

## Moving Test - MT3000

Three-Phase Portable Test System



Keep ahead with Modular Design

### The Modular Concept

The MT3000 is based on a real modular design concept to provide the greatest possible flexibility for a comprehensive testing of metering installations in the field.

The stable casing made of aluminium frames looks appealing and support the functionality of the system. A coloured 10.4" TFT display visualize the high quality of the system.

The MT3000 system is distinguished by its excellent menu guided operation via the built in soft-keys and the coloured 10.4" TFT-display.



MT3000 Test System

Because of the real modular design concept the system comprises of various interchangeable modules to configure the system individually according to customer requirements. A system upgrade by adding various modules with new functionality can be easily done at any time without opening the calibration seal.

The protection of designs has been registered under approval No. 20111830.0.

### Features

- A consistently modular design allows a system upgrade at any time
- Excellent user-guidance
- Many configuration possibilities by adding various modules
- Unique long-term and temperature stability of the measuring module
- Measurement is also possible via error compensated Clip-on CT modules up to 120 A
- Extendable Compact-Flash-Memory for measurement results and customer data
- Windows based data management software MTVis for evaluation of the test results
- Current measurement up to 10000 A by using a required current sensor
- No additional error for reactive measurement
- Automatic meter testing without external PC
- External control via PC by using the Windows control software WinSAM

### Functions

The MT3000 Portable Test System is designed for the following applications:

- Testing of energy meters for accuracy classes 0.2s, 0.2, 0.5, 1 and 2 for 2-wire, 3-wire and 4-wire circuits
- Power and energy measurement of active, reactive and apparent energy
- 4 quadrant measurement
- Frequency-, phase angle- and power factor measurement
- Harmonic waveform analysis for voltage and current up to the 40<sup>th</sup> THD
- Harmonic analysis through selective power measurement
- Vector diagram display
- Waveform display
- Rotary field display
- Operating burden measurement on instrument transformers for CT and PT
- Ratio test on PTs and CTs by simultaneous measurement of both primary and secondary values in CT connected metering systems
- Testing of voltage, current and power transducers
- Free programmable load point settings for voltage and current generation
- Programmable phase shift control from 0 ... 360°

## Functions

- Programmable waveform generation for voltage and current
- Generation up to the 20<sup>th</sup> harmonic in voltage and current
- Programmable frequency
- Programmable balance and unbalance load
- Energy dosage
- Meter reading via IR-Flag probe, Current loop, RS232, RS485 and M-Bus interface
- Simultaneous testing of up to 11 pulse outputs of the meter under test

## Data-Management

For later download on a PC the operator can store all measuring values on a Compact-Flash-Memory-Card. The data management software MTVis provides the ability to transfer the data between PC and MT3000 on a bi-directional way.

For data representation, the operator can print all results in a test report.

## Possible Combinations

The Portable Test System can be configured according to customer requirements.

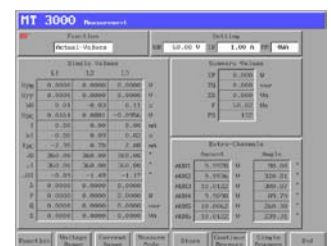
- Power Source and Reference System as separate units.
- Power Source and Reference System combined in one unit.



## Actual Values Measurement

All instantaneous values are displayed simultaneously.

- RMS values for AC and DC components of all voltages and currents phases
- All phase angles between voltage and current
- Active, reactive and apparent power
- Frequency and phase rotation
- Power factor (cos  $\varphi$ )



## Vector Display

The coloured vector diagram display for voltage and current makes it very easy to detect wiring faults in voltage and current circuits.

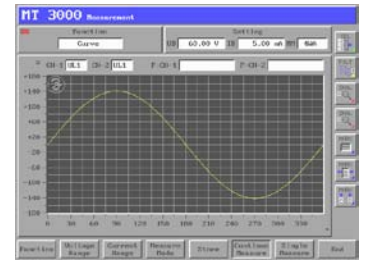
All measured values can be stored on the Compact-Flash-Memory according to the customer information data.



## Waveform Display

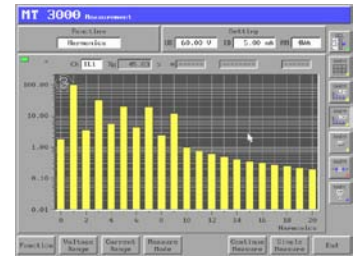
The waveform display for voltage and current serves for analysing of the signal quality. Two channels can be measured and displayed simultaneously. The measured waveform can be stored according to the customer information data on the memory card.

This function provides also the ability to scan the measured signal by using two cursors and to display the scanned values referring to the cursor position on the screen.



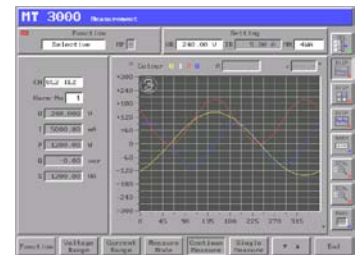
## Harmonic Measurement

Harmonic spectrum measurement in voltage and current up to the 40<sup>th</sup> THD conforming to EN50160. The harmonic spectrum can be displayed in a chart or in a diagram. All measured harmonic values can be stored according to the customer information data on the Compact-Flash-Memory. The system has also the ability to scan the measured harmonic by using a cursor and to display the scanned values referring to the cursor position on the screen.



## Selective Power Measurement

The selective power measurement serves for analysing of specific harmonics measured in the voltage and current circuit. The system can display the voltage, current and power values of the selected measuring channel as numeric values, wave forms and vector diagram. All wave forms can be scanned by using a cursor and the numeric value of the specific cursor position is displayed on the screen.



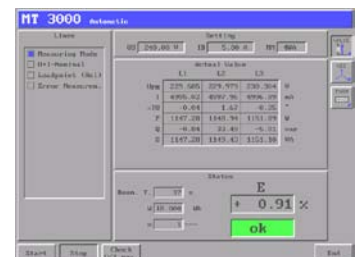
## Error Measurement

By entering of all relevant parameter like meter constant and the number of pulses the system can perform the error measurement on electricity meters. The system is able to determine the percentage error including all statistical values to store it according to the customer information data. In order to inform the operator about the status of the measurement a graph bar will indicate continuously the measured energy as well as the detected metrology pulses from the unit under test.



## Automatic Operation

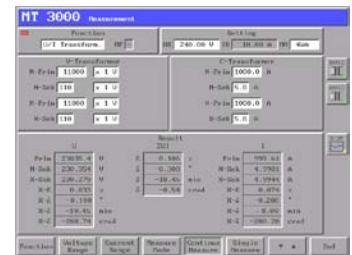
By using predefined test routines the MT3000 system will lead through the automatic meter testing without any external PC.



### Transformer Testing

For verification of the load on an instrument transformer in a metering installation the MT3000 system is equipped with a feature to measure the operating burden as well as the ratio on voltage and current transformers. Beside the determined conductance and resistance of a transformer the unit display also the ratio, errors and phase angles between primary and secondary side of a transformer.

All measured results can be stored according to customer information data on the Compact-Flash-Memory.



### Load Point Settings

The test system is providing an individual load point programming to simulate the load.

- The voltage and as well as the current generation facilities can be programmed independently from each other.
- Power factor programming between voltage and current circuit
- Phase angle programming between the voltage and current phases from 0 to 360°
- Test frequency setting from synthetic or synchronized to the mains
- All values are shown numeric and graphic in a vector diagram
- The generated values are stabilized by digital feedback control



### Energy Dosage

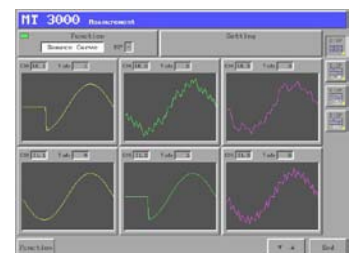
The source dosage menu serves for a defined energy programming. The operator can control the energy dosage manually by pressing the push buttons at the soft-key terminal.



### Waveform Programming

The MT3000 Test System is providing an individual programming of the waveform signals independently from each other.

All programmed waveforms can be stored for further processing. With the harmonic generation tool it is possible to program a customized harmonic spectrum in voltage and current up to the 20<sup>th</sup> harmonic. Also a programmable phase shift control is possible. All de-fined waveforms can be displayed as single curve or as overview of various waveforms.



### Accessories

#### Transport Case

Rigid and stable trolley transport case with wheels and an inlay made of foamed plastic.

For a secure transport of the MT3000 unit including accessories such as cable set, photo electric scanning head, AC-current clamps.



#### DakKS- Calibration Certificate

DakKS-calibration certificate of the MT3000 system is traceable to international standards.



#### Quick Connection Cable Set

The quick connection cable set serves for an easy connection of the voltage and current measuring circuit. The quick connecting cable set has been especially designed to minimize the risk of wiring faults and to speed up the preparations for the measurement in the field.



#### Photo Electric Scanning Head

The photo electric scanning head TK326 serves for detection of flashing LEDs on a static meter or rotor disc of electromechanical meters. The holding facility is especially designed for mounting on various meter housings with different shapes in the field.



#### Infrared Data Scanning Head

With the magnetic infrared data head TK117 it is possible either to detect metrology pulses from a flashing LED or to read the internal data of a static meter



### Testing of Transducers

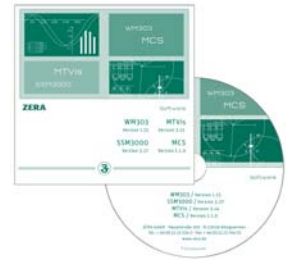
With the additional module MT3303 it is possible to test various types of measuring transducer. The MT3303 is equipped with six free programmable DC-measurement inputs. Each of them can measure up to  $\pm 10$  Volts and currents up to  $\pm 20$  mA with an accuracy of  $< 0.1$  %. All primary and secondary values are simultaneously displayed on the screen.



### Windows Control Software

By using the windows based control software SSM3000 the MT3000 system can be controlled by an external PC.

For later evaluation or report printing the measuring results will be stored in the internal data base.



### Error Compensated AC current clamps up to 120 A

The MT3422 are error compensated AC current clamps for current measurements up to 120 A and can be used as extension of the measuring range for the MT3000 system. It can be re-calibrated independently from the MT3000 unit because all calibration data are stored internally in a chip. A calibration report traceable to international standards belongs to the MT3422.



### High Current Clamps up to 1000 A

The MT3403 are current clamps for current measurements up to 1000 A. It serves especially for clamping on thick cables with a diameter of up to 53 mm.

The clip-on CT adapter MT3403 can be used as extension of the measuring range on the MT3000 system.



### Flexible Current Sensor up to 10000 A

The MT3404 is a flexible current sensor for current measurements up to 10000 A on cables, bars and cores.

The flexible current sensor MT3404 can be used as extension of the measuring range on the MT3000 system.



## Technical Data

	MT3000 Portable Test System	MT3301 Class 0.02	MT3302 Class 0.05
<b>General</b>			
Power supply	85 ... 265 VAC, 47... 63 Hz	85 ... 265 VAC, 47... 63 Hz	85 ... 265 VAC, 47... 63 Hz
Power consumption	max. 550 VA (12 A system) max. 1250 VA (120 A system)	max. 550 VA (12 A system) max. 1250 VA (120 A system)	max. 550 VA (12 A system) max. 1250 VA (120 A system)
Temperature range, operation	-10° ... +50° C	-10° ... +50° C	-10° ... +50° C
Temperature range, storage	-15° ... +65° C	-15° ... +65° C	-15° ... +65° C
Relative humidity (not condensing)	max. 95 %	max. 95 %	max. 95 %
Dimensions (DxWxH)	448 x 321 x 310 mm (S)* 448 x 321 x 168 mm (RS)* 448 x 321 x 310 mm (B)* 448 x 321 x 454 mm (RM&S)*	448 x 321 x 310 mm (S)* 448 x 321 x 168 mm (RS)* 448 x 321 x 310 mm (B)* 448 x 321 x 454 mm (RM&S)*	448 x 321 x 310 mm (S)* 448 x 321 x 168 mm (RS)* 448 x 321 x 310 mm (B)* 448 x 321 x 454 mm (RM&S)*
Weight	~ 16 kg (S)* ~ 8 kg (RS)* ~ 25 kg (B)* ~ 24 kg (RM&S)*	~ 16 kg (S)* ~ 8 kg (RS)* ~ 25 kg (B)* ~ 24 kg (RM&S)*	~ 16 kg (S)* ~ 8 kg (RS)* ~ 25 kg (B)* ~ 24 kg (RM&S)*
<b>Safety</b>			
IP class according to DIN EN 60529	IP30	IP30	IP30
Declaration of conformity	CE conform	CE conform	CE conform
Protection class according to DIN EN 61140	I	I	I
<b>Reference meter</b>			
Measuring modes	2WA / 2WR / 2WAP 3WA / 3WR / 3WRCA / 3WRCB / 3WAP 4WA / 4WAb / 4WR / 4WRb / 4WRC / 4WAP / 4WAPb		
Fundamental frequency	15... 70 Hz		
Bandwidth	DC ... 3000 Hz		
Sampling	16 bit 504 samples/period		
Accuracy class for measuring of power / energy	0.02		0.05
Angle measurement accuracy 3) 4) 11)	< 0.01°		
Frequency measurement deviation	± 0.01 Hz		
<b>Voltage Measurement</b>			
Voltage measurement	40 mV... 300 V ≈		
Voltage range(s)	2 V, 15 V, 60 V, 125 V, 250 V		
Voltage measurement accuracy 5)	< 0.01 % @ 30V .. 300 V (AC) < 0.1 % @ 30 V .. 300 V (DC)		< 0.02 % @ 30V .. 300 V (AC) < 0.1 % @ 30 V .. 300 V (DC)
Voltage measurement temperature drift 3)	< 3 x 10 E-6 / K		< 6 x 10 E-6 / K
Voltage measurement stability 1) 3) 11)	< 25 x 10 E-6		< 50 x 10 E-6
Voltage measurement long term stability 2) 3) 11)	< 40 x 10 E-6 / Year		< 80 x 10 E-6 / Year
<b>Current measurement</b>			
Current measurement	4 mA ... 12 A ≈		
Current range(s)	25 mA, 50 mA, 100 mA, 250 mA, 500 mA 1 A, 2.5 A, 5 A, 10 A		
Current measurement accuracy 5)	< 0.01 % @ 20 mA...12 A (AC) < 0.1 % @ 4 mA... < 20 mA (AC) < 1 % @ 20 mA...12 A (DC)		< 0.02 % @ 20 mA...12 A (AC) < 0.2 % @ 4 mA... < 20 mA (AC) < 1 % @ 20 mA...12 A (DC)
Current measurement temperature drift	< 2 x 10 E-6 / K @ 20 mA... 12 A (AC) < 0.025 % / K @ 20 mA... 12 A (DC)		< 4 x 10 E-6 / K @ 20 mA... 12 A (AC) < 0.025 % / K @ 20 mA... 12 A (DC)
Current measurement stability 1) 4) 11)	< 35 x 10 E-6		< 70 x 10 E-6
Current measurement long term stability 2) 4) 11)	< 40 x 10 E-6 / Year		< 80 x 10 E-6 / Year
<b>Power Measurement</b>			
Power/energy measurement accuracy 3) 4) 5) 11)	< 0.02 %		< 0.05 %
Power/energy measurement temperature drift 3) 4) 11)	< 5 x 10 E-6 / K		< 10 x 10 E-6 / K
Power/energy measurement stability 1) 3) 4) 11)	< 60 x 10 E-6		< 120 x 10 E-6
Power/energy measurement long term stability 2) 3) 4) 11)	< 80 x 10 E-6 / Year		< 160 x 10 E-6 / Year
<b>Source</b>			
Voltage min. max.	40 V ... 300 V		40 V ... 300 V
Voltage distortion	< 0.5 %		< 0.5 %
Voltage max. output power	30 VA		30 VA
Voltage accuracy <sup>3</sup>	< 0.02 % + X <sup>6</sup>		< 0.02 % + X <sup>6</sup>
Current min. max.	1 mA ... 12 A 1 mA ... 120 A (with Booster)		1 mA ... 12 A 1 mA ... 120 A (with Booster)
Current distortion	< 0.5 % (100 mA ... 12 A) < 1.5 % (>12 A ... 120 A) (with Booster)		< 0.5 % (100 mA ... 12 A) < 1.5 % (>12 A ... 120 A) (with Booster)
Current max. output power	30 VA 150 VA (with Booster)		30 VA 150 VA (with Booster)
Current accuracy <sup>4</sup>	< 0.02 % + Y <sup>6</sup>		< 0.02 % + Y <sup>6</sup>

Version: 3<sup>rd</sup> September 2013

- 1 Stability over 1 hour (every minute one measurement with  $t_i=10$  s)
- 2 Stability over 1 hour (every minute one measurement with  $t_i=10$  s)
- 3 From 30 V ... 300 V
- 4 From 20 mA ... 12 A
- 5 Related to the read value with optimal range selection
- 6 X = voltage accuracy of reference meter – Y current accuracy of reference meter
- 11 From 45 Hz ... 65 Hz

\* **Abbreviations:**

S - Source                      RS – Reference system  
B – Booster(module)        RM&S – Reference meter & Source