Changes to draft OIML R 46 Active Electrical Energy Meters

17 August 2010

Introduction

A 5th committee draft of OIML R 46 Active Electrical Energy Meters has now been produced under OIML TC 12. This document lists the major changes that have been made since the 4th draft.

Major changes / topics

Temperature dependence

Background

At the last TC 12 meeting, it was agreed to delete the error shift limits for temperature dependence (row 1 of table 4), leaving the limits of temperature coefficients (table 3) as the only requirements for temperature dependence. It was agreed to investigate the implications for extreme temperature ranges and class A values.

Changes

- None. Limits of error shift in Table 4 have NOT been removed. This is subject to expected proposal from OIML TC 12 members.

Durability

Background

At the last TC 12 meeting it was agreed to reinstate durability (there was no test in CD4). IEC 62059-32-1 was suggested by an OIML TC 12 member as an appropriate reference for the test.

Status

- Copy of IEC 62059-32-1 is unavailable.

Changes

- None.

Protection of metrological properties - 3.6

Background

At the last TC 12 meeting it was agreed that BIML would provide appropriate text based on OIML D31.

Changes

- New text from BIML
  - Section 3.6 (up to 3.6.7.4)
  - Section 4.3 'Validation procedure'
  - Additional documentation under section 4.1
- Section 3.6.8 'checking facility event record' was also moved to section 3.6 from 3.7.3
  - Size of event logger text changed: 100 events (or an alternative number determined by the national authority).

Merge of Tables 4 & 5

Background

At the last TC 12 meeting it was agreed to merge tables 4 & 5 under title: 'Limits of error shift due to influence quantities'.

Changes

- Tables 4 and 5 now merged into Table 4.
- Terminology merged to use only influence quantity and limit of error shift.
- 'Maximum permissible error shift' definition remains for definition of maximum permissible error and Annex C.
- Merging tables 4 and 5 also resulted in a change to (and simplification of) section numbering:
  - 3.3.3 Maximum permissible errors

- o 3.3.4 Allowed effects of influences
- o 3.3.5 Allowed effects of disturbances
- o 6.2 Tests for maximum permissible errors
- o 6.3 Tests for influence quantities
- o 6.4 Tests for disturbances

High-order harmonics - 6.3.17 (old 6.3.1.11)

Background

At the last TC 12 meeting it was agreed to search for appropriate standards or tests.

Status

A TC 12 member suggested IEC 61000-4-13, but we believe this is not suitable as it only provides for voltage harmonics (not current harmonics).

Changes

None

Shock – 6.4.13.2 (old 6.3.2.12.2)

Background

Alternative tests were proposed in CD4 with no consensus.

Changes

- Replaced with test based on IEC 60068-2-27.

Protection against solar radiation – 6.4.14 (old 6.3.2.13)

Background

Alternative tests were proposed in CD4 with no consensus.

Changes

- Replaced with test based on ISO 4892-3. This test is based on a draft Australian standard AS 4647 for gas meters.

All major changes (minor corrections and edits are omitted)

Clause/Table		Heading / Issue	Changes / Notes
CD5	CD4		
G	G	**Title**	• Now 'Active Electrical Energy Meters' as agreed
1	1	**Scope**	• Active energy meters only. Other types may be addressed in future versions.
2; Annex A	2	**Terminology**	• Several changes for consistency with VIM and D11 as agreed. • Inserted Annex A "Definitions Taken From Other References". This contains definitions taken directly from VIM. All terms are listed in section 2 "Terminology" and the definitions refer to Annex A. • There are now two separate definitions for 'primary rated register' and 'primary register'. The former relates to transformer-operated meters, the later is the register subject to requirements. • Definition of 'sub-harmonic' added. • Definition of 'relative error (of indication)' updated with 'absolute error' definition removed. (This recommendation only deals with relative errors.) • Added note to definition of m.p.e that says: it is a combination of base mpe and maximum permissible error shift as described in Annex C. • Changed 'class index' to 'accuracy class' for consistency with VIM. • Removed 'critical change value'. Use concept of significant fault in recommendation. • Removed articles ('a' and 'the') from start of definitions, and made them all singular.
3.1	-	**Units of measurement**	• Added clause to specify units: W·h, kW·h, MW·h, GW·h
3.2; Table 1	3.1; Table 1	**Rated operating conditions**	• I_{min} for class B transformer-operated changed from 0.4 to 0.2 I_{tr} with a footnote added saying 0.4 I_{tr} for electromechanical meters as per MID. • Values for I_{min} and I_{st} were also converted into a table (for ease of reading). • Added symbols for connection modes from IEC 62053-52. • Temperature: removed 5ºC and 30ºC values from low and high temperature limits respectively as suggested.
3.3.2	3.2.2	**Direction of energy flow**	• Changed to read 'A meter shall fall into at least one of the following categories' as agreed.
3.3.3; Table 2	3.2.3; Table 2	**Maximum permissible errors**	• Clarified current ranges using inequality signs.
3.3.3; 8.1	3.2.3; 8.1	**Maximum permissible errors / Verification**	• Added notes saying individual national authorities may specify base maximum permissible errors for subsequent verification and in-service inspections as agreed.
3.3.5.2; Table 5	3.2.4.3; Table 6	**Disturbances**	• Simplified section name to Disturbances (following merge of table 4 & 5). • Changed definition of *m* in critical change value formula to 'number of measuring elements', not 'circuits'. • Added limit of error shift column to table 5 to bring requirements out front rather than in the test.
3.4	3.4	**Timing requirements for interval and multi-tariff meters**	• Overall minimum of 35 days with national authorities able to set longer storage periods as agreed.

Clause/Table		Heading / Issue	Changes / Notes
CD5	CD4		
3.5	3.5	**Meter markings**	• Changed so requirements for markings shall be determined by national authorities. List provided for consideration.
3.6	3.6	**Protection of metrological properties**	• Section replaced by text supplied from BIML as discussed above.
3.7.1	3.7.1	**Readability of result**	• Added sentence: 'Electronic indicating devices shall be provided with a display test.' as suggested. • Transmission is covered by new section 3.6.
3.9	-	**Presumption of compliance**	• Added standard text on presumption of compliance.
4.1	4.1	**Documentation**	• Added software documentation as per BIML supplied text (see Protection of Metrological Properties above). • Added specified clock frequency as required for radiated RF immunity test (6.3.15.1).
4.2.1	4.2.1	**Type test sampling**	• Number of specimens set by national authority.
4.3	-	**Validation procedure**	• Added as per BIML supplied text (see Protection of Metrological Properties above).
6	6	**Formatting of tests**	• All tests have been reformatted with standard headings (eg: object of the test, test procedure, mandatory testpoints etc) and the wording has been edited for grammar and consistency. • Replaced all instances of 'EUT' with 'meter'.
6.2.1	6.2.1	**Determination of initial intrinsic error**	• Changed Table 10 (old Table 9) to list all mandatory testpoints for different directions of flow. • Changed testpoints to include two specified by national authority.
6.2.4; 8.2.4.1	6.2.4; 8.2.4.1	**Test of no-load condition**	• Tests now conducted with no current as agreed. • Substituted formula for minimum test period as per Jean-Francois Magana's presentation.
6.2.5	6.2.5	**Meter constants**	• Reworded test to emphasis 1/10 base mpe requirement as agreed.
6.3.6	6.2.6.6	**Harmonics in voltage and current**	• Some values in the tables were changed for consistency with requirements stated in text: 0.12 U_1/h for voltage and I_1/h for the current. • Plots of current amplitude for each waveform were added.
6.3.8	6.3.1.2	**Severe voltage variations**	• Reworded final paragraph regarding testpoints for meters with a distinct shut-down voltage. • Clarified test by labelling as test procedures 1 and 2. • Removed 1.10 U_{nom} testpoint because it is covered by Voltage Variation test.
6.3.10; Figure 3	6.3.1.4; Figure 1	**Sub-harmonics and harmonics**	• Figures 1 a), b) and c) were updated to better illustrate the relative amplitudes of the test current waveforms.
6.3.13	6.3.1.7	**Continuous (DC) magnetic induction of external origin**	• Edited test procedure to clarify the specification of the field. • Removed allowance for not testing back surface if wall mounted.
6.3.14; Table 4	6.3.1.8; Table 5	**Magnetic field (AC, power frequency) of external origin**	• Increased field from 300 V/m to 400 V/m as agreed • Changed influence quantity/test name from: 'Magnetising field…' to 'Magnetic field…'

Clause/Table		Heading / Issue	Changes / Notes
CD5	**CD4**		
6.3.15.1; Table 4; (6.4.6; Table 5)	6.3.1.9.1; Table 5	**Radiated, radio frequency (RF) electromagnetic fields**	• Added text for testing under different orientations. • Added text for separately testing at manufacturer's specified clock frequency. (Left in sentence about other sensitive frequencies to be analysed separately). • Changed to 10 V/m over all frequencies. • Increased frequency range up to 6 GHz. • Added second test at 30 V/m with no current as per IEC. Note: this test has been listed in disturbances (Table 5), with test section 6.4.6.
6.4.3	6.3.2.3	**Electrostatic discharge**	• Changed test severity for contact discharge voltage from 8 to 6 kV as per D11. • Similarly changed air discharge voltage from 15 to 8 kV as per D11. • Added condition to test as table-top equipment.
6.4.5	6.3.2.5	**Voltage dips and interruptions**	• Updated test severity values in line with latest 61000-4-11 and D11.
6.4.6	-	**Radiated, radio frequency (RF), electromagnetic fields**	• Disturbance test added. As per IEC: 30 V/m, no current.
6.4.8	6.3.2.7	**Damped oscillatory waves immunity test**	• Changed mandatory testpoints to 20 I_{tr}, PF = 1 and 0.5 inductive for consistency with meter condition specified in test procedure.
6.4.10; Table 5	6.3.2.9; Table 6	**Impulse voltage**	• Changed minimum time between impulses from 3 s to 30 s as agreed. • Removed low/high system exposure columns. (It was suggested the categorisation is not technically useful). Kept voltage levels from high column. • Specification of source series impedance has been removed. (It was suggested the specified impedance and energy levels do not match. Also, no existing equipment to meet specs). Only source energy is now specified. It is suggested that appropriate source series impedances may be determined by testing laboratory.
6.4.13.1 (Table 5)	6.3.2.12 1 (Table 6)	**Vibrations**	• No changes have been made. • An IEC interpretation document, 13/1374/DC, interprets the requirement "no change in information" in IEC 62052.11 (2005) for electromechanical meters. However, this recommendation does not currently contain that requirement. Furthermore the interpretation is still in draft.
6.4.13.2	6.3.2.12. 2	**Shock**	• Replaced all tests and alternatives with test based on IEC 60068-2-27 as suggested
6.4.14	6.3.2.13	**Protection against solar radiation**	• Replaced all tests and alternatives with test based on ISO 4892-3. This test is based on a draft Australian standard AS 4647 for gas meters.
6.4.16.1	6.3.2.15. 1	**Extreme temperatures – dry heat**	• Removed 40ºC option following changes to rated operating conditions for temperature (ie, removed 30ºC as option for upper temperature limit).
6.4.16.2	6.3.2.15. 2	**Extreme temperatures – cold**	• Removed -10ºC option following changes to rated operating conditions for temperature (ie, removed 5ºC as option for lower temperature limit). • Added note to say if -55ºC is lower specified temperature limit, then test at -55ºC (no lower value is listed).

Clause/Table		Heading / Issue	Changes / Notes
CD5	CD4		
6.4.16.4	6.3.2.15.4	**Damp heat, cyclic (condensing) for humidity class H2 and H3**	• Was inconsistency: test procedure said to test at upper temp limit of meter, but test severities specified temperature based on humidity class • Changed to use temperature based on humidity class and extended test severities table to make relationship between humidity class and severity levels more explicit.
8.2.4	8.2.4	**Minimum test program**	• Changed section name from 'Test for base maximum permissible error' to 'Minimum test program' as a more logical title. • Changed names of tests in list to match test names in flowing sub-sections.
8.4	8.4	**Additional requirements for statistical verifications**	• Added proposed text based on OIML R 137 Gas Meters.
8.5	8.4	**Additional requirements for statistical in-service inspections**	• Separated additional requirements for verifications and in-service inspections because OIML TC 3/SC 4 is aimed at in-service inspections only. • Added proposed text referencing OIML TC 3/SC 4 as per OIML R 137 Gas Meters.
Annex A	-	**Definitions taken from other references**	• Added this section as suggested for definitions from VIM.
Annex B	9	**Bibliography**	• Bibliography now in tabular format as per D11 and placed informative Annex B
Annex D	Annex B	**Legislative Matters**	• Moved from Annex B and added title.