

## Moving Test - MT3000

Three-Phase Reference Standard



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 supports the functionality of the system. A coloured 10.4" TFT display visualizes 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.

Because of the real modular design concept the MT3000 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
- Voltage measurement up to 40000 V by using a high voltage stick
- No additional error for reactive measurement

### Functions

The MT3000 Reference Standard supports the following functions:

- Energy meter testing of the 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
- Waveform sampling and displaying
- Vector diagram 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

### Data Management

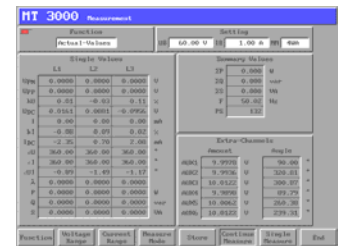
For later download on a PC the operator can store all measuring values on a Compact-Flash-Memory-Card. The data management software MTVis provides the ability to transfer the data between PC and MT3000 on a bi-directional way.

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

## 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.

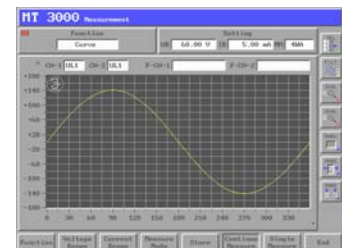
All measured values can be stored on the Compact-Flash-Memory according to customer information data.



## Waveform Display

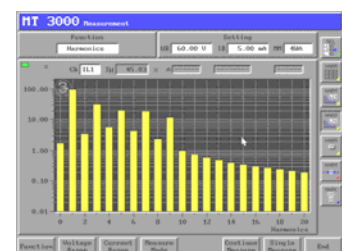
The waveform display for voltage and current serves for analysing of the signal quality. Two channels can be measured and displayed simultaneously. The measured waveform can be stored according to the customer information data on the memory card.

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.



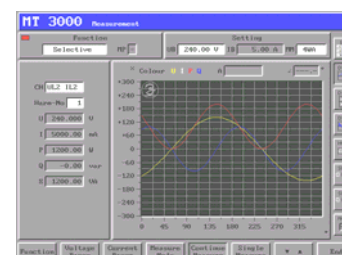
## Harmonic Measurement

Harmonic spectrum measurement in voltage and current up to the 40<sup>th</sup> THD conforming to EN 50160. 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.





### 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.



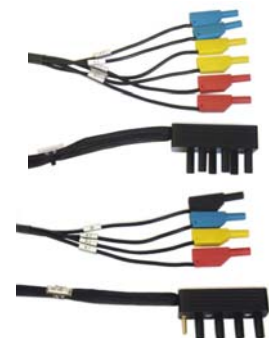
#### DKD Calibration Certificate

DKD-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 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.





### High Current Clamps up to 1000 A

The MT3403 is a clip-on CT adapter 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 Clamp up to 10000 A

The MT3404 is a flexible measuring adapter 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.



### High Voltage Stick up to 40000 V

The MT3405 is a measuring adapter for primary voltage measurements on power transmission lines up to 40 kV.

The high-voltage measuring sensor MT3405 can be used as extension of the measuring range on the MT3000 system.



### High Current Stick up to 2000 A

The MT3406 is a measuring adapter for primary current measurements on power transmission lines up to 2000 A.

The high-current measuring sensor MT3406 can be used as extension of the measuring range on the MT3000 system.



### Options

- Three-phase transformer ratio testing prim/sec *(MT3303 required)*
- Single-phase current measurement direct up to 120 A cl. 0.02 *(MT3304 required)*
- Three-phase current measurement direct up to 120 A cl. 0.02 *(MT3305 required)*
- Error compensated clip-on CT for 12 A measurement *(MT3401 required)*
- Error compensated clip-on CT for 120 A measurement *(MT3402 required)*
- Clip-on CT for 1000 A measurement *(MT3403 required)*
- Flexible current sensor for 10000 A measurement *(MT3404 required)*
- High voltage stick for 40000 V primary measurement *(MT3405 required)*
- High current stick for 2000 A primary measurement *(MT3406 required)*
- VCS320 power source control *(MT3605 required)*
- Meter reading according to IEC110 *(TK117 required)*
- Photo electric scanning head *(TK326 required)*

### Technical Data

MT3000 Reference Standard	MT3301 Class 0.02	MT3302 Class 0.05
<b>General</b>		
Power supply	85 ... 132 VAC / 170 ... 265 VAC, 47... 63 Hz	85 ... 132 VAC / 170 ... 265 VAC, 47... 63 Hz
Power consumption	approx. 50 VA	approx. 50 VA
Temperature range	0° ... 45° C	0° ... 45° C
Rel. Humidity, not condensing	max. 95 %	max. 95 %
Max. dimensions (HxWxD)	448 x 321 x 168 mm	448 x 321 x 168 mm
Weight	approx. 9 kg	approx. 9 kg
<b>Reference Meter</b>		
Measuring modes	4 wire active, reactive true, reactive cc, apparent 3 wire active, reactive true, reactive cc A and B 2 wire active, reactive true, apparent	4 wire active, reactive true, reactive cc, apparent 3 wire active, reactive true, reactive cc A and B 2 wire active, reactive true, apparent
Fundamental frequency	15 ... 70 Hz	15 ... 70 Hz
Bandwidth	DC ... 3 kHz	DC ... 3 kHz
Accuracy class rating according to PTB for measuring of power and energy. <i>Independent of the measuring mode</i>	0.02	0.05
Voltage measurement	40 mV <sup>6</sup> ... 300 V	40 mV <sup>7</sup> ... 300 V
Voltage ranges	2 - 15 - 60 - 125 - 250 V	2 - 15 - 60 - 125 - 250 V
Voltage measurement accuracy <sup>3 4</sup>	< 0.01 % for AC measurement < 0.1 % for DC measurement <sup>8</sup>	< 0.02 % for AC measurement < 0.1 % for DC measurement <sup>8</sup>
Voltage temperature drift <sup>3</sup>	< 3 x 10 <sup>-6</sup> /K (for AC measurement)	< 6 x 10 <sup>-6</sup> /K (for AC measurement)
Voltage measurement stability <sup>1 3</sup>	< 25 x 10 <sup>-6</sup> (for AC measurement)	< 50 x 10 <sup>-6</sup> (for AC measurement)
Voltage measurement long term drift <sup>2 3</sup>	< 40 x 10 <sup>-6</sup> /year	< 80 x 10 <sup>-6</sup> /year
Current measurement	4 mA ... 12 A	4 mA ... 12 A
Current ranges	25 - 50 - 100 - 250 - 500 mA 1 - 2.5 - 5 - 10 A	25 - 50 - 100 - 250 - 500 mA 1 - 2.5 - 5 - 10 A
Current measurement accuracy <sup>4</sup>	< 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 <sup>4</sup>	< 2 x 10 <sup>-6</sup> /K AC < 0,025 %/K DC	< 4 x 10 <sup>-6</sup> /K AC < 0,025 %/K DC
Current measurement stability <sup>1 3</sup>	< 35 x 10 <sup>-6</sup>	< 70 x 10 <sup>-6</sup>
Current measurement long term drift <sup>2 4</sup>	< 40 x 10 <sup>-6</sup> /year	< 80 x 10 <sup>-6</sup> /year
Phase angle measurement error <sup>3 4</sup>	< 0.01°	< 0.02°
Frequency measurement error	< 0.01 Hz	< 0.01 Hz
Harmonic measurement accuracy <sup>7</sup>	< 0.1 %	< 0.2 %
Power/energy measurement accuracy <sup>3 4</sup>	< 0.02 %	< 0.05 %
Power/energy temperature drift <sup>3 4</sup>	< 5 x 10 <sup>-6</sup> /K	< 10 x 10 <sup>-6</sup> /K
Power/energy measurement stability <sup>1 3</sup>	< 60 x 10 <sup>-6</sup>	< 120 x 10 <sup>-6</sup>
Power/energy long term drift <sup>2 3 4</sup>	< 80 x 10 <sup>-6</sup> /year	< 160 x 10 <sup>-6</sup> /year

Subjects to alteration.  
Status: 11<sup>th</sup> May 2010

1 Stability over one hour (every minute one measurement with  $t_i = 10$  s)

2 Stability over one year (every month one measurement with  $t_i = 10$  s)

3 in the range of 30 V ... 300 V and/ or 20 mA ... 12 A

4 related to the measured value

5 depending on the current program version

6 < 100 mV only for frequencies > 48 Hz

7 up to 20. harmonics

8 by not adjusted offset