[var]	574.67	574.64	574.49
S[VA]	1149.66	1149.98	1149.62
Phi[°]	29.95	29.95	29.95
PF	0.87	0.87	0.87
QF	0.50	0.50	0.50

Σ	P[W]	Q[var]	S[VA]
Power	2987.63	1723.81	3449.26

The CAMCAL Report Generator, enables the user to create and define there own protocol masks (calibration certificates, pass/fail reports, statistical reports, customer reports etc).

Furthermore the CAMCAL Report Generator has the flexibility to add to reports logos, diagrams and fields (e.g. for signatures) etc.

Additional standard functions of the CAMCAL® for Windows Software

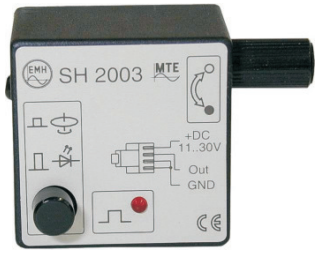
Testing of modern meters requires an adaptable and flexible software package. Because of its modular design, CAMCAL® for Windows covers this requirement.

CAMCAL® for Windows Software meets the following requirements:

- Modular extensions of semi-automatic and fully automatic systems are possible without extensive software adaptations
- Demonstration programmes allow training to be given before delivery of the test system
- Standardized meter type and test sequence definitions considerably reduce the need for extensive training and familiarisation
- Data export modules support data transfer to other systems
- The operator interface is available in many different languages
- Password protection is provided for different user levels
- Import and export function enable the easy transfer of meter types , test sequences, report protocol masks etc. between test systems or across sites or between manufacturers and customers for instance

Optional Software Modules

- Tariff device communication / dlms
- Generation of harmonics
- Tariff device testing with pulse transmitter
- Error compensation
- Generation of ripple control signals
- Generation of special test signals and wave forms according to IEC 62052-11
  IEC 62053-11/-21/-22



Scanning head SH 2003

The SH 2003 photoelectric scanning head is suitable for use with both LED impulses from static/electronic meters and also for detecing the marks on Ferraris/mechanical rotating disc meters, selectable via a switch. Due to its high performance and robust construction it is suitable for both stationary and portable test systems.

Scanning head SH 11 with integrated teach function

The SH 11 scanning head was especially designed for scanning of the marks on the rotating discs of Ferraris/mechanical meters or simulated disc marks on LCD displays plus the detection of light emitting diodes (LED's) of static/electronic meters. The choice of operation with mechanical or electronic meters is made by simple rotation of a selection switch. The manually sensibility set-up for the disc or LCD marks is not necessary.

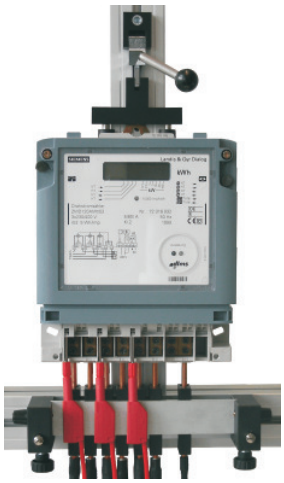
The optimal set-up is automatically learned by the integrated teach function, which can be activated by the rotary switch or an external control signal.

Scanning head carriages SHC 1.2 and SHC 2.2

The SHC range of scanning head carriages has been designed for use with the SH 2003 and SH 11 model scanning heads. The range is user friendly and offers a high degree of flexibility.

- Horizontal adjustment and scanning head fixing are built into each individual support position
- Depth adjustment has also been provided in order to adapt the scanning head to meters of diverse constructional depths
- Fast height adjustment by using the direct 'press-button' control
- There is a fine setting control, both in depth and height, for each version of the scanning head. Meters may be scanned from the side by simple rotation of the fine setting

Quick connection devices



Quick connection device QCD

This QCD quick connector may be used with current levels up to 80 A for long period testing, and with up to 100 A for short periods of time. The connector is available in three different versions, which may be used together with single and three phase meters.

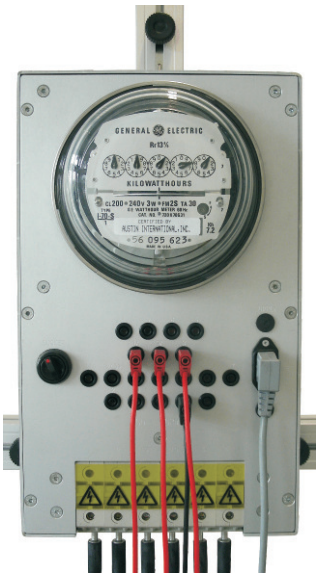
The QCD 3 I/U is constructed identically to the QCD 3 I, with the difference that the voltage connection is assured over a jumping finger contact system.

Quick connection device EMP 1.3

The EMP 1.3 Quick Connection Device is used together with Electricity Meter Test Systems, and is especially recommended for situations where the time factor is of importance.

Thanks to the universal construction of the EMP 1.3 quick connection device, it may be used for the support and connection of practically all types of electricity meters.

This EMP 1.3 quick connection device can be used with current levels up to 100 A testing, and even with the additional high current adapters up to 120 A.



Quick connection device QCD Form S

Due to its universal construction the QCD Form S Universal Quick Connection Device may be used for the support and connection of practically all types of self contained (direct connected) or transformer operated ANSI socket meters, including the most used Forms 1S, 2S, 3S, 4S, 5S, 6S, 8S, 9S, 12S, 13S, 14S, 15S, 16S, 17S.

This QCD Form S Universal Quick Connection Device can be used with current levels up to 200 A.

Hand Held Terminals

The HT 2010 wireless hand held terminal with an integrated bar code reader is designed for recording meter specific data at meter test systems.

Impulse Interface Adapter

The IMP-IF1 interface adapter is suitable to interface MTE reference standards with meters having retransmitting contacts, open-collector transistor outputs or true S0-outputs to allow full testing of meters with these types of outputs interfaces.

OKK optical communication head

The communication to sophisticated electronic tariff devices/meters is performed according to IEC61107 Mode C, using an OKK optical communication head.

The OKK is directly connected to the corresponding interface of the measuring module SMM 400.

Accessories for quick connection devices

- Adapter to electronic meters for fast connection of the measuring voltage
- Voltage contacts for transformer connected meters
- Customized meter templates for fast assembly of the quick connection device
- High current screw adapter for currents up to 120 A

The following MTE brochures are available:

Stationary Meter Test Systems:	Fixed Rack Systems / Gantry-Trolley System / Customized System
Comparator:	K2006
Portable Reference Standards:	PRS 400.3 / CALPORT 300
Portable Working Standards:	PWS 3.3 / PWS 2.3 PLUS
Portable Standard Meters:	CheckMeter 2.3 / CheckMeter 2.1
Portable Power Sources:	PPS 400.3 / PPS 3.3 C / CheckSource 2.3
Portable Test Systems:	PTS 2.3 C / PTS 3.1 C / PTS 3.3 C / PTS 400.3 / CheckSystem 2.1 / CheckSystem 2.3
Instrument Transformer Tester:	PTT 2.1
Transformer Monitoring Systems:	HYDROCAL 1001 / HYDROCAL 1003 / HYDROCAL 1005 / HYDROCAL 1008
Software:	CAMCAL for Windows / CALSOFT I / II

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