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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electricity metering equipment (AC) – Acceptance inspection – Part 31: Particular requirements for static meters for active energy (classes 0,2 S, 0,5 S, 1 and 2)

Equipement de comptage de l'électricité (c.a.) – Contrôle de réception Partie 31: Exigences particulières pour compteurs statiques d'énergie active (de classes 0,2 S, 0,5 S, 1 et 2)

IEC 62058-31:2008

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International Standard IEC 62058-31 has been prepared by IEC technical committee 13: Electrical energy measurement, tariff- and load control.

The text of this standard is based on the following documents:

FDIS	Report on voting
13/1432/FDIS	13/1440/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

A list of all parts of IEC 62058 series, published under the general title *Electricity metering equipment (AC) – Acceptance inspection,* can be found on the IEC website.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

This standard together with IEC 62058-11 cancels and replaces IEC 61358, *Acceptance inspection for direct connected alternating-current static watt-hour meters for active energy (Classes 1 and 2).*

ELECTRICITY METERING EQUIPMENT (AC) – ACCEPTANCE INSPECTION –

Part 31: Particular requirements for static meters for active energy (classes 0,2 S, 0,5 S, 1 and 2)

1 Scope

This part of IEC 62058 specifies particular requirements for acceptance inspection of newly manufactured direct connected or transformer operated static meters for active energy (classes 0,2 S, 0,5 S, 1 and 2) delivered in lots in quantities above 50. The method of acceptance of smaller lots should be agreed upon by the manufacturer and the customer.

The process described herein is primarily intended for acceptance inspection between the manufacturer and the purchaser.

NOTE It can also be used for other purposes, for example to support initial verification.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62053-21:2003, *Electricity metering equipment (a.c.) – Particular requirements – Part 21: Static meters for active energy (classes 1 and 2)*

IEC 62053-22:2003, *Electricity metering equipment (a.c.) – Particular requirements – Part 22: Static meters for active energy (classes 0,2 S and 0,5 S)*

IEC 62058-11:2008, *Electricity metering equipment (a.c.) – Acceptance inspection – Part 11: General acceptance inspection methods*

ISO/IEC GUIDE 98: 1995, *Guide to the Expression of Uncertainty in Measurement*

3 Terms, definitions, symbols and abbreviations

For the purposes of this document, the terms, definitions, symbols and abbreviations in IEC 62058-11 apply.

4 Test conditions

4.1 Place of inspection

Subclause 5.15 of IEC 62058-11 applies.

4.2 Reference conditions

The tests shall be carried out under the following conditions:

Table 1 – Voltage and current balance for polyphase meters

Condition	Class of meter			
	0,2 S	0,5 S	1	2
Each of the voltages between phase and neutral and between any two phases shall not differ from the average corresponding voltage by more than	± 1 %			
Each of the currents in the conductors shall not differ from the average current by more than	± 1 %		± 2 %	
The phase displacements of each of these currents from the corresponding phase-to-neutral voltage, irrespective of the phase angle, shall not differ from each other by more than	2°			

Table 2 – Reference conditions

Influence quantity	Reference value	Permissible tolerances for meters of class			
		0,2 S	0,5 S	1	2
Ambient temperature	Reference temperature or, in its absence, 23 °C [a]	± 2 °C			
Voltage	Reference voltage	± 1,0 %			
Frequency	Reference frequency	± 0,3 %	± 0,3 %	± 0,3 %	± 0,5 %
Phase sequence	L1 – L2 – L3	-			
Voltage unbalance	All phases connected	-			
Wave-form	Sinusoidal voltages and currents	Distortion factor less than			
		2,0 %	2,0 %	2,0 %	3,0 %
Continuous magnetic induction of external origin	Equal to zero	-			
Magnetic induction of external origin at the reference frequency	Magnetic induction equal to zero	Induction value which causes a variation of error not greater than: ± 0,3 % [b]			
		± 0,1 %	± 0,1 %	± 0,2 %	± 0,3 %
		but should in any case be smaller than 0,05 mT [b]			
Electromagnetic RF fields, 30 kHz to 2 GHz	Equal to zero	< 1 V/m			
Operation of accessories	No operation of accessories	-			
Conducted disturbances, induced by radio frequency fields, 150 kHz to 80 MHz	Equal to zero	< 1 V			

[a] If the tests are made at a temperature other than the reference temperature, including permissible tolerances, the results shall be corrected by applying the appropriate temperature coefficient of the meter.

[b] The test consists of:

1) for a single-phase meter, determining the errors first with the meter normally connected to the mains and then after inverting the connections to the current circuits as well as to the voltage circuits. Half of the difference between the two errors is the value of the variation of error. Because of the unknown phase of the external field, the test should be made at 0,1 I_b resp. 0,05 I_n at unity power factor and 0,2 I_b resp. 0,1 I_n at 0,5 power factor;

2) for a three-phase meter, making three measurements at 0,1 I_b resp. 0,05 I_n at unity power factor, after each of which the connection to the current circuits and to the voltage circuits are changed over 120° while the phase sequence is not altered. The greatest difference between each of the errors so determined and their average value is the value of the variation of error.

4.3 Uncertainty of measurement of percentage error

The measuring process shall be such that the uncertainty of the measurement of the percentage error should not exceed 1/5th of the limit of percentage error for the given test point at reference conditions.

For determining the uncertainty of measurement, see ISO/IEC GUIDE 98.

If the uncertainty exceeds this limit, then inspection by variables cannot be used. Only inspection by attributes will be possible and the limits of percentage error shall be corrected using the following formula:

$$e_{corr}(I, \cos\varphi) = 6/5 \bullet e(I, \cos\varphi) - U$$

where:

- $e(I, \cos\varphi)$ is the limit of percentage error for the given test point at reference conditions;
- U is the measurement uncertainty.

EXAMPLE If, for a given test point, the limit of percentage error at reference conditions is $e(I, \cos\varphi) = \pm 2\,\%$; and U = 0,5 %; then

$$e_{corr}(I, \cos\varphi) = \pm(6/5 \bullet 2{,}0 - 0{,}5) = \pm 1{,}9\,\%$$

Instead of the original limit, this corrected limit applies.

Table 3 gives percentage error limits corrected with uncertainty of measurement, using the formula above.

Table 3 – Percentage error limits corrected with uncertainty

Percentage error limit %	Uncertainty of measurement of percentage error, %									
	0,6	**0,5**	**0,45**	**0,4**	**0,35**	**0,3**	**0,25**	**0,2**	**0,15**	**0,1**
± 3,0	± 3,0	± 3,0	± 3,0	± 3,0	± 3,0	± 3,0	± 3,0	± 3,0	± 3,0	± 3,0
± 2,5	± 2,4	± 2,5	± 2,5	± 2,5	± 2,5	± 2,5	± 2,5	± 2,5	± 2,5	± 2,5
± 2,0	± 1,8	± 1,9	± 1,95	± 2,0	± 2,0	± 2,0	± 2,0	± 2,0	± 2,0	± 2,0
± 1,5	± 1,2	± 1,3	± 1,35	± 1,4	± 1,45	± 1,5	± 1,5	± 1,5	± 1,5	± 1,5
± 1,0	± 0,6	± 0,7	± 0,75	± 0,8	± 0,85	± 0,9	± 0,95	± 1,0	± 1,0	± 1,0
± 0,6	± 0,12	± 0,22	± 0,27	± 0,32	± 0,37	± 0,42	± 0,47	± 0,52	± 0,57	± 0,6
± 0,5	0	± 0,1	± 0,15	± 0,2	± 0,25	± 0,3	± 0,35	± 0,4	± 0,45	± 0,5
± 0,4	0	0	± 0,03	± 0,08	± 0,13	± 0,18	± 0,23	± 0,28	± 0,33	± 0,38
± 0,3	0	0	0	0	± 0,01	± 0,06	± 0,11	± 0,16	± 0,21	± 0,26
± 0,2	0	0	0	0	0	0	0	± 0,04	± 0,09	± 0,14

NOTE In any case, the uncertainty should not exceed half of the percentage error limit.

4.4 Cover and seal

The meters shall be inspected and tested with their covers on and manufacturer's seal unbroken.

NOTE If testing of mechanical aspects is required, the conditions should be agreed between the manufacturer and the purchaser.

5 Inspection procedure

5.1 Tests to be performed and inspection methods

Table 4 specifies the characteristics to be inspected, the classification of nonconformities, and the inspection method(s) to be applied, with reference to the sampling plans given in IEC 62058-11.

Table 4 – Acceptance tests and inspection methods

Test No.	Test	Classification of nonconformities	Inspection methods available [a]	IEC 62058-11 sampling plan
1	AC voltage test	Critical	Lot-by-lot inspection by attributes, single sampling, Ac = 0 or	Table 6
			Isolated lot inspection by attributes, procedure A, Ac = 0	Table 18
2	No-load	Non-critical	Lot-by-lot inspection by attributes, single sampling, AQL = 1,0 or	Table 2
			Lot-by-lot inspection by attributes, double sampling, AQL = 1,0 or	Table 7
			Isolated lot inspection by attributes, single or double sampling, Procedure A, LQ = 5,0 or	Table 17
			Isolated lot inspection by attributes, single or double sampling, Procedure B, LQ = 5,0	Table 20
3	Starting	Non-critical	As for test No. 2	
4…9	Accuracy	Non-critical	As for test No. 2, in addition	
			Lot-by-lot inspection by variables, "s" method, AQL = 1,0 or	Table 24
			Lot-by-lot inspection by variables, "σ" method, AQL = 1,0	Table 26
10	Meter constant	Critical	As for test No. 1	
-	Other tests	See 5.9		-

[a] 100 % inspection can always be used, see Clause 6 of IEC 62058-11.

If, for the different tests, the sampling plans give different sample sizes, then the number of samples shall be equal to the largest sample size. The smaller sample shall be chosen from the larger sample randomly.

5.2 Preliminary tests and pre-conditioning

The meters selected for inspection shall be visually examined in order to verify that they belong to the same type, that their specified markings are correct and that none of them

shows signs of damage. The meters shall be in conformity with the type approval and they shall have the same voltage and current charactesristics.

Before the tests, the meters shall be energized at reference voltage and loaded with the current specified below, at unity power factor, to reach thermal stability.

The value of the current shall be 0,1 I_b for direct connected meters or 0,1 I_n for transformer operated meters respectively

The tests shall be performed in the order below.

5.3 Test No. 1: AC voltage test

The a.c. voltage test shall be carried out in accordance with Table 5.

The test voltage shall be substantially sinusoidal, having a frequency between 45 Hz and 65 Hz, and applied for 2 s. The power source shall be capable of supplying at least 500 VA. The rise time and the fall time of the test voltage shall be ≤ 2 s. The auxiliary circuits with reference voltage equal to or below 40 V shall be connected to earth.

During this test, no flashover, disruptive discharge or puncture shall occur.

Table 5 – AC voltage test

Test voltage r.m.s for meters of insulation class		Points of application of the test voltage
I	II	
1,6 kV	3,2 kV	Between on the one hand, all the current and voltage circuits as well as the auxiliary circuits whose reference voltage is over 40 V, connected together, and, on the other hand, earth.

If the manufacturer provides evidence that the test has been already performed on each item before acceptance inspection, then this test does not have to be performed.

5.4 Test No. 2: Test of no-load condition

The test of no-load condition shall be carried out in accordance with 8.3.2 of IEC 62053-21 and IEC 62053-22 respectively.

5.5 Test No. 3: Starting

When the meter is energized at reference voltage, (and in case of polyphase meters, with balanced load) and connected as shown in the diagram of connections, it shall start and continue to register at the current given in Table 6.

Table 6 – Value of current for starting test

Meters for	Class of meter				Power factor
	0,2 S	0,5 S	1	2	
Direct connection	-		0,004 I_b	0,005 I_b	1
Connection through current transformers	0,001 I_n	0,001 I_n	0,002 I_n	0,003 I_n	1

5.6 Tests No. 4...9: Accuracy tests

The accuracy tests for single- and polyphase shall be carried out at the test points specified in Table 7, in the order shown in the table, without waiting for the thermal equilibrium to be attained between the measurements.