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Reference standards and meter test systems

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A specifically designed programme for

Da Afghanistan Breshna Sherkat (DABS)
Afghanistan

Meter Test Equipment and related standards

Why meter testing is required for Utilities?

- Acceptance testing of meters
- Testing of samples for routine or type test
- Periodic re-certification
- Certification in case of disputes

Applicable standards on MTE

- IEC 60736....(1982): Testing equipment for electrical energy meters
- These shall be read along with relevant metering standard like i.e. IEC62053-21,22,23
 - For various definitions
 - Acceptable limits
 - Test conditions

Scope of IEC60736

- This standard is applicable to three-phase and/or single-phase equipment for type, routine and acceptance testing of electrical energy meters of Classes 0.2, 0.5, 1 and 2.
- This includes requirements for portable meter test equipment

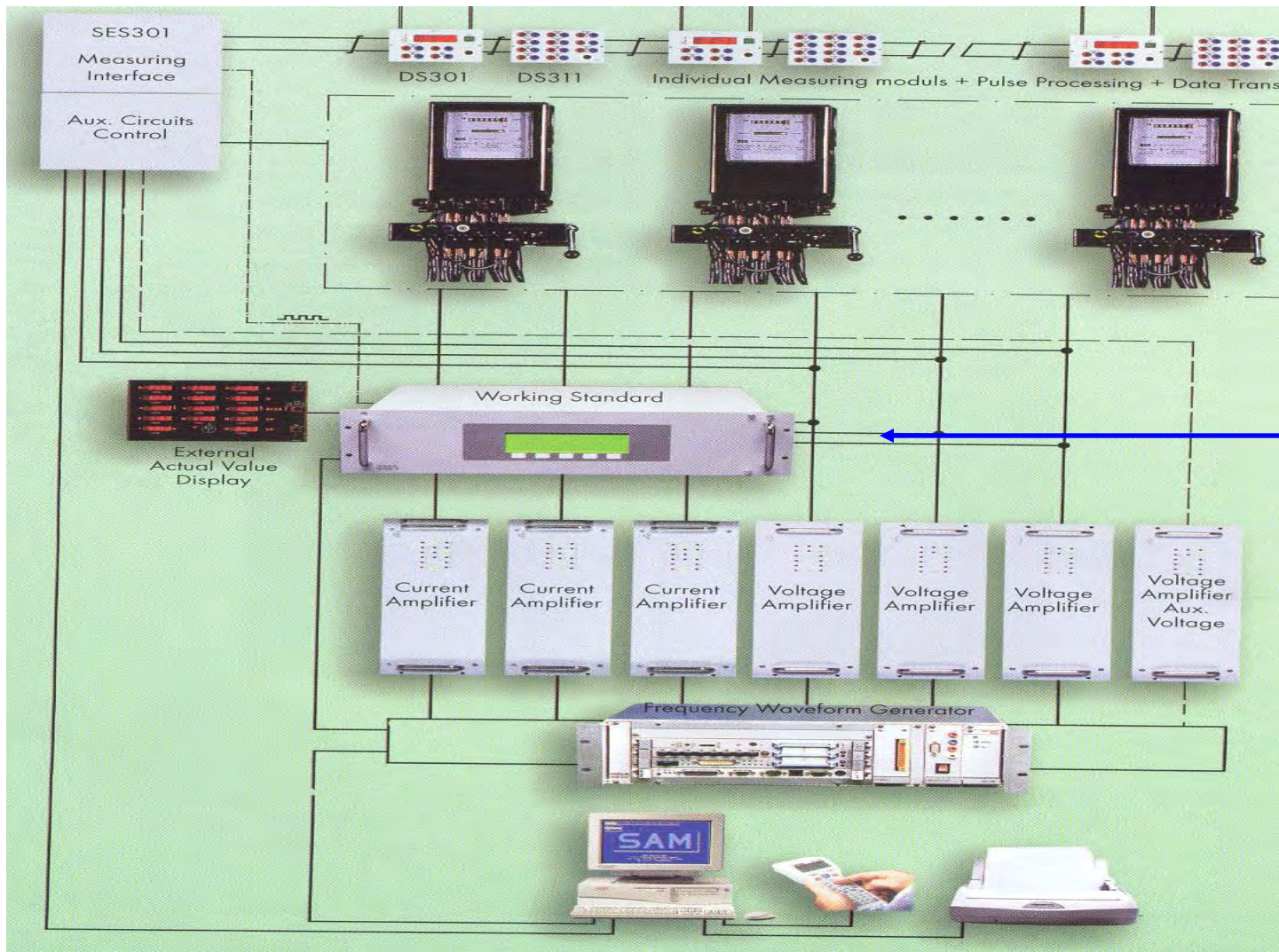
What is a MTE ?

- A set /assembly of equipments which supply voltage , current , power factor,
- Measure reference energy / power
- Sequence the tests, test procedures
- Error calculation and reporting/
recording of results

Types of meter test equipments ..contd.

- **Fully automatic** The supply of energy to MUT, (synthesized waveform generator, power amplifiers based source), its measurement, error calculation using single or multiple scanners, the test sequence and the test procedure, are all performed with the aid of electronic devices and controlled automatically as well as recorded along with the test data, through a computer program (software).
- **Portable MTE** An electronic apparatus to measure electrical energy supplied to meters under test at site and which can be conveniently carried by hand. It may optionally include an apparatus to supply the energy required along with a device for error calculation, display and record.

A typical automatic meter test system



Error Display

MUTs

Working Standard

V & I Amplifiers

Wave Generator

Programming Computer

Fully Automatic Test system



Types of measurements

- **Basic Measurements**

Measurements for calibration when an MTE commences service.

- **Control Measurements**

Measurements for periodical check on the accuracy of MTE while in service.

Determination of errors of MTE...methods

An MTE Requires Periodic Calibration

- For the measuring Standard
 - By an accredited Lab (on site or in lab)
 - Against a reference standard
- For Source as per the metering standard
 - By an accredited lab at site
 - Against a reference standard

Repeatability of Errors of MTE

- Take 5 successive measurements at control points
- Operate switches and controlling devices
- Calculate Standard deviation

$$s = \sqrt{\frac{1}{(n-1)} \sum_1^n (E_i - \bar{E})^2}$$

for $i=1$ to n

- where E_i = error of the MTE determined by one individual measurement
- \bar{E} = mean value of the errors E_i , and
- n = total number of individual measurements.



Allowed values of.. s for new equipments

Class 1,2	PF 1	PF 0.5	
S _{max}	0.02, 0.05	0.03, 0.07	
Class 0.5			
S _{max}	0.01	0.02	
Class 0.2			
S _{max}	0.005	0.01	

MTE in service....twice the above values are allowed

Allowed limits of errors for class 1 / 2

- The error E of an MTE is the overall error of all its components under normal service condition.
- The error of an MTE shall be lower than the error E_{max} at a set of test points given.

Power Factor	1.0	0.5 Lag	0.5 Lead
E _{max} % Class 1 MUT	±0.20	±0.30	±0.40
E _{max} % Class 2 MUT	±0.30	±0.45	±0.60

Allowed limits of errors for class 0.5/ 0.2

- The error of an MTE shall be lower than the error E_{max} at a set of test points given.

Power Factor	1.0	0.5 Lag	0.5 Lead
E_{max} % Class 0.2 MUT	± 0.05	± 0.10	± 0.15
E_{max} % Class 0.5 MUT	± 0.10	± 0.15	± 0.20

What if errors of MTE are not in limits?

- Limited use allowed (yellow sticker)
can be used in the restricted ranges
- Correction of errors, if the errors are with in
twice the allowed ranges.