1 CD OIML R 46-3

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OIML TC 12 Instruments for measuring electrical quantities Secretariat/Convenor: Phillip Mitchell, Australia Email: Phillip.mitchell@measurement.gov.au	Circulated to P- and O-members and liaison bodies and external organisations for: [X] Discussion at meeting on June 2023 [X] Comments by: 6 April2023 [ ] Vote (P-members only) and comments by:

TITLE OF THE CD (English):
OIML R 46-3
Electrical Energy Meters – Alternating Current (a.c.)
Part 3: Test report format

Contents

Foreword

[To be added]

Explanatory Notes

Meaning of symbols used in this report

base m.p.e	=	base maximum permissible error
b	=	base maximum permissible error (at the appropriate current) expressed as a percentage (%) and taken as a positive value
c	=	mean temperature coefficient
e_u and e_l	=	errors at the uppermost and the lowest temperatures respectively in the temperature interval of interest
t_u and t_l	=	uppermost and the lowest temperatures respectively in the temperature interval of interest
f_{nom}	=	nominal frequency
U_{nom}	=	nominal voltage
U_{test}	=	test voltage
I_{max}	=	maximum current
I_{tr}	=	transitional current
I_{min}	=	minimum current
I_{st}	=	starting current
H1	=	humidity class 1: enclosed locations where the instruments are not subjected to condensed water, precipitation, or ice formations
H2	=	humidity class 2: enclosed locations where the instruments may be subjected to condensed water, to water from sources other than rain and to ice formations.
H3	=	humidity class 3: open locations with average climatic conditions
|x|	=	absolute value of x
τ	=	expected time between two pulses (period)
m	=	number of elements
k	=	is the number of pulses emitted by the test output per kilowatt hour (the meter constant expressed in imp/kWh)
Δt	=	test period (for test of no-load condition)

References to the test procedures in Part 2 of this Recommendation are given in brackets after each test heading.

1 Information

1.1 Test information

Test Report

Report reference number:	
Date of issue:	
Date(s) of testing:	

Laboratory

Name:	
Address:	
Contact details:	

Client / applicant

Name:	
Address:	

Test specification

Record any variations from Parts 1 and 2 of this Recommendation.

1.2 Meter information

Manufacturer and type

Meter manufacturer:	
Meter type (model designation):	

Sample meters

Serial number(s):	

Remarks

1.3 Meter specification

Accuracy and measurement quantities

Accuracy class: ☐ A / 2 ☐ B / 1 ☐ C / 0.5 ☐ D / 0.2 ☐ E / 0.1

Quantities (electrical energy):	☐ Active	☐ Fundamental frequency only
Quantities (electrical energy):	☐ Reactive	☐ Fundamental frequency only
Quantities (electrical energy):	☐ Apparent	☐ Fundamental frequency only

Demand metering: ☐ Yes ☐ No

Electrical parameters

Nominal frequency, f_{nom}:		Hz
Nominal voltage, U_{nom}:		V
Maximum current, I_{max}:		A
Transitional current, I_{tr}:		A
Minimum current, I_{min}:		A
Starting current, I_{st}:		A

Environment

Lower specified temperature: ☐ −55 °C ☐ −40 °C ☐ −25 °C ☐ −10 °C ☐ +5 °C

Upper specified temperature: ☐ +30 °C ☐ +40 °C ☐ +55 °C ☐ +70 °C

Humidity class: ☐ H1 ☐ H2 ☐ H3

For use: ☐ Outdoor ☐ Indoor use only

Connection mode(s)

☐ Direct-connected ☐ Current transformer ☐ Current and voltage transformers

Phases, wires, elements:

Direction of energy flow and load balance

☐ Single-register, bi-directional ☐ Single-register, positive direction only

☐ Two-register, bi-directional ☐ Single-register, uni-directional

For bi-directional and poly-phase meters:

☐ Concurrent flow of current in the positive and negative directions on different phases

Testability

Meter constant, active energy:		*(include units of measurement)*
Meter constant, reactive energy:		*(include units of measurement)*
Meter constant, apparent energy:		*(include units of measurement)*

Number of pulses to ensure a standard deviation of measurement less than 0.1 base m.p.e.:

at maximum current, I_{max}:	
at transitional current, I_{tr}:	
at minimum current, I_{min}:	

Interval meter

Interval data storage capability:

Internal clock

Clock type(s): ☐ Synchronous ☐ Crystal-controlled

Hardware and software

Hardware version(s):		
Software version(s):		
Specified clock output frequencies:		*(include units of measurement)*

Auxiliary devices

Provide information about any auxiliary devices

Remarks

1.4 Adjustments or modifications

Provide information about any authorised and agreed upon adjustments or modifications for sample meters during the evaluation.

1.5 Test values and configuration

Specify the values used for testing (unless otherwise specified in individual tests).

Test voltage:		V
Test frequency:		Hz
Test connection mode:		

Remarks

1.6 Critical change value

The critical change value is used as part of the acceptance criteria for some disturbance tests. See OIML R 46-2, 2.1.3.

Number of measuring elements:	m		
Nominal voltage:	U_{nom}		V
Maximum current:	I_{max}		A
Critical change value:	$x = 10^{-6} \times m \times U_{nom} \times I_{max}$		*(include units)*

1.7 Test equipment

List all test equipment used in this report.

Equipment name	Manufacturer	Type no.	Serial no.	Used for (test reference)

Remarks

2 Tests for compliance with maximum permissible error

2.1 Initial intrinsic error for positive and negative flow (2.2.1)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Quantity (electrical energy): ☐ **Active** ☐ **Reactive** ☐ **Apparent**

If a meter is specified with alternate connection modes, this test shall be made for all specified connection modes.

Connection mode:

Value of most inductive power factor in test:

Value of most capacitive power factor in test:

Positive energy flow					
Test Current (A)	Power Factor	Error (%) with test current from…		Mean error[1] (%)	Base m.p.e. (%)
		Low to high	High to low		
I_{min}	unity				
I_{tr}					
10 I_{tr}					
I_{max}					
I_{tr}	(most inductive)				
10 I_{tr}					
I_{max}					
I_{tr}	(most capacitive)				
10 I_{tr}					
I_{max}					
Negative energy flow					
I_{tr}	unity				
I_{max}					
I_{tr}	(most inductive)				
I_{max}					
I_{tr}	(most capacitive)				
I_{max}					
Note 1: Mean error is the mean of the error with increasing and decreasing currents for each testpoint.					

- Check that each |mean error| ≤ |base m.p.e|

☐ Passed ☐ Failed

Remarks:

2.2 Reverse energy flow (2.2.1)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Applicable for positive direction only meters

Calculation for test time for reverse flow		I_{min}	I_{max}
a)	Time that the test output would register ten pulses in the forward energy flow direction (minutes):		
b)	Time that the primary register would register 2 units of the least significant digit in the forward energy flow direction (minutes):		
c)	1 minute:	1	1
	Test time is the maximum of a), b) and c) (minutes):		

Test Current (A)	Power Factor	Test Time (minutes)	Change in register		Number of test pulses	
			Measured	Limit	Measured	Limit
I_{min}	unity			0		1
I_{max}						

- Check that there is no change in the energy registered in the primary register.
- Check that the number of test pulses emitted ≤ 1.

☐ Passed ☐ Failed

Remarks:

2.3 Starting current (2.2.2)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Expected time between pulses (period)	τ (seconds)
$\tau = 3.6 \times 10^6/(m \cdot k \cdot U_{nom} \cdot I_{st})$	

Test current (A)	Power factor	Meter started (Yes/No)	Error (%)	Base m.p.e. (%)
	Unity			

- Check that |error| ≤ |base m.p.e|

☐ Passed ☐ Failed

Remarks:

2.4 Test of no-load condition (2.2.3)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Test voltage, U_{test} (V)	110 % of U_{nom}	
Minimum test period (hours)	$100 \times 10^3/(b \cdot k \cdot m \cdot U_{test} \cdot I_{min})$	

Test current (A)	Test voltage, U_{test} (V)	Test period Δ*t* (hours)	Test output	
			Number of pulses emitted	Limit
No current				1

- Check if the test period Δ*t* ≥ minimum test period.
- Check if the number of pulses emitted ≤ 1.

☐ Passed ☐ Failed

Remarks:

2.5 Meter constants (2.2.4)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Quantity (electrical energy): ☐ **Active** ☐ **Reactive** ☐ **Apparent**

Does the meter have multiple registers or pulse outputs under legal control? (Yes/No)	
If yes, is there a system in place to guarantee identical behaviour of meter constants? (Yes/No)	

If yes, specify the system, otherwise all registers and pulse outputs must be tested.

Determine the minimum energy (E_{min}) to be passed through the meter:

Register to be tested:	
Test output to be tested:	
Apparent resolution of basic energy register, *R (include units of measurement)*:	
Minimum energy to be passed through, $1000 \times R/b$ *(include units of measurement)*:	

Test current (A)	Power factor	Energy measured by		Count of test output pulses	Relative difference (%) $(t-r)/r$	Limit (%) (10% of base m.p.e.)
		Register (r)	Test output (t)			
	Unity					

- Check that each $|\text{relative difference}| \leq |\text{limit}|$

☐ Passed ☐ Failed

Remarks:

2.6 Test mode for demand meters

(To be completed)

3 Tests for influence quantities

3.1 Temperature dependence (2.3.1)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

- The mean temperature coefficient, c, is calculated by $c = (e_u - e_l)/(t_u - t_l)$.
- The temperature intervals, $(t_u - t_l)$, span at least 15 °C and no more than 23 °C; and the set of intervals span the entire specified operating range (intervals may overlap).

Temperature interval, t_l to t_u (°C):					
Test Current (A)	Power factor	Error (%)		Mean temperature coefficient (%/K)	
		e_l	e_u	c	Limit
I_{tr}	unity				
10 I_{tr}					
I_{max}					
I_{tr}	0.5 inductive				
10 I_{tr}					
I_{max}					

Add temperature coefficients table for each temperature interval.

- Check that each $|c| \leq |\text{limit}|$.
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

3.2 Self heating (2.3.2)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Voltage circuits energised for time (hours):	
Base m.p.e, at I_{max} and unity power factor:	

Test current (A)	Power factor	Time at I_{max} (minutes)	Error (%)	Error shift (%)	Limit (%)
I_{max}	Unity	0 (intrinsic error)		N/A	N/A

Has the error shift levelled out? ☐ *If no, continue test according to (a) or (b) below.*

(a) *If the load can be changed in less than 30 seconds*:

Test current (A)	Power factor	Intrinsic Error (%)	Error (%)	Error shift (%)	Limit (%)
I_{max}	0.5 inductive				

(b) *Else, allow meter to return to its initial temperature and repeat test for power factor 0.5 inductive*.

Voltage circuits energised for time (hours):	
Base m.p.e, at I_{max} and power factor 0.5 inductive:	

Test current (A)	Power factor	Time at I_{max} (minutes)	Error (%)	Error shift (%)	Limit (%)
I_{max}	0.5 inductive	0 (intrinsic error)		N/A	N/A

- Check that each $|\text{error shift}| \leq |\text{limit}|$
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

3.3 Load balance (2.3.3)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Reference voltage applied to all voltage circuits:

Test current (A)	Power factor	Load	Error (%)	Error shift (%)	Limit (%)
10 I_{tr}	unity	Balanced		N/A	N/A
		Current in L1 only			
		Current in L2 only			
		Current in L3 only			
I_{max}	unity	Balanced		N/A	N/A
		Current in L1 only			
		Current in L2 only			
		Current in L3 only			
10 I_{tr}	0.5 inductive	Balanced		N/A	N/A
		Current in L1 only			
		Current in L2 only			
		Current in L3 only			
I_{max}	0.5 inductive	Balanced		N/A	N/A
		Current in L1 only			
		Current in L2 only			
		Current in L3 only			

- Check that each |error shift| ≤ |limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

3.4 Voltage variation (2.3.4)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

U_{nom} (V):					
Test current (A)	Power factor	Voltage variation	Error (%)	Error shift (%)	Limit (%)
10 I_{tr}	unity	Reference (U_{nom})		N/A	N/A
		0.9 U_{nom}			
		1.1 U_{nom}			
10 I_{tr}	0.5 inductive	Reference (U_{nom})		N/A	N/A
		0.9 U_{nom}			
		1.1 U_{nom}			

Add tables for additional U_{nom} values as required.

- Check that each |error shift| ≤ |limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

3.5 Frequency variations (2.3.5)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

f_{nom} (Hz):					
Test current (A)	Power factor	Frequency variation	Error (%)	Error shift (%)	Limit (%)
10 I_{tr}	unity	Reference (f_{nom})		N/A	N/A
		0.98 f_{nom}			
		1.02 f_{nom}			
10 I_{tr}	0.5 inductive	Reference (f_{nom})		N/A	N/A
		0.98 f_{nom}			
		1.02 f_{nom}			

Add tables for additional f_{nom} values as required.

- Check that each |error shift| ≤ |limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

3.6 Harmonics in voltage and current (2.3.6.1)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

- The quadriform waveform is specified in OIML R 46-2, clause 2.3.6.1, Table 7 and Figure 1.
- The peaked waveform is specified in OIML R 46-2, clause 2.3.6.1, Table 8 and Figure 2.

Test current (A)	Power factor	Harmonics applied to both voltage and current circuits	Error (%)	Error shift (%)	Limit (%)
10 I_{tr}	unity	Reference, sinusoidal waveform		N/A	N/A
		Quadriform waveform			
		Peaked waveform			

- Check that each |error shift| ≤ |limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

3.7 Integral cycle load control test (2.3.6.2)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

- The test current waveform is specified in OIML R 46-2, clause 2.3.6.2 and Figure 3.

Test current (A)	Power factor	Current signal	Error (%)	Error shift (%)	Limit (%)
10 I_{tr}	unity	Reference sinusoidal waveform		N/A	N/A
		Test current waveform			

- Check that each |error shift| ≤ |limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

3.8 Odd harmonics in the AC current circuit (2.3.6.3)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

- The phase fired waveforms are specified in OIML R 46-2, clause 2.3.6.3 and Figures 4, 5 and 6.

Test current (A)	Power factor	Current signal	Error (%)	Error shift (%)	Limit (%)
10 I_{tr}	unity	Reference sinusoidal waveform		N/A	N/A
		a) 45° phase fired waveform			
		b) 90° phase fired waveform			
		c) 135° phase fired waveform			

- Check that each |error shift| ≤ |limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

3.9 High-order harmonics (2.3.6.4)

[To be added after next meeting]

3.10 DC in the AC current circuit (2.3.6.5)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Test current (A)	Power factor	Current test wave	Error (%)	Error shift (%)	Limit (%)
$I_{max}/2\sqrt{2}$	unity	Sinusoidal (intrinsic error)		N/A	N/A
$I_{max}/\sqrt{2}$		Half-wave rectified			

- Check that each $|\text{error shift}| \leq |\text{limit}|$
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

3.11 Reversed phase sequence (any two phases interchanged) (2.3.7)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Test current (A)	Power factor	Phase sequence	Error (%)	Error shift (%)	Limit (%)
10 I_{tr}	unity	Reference (L1, L2, L3)		N/A	N/A
		L1, L3, L2			
		L2, L1, L3			
		L3, L2, L1			

- Check that each |error shift| ≤ |limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

3.12 Magnetic field (AC, power frequency) of external origin (2.3.8)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Operating
Voltage applied to voltage circuits:	
Applicable standard:	IEC 61000-4-8
Magnetic field:	Continuous, 1 min
Magnetic field strength:	0.5 mT (400 A/m)
Magnetic field frequency ($f = f_{nom}$):	

Specify or illustrate the three orthogonal directions relative to the meter designated as x, y & z:

Test current (A)	Power factor	Magnetic field axis direction	Phase	Error (%)	Error shift (%)	Limit (%)
10 I_{tr}	unity	Reference (no magnetic induction)			N/A	N/A
I_{max}	unity				N/A	N/A
10 I_{tr}	unity	x-axis				
I_{max}	unity					
10 I_{tr}	unity	y-axis				
I_{max}	unity					
10 I_{tr}	unity	z-axis				
I_{max}	unity					
The reported values are the greatest error shifts for each test point and direction under the most unfavourable condition of phase.						

- Check that each $|\text{error shift}| \leq |\text{limit}|$
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

3.13 Radiated, radio frequency (RF), electromagnetic fields – Test condition 1 – with current (2.3.9.1)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Operating
Applicable standard:	*(IEC 61000-4-3 or IEC 61000-4-20)*

Antenna / facility:	
Field Strength (V/m):	
Dwell time:	

Test current (A)	Power factor	Frequency value / range (MHz)	Polarization	Facing meter	Error shift (%)	Limit (%)
10 I_{tr}	unity		Vertical	Front		
				Back		
				Right		
				Left		
				Top		
				Bottom		
			Horizontal	Front		
				Back		
				Right		
				Left		
				Top		
				Bottom		

Extend for each antenna/facility, field strength and frequency values (including sensitive frequencies).

- Check that each |error shift| ≤ |limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

3.14 Immunity to conducted disturbances, induced by radiofrequency fields (2.3.9.2)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Operating
Applicable standard:	IEC 61000-4-6

RF Amplitude:	
Frequency range:	
Dwell time:	

Test current (A)	Power factor	Power or I/O port	Error shift (%)	Limit (%)
10 I_{tr}	unity			

- Check that each |error shift| ≤ |limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

3.15 Fast load current variation test (2.3.10)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Applicable standard:	IEC 62052-11
Voltage applied to voltage circuits (highest nominal):	

Test current (A)	Power factor	Test profile	Error (%)	Error shift (%)	Limit (%)
10 I_{tr}	unity	Reference		N/A	N/A
		1) 10 s on, 10 s off			
		2) 5 s on, 5 s off			
		3) 5 s on, 0.5 s off			

- Check that each |error shift| ≤ |limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

4 Test for disturbances

4.1 Magnetic field (AC, power frequency) of external origin (2.4.1)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Operating, with no current
Voltage applied to voltage circuits:	
Applicable standard:	IEC 61000-4-8
Magnetic field:	Short-duration, 3 s
Magnetic field strength:	1.26 mT (1000 A/m)
Magnetic field frequency ($f = f_{nom}$):	

Specify or illustrate the three orthogonal directions relative to the meter designated as x, y & z:

Check for significant fault (critical change value)

Magnetic field axis direction	Change in energy		Critical change value
	Register	Test output	
x-axis			
y-axis			
z-axis			

Check base m.p.e.

Test current (A)	Power factor	Error (%)	Base m.p.e. (%)
I_{tr}	unity		
10 I_{tr}	0.5 inductive		

- Check that each change in energy is not more than the critical change value.
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance
  - the meter still fulfils the base m.p.e.

☐ Passed ☐ Failed

Remarks:

4.2 Electrostatic discharge (2.4.2)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Operating, with no current
Voltage applied to voltage circuits:	
Applicable standard:	IEC 61000-4-2

Check for significant fault (critical change value)

Application	Discharge mode	Test voltage (kV)	Polarity	Number of discharges (≥ 10)	Change in energy		Critical change value
					Register	Test output	
Direct	Contact	8	Positive				
			Negative				
	Air	15	Positive				
			Negative				
Indirect, Horizontal coupling plane	Contact	8	Positive				
			Negative				
Indirect, Vertical coupling plane	Contact	8	Positive				
			Negative				

Check base m.p.e.

Test current (A)	Power factor	Error (%)	Base m.p.e. (%)
I_{tr}	unity		
10 I_{tr}	0.5 inductive		

- Check that each change in energy is not more than the critical change value.
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance
  - the meter still fulfils the base m.p.e.

☐ Passed ☐ Failed

Remarks:

4.3 Fast transients (2.4.3)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Operating
Voltage applied to voltage circuits:	
Applicable standards:	IEC 62052-11, IEC 61000-4-4
Duration of test:	60 s at each polarity
Repetition rate:	100 kHz

Test current (A)	Power factor	Circuit	Test Voltage (kV)	Error (%)	Fault (%) (error shift)	Fault limit (%)
10 I_{tr}	unity	Reference			N/A	N/A

- Check that each |fault| ≤ |fault limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

4.4 Severe voltage variations (2.4.4)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Operating
Value of nominal voltage (V):	

Test procedure 1

Test current (A)	Power factor	Voltage variation	Error (%)	Fault (%) (error shift)	Fault limit (%)
10 I_{tr}	unity	Reference (U_{nom})		N/A	N/A
		0.8 U_{nom}			
		0.85 U_{nom}			
		1.15 U_{nom}			

Test procedure 2

Does the meter have distinct shut-down / turn-on voltages? (Yes/No):	
Shut-down voltage (V):	
Turn-on voltage (V):	

If yes, two additional mandatory testpoints (shutdown low and shutdown high) shall be included. Shutdown low shall be within a 2 V range below the shut-down voltage. Shutdown high shall be within a 2 V range above the turn-on voltage.

Test current (A)	Power factor	Voltage variation	Error (%)	Fault (%) (error shift)	Fault limit (%)
10 I_{tr}	unity	Reference (U_{nom})		N/A	N/A
		0.7 U_{nom}			+10 to −100
		0.6 U_{nom}			
		0.5 U_{nom}			
		0.4 U_{nom}			
		0.3 U_{nom}			
		0.2 U_{nom}			
		0.1 U_{nom}			
		0 U_{nom}			
		(shutdown low)			
		(shutdown high)			

- Check that each |fault| ≤ |fault limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

4.6 One or two phases interrupted (2.4.5)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Operating
Voltage applied to voltage circuits:	

Test current (A)	Power factor	Load	Error (%)	Fault (%) (error shift)	Fault limit (%)
10 I_{tr}	unity	Reference (no phases removed)		N/A	N/A
		Phase L1 removed			
		Phase L2 removed			
		Phase L3 removed			
		Phases L1, L2 removed			
		Phases L1, L3 removed			
		Phases L2, L3 removed			

- Check that each |fault| ≤ |fault limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

4.7 Continuous (DC) magnetic induction of external origin (2.4.6)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Operating
Voltage applied to voltage circuits:	
Magnetic field:	Continuous
Magnetic field strength along axis of magnet's core:	400 mT at 0 mm from surface

Specify or illustrate the surfaces designated as front, back, top, bottom, left and right.

Test current (A)	Power factor	Meter surface tested	Error (%)	Fault (%) (error shift)	Fault limit (%)
10 I_{tr}	unity	Reference (no magnetic induction)		N/A	N/A
		Front			
		Back			
		Top			
		Bottom			
		Left			
		Right			
The reported values are the greatest faults (error shifts) of 6 points per meter surface for each test point and direction under the most unfavourable condition of phase.					

- Check that each |fault| ≤ |fault limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

4.8 Voltage dips and interruptions (2.4.7)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Operating, with no current
Voltage applied to voltage circuits:	
Applicable standards:	IEC 62052-11, IEC 61000-4-11

Check for significant fault (critical change value)

Event / Test	Voltage reduction relative to U_{nom} (%)	Duration (cycles[1])	No. of events	Inception angle	Change in energy		Critical change value
					Register	Test output	
Interruption Test 1	100	5/6	3	0			
Interruption Test 2	100	50/60	3	0			
Interruption Test 3	100	1/1	1	0			
Interruption Test 4	90	250/300	3	0			
Dip Test 5	60	5/6	3	0			
Dip Test 6	60	50/60	3	0			
Dip Test 7	30	0.5/0.5	3	0			
			3	180			
Dip Test 8	30	1/1	3	0			
Dip Test 9	50	3000/3600	3	0			

Note 1: Cycles are given for 50 Hz and 60 Hz power line frequencies. E.g. 5/6 means 5 cycles for 50 Hz, and 6 cycles for 60 Hz.

Check base m.p.e.

Test current (A)	Power factor	Error (%)	Base m.p.e. (%)
I_{tr}	unity		
10 I_{tr}	0.5 inductive		

- Check that each change in energy is not more than the critical change value.
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance
  - the meter still fulfils the base m.p.e.

☐ Passed ☐ Failed

Remarks:

4.9 Radiated, radio frequency (RF), electromagnetic fields – Test condition 2 – without current (2.4.8)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Operating, with no current
Voltage applied to voltage circuits:	
Applicable standard:	IEC 61000-4-3

Check for significant fault (critical change value)

Antenna / facility:	
Field Strength (V/m):	
Dwell time:	

Frequency value / range (MHz)	Polarization	Facing meter	Change in energy		Critical change value
			Register	Test output	
	Vertical	Front			
		Back			
		Right			
		Left			
		Top			
		Bottom			
	Horizontal	Front			
		Back			
		Right			
		Left			
		Top			
		Bottom			

Extend for each antenna/facility, field strength and frequency values (including sensitive frequencies).

Check base m.p.e.

Test current (A)	Power factor	Error (%)	Base m.p.e. (%)
I_{tr}	unity		
10 I_{tr}	0.5 inductive		

- Check that each change in energy is not more than the critical change value.
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance
  - the meter still fulfils the base m.p.e.

☐ Passed ☐ Failed

Remarks:

4.11 Surges on AC mains power lines (2.4.9)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Operating, with no current
Voltage applied to voltage circuits:	
Applicable standard:	IEC 61000-4-5
Number of tests:	5 positive, 5 negative
Repetition rate:	Maximum 1 per minute

Check for significant fault (critical change value)

Voltage circuits, application	Test voltage (kV)	Generator source impedance (Ω)	Phase angle	Polarity	Change in energy		Critical change value
					Register	Test output	
Voltage circuits line to line	2	2	0°	Positive			
				Negative			
			90°	Positive			
				Negative			
			180°	Positive			
				Negative			
			270°	Positive			
				Negative			
Voltage circuits line to earth	4	2	0°	Positive			
				Negative			
			90°	Positive			
				Negative			
			180°	Positive			
				Negative			
			270°	Positive			
				Negative			
Auxiliary circuits, application	Test voltage (kV)[1]	Generator source impedance (Ω)	Phase angle	Polarity[2]	Change in energy		Critical change value
					Register	Test output	
Auxiliary circuits line to line	1	42	0°	Positive			
				Negative			
			90°	Positive			
				Negative			
			180°	Positive			
				Negative			
			270°	Positive			
				Negative			
Auxiliary circuits line to earth	2	42	0°	Positive			
				Negative			
			90°	Positive			
				Negative			
			180°	Positive			
				Negative			
			270°	Positive			
				Negative			

Check base m.p.e.

Test current (A)	Power factor	Error (%)	Base m.p.e. (%)
I_{tr}	unity		
10 I_{tr}	0.5 inductive		

- Check that each change in energy is not more than the critical change value.
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance
  - the meter still fulfils the base m.p.e.

☐ Passed ☐ Failed

Remarks:

4.12 Damped oscillatory waves immunity test (2.4.10)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Operating
Voltage applied to voltage circuits:	
Applicable standard:	IEC 61000-4-18
Test duration:	60 s (15 cycles with 2 s on, 2 s off, for each frequency)

Test current (A)	Power factor	Mode	Test Voltage (kV)	Test frequency (kHz)	Repetition rate (Hz)	Error (%)	Fault (%) (error shift)	Fault limit (%)
20 I_{tr}	unity	Reference (intrinsic error)					N/A	N/A
	0.5 inductive	Reference (intrinsic error)					N/A	N/A
Voltage Circuits								
20 I_{tr}	unity	Common	2.5	100	40			
				1000	400			
	0.5 inductive	Common	2.5	100	40			
				1000	400			
20 I_{tr}	unity	Differential	1.0	100	40			
				1000	400			
	0.5 inductive	Differential	1.0	100	40			
				1000	400			
Auxiliary Circuits								
20 I_{tr}	unity	Common	2.5	100	40			
				1000	400			
	0.5 inductive	Common	2.5	100	40			
				1000	400			
20 I_{tr}	unity	Differential	1.0	100	40			
				1000	400			
	0.5 inductive	Differential	1.0	100	40			
				1000	400			

- Check that each $|\text{fault}| \leq |\text{fault limit}|$
- Check that the meter function shall not be perturbed during the disturbance
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

4.13 Short-time overcurrent (2.4.11)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Operating
Voltage applied to voltage circuits:	
Short-time overcurrent (A):	
Duration:	

Before application of short-time overcurrent				After return to normal temperature		
Test current (A)	Power factor	Phase	Intrinsic Error (%)	Error (%)	Fault (%) (error shift)	Fault limit (%)
10 I_{tr}	unity	L1				
		L2				
		L3				

- Check that each |fault| ≤ |fault limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

4.14 Impulse Voltage (2.4.12)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		
Relative humidity (%):		
Atmospheric pressure (kPA):		

Impulse waveform:	1.2/50 µs impulse specified in IEC 60060-1
Voltage rise time:	± 30 %
Voltage fall time:	± 20 %
Source energy:	10.0 J
Source impedance:	500 Ω

Check for significant fault (critical change value)

Test	Circuits tested	Impulse Voltage (V)	Polarity	Change in energy		Critical change value
				Register	Test output	
For circuits and between circuits			Positive			
			Negative			
Circuits relative to earth			Positive			
			Positive			

Note: For each test, the impulse voltage is applied 10 times for each polarity. Minimum of 30 s between impulses.

Check base m.p.e.

Test current (A)	Power factor	Error (%)	Base m.p.e. (%)
I_{tr}	unity		
10 I_{tr}	0.5 inductive		

- Check that each change in energy is not more than the critical change value.
- Check that during the test, there is no flashover, disruptive discharge or puncture.
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance
  - the meter still fulfils the base m.p.e.

☐ Passed ☐ Failed

Remarks:

4.15 Earth Fault (2.4.13)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Voltage (1.1 U_{nom}):	
Duration:	4 hours

Before application of earth-fault condition			After return to normal temperature		
Test current (A)	Power factor	Intrinsic Error (%)	Error (%)	Fault (%) (error shift)	Fault limit (%)
10 I_{tr}	unity				

- Check that each |fault| ≤ |fault limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

4.16 Operation of auxiliary devices (2.4.14)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state: Operating

Test current (A)	Power factor	Auxiliary Device	Error (%)	Fault (%) (error shift)	Fault limit (%)
I_{tr}	unity	Reference		N/A	N/A
I_{max}				N/A	N/A
I_{tr}	unity				
I_{max}					
I_{tr}					
I_{max}					

- Check that each |fault| ≤ |fault limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

4.17 Vibrations (2.4.15.1)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Non-operating, without packing
Frequency range:	10 Hz to 150 Hz
f < 60 Hz:	Constant amplitude of movement 0.075 mm
f < 60 Hz:	Constant acceleration, 9.8 m/s^2
Number of sweep cycles per axis	10

Before application of vibrations			After application of vibrations		
Test current (A)	Power factor	Intrinsic Error (%)	Error (%)	Fault (%) (error shift)	Fault limit (%)
10 I_{tr}	unity				

- Check that each |fault| ≤ |fault limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance
- Supply and load control switches are allowed to change state during the disturbance

☐ Passed ☐ Failed

4.18 Shock (2.4.15.2)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Non-operating, without packing
Pulse shape:	Half-sine
Peak acceleration:	300 m/s^2
Duration of the pulse:	18 ms

Before application of shock			After application of shock		
Test current (A)	Power factor	Intrinsic Error (%)	Error (%)	Fault (%) (error shift)	Fault limit (%)
10 I_{tr}	unity				

- Check that each |fault| ≤ |fault limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance
- Supply and load control switches are allowed to change state during the disturbance

☐ Passed ☐ Failed

Remarks:

4.19 Protection against solar radiation (2.4.16)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Non-operating
Applicable standard:	ISO 4892-3
Test cycle:	8 h dry, 4 h condensation (12 h)
Spectral irradiance:	0.76 $W \cdot m^{-2} \cdot nm^{-1}$ at 340 nm
Duration:	66 days (132 cycles)

Check for significant fault (critical change value)

After exposure to solar radiation test	Change in energy		Critical change value
	Register	Test output	

Check base m.p.e.

Test current (A)	Power factor	Error (%)	Base m.p.e. (%)
I_{tr}	unity		
10 I_{tr}	0.5 inductive		

- Check that each change in energy is not more than the critical change value.
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance
  - the meter still fulfils the base m.p.e.
  - the appearance and, in particular, the legibility of markings and displays is not altered
  - the means of protecting the metrological properties, including the case and sealing, are not affected

☐ Passed ☐ Failed

Remarks:

4.20 Extreme temperatures - Dry Heat (2.4.17.1)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Non-operating
Applicable standards:	IEC 60068-2-2, IEC 60068-3-1
Test temperature (one step higher than upper specified temperature) (°C):	
Duration:	2 h

Before application of dry heat			After application of dry heat		
Test current (A)	Power factor	Intrinsic Error (%)	Error (%)	Fault (%) (error shift)	Fault limit (%)
10 I_{tr}	unity				

- Check that each |fault| ≤ |fault limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

4.21 Extreme temperatures - Cold (2.4.17.2)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Non-operating
Applicable standards:	IEC 60068-2-1, IEC 60068-3-1
Test temperature (one step lower than lower specified temperature) (°C)	
Duration (hours)	2

Before application of cold			After application of cold		
Test current (A)	Power factor	Intrinsic Error (%)	Error (%)	Fault (%) (error shift)	Fault limit (%)
10 I_{tr}	unity				

- Check that each |fault| ≤ |fault limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

4.22 Damp Heat, steady-state (non-condensing), for humidity class H1 (2.4.17.3)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Operating, with no current
Applicable standards:	IEC 60068-2-78, IEC 60068-3-4
Test temperature:	30 °C
Humidity:	85 %
Duration:	2 days

Before application of damp heat			After application of damp heat		
Test current (A)	Power factor	Intrinsic Error (%)	Error (%)	Fault (%) (error shift)	Fault limit (%)
10 I_{tr}	unity				

After 24 h, check base m.p.e.

Test current (A)	Power factor	Error (%)	Base m.p.e. (%)
I_{tr}	unity		
10 I_{tr}	0.5 inductive		

- Check that each |fault| ≤ |fault limit|
- Check that 24 h after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance
  - the meter still fulfils the base m.p.e.
  - there is no evidence of any mechanical damage or corrosion which may affect the functional properties of the meter

☐ Passed ☐ Failed

Remarks:

4.23 Damp Heat, cyclic (condensing), for humidity class H2 and H3 (2.4.17.4)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Meter state:	Operating, with no current
Applicable standards:	IEC 60068-2-30, IEC 60068-3-4
Specified humidity class:	
Upper temperature:	
Lower temperature:	25 °C
Humidity:	85 %
Duration:	2 days (2 cycles)

Before application of damp heat			After application of damp heat		
Test current (A)	Power factor	Intrinsic Error (%)	Error (%)	Fault (%) (error shift)	Fault limit (%)
10 I_{tr}	unity				

After 24 h, check base m.p.e.

Test current (A)	Power factor	Error (%)	Base m.p.e. (%)
I_{tr}	unity		
10 I_{tr}	0.5 inductive		

- Check that each |fault| ≤ |fault limit|
- Check that 24 h after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance
  - the meter still fulfils the base m.p.e.
  - there is no evidence of any mechanical damage or corrosion which may affect the functional properties of the meter

☐ Passed ☐ Failed

Remarks:

4.24 Durability (2.4.18)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Standard(s):

Specify details of durability test including test conditions and severity levels

Before application of durability test			After application of durability test		
Test current (A)	Power factor	Intrinsic Error (%)	Error (%)	Fault (%) (error shift)	Fault limit (%)
I_{tr}	unity				
10 I_{tr}	unity				
I_{max}	unity				

- Check that each |fault| ≤ |fault limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

4.25 Ring wave test (2.4.19)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Applicable standards: IEC 61000-4-12, IEC 62052-11

Check for significant fault (critical change value)

After application of ring wave test	Change in energy		Critical change value
	Register	Test output	

Check base m.p.e.

Test current (A)	Power factor	Error (%)	Base m.p.e. (%)
I_{tr}	unity		
10 I_{tr}	0.5 inductive		

- Check that each change in energy is not more than the critical change value.
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance
  - the meter still fulfils the base m.p.e.

☐ Passed ☐ Failed

Remarks:

4.26 Conducted differential mode current disturbances (2-150 kHz) (2.4.20)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Applicable standards:	IEC 62052.11, IEC 61000-4-19
Meter state:	Operating

Before application of disturbance			After application of disturbance		
Test current (A)	Power factor	Intrinsic Error (%)	Error (%)	Fault (%) (error shift)	Fault limit (%)
10 I_{tr}	unity				

- Check that each |fault| ≤ |fault limit|
- Check that after the test:
  - the meter shows no damage
  - the meter operates with no degradation to metrological performance

☐ Passed ☐ Failed

Remarks:

5 Tests for technical requirements

5.1 Internal clocks (2.5.1)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Applicable standards: IEC 62054-21:2004-05, clause 7.5

Synchronous clock

Test	Temperature (°C)	Duration	Result (s/day)	Limit (s/day)
Mains supply	23	30 days		0.167
Operation reserve – spring	23	36 hours		120
Operation reserve – battery/super-capacitor/primary cell	23	36 hours		1

Crystal-controlled clock

Test	Temperature (°C)	Duration	Result (s/day)	Limit (s/day)
Mains operation	23	30 days		0.5
Operation reserve:	23	36 hours		1
High temperature:	45	24 hours		0.15
Low temperature:	−10	24 hours		0.15

- Check that each $|\text{result}| \leq |\text{limit}|$

☐ Passed ☐ Failed

Remarks:

5.2 Tests for the evaluation of software-controlled meters (Annex C)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Requirements for software-controlled meters (OIML R 46-1, Annex B)	Validation method	Validation Description	Passed	Failed
Software identification (B.2.1)	VFTSw			
Correctness of metrological algorithms and functions (OIML R 46-1, B.2.2)	VFTSw / VFTM			
Software securing and protection (OIML R 46-1, B.2.3)	VFTSw			
Audit trails (OIML R 46-1, B.2.4)	VFTSw			
Prevention of misuse (OIML R 46-1, B.2.5)	VFTSw			
Support of fault and defect detection (OIML R 46-1, B.2.6)	VFTSw			
Shared indications (OIML R 46-1, B.3.1.4)	VFTSw			
Protection of stored data (OIML R 46-1, B.3.3.2)	VFTSw			
Automatic storage (OIML R 46-1, B.3.3.3)	VFTSw / VFTM			
Deletion of stored data (OIML R 46-1, B.3.3.4)	VFTSw			
Protection of transmitted data (OIML R 46-1, B.3.4.2)	VFTSw			
Transmission delay or interruption (OIML R 46-1, B.3.4.3)	VFTSw			
Indications from dynamic modules of legally relevant software (OIML R 46-1, B.3.5)	VFTSw			

5.3 Tests for demand meters

[To be added]

5.4 Tests for interval and multi-tariff meters

[To be added]

6 Tests for kinds of meters

6.1 Tests for multi-branch meters

6.1.1 Cross-channel Influences (B.2.3)

Meter serial no.	
Observer:	
Date (dd/mm/yyyy):	

	At start	At end
Temperature (°C):		
Time (hh:mm):		

Quantity (electrical energy): ☐ **Active** ☐ **Reactive** ☐ **Apparent**

Test channel:

Accuracy

Other channels		Test channel			
Current	Power factor	Current	Power factor	Error (%)	Base m.p.e. (%)
I_{max}	1	I_{min}	1		
			0.5 inductive		
			0.8 capacitive		
	0.5 inductive	I_{min}	1		
			0.5 inductive		
			0.8 capacitive		
	0.8 capacitive	I_{min}	1		
			0.5 inductive		
			0.8 capacitive		

- Check that each $|\text{error}| \leq |\text{base m.p.e}|$

No Load

Test voltage, U_{test} (V)	110 % of U_{nom}	
Minimum test period (hours)	$100 \times 10^3/(b \cdot k \cdot m \cdot U_{test} \cdot I_{min})$	

Other channels		Test current (A)	Test voltage, U_{test} (V)	Test period Δt (hours)	Test output	
Current	Power factor				Number of pulses emitted	Limit
I_{max}	1	No current				1
	0.5 inductive	No current				
	0.8 capacitive	No current				

- Check if the test period $\Delta t \geq$ minimum test period.
- Check if the number of pulses emitted ≤ 1.

☐ Passed ☐ Failed

Remarks:

6.2 Tests for street-light meters

[To be added]