

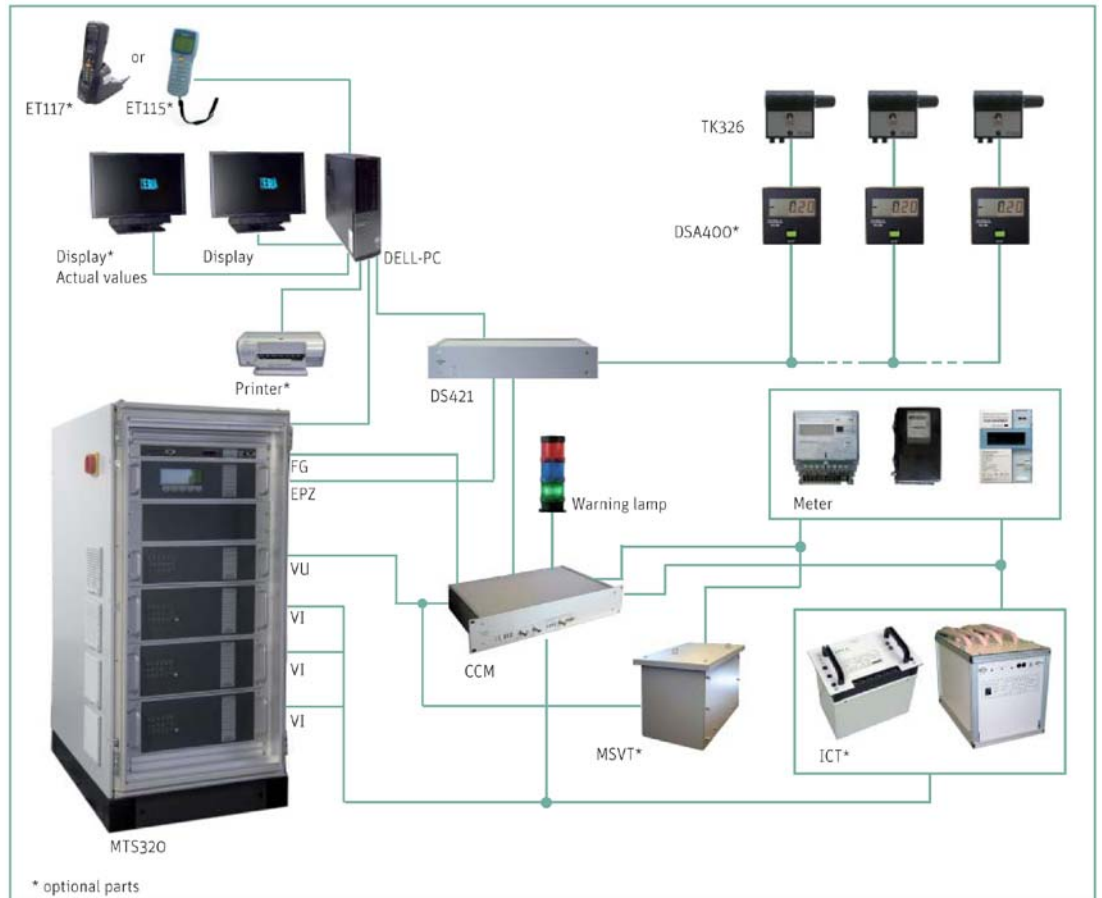
## MTS

### Stationary Meter Test Systems

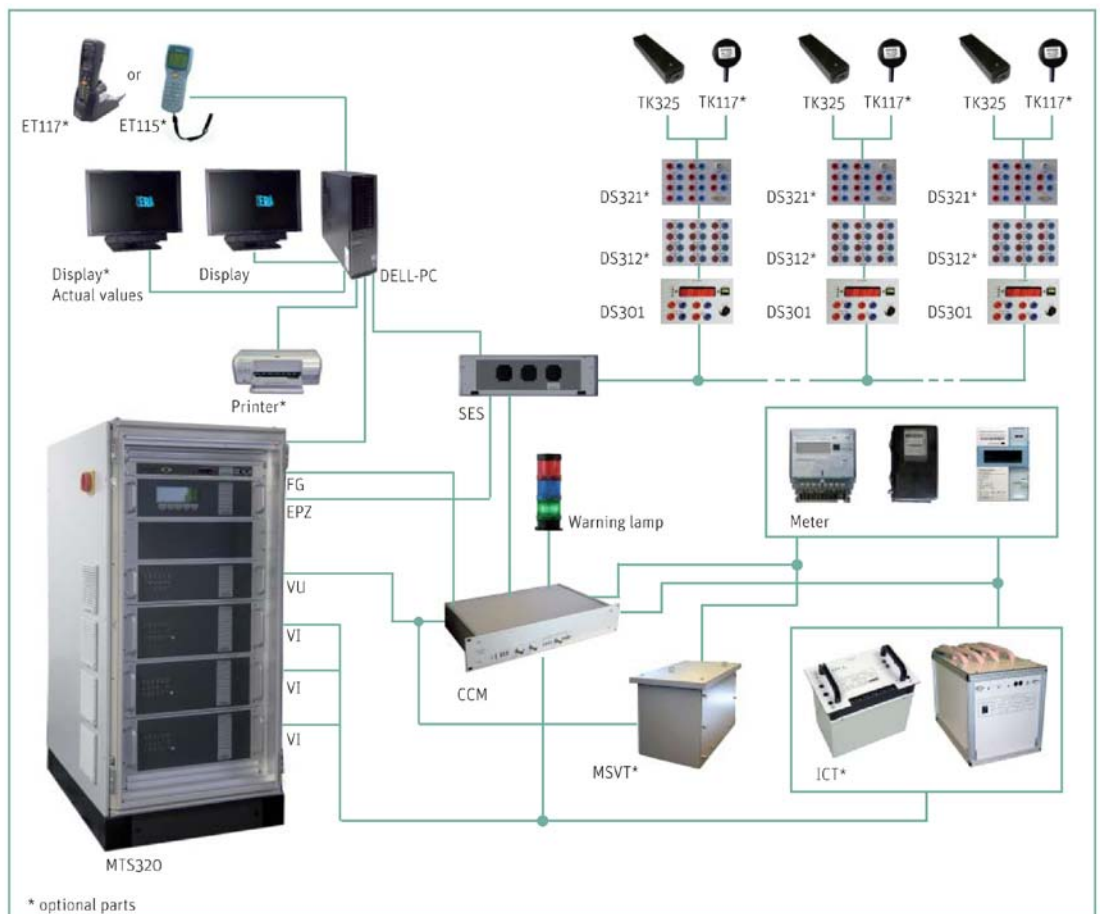


- Source Systems
- Amplifiers
- Reference Meters
- Error Calculators
- Scanning Heads
- Transformers

### Design of a Standard System



### Design of an Advanced System



### Our Competence

ZERA is your competent and reliable partner on the area of automated testing technology especially for the testing of electricity meters and working standards. Using modern technology and having more than 75 years of experience in the development and manufacturing of meter test systems and components, ZERA supplies customized systems to metrological institutes, test laboratories of energy provider and meter manufacturer all over the world.

ZERA equipment consists the latest power electronic developments, newest digital measurement engineering and system-control software solutions according to the actual standards. We supply complete system solutions as a single solution provider in the approved ZERA quality.



Due to this competence and experience as well as our situation in the market as an independent manufacturer of automated testing technology – but not as a meter manufacturer – ZERA becomes a partner of all major meter manufacturer around the world.

Already in the development stage of new electricity meter we are involved and can modify our test equipment to the earliest possible date to the newest requirements.

The modular test system, developed by ZERA allows customized configurations on the hardware, as well as the software side, individual adapted to your special test requirements. So you can act economical and future-proof.

The development of the multi-functional meters has increased demands for the test systems. ZERA's product range with a multiplicity of new developed products, represents an optimum in technological and in economic point of view.

Furthermore ZERA disposes likewise of an extensive experience for optimization and automation of test sequences as well as with the connectivity of the test systems to superior hierarchy data management systems (e.g. SAP, ISV, RIVA etc.).

Our modern test systems are suitable for economic testing of all types of meters as well as static meter of class 0.2. Measurements can be performed according to actual standards e.g. IEC, PTB, EN or other national standards.

The systems are equipped with a highly precise power generation, a static reference meter, powerful measuring electronic for error calculation, pulse processing and data communication as well as with universal meter suspensions and meter connecting devices. The modular test system, developed by ZERA and described on the following pages allows us to offer you an individual powerful system solution.






### The ZERA Power Source System

The product series MTS, developed by ZERA, is based on digital switch mode amplifier modules and allow the combination of the different amplifiers with the function generator FG301 to a MTS power source system. By this modular concept an upgrading or modification is possible all the time. The advantages of a ZERA power source system:

#### Advantages

- The digital function generator FG301 can be combined with all amplifier modules of the different power classes.
- To increase the output power amplifier modules can be cascaded.
- User-friendly by easy replacing of particular modules for system upgrading.
- Flexibility by combination of the function generator FG301 with different reference standard e.g. EPZ103, 303 and COM303/3000/3003.

By the use of most modern power electronics components the power source system of ZERA is characterized by an extremely compact design.

	MTS310	MTS320	MTS340
			
<b>U<sub>max</sub> (P-N)</b>	3 x 40 V ... 320 V	3 x 40 V ... 320 V	3 x 40 V... 480 V
<b>Power voltage</b>	3 x 500 VA	3 x 500 VA	3 x 1500 VA
<b>I<sub>max</sub></b>	1 mA ...120 A	1 mA ...120 A optional > 120 A	1 mA ...120 A optional > 120 A
<b>Power current</b>	3 x 600 VA	3 x 1500 VA	3 x 2000 VA
<b>Accuracy of the test setting amplitude</b>	0,05 %	0,05 %	0,05 %
<b>Accuracy of the test setting phase</b>	0,02°	0,02°	0,02°
<b>Stability of the test setting amplitude</b>	< 100 x 10 <sup>-6</sup> /h	< 100 x 10 <sup>-6</sup> /h optional < 50 x 10 <sup>-6</sup> /h	< 100 x 10 <sup>-6</sup> /h optional < 50 x 10 <sup>-6</sup> /h
<b>Temperature range</b>	+15° ... +35° C	+15° ... +35° C	+15° ... +35° C

### Generation of the test values

All components of the MTS power source system for generation of the test values are located in the source cabinet:

- Frequency generator for signal generation, actual value processing and digital i/o unit.
- Reference standard of class 0.02.
- Voltage amplifiers with integrated mains power supply unit.
- Current amplifiers with integrated mains power supply unit.

By the conception of the MTS series ZERA has attached importance to:

- Highest quality of the signals, minimal harmonic distortion.
- High stability and accuracy of the test values under all existing loads in the power factor range up to 0.25.
- High efficiency, free of mains distortions according to EN 60555/IEC 555 by power factor compensation.
- Designed for the generation of harmonics, ripple control signals and non-sinusoidal waveforms.

The digital switch mode amplifiers used in the MTS series fulfil all requirements of modern static power supply units.

### Frequency generator FG301-02



The frequency generator FG301-02 is the central unit of the MTS power source system. The FG301 generates the set values for the digital control of the amplifier modules, carries out the closed loop control of the test values and controls switching operations during the test procedure. Also the FG301 assumes special functions of the meter testing procedure e.g. dosage of power via a 32-bit dosage counter and measures the test frequency with a resolution of 1 Hz.

The FG301 offers the following applications:

- Independent superposition of harmonic components in each phase of test current and test voltage
- Curve shape frequency: very fast alternation between the curves
- Transmission of ripple control commands to verify the function of meters with incorporated ripple control receiver
- Phase control in the test current selectable in steps of 0.1°


The FG301 permits the control of up to 8 amplifiers, so that e.g. an independent auxiliary voltage amplifier is optionally available.

### Reference Standard and Source System

The wide range reference standard EPZ303 and EPZ103 developed by ZERA are used as working standards class 0.02 of the meter test system. The EPZ provides the power proportional output frequency as reference signal for the measuring system as well as the actual values of the test settings for the closed loop control on an external monitor.


The working standard is connected directly to the primary test circuit thus ensuring that the measuring accuracy of the complete system corresponds to the built in reference standard. The modern principle of measurement detects the analogue test signals by precision resistive dividers and carries out a 16-bit analogue digital conversion with 720 samples per period and measuring channel. The measured data is processed by signal processors which also carry out a "Discrete Fourier Transformation" (DFT) in order to register the DC parts and harmonics as well as highly accurate phase angle measurement of the test settings.

### Reference Standard

EPZ303		
		
Voltage measuring range	60 - 120 - 240 - 480 V	
Current measuring range	5 - 10 - 20 - 50 - 100 - 200 - 500 mA 1 - 2 - 5 - 10 - 20 - 50 - 100 - 200 A	
Accuracy (The accuracy is independent of the measuring mode! No additional error at reactive measurement.)	Voltage	< 0.01 %
	Current	< 0.01 %
	Power	< 0.02 %
	Phase angle	0.02 %

Optional the reference standard EPZ303 can be replaced by a comparator. By using comparator the accuracy of the complete system will be increase from 0.02 % to 0.01 %. The COM1003/3003 is optionally available in a DC variant.

### Comparator

COM1003/3003		
		
Voltage measuring range	60 - 120 - 240 - 480 V	
Current measuring range	5 - 10 - 20 - 50 - 100 - 200 - 500 mA 1 - 2 - 5 - 10 - 20 - 50 - 100 - 200 A	
Accuracy (The accuracy is independent of the measuring mode! No additional error at reactive measurement.)	Voltage	< $30 \times 10^{-6}$
	Voltage DC*	< $50 \times 10^{-6}$ (30 V ... 500 V)
	Current	< $50 \times 10^{-6}$ (50 mA ... 160 A)
	Current DC*	< $350 \times 10^{-6}$ (50 mA ... 160 A)
	Power and energy	< $80 \times 10^{-6}$ (50 mA ... 160 A)
	Power and energy DC*	< $400 \times 10^{-6}$ (50 mA ... 160 A)

\* Measuring is possible only with the DC variant.

### Stationary Meter Test Systems

Different test requirements in the range of electricity meter testing involve individual mechanical solutions with regard to the suspension and contacting of the meters under test. Our long term experience in the field of manufacturing meter test systems for special customer solutions has shown the way to the universal test systems. This cost-saving mechanical systems provide high flexibility very good mechanical stability, is quite user friendly and a long service life.

Thus to this modular concept an upgrading or expansion is possible every time. The customer can select between stationary and mobile test system solutions. For the selection of a test system for your special technical and economic test requirements we advise you gladly.

For special test requirements we can realize special customized designs, for position of the meter under test, scan positions, meter connection, data communication or handling.

### Basic System

Functional scanning head suspension, adjustable in all positions. The expansion possibilities of this kind of system are limited.



### Advanced System

Comfortable ball bearing suspension for scanning head, adjustable in all positions. The expansion possibilities of the measuring system are possible every time.



### Mobile Systems

Mobile test systems allow the separation of individual test procedures for testing of electricity meters. These are:

- Changing of the meters and insulation test.
- Pre-heating and/or start-up and low load test at a separate test station.
- Fully automatic testing of the electricity meters.

The fully automatic test procedure requires sophisticated measuring electronic at each test position. The ZERA's system concept offers an optimal use of the component capacity to reach high test capacities.



### Insulation Test System

The ZERA insulation test system presents adapted solutions for insulation testing of electricity meters and many other applications. The modules of the high-voltage source are 19"-rack compatible and can be combined with the available test compartments to fulfil special customer requirements.

The separate and high-voltage cabin HVC presents a separated closed test system and is designed for insulation testing of electricity meters, which mounted on movable meter racks.

The PK test cage presents a separated closed test system and is designed for isolation testing of individual electricity



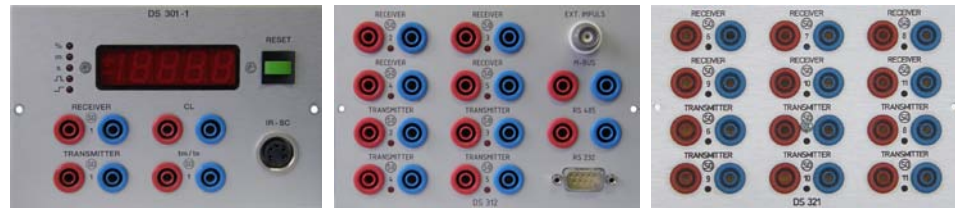


### The Measuring System

The new modular measuring systems are unique in terms of functions, easy operation and friendly of servicing. The system contains the control unit SES330 and different measuring modules from the DS-series for each meter test position. All measuring modules are electrically connected via a system bus to SES330 for the complete data transfer.

Depending on the customer demands for testing procedures, several measuring modules are available. Modules for simple error calculation as well as modules for testing of complex static meter with different data communication interfaces (RS232, RS485, M-bus, ...) and simultaneous connection of up to 11 pulse transmitter and 11 pulse receiver. A system upgrade with additional measuring modules is possible any time.

### Single Position Measuring Modules



DS301

DS312

DS321

The different single position measuring modules perform the error-measurement and displaying, tm/te-time measurement of demand meter contacts, testing of pulse transmitter or receiver and parallel data communication according IEC1107 via infrared-, 20mA-, RS232-, RS485- and M-bus-interface at all test positions.

### Scanning Heads



The scanning heads of the TK-series cover the complete requirement profile to modern scanning devices. Blue LEDs with a very large light intensity offer the best contrast for scanning of all kinds of meter LEDs and meter disks.

### Module AMV301



Pluggable AMV module

The built-in module AMV301 provides automatic rotor mark positioning of Ferraris meters discs. It will be connected via test voltage sockets at the operation panel of the test bench. For mobile systems a central module unit with AMV301 with direct wiring is connected to each meter position on mobile meter racks. This feature offers an enormous saving of time for the start-up and low load tests.

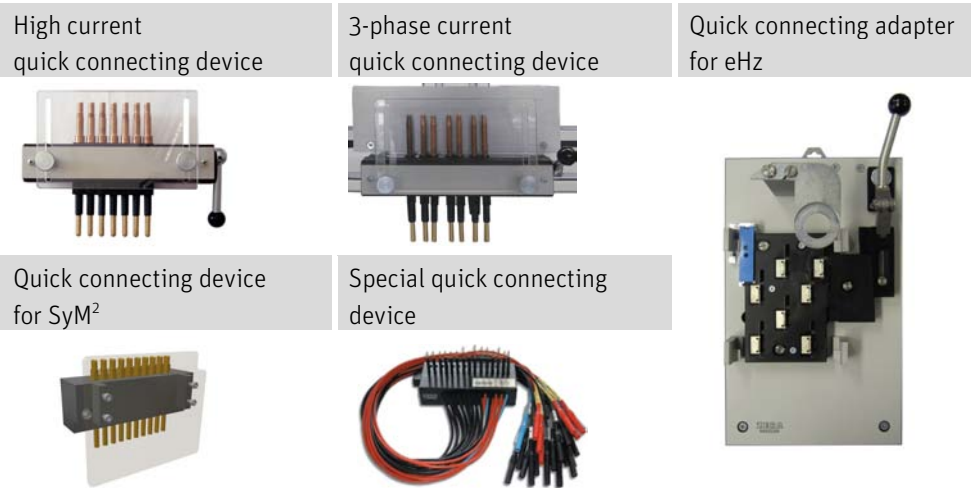
For an easy upgrade a pluggable module is optionally available.

### Mechanical Components

Due to the incrementally complexity of the electricity meters the preparation and connection time for meter testing is increasing. Additionally the possibility of wrong connection to the meter under test becomes higher. In the worst case this can destroy the meter or the measuring system of the test stand. After many requests of our customers ZERA has developed special quick acting adapters for different types of meters to optimize connection time and avoid wrong meter connections.

With quick acting adaptors it is possible to connect all auxiliary circuits and test voltage via contact pins to the meter under test.

### Quick Connecting Devices



### Handheld Terminal

The ET115 is a handheld input terminal for meter data like register values, serial number, etc. The functionality and software of ET115 has been adapted for high efficient performance with ZERA's Meter Test System. Input of data can be performed via numerical keypad or bar code scanner. Export of data from ET144 to the adapted control PC will be carried out by docking station via RS232 interface.

The ET117 serves for scanning of 2D codes, e. g. at highly complex DataMatrix meters. Data transfer to PC will be performed via Bluetooth.



### MSVT

The MSVT is used for isolating test voltage from test current. This is absolute required for the testing of single phase meters with closed voltage – current link. The voltage of secondary side is potential free without generating a short circuit. The MSVT is designed to be integrated in ZERA test systems. A modified version can also be used for existing meter test systems as upgrade or enhancement.



### ICT

The precision three phase isolated current transformers ICT123 and ICT200 are used for isolating test voltage from test current. This is absolute required for the testing of three phase meters with closed voltage-current link.

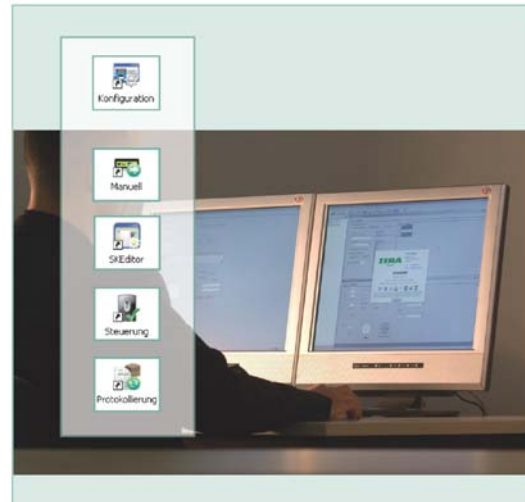
Certainly, A. C. meters with closed link can be tested with these ICTs in single-phase mode. Choose the model best suitable for your needs.



### WinSAM-Software for MeterTesting

Due to the fact that the operation and control of modern meter testing system is performed via PC and application software, modularity, functionality and easy handling for the operator is very important.

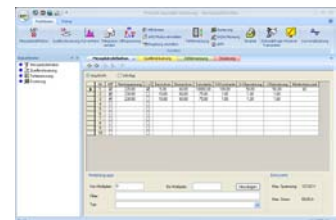
ZERA operation software WinSAM is suitable to fulfil all these customer demands.



For the development of WinSAM application software, ZERA has followed a new concept. From our experience and the fact that the meter development changed rapidly, WinSAM has a highly flexible modular structure which allows the operator to create own test sequences. This is very important because new features or functional improvements for new meter generations can be involved easily without changing the complete software. WinSAM represents a future orientated and highly future-proof part of ZERA Meter Test System.

### Manual Mode

The manual mode allows the manual control and operation of the entire test equipment. Direct execution of single test steps can be performed without need to integrate these into an entire test sequences. It offers an ideal solution for tests and evaluation of entire specifications for meter under test without generating test sequences.



### Editor

Editor for automatically control: With this feature an automatic test sequence can be created individual in dependence on meter under test. If the user starts this test sequence in automatic control mode, all predefined tests will be processed automatically.



### Automated Test Sequence

The system will follow the complete test sequence automatically and requires no more additional handling by operator unless it will not be defined in the test sequence (for example manual input of register value from Ferraris Meters by operator).



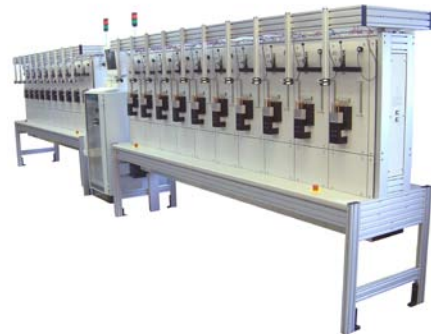
### Special Test Systems

As a traditional and long experienced supplier of test applications for meter manufacturer ZERA is a competent partner for test requirements in special test systems, as well as the integration of test systems in industrial manufacturing processes from our customers.

Fully automatic meter test system integrated in a computer processed tool carrier system.



Automatic test system for quality assurance for meter manufacture. The meters are supplied by an automatic tool carrier to the test system.



Manual function test system for meters with different designs.



Fully automatic laboratory calibration system for the testing of working and reference standards. With the integrated 3-phase power comparator COM3003 the system can calibrate the test devices with an accuracy of  $<0.01\%$  in the power measurement. The system performs an excellent long time stability of  $< 30 \times 10^{-6}/\text{year}$ .

