INTERNATIONAL RECOMMENDATION

OIML R 61-3

Edition 2017 (E)

Automatic gravimetric filling instruments.

Part 3: Test report format

Doseuses pondérales à fonctionnement automatique.

Partie 3: Format du rapport d'essais

ORGANISATION INTERNATIONALE DE MÉTROLOGIE LÉGALE

INTERNATIONAL ORGANIZATION OF LEGAL METROLOGY

Contents

Foreword

The International Organization of Legal Metrology (OIML) is a worldwide, intergovernmental organization whose primary aim is to harmonize the regulations and metrological controls applied by the national metrological services, or related organizations, of its Member States. The main categories of OIML publications are:

- **International Recommendations (OIML R),** which are model regulations that establish the metrological characteristics required of certain measuring instruments and which specify methods and equipment for checking their conformity. OIML Member States shall implement these Recommendations to the greatest possible extent;
- **International Documents (OIML D),** which are informative in nature and which are intended to harmonize and improve work in the field of legal metrology;
- **International Guides (OIML G),** which are also informative in nature and which are intended to give guidelines for the application of certain requirements to legal metrology;
- **International Basic Publications (OIML B),** which define the operating rules of the various OIML structures and systems; and

OIML Draft Recommendations, Documents and Guides are developed by Project Groups linked to Technical Committees or Subcommittees which comprise representatives from OIML Member States. Certain international and regional institutions also participate on a consultation basis. Cooperative agreements have been established between the OIML and certain institutions, such as ISO and the IEC, with the objective of avoiding contradictory requirements. Consequently, manufacturers and users of measuring instruments, test laboratories, etc. may simultaneously apply OIML publications and those of other institutions.

International Recommendations, Documents, Guides and Basic Publications are published in English (E) and translated into French (F) and are subject to periodic revision.

Additionally, the OIML publishes or participates in the publication of **Vocabularies (OIML V)** and periodically commissions legal metrology experts to write **Expert Reports (OIML E)**. Expert Reports are intended to provide information and advice, and are written solely from the viewpoint of their author, without the involvement of a Technical Committee or Subcommittee, nor that of the CIML. Thus, they do not necessarily represent the views of the OIML.

This publication - reference OIML R 61-3, Edition 2017 - was developed by Technical Subcommittee TC 9/SC 2 *Automatic weighing instruments*. It was approved for final publication by the International Committee of Legal Metrology in 2017 and will be submitted to the International Conference on Legal Metrology in 2020 for formal sanction. It supersedes the previous edition of R 61-2 (2004).

OIML Publications may be downloaded from the OIML web site in the form of PDF files. Additional information on OIML Publications may be obtained from the Organization's headquarters:

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Introduction

This "Test Report Format" presents, in a standardized format, the results of the various tests and examinations to which a type of an automatic gravimetric filling instrument (hereafter referred to as "AGFI" shall be submitted with a view to its approval.

The Test Report Format consists of two parts: a "checklist" and the "test report format" itself.

The checklist is a summary of the examinations carried out on the instrument. It includes the conclusions on the results of the test performed, and experimental or visual checks based on the requirements of R 61-1. The words or condensed sentences are intended to remind the examiner of the requirements in R 61-1 and R 61-2 without reproducing them.

The test report is a record of the results of the tests carried out on the instrument. The "test report format" forms have been produced based on the tests detailed in R 61-2.

All metrology services or laboratories evaluating types of automatic gravimetric filling instruments according to R 61 or to national or regional regulations based on this Recommendation are strongly advised to use this test report format, directly, or after translation into a language other than English or French. Its direct use in English or in French, or in both languages, is even more strongly recommended whenever test results may be transmitted by the country performing these tests to the approving authorities of another country, under bi- or multilateral cooperation agreements. In the framework of the *OIML Certification System (OIML-CS)*, use of this test report format is mandatory.

The "information concerning the test equipment used for type evaluation" shall cover all test equipment which has been used in determining the test results given in a report. The information may be a short list containing only essential data (name, type, reference number for the purpose of traceability). For example:

- Verification standards (accuracy, or accuracy class, and number),
- Simulator for testing of modules (name, type, traceability and number),
- Climatic test and static temperature chamber (name, type and number),
- Electrical tests, bursts (name of the instrument, type and number),
- Description of the field calibration procedure for the test for immunity to radiated electromagnetic field.

Note concerning the numbering of the following pages:

In addition to sequential numbering: "R 61-3 page ….." at the bottom of the pages of this publication, a special place is left at the top of each page (starting with the following page) for numbering the pages of reports established following this model. In particular, some tests (e.g. metrological performance tests) shall be repeated several times, each test being reported individually on a separate page following the relevant format. In the same way, a multiple range instrument shall be tested separately for each range and a separate form (including the general information form) shall be filled out for each range. For a given report, it is advisable to give also the total number of pages in the report.

Type evaluation report explanatory notes

Symbols	Meaning
I	Indication
I_n	nth indication
L	Load
ΔL	Additional load to next changeover point
P	$I + ½\ d - \Delta L$ = Indication prior to rounding (digital indication)
E	$I - L$ or $P - L$ = Error
F	Mass of the fill
F_P	Preset value of the fill
MPE	Maximum permissible error
$mpe_{(1)}$	maximum permissible error for influence factor tests for class X(1)
se	preset value error (setting error)
$mpse_{(1)}$	maximum permissible preset value error for class X(1)
md	maximum deviation of each fill from the average
$mpd_{(1)}$	maximum permissible deviation of each fill from the average for class X(1)
$mp\Delta z_{(1)}$	maximum permissible zero change per 5 °C for class X(1)
EUT	Equipment under test
e.m.f	Electromotive force

The name(s) or symbol(s) of the unit(s) used to express test results shall be specified in each form.

For each test, the "SUMMARY OF TYPE EVALUATION" and the "CHECKLIST" shall be completed according to this example:	P	F	P = Passed F = Failed
when the instrument has passed the test:	X		
when the instrument has passed the test:		X	
when the test is not applicable:			

The white spaces in boxes in the headings of the report should always be filled in according to the following example:

	At start	At end	
Temp.:	20.5	21.1	°C
Rel. h.:			%
Date:	2012-10-29	2012-10-30	yyyy-mm-dd
Time:	16:00:05	16:30:25	hh:mm:ss
Bar. pres.:			hPa

"Date" in the test report refers to the date that the test was performed.

In the disturbance tests, faults greater than d are acceptable provided that they are detected and acted upon, or that they result from circumstances such that these faults shall not be considered as significant; an appropriate explanation shall be given in the column "Yes (remarks)".

Section numbers in brackets refer to the corresponding subclauses of OIML R 61-1 and R 61-2.

Type evaluation report

General information concerning the type

Application no.: ---------- Manufacturer: ----------

Type designation: ---------- Applicant: ----------

Instrument category: ----------

Testing on:

☐ Complete instrument ☐ Module[1]

Reference accuracy class ☐ Ref( )

Accuracy class ☐ X( )

Minimum capacity ☐

Maximum capacity ☐

T = + ☐ T = - ☐ d = ☐

U_{nom}[2] = ☐ V U_{min} = ☐ V U_{max} = ☐ V f = ☐ Hz Battery, U = ☐ V

Zero-setting device: ☐ Non-automatic ☐ Semi-automatic ☐ Automatic

Initial zero-setting range ☐ % Temperature range ☐ °C

Printer: ☐ Built-in ☐ Connected ☐ Not present but connectable ☐ No connection

[1] The test equipment (simulator or part of a complete instrument) connected to the module shall be defined in the test form(s) used.

[2] The voltage U_{nom} shall be as defined in IEC 1000-4-11:1994, section 5.

General information concerning the type

Instrument submitted: ----------

Identification no.: ----------

Software version: ----------

Connected equipment: ----------

Interfaces (number, nature): ----------

Evaluation period: ----------

Date of report: ----------

Observer: ----------

Load sensor: ----------

Manufacturer: ----------

Type: ----------

Capacity: ----------

Number:

Classification symbol: ----------

	Yes	No
OIML R 60 Certificate of conformity. Please tick and if "Yes" supply Certificate number.		

Certificate number: ----------

General information concerning the type

Use this space to indicate additional remarks and/or information: other connected equipment, interfaces and load cells, choice of the manufacturer regarding protection against disturbances, etc.

Identification of the instrument

Application no.:		Type designation:	
Identification no.:		Manufacturer:	
Software version:			
Report date:			

Manufacturing documentation

(Record as necessary to identify the equipment under test)

System or module name	Drawing number or software reference	Issue level	Serial no.

Simulated setup documentation

System or module name	Drawing number or software reference	Issue level	Serial no.

Simulated setup function (summary)

(*Simulated setup description and drawings, block diagram, etc. should be attached to the report if available*)

Description or other information pertaining to identification of the instrument

(*attach photograph here if available*)

Information concerning the test equipment used for type evaluation

Test equipment

Application no.: _____ Type designation: _____

Report date: _____ Manufacturer: _____

List all test equipment used in this report (including descriptions of the reference vehicles used for testing)

Equipment name	Manufacturer	Type No.	Serial No.	Used for (test references)

Remarks:

Configuration for test

Application no.:		Type designation:	
Report date:		Manufacturer:	

Use this space for additional information relating to equipment configuration, interfaces, data rates, EMC protection options for load cells, etc. for the instrument and / or simulated setup.

Summary of type evaluation tests

Application no.: ---------- Type designation: ----------

Report date: ---------- Manufacturer: ----------

R 61-2	R 61-3	Tests	Report page	Passed	Failed	Remarks
9.2.3	1	Accuracy of zero-setting				
9.2.4	2	Accuracy of tare setting				
10.2	3	**Influence factors:**				
10.2.1	3.1	Warm-up time				
10.2.2	3.2	Temperature with static load				
10.2.3	3.3	Temperature effect at no load (dry heat and cold)				
10.2.4	3.4	Damp heat test:				
10.2.4.1	3.4.1	Damp heat, steady state (non-condensing)				
10.2.4.2	3.4.2	Damp heat, cyclic (condensing)				
10.2.5	3.5	Voltage variations test:				
10.2.5.1	3.5.1	AC mains voltage variation test				
10.2.5.2	3.5.2	DC mains voltage variation test				
10.2.5.3	3.5.3	Low voltage of internal battery, not connected to mains power				
10.2.5.4	3.5.4	Power from external 12 V and 24 V road vehicle batteries				
10.2.6	3.6	Tilting				
10.3	4	**Disturbance tests:**				
10.3.1	4.1	AC mains voltage dips, short interruptions and reductions				
10.3.2	4.2	Bursts (fast transient tests) on mains power lines and on signal and control lines				
10.3.2.1	4.2.1	AC and DC mains power lines				
10.3.2.2	4.2.2	Signal, data and control lines				
10.3.3	4.3	Electrostatic discharge test				
10.3.3.1	4.3.1	Direct application				
10.3.3.2	4.3.2	Contact discharge (indirect application)				
10.3.4	4.4	Immunity to electromagnetic fields				
10.3.4.1	4.4.1	Radiated electromagnetic fields				
10.3.4.2	4.4.2	Conducted electromagnetic fields				

R 61-2	R 61-3	Tests	Report page	Passed	Failed	Remarks
10.3.5	4.5	Electrical surges on AC and DC mains power lines and on signal, data and control lines				
10.3.5.1	4.5.1	Surges on AC and DC mains power lines				
10.3.5.2	4.5.2	Surges on signal, data and control lines				
10.3.6	4.6	Electrical transient conduction for instruments powered from 12 V and 24 V road vehicle batteries				
10.3.6.1	4.6.1	Conduction along supply lines of external voltage supply				
10.3.6.2	4.6.2	Conduction via lines other supply lines, for external voltage supply				
10.3.7	4.7	Ripple on DC mains power				
10.3.8	4.8	Battery voltage variations during start-up of a vehicle engine				
10.3.9	4.9	Load dump test				
10.3.10	4.10	DC mains voltage dips, short interruptions and reductions				
11	5	Span stability test				
12.2.1	7	Load indicator performance test				

Summary of type evaluation

Use this page to detail remarks from the summary of type evaluation.

1 Zero-setting (R 61-1, 5.8, R 61-2, 9.2.3)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Accuracy of zero-setting

Zero-setting mode:		
ΔL	$E = 0.5\ d - \Delta L$	E/d

Remarks:

Accuracy of zero-setting

Zero-setting mode:		
ΔL	$E = 0.5\ d - \Delta L$	E/d

Remarks:

Accuracy of zero-setting

Zero-setting mode:		
ΔL	$E = 0.5\ d - \Delta L$	E/d

Remarks:

2 Tare setting (R 61-1, 5.8, R 61-2, 9.2.4)

			At start	At end	
Application no.:	-------------------	Temp.:			°C
Type designation:	-------------------	Rel. h.:			%
Observer:	-------------------	Date:			yyyy-mm-dd
Control scale interval, *d*:	-------------------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	-------------------	Bar. pres.:			hPa

Accuracy of tare setting

Tare setting mode:		
Tare load:		
ΔL	$E = 0.5\ d - \Delta L$	E/d

☐ Passed ☐ Failed

Remarks:

Accuracy of tare setting

Tare setting mode:		
Tare load:		
ΔL	$E = 0.5\ d - \Delta L$	E/d

☐ Passed ☐ Failed

Remarks:

Accuracy of tare setting

Tare setting mode:		
Tare load:		
ΔL	$E = 0.5\ d - \Delta L$	E/d

☐ Passed ☐ Failed

Remarks:

3 Influence factors (R 61-1, 4.8)

3.1 Warm-up time (R 61-1, 6.8, R 61-2, 10.2.1)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Duration of disconnection before test: ☐ h

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation[3]

$E = I + ½\, d - \Delta L - L$

E_0 = error calculated at zero or near zero (unloaded)

E_L = error calculated at load (loaded)

[3] In operation only if zero operates as part of every automatic weighing cycle

	Time (*) (min)	Load	Indication, I	Add. load, ΔL	Error	$E_L - E_0$	mpe =
Unloaded	0						
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
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Unloaded							
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Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							

	Time (*) (min)	Load	Indication, I	Add. load, ΔL	Error	$E_L - E_0$	mpe =
Unloaded	5						
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
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Unloaded							
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Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							

	Time (*) (min)	Load	Indication, I	Add. load, ΔL	Error	$E_L - E_0$	mpe =
Unloaded	15						
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
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Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							

	Time* (min)	Load	Indication, I	Add. load, ΔL	Error	$E_L - E_0$	mpe =
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded	30						
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							
Unloaded							
Loaded							

* Counted from the moment an indication has first appeared.

Check if $|E_L - E_0| \leq |\text{mpe}|$

Initial zero-setting error	E_{0I}	
Maximum value of error unloaded	E_0	
Maximum value of error loaded	$E_L - E_0$	

☐ Passed ☐ Failed

Remarks:

3.2 Static temperatures (R 61-1, 4.8.2, R 61-2, 10.2.2)

3.2.1 Temperature with static load (20 °C)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

$E = I + ½\, d - \Delta L - L$

$E_C = E - E_0$ with E_0 = error calculated at or near zero*

Load, *L*	Indication, *I*		Add. load, ΔL		Error, *E*		Corrected error, E_C		$mpe_{(1)}$	$\frac{E_C^{**}}{mpe_{(1)}}$
	↓	↑	↓	↑	↓	↑	↓	↑		
*					*					

** Use largest value of E_C in each case.

$mpe_{(1)}$ = the maximum permissible error for influence factor tests for class X(1)

Maximum value of $\frac{E_C}{mpe_{(1)}}$ (largest value in right hand column) ☐

Note: This value is to be inserted in the checklist

Remarks:

3.2.2 Temperature with static load (specified high = ……. °C)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

$E = I + ½\ d - \Delta L - L$

$E_C = E - E_0$ with E_0 = error calculated at or near zero*

Load, *L*	Indication, *I*		Add. load, ΔL		Error, *E*		Corrected error, E_C		$mpe_{(1)}$	$\frac{E_C^{**}}{mpe_{(1)}}$
	↓	↑	↓	↑	↓	↑	↓	↑		
*					*					

** Use largest value of E_C in each case.

$mpe_{(1)}$ = the maximum permissible error for influence factor tests for class X(1)

Maximum value of $\frac{E_C}{mpe_{(1)}}$ (largest value in right hand column)

Note: This value is to be inserted in the checklist

Remarks:

3.2.3 Temperature with static load (specified low = ……. °C)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

$E = I + ½\ d - \Delta L - L$

$E_C = E - E_0$ with E_0 = error calculated at or near zero*

Load, *L*	Indication, *I*		Add. load, ΔL		Error, *E*		Corrected error, E_C		$mpe_{(1)}$	$\frac{E_C^{**}}{mpe_{(1)}}$
	↓	↑	↓	↑	↓	↑	↓	↑		
*					*					

** Use largest value of E_C in each case.

$mpe_{(1)}$ = the maximum permissible error for influence factor tests for class X(1)

Maximum value of $\frac{E_C}{mpe_{(1)}}$ (largest value in right hand column)

Note: This value is to be inserted in the checklist

Remarks:

3.2.4 Temperature with static load (5 °C if the specified low temperature is ≤ 0 °C)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

$E = I + ½\, d - \Delta L - L$

$E_C = E - E_0$ with E_0 = error calculated at or near zero*

Load, *L*	Indication, *I*		Add. load, ΔL		Error, *E*		Corrected error, E_C		$mpe_{(1)}$	$\frac{E_C^{**}}{mpe_{(1)}}$
	↓	↑	↓	↑	↓	↑	↓	↑		
*					*					

** Use largest value of E_C in each case.

$mpe_{(1)}$ = the maximum permissible error for influence factor tests for class X(1)

Maximum value of $\frac{E_C}{mpe_{(1)}}$ (largest value in right hand column) ☐

Note: This value is to be inserted in the checklist

Remarks:

3.2.5 Temperature with static load (20 °C)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

$E = I + ½\ d - \Delta L - L$

$E_C = E - E_0$ with E_0 = error calculated at or near zero*

Load, *L*	Indication, *I*		Add. load, ΔL		Error, *E*		Corrected error, E_C		$mpe_{(1)}$	$\frac{E_C^{**}}{mpe_{(1)}}$
	↓	↑	↓	↑	↓	↑	↓	↑		
*					*					

** Use largest value of E_C in each case.

$mpe_{(1)}$ = the maximum permissible error for influence factor tests for class X(1)

Maximum value of $\frac{E_C}{mpe_{(1)}}$ (largest value in right hand column) ☐

Note: This value is to be inserted in the checklist

Remarks:

3.3 Temperature effect on no-load indication (dry heat and cold) (R 61-1, 4.8.2.3, R 61-2, 10.2.3)

Application no.: ----------

Type designation: ----------

Observer: ----------

Scale interval, *d*: ----------

Resolution during test (smaller than *d*): ----------

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

$P = I + ½\ d - \Delta L$

Report page[4]	Date	Time	Temp (°C)	Zero indication, I	Add. load	P	ΔP	ΔTemp	Zero-change per 5 °C Δz	$\frac{\Delta z}{\text{mp}\,\Delta z_{(1)}}$

Maximum permissible zero change per 5 °C, $\text{mp}\Delta z_{(1)}$ for the rated minimum fill

ΔP = difference of P for two consecutive tests at different temperatures

ΔTemp = difference of Temp for two consecutive tests at different temperatures

Maximum value of $\frac{E_C}{\text{mpe}_{(1)}}$ (largest value in right hand column) ☐

Note: This value is to be inserted in the checklist

Remarks:

[4] Give the report page of the relevant weighing test where weighing tests and temperature effect on no-load indication test are conducted together.

3.4 Damp heat tests (R 61-1, 4.8.1, R 61-2, 10.2.4)

Damp heat tests are performed alternatively in accordance with R 61-1, 4.8.1, the option chosen recorded in 4.3.1 or 4.3.2 below accordingly.

3.4.1 Damp heat, steady state (non-condensing) (R 61-2, 10.2.4.1)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

$E = I + ½\ d - \Delta L - L$

$E_C = E - E_0$ with E_0 = error calculated at or near zero*

3.4.1.1 Initial test at reference temperature of 20 °C and relative humidity of 50 %

Load, *L*	Indication, *I*		Add. load, ΔL		Error, *E*		Corrected error, E_C		$mpe_{(1)}$	$\frac{E_C^{**}}{mpe_{(1)}}$
	↓	↑	↓	↑	↓	↑	↓	↑		
*					*					

** Use largest value of E_C in each case.

$mpe_{(1)}$ = the maximum permissible error for influence factor tests for class X(1)

Maximum value of $\frac{E_C}{mpe_{(1)}}$ (largest value in right hand column) ☐

Note: This value is to be inserted in the checklist

Remarks:

3.4.1.2 Test at specified high temperature (…….°C), relative humidity 85 %

	At start	At end	
Temp.:			°C
Rel. h.:			%
Date:			yyyy-mm-dd
Time:			hh:mm:ss
Bar. pres.:			hPa

Load, L	Indication, I		Add. load, ΔL		Error, E		Corrected error, E_C		$mpe_{(1)}$	$\frac{E_C^{**}}{mpe_{(1)}}$
	↓	↑	↓	↑	↓	↑	↓	↑		
*					*					

** Use largest value of E_C in each case.

$mpe_{(1)}$ = the maximum permissible error for influence factor tests for class X(1)

Maximum value of $\frac{E_C}{mpe_{(1)}}$ (largest value in right hand column)

Note: This value is to be inserted in the checklist

Remarks:

3.4.1.3 Final test at reference temperature 20 °C, relative humidity 50 %

	At start	At end	
Temp.:			°C
Rel. h.:			%
Date:			yyyy-mm-dd
Time:			hh:mm:ss
Bar. pres.:			hPa

Load, L	Indication, I		Add. load, ΔL		Error, E		Corrected error, E_C		$mpe_{(1)}$	$\frac{E_C^{**}}{mpe_{(1)}}$
	↓	↑	↓	↑	↓	↑	↓	↑		
*					*					

** Use largest value of E_C in each case.

$mpe_{(1)}$ = the maximum permissible error for influence factor tests for class X(1)

Maximum value of $\frac{E_C}{mpe_{(1)}}$

(largest value in right hand column)

Note: This value is to be inserted in the checklist

Remarks:

3.4.2 Damp heat, cyclic (condensing) (R 61-1, 4.8.1, R 61-2, 10.2.4.2)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

Load, *L* ☐

$E = I + ½\, d - \Delta L - L$

$E_C = E - E_0$ with E_0 = error calculated at or near zero*

3.4.2.1 Initial temperature

Load, *L*	Indication, *I*		Add. load, ΔL		Error, *E*		Corrected error, E_C		$mpe_{(1)}$	$\frac{E_C^{**}}{mpe_{(1)}}$
	↓	↑	↓	↑	↓	↑	↓	↑		
*					*					

** Use largest value of E_C in each case.

$mpe_{(1)}$ = the maximum permissible error for influence factor tests for class X(1)

Maximum value of $\frac{E_C}{mpe_{(1)}}$ ☐

(largest value in right hand column)

Note: This value is to be inserted in the checklist

Remarks:

3.4.2.2 Damp heat, cyclic (condensing)

	At start	At end	
Temp.:			°C
Rel. h.:			%
Date:			yyyy-mm-dd
Time:			hh:mm:ss
Bar. pres.:			hPa

Upper temperature

Load, L	Indication, I		Add. load, ΔL		Error, E		Corrected error, E_C		$mpe_{(1)}$	$\frac{E_C^{**}}{mpe_{(1)}}$
	↓	↑	↓	↑	↓	↑	↓	↑		
*					*					

** Use largest value of E_C in each case.

$mpe_{(1)}$ = the maximum permissible error for influence factor tests for class X(1)

Maximum value of $\frac{E_C}{mpe_{(1)}}$ (largest value in right hand column)

Note: This value is to be inserted in the checklist

Remarks:

3.4.2.3 Damp heat, cyclic (condensing)

	At start	At end	
Temp.:			°C
Rel. h.:			%
Date:			yyyy-mm-dd
Time:			hh:mm:ss
Bar. pres.:			hPa

Lower temperature

Load, L	Indication, I		Add. load, ΔL		Error, E		Corrected error, E_C		$mpe_{(1)}$	$\frac{E_C^{**}}{mpe_{(1)}}$
	↓	↑	↓	↑	↓	↑	↓	↑		
*					*					

** Use largest value of E_C in each case.

$mpe_{(1)}$ = the maximum permissible error for influence factor tests for class X(1)

Maximum value of $\frac{E_C}{mpe_{(1)}}$ (largest value in right hand column)

Note: This value is to be inserted in the checklist

Remarks:

3.5 Voltage variation tests (R 61-1, 4.8.3)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

$E = I + ½\ d - \Delta L - L$ $E_C = E - E_0$ with E_0 = error calculated at or near zero*

☐ AC mains voltage, R 61-2, 10.2.5.1

☐ DC mains voltage, R 61-2, 10.2.5.2

☐ Battery variation, not connected to the mains (DC), R 61-2, 10.2.5.3

☐ Power from external 12 V and 24 V road vehicle batteries, R 61-2, 10.2.5.4

Voltage: ☐ V U_{min} = ☐ V U_{max} = ☐ V frequency: ☐ Hz

$mpe_{(1)}$ ☐

3.5.1 AC mains voltage variation test (R 61-2, 10.2.5.1)

Voltage[5]	U (V)	Load, L	Indication, I	Add. load, ΔL	Error, E	Corrected error, E_C	$\frac{E_C}{mpe_{(1)}}$
Reference value					*		
Lower limit							
Upper limit							

$mpe_{(1)}$ = the maximum permissible error for influence factor tests for class X(1)

Maximum value of $\frac{E_C}{mpe_{(1)}}$ ☐

(largest value in right hand column)

Note: This value is to be inserted in the checklist

Remarks:

[5] The reference voltage shall be as defined in IEC 1000-4-11 (1994) section 5

3.5.2 DC mains voltage variation test (R 61-2, 10.2.5.2)

Voltage[6]	U (V)	Load, L	Indication, I	Add. load, ΔL	Error, E	Corrected error, E_C	$\frac{E_C}{\text{mpe}_{(1)}}$
Reference value					*		
Lower limit							
Upper limit							

$\text{mpe}_{(1)}$ = the maximum permissible error for influence factor tests for class X(1)

Maximum value of $\frac{E_C}{\text{mpe}_{(1)}}$ (largest value in right hand column)

Note: This value is to be inserted in the checklist

Remarks:

3.5.3 Low voltage of internal battery, not connected to the mains power (R 61-2, 10.2.5.3)

Voltage[6]	U (V)	Load, L	Indication, I	Add. load, ΔL	Error, E	Corrected error, E_C	$\frac{E_C}{\text{mpe}_{(1)}}$
Reference value					*		
Lower limit							
Upper limit							

$\text{mpe}_{(1)}$ = the maximum permissible error for influence factor tests for class X(1)

Maximum value of $\frac{E_C}{\text{mpe}_{(1)}}$ (largest value in right hand column)

Note: This value is to be inserted in the checklist

Remarks:

[6] The reference voltage shall be as defined in IEC 1000-4-11 (1994) section 5

3.5.4 Power from external 12 V and 24 V road vehicle batteries (R 61-2, 10.2.5.4)

Voltage[7]	U (V)	Load, L	Indication, I	Add. load, ΔL	Error, E	Corrected error, E_C	$\frac{E_C}{\text{mpe}_{(1)}}$
Reference value					*		
Lower limit							
Upper limit							

$\text{mpe}_{(1)}$ = the maximum permissible error for influence factor tests for class X(1)

Maximum value of $\frac{E_C}{\text{mpe}_{(1)}}$

(largest value in right hand column)

Note: This value is to be inserted in the checklist

Remarks:

[7] The reference voltage shall be as defined in IEC 1000-4-11 (1994) section 5

3.6 Tilting (R 61-1, 4.8.4, R 61-2, 10.2.6)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

☐ Tilting at no-load, R 61-2, 10.2.6.1.11

☐ Tilting when loaded, R 61-2, 10.2.6.1.2

☐ Tilting 5 % not required for fixed installation, R 61-2, 10.2.6.2

☐ Tilting 5 % not required, can be adjusted to 1 % or less, R 61-2, 10.2.6.2

☐ Tilting 10 % installation in road vehicles

Load, L

Maximum permissible error for class X(1) $mpe_{(1)}$

$E = I + ½\,d - \Delta L - L$ $E_C = E - E_0$ with E_0 = error calculated at or near zero*

Tilt	Indication, I	Add. load, ΔL	Error, E	Corrected error, E_C	$\frac{E_C}{mpe_{(1)}}$
Reference			(*)		
Tilt limit →					
Tilt limit ←					
5 % →					
5 % ←					
5 % ↑					
5 % ↓					
10 %					
Reference					

Remarks:

Maximum value of $\frac{E_C}{mpe_{(1)}}$ (largest value in right hand column)	

Note: This value is to be inserted in the checklist

4 Disturbance tests (R 61-1, 6.2, R 61-2, 10.3)

4.1 AC mains voltage dips, short interruptions and reductions (R 61-2, 10.3.1)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

Marked nominal voltage, U_{nom}, or voltage[8] range: ☐ V

Load, *L*: ☐

Disturbance				Result		
Amplitude, % U_{nom}	Duration (cycles)	Number of disturbances	Repetition interval (s)	Indication, *I*	Significant fault (> *d*) or detection and reaction	
					No	Yes (remarks)
without disturbance						
0	0.5 / 0.6*	10				
0	1	10				
40	10 / 12*	10				
70	25 / 30*	10				
80	250 / 300*	10				
0	250 / 300*	10				

* These values are for 50 Hz / 60 Hz respectively

☐ Passed ☐ Failed

Note: If significant faults are detected and acted upon, or if the EUT fails, the test point at which this occurs shall be recorded.

Remarks:

[8] The reference voltage shall be as defined in IEC 1000-4-11 (1994) section 5.

4.2 Burst/fast transients on mains power lines and on signal, data and control lines (R 61-2, 10.3.2)

4.2.1 Burst (transients) on AC and DC mains power lines

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

Load, *L*: ☐

Voltage supply lines: test voltage 2.0 kV (peak value), duration of the test > 1 minute at each polarity

Disturbance		Result		
Disturbance	Polarity	Indication, *I*	Significant fault (> *d*) or detection and reaction	
			No	Yes (remarks)
without disturbance				
line ↓ ground	positive			
	negative			
without disturbance				
neutral ↓ ground	positive			
	negative			
without disturbance				
protective earth ↓ ground	positive			
	negative			

☐ Passed ☐ Failed

Note: If significant faults are detected and acted upon, or if the EUT fails, the test point at which this occurs shall be recorded.

Remarks:

4.2.2 Bursts (transients) on signal, data and control lines

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

Load, *L*: ☐

Signal, data and control lines: test voltage 1.0 kV, duration of the test > 1 minute at each polarity

Disturbance		Result		
Bursts (transients) on cable / interface (type, nature)	Polarity	Indication, *I*	Significant fault (> *d*) or detection and reaction	
			No	Yes (remarks)
without disturbance				
	positive			
	negative			
without disturbance				
	positive			
	negative			
without disturbance				
	positive			
	negative			
without disturbance				
	positive			
	negative			
without disturbance				
	positive			
	negative			
without disturbance				
	positive			
	negative			

☐ Passed ☐ Failed

Remarks:

Explain or make a sketch indicating where the clamp is located on the cable; if necessary, add additional page.

☐ Passed ☐ Failed

Note: If significant faults are detected and acted upon, or if the EUT fails, the test point at which this occurs shall be recorded.

Remarks:

4.3 Electrostatic discharge test (R 61-2, 10.3.3)

4.3.1 Direct application

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

Load, *L*: ☐

☐ Contact discharges ☐ Paint penetration

☐ Air discharges Polarity[9]: ☐ Positive ☐ Negative

Discharges			Result		
Test voltage[10] (kV)	Number of discharges ≥ 10	Repetition interval (s)	Indication, *I*	Significant fault (> *d*) or detection and reaction	
				No	Yes (remarks, test points, etc.)
without disturbance					
2					
4					
6					
8 (air discharges)					

☐ Passed ☐ Failed

Note: If significant faults are detected and acted upon, or if the EUT fails, the test point at which this occurs shall be recorded.

Remarks:

[9] IEC 61000-4-2 specifies that the test shall be conducted with the most sensitive polarity

[10] Tests shall be performed at the specified lower levels, starting with 2 kV and proceeding with 2 kV steps up to and including the level specified above in accordance with IEC 61000-4-2

4.3.2 Contact discharge (indirect application)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

Load, *L*: ☐

Polarity[11]: ☐ Positive ☐ Negative

Horizontal coupling plane:

Discharges			Result		
Test voltage (kV)	Number of discharges (≥ 10)	Repetition interval (s)	Indication, *I*	Significant fault (> *d*) or detection and reaction	
				No	Yes (remarks)
without disturbance					
2					
4					
6					

Vertical coupling plane:

Discharges			Result		
Test voltage (kV)	Number of discharges (≥ 10)	Repetition interval (s)	Indication, *I*	Significant fault (> *d*) or detection and reaction	
				No	Yes (remarks)
without disturbance					
2					
4					
6					

☐ Passed ☐ Failed

Note: If significant faults are detected and acted upon, or if the EUT fails, the test point at which this occurs shall be recorded.

Remarks:

[11] IEC 61000-4-2 specifies that the test shall be conducted with the most sensitive polarity

Specification of test points of EUT (direct application), e.g. by photos or sketches

a) Direct application

Contact discharges:

Air discharges:

b) Indirect application

4.4 Immunity to electromagnetic fields (R 61-2, 10.3.4)

4.4.1 Radiated electromagnetic fields (R 61-2, 10.3.4.1)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Rate of sweep: ☐ Load, *L*: ☐ Material load: ☐

Disturbance				Result		
Antenna	Frequency range (MHz)	Polarization	Facing EUT	Indication, *I*		Significant fault (> *d*) or detection and reaction
					No	Yes (remarks)
without disturbance						
		Vertical	Front			
			Right			
			Left			
			Rear			
		Horizontal	Front			
			Right			
			Left			
			Rear			
		Vertical	Front			
			Right			
			Left			
			Rear			
		Horizontal	Front			
			Right			
			Left			
			Rear			

Frequency range: 80 MHz[12] to 3000 MHz[13]
RF amplitude (50 ohms): 10 V/m
Modulation: 80 % AM, 1 kHz, sine wave

☐ Passed ☐ Failed

Note: If EUT fails, the frequency and field strength at which this occurs must be recorded.

Remarks:

[12] Lower limit is 26 MHz if the test according to R 61-2, 10.3.4.2 cannot be applied due to lack of mains or I/O ports.
[13] Appropriate for conditions where influences from wireless networks, mobile phones and the like cannot be excluded.

4.4.2 Conducted electromagnetic fields (R 61-2, 10.3.4.2)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Rate of sweep: ☐ Load, *L*: ☐ Material load: ☐

Disturbance			Result		
Frequency range (MHz)	Cable / interface	Level (V RMS)	Indication, *I*	Significant fault (> *d*) or detection and reaction	
				No	Yes (remarks)
without disturbance					
without disturbance					
without disturbance					
without disturbance					
without disturbance					
without disturbance					

Frequency range: 0.15 MHz – 80 MHz
RF amplitude (50 ohms): 10 V/m (e.m.f.)
Modulation: 80 % AM, 1 kHz, sine wave

☐ Passed ☐ Failed

Note: If EUT fails, the frequency and field strength at which this occurs must be recorded.

Remarks:

Include a description of the setup of EUT, e.g. by photos or sketches.

Note: If EUT fails, the frequency and field strength at which this occurs must be recorded.

4.5 Surges on AC and DC mains power lines and on signal, data and control lines (R 61-2, 10.3.5)

4.5.1 AC and DC mains power supply lines[14]

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

Load, *L*: ☐

[14] Test voltage 1.0 kV (line to line) and 2.0 kV (line to earth) for 1 minute at each amplitude and polarity

Disturbance						Result		
3 positive and 3 negative surges synchronously with AC supply voltage						Indication, *I*	Significant fault (> *d*) or detection and reaction	
Amplitude/ apply on	angle				Polarity			
	0°	90°	180°	270°			No	Yes (remarks)
1.0 kV line ↓ neutral	without disturbance							
	X				positive			
					negative			
		X			positive			
					negative			
			X		positive			
					negative			
				X	positive			
					negative			
2.0 kV line ↓ protective earth	without disturbance							
	X				positive			
					negative			
		X			positive			
					negative			
			X		positive			
					negative			
				X	positive			
					negative			
2.0 kV neutral ↓ protective earth	without disturbance							
	X				positive			
					negative			
		X			positive			
					negative			
			X		positive			
					negative			
				X	positive			
					negative			

☐ Passed ☐ Failed

Remarks:

4.5.2 Surges on signal, data and control lines

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

Cable/interface	Polarity	Result			
		Load, *L*	Indication, *I*	Significant fault (> *d*) or detection and reaction	
				No	Yes (remarks)
without disturbance					
C/1,1	positive				
	negative				
without disturbance					
C/1,2	positive				
	negative				
without disturbance					
C/1,3	positive				
	negative				
without disturbance					
C/1,4	positive				
	negative				
without disturbance					
C/1,5	positive				
	negative				
without disturbance					
C/1,6	positive				
	negative				

Note: Explain or make a sketch indicating where the clamp is located on the cable; if necessary, add additional page.

☐ Passed ☐ Failed

Remarks:

4.6 Electrical transient conduction for instruments powered from 12 V and 24 V road vehicle batteries (R 61-2, 10.3.6)

4.6.1 Conduction along supply lines of external voltage supply (R 61-2, 10.3.6.1)

		At start	At end	
Application no.: ----------	Temp.:			°C
Type designation: ----------	Rel. h.:			%
Observer: ----------	Date:			yyyy-mm-dd
Control scale interval, *d*: ----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*) ----------	Bar. pres.:			hPa

Load, *L*: ____

Marked nominal voltage (U_{nom}) or voltage range: ____ V

☐ 12 V battery voltage ☐ 24 V battery voltage ☐ Other voltage supply

Disturbance				Result		
Voltage conditions U_{nom}	Test pulse	Pulse voltage, U_s (V)	Number of pulses applied / duration	Indication, *I*	Significant fault (> *d*) or detection and reaction	
					No	Yes (remarks) [15]
without disturbance						
12 V	2a	+ 50				
	2b[16]	+ 10				
	3a	– 150				
	3b	+ 100				
24 V	2a	+ 50				
	2b[14]	+ 20				
	3a	– 200				
	3b	+ 200				
Other voltage supply						
without disturbance						

☐ Passed ☐ Failed

Note: If EUT fails, the frequency at which this occurs shall be recorded.

Remarks:

[15] Functional status of the instrument during and after exposure to test pulses

[16] Test pulse 2b is only applicable if the instrument is connected to the battery via the main (ignition) switch of the car, i.e. if the manufacturer has not specified that the instrument is to be connected directly (or by its own main switch) to the battery.

4.6.2 Conduction via lines other supply lines, for external voltage supply (R 61-2, 10.3.6.2)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Load, *L*: ☐

Marked nominal voltage (U_{nom}) or voltage range: ☐ V

☐ 12 V battery voltage ☐ 24 V battery voltage ☐ Other voltage supply

Disturbance					Result	
Voltage conditions, U_{nom}	Test pulse	Pulse voltage, U_s (V)	Number of pulses applied / duration	Indication, *I*	Significant fault (> *d*) or detection and reaction	
					No	Yes (remarks) [17]
without disturbance						
12 V	a	– 60				
	b	+ 40				
24 V	a	– 80				
	b	+ 80				
Other voltage supply						
without disturbance						

☐ Passed ☐ Failed

Note: If EUT fails, the frequency at which this occurs shall be recorded.

Remarks:

[17] Functional status of the instrument during and after exposure to test pulses

4.7 Ripple on DC mains power (R 61-2, 10.3.7)

		At start	At end	
Application no.:	----------	Temp.:		°C
Type designation:	----------	Rel. h.:		%
Observer:	----------	Date:		yyyy-mm-dd
Control scale interval, *d*:	----------	Time:		hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:		hPa

Load, *L*: ____

Voltage, U_{nom} = ____ V U_{min} = ____ V U_{max} = ____ V

Disturbance			Result	
Test condition		Indication, *I*	Significant fault (> *d*) or detection and reaction	
Test	Duration		No	Yes (remarks) [18]
without disturbance				
without disturbance				

☐ Passed ☐ Failed

Note: If significant faults are detected and acted upon, or if the EUT fails, the test point at which this occurs shall be recorded.

Remarks:

[18] Functional status of the instrument during and after exposure to test pulses

4.8 Battery voltage variations during start-up of a vehicle engine (R 61-1, 4.8.3, R 61-2, 10.3.8)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

☐ Power from external 12 V and 24 V road vehicle batteries, R 61-2, 10.2.8

Voltage, U_{nom} = ☐ V U_{min} = ☐ V U_{max} = ☐ V

Load, *L*: ☐

Disturbance			Result	
Test condition		Indication, *I*	Significant fault (> *d*) or detection and reaction	
Voltage[19]	Level		No	Yes (remarks)[20]
without disturbance				
Reference				
Lower limit				
Upper limit				
Reference				
without disturbance				

☐ Passed ☐ Failed

Note: If significant faults are detected and acted upon, or if the EUT fails, the test point at which this occurs shall be recorded.

Remarks:

[19] The reference voltage shall be as defined in IEC 1000-4-11 (1994) section 5.
[20] Functional status of the instrument during and after exposure to test pulses

4.9 Load dump test (R 61-2, 10.3.9)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

☐ Power from external 12 V and 24 V road vehicle batteries, R 61-2, 10.2.8

Voltage, U_{nom} = ☐ V U_{min} = ☐ V U_{max} = ☐ V

Load, *L*: ☐

Disturbance			Result	
Test condition		Indication, *I*	Significant fault (> *d*) or detection and reaction	
Test pulse shape[21]	Level		No	Yes (remarks) [22]
without disturbance				
Reference				
U_S (V)				
R_i (Ω)				
Reference				
without disturbance				

☐ Passed ☐ Failed

Note: If significant faults are detected and acted upon, or if the EUT fails, the test point at which this occurs shall be recorded.

Remarks:

[21] Specified by the manufacturer, see applicable test levels in R 61 -2, Table 18.
[22] Functional status of the instrument during and after exposure to test pulses

4.10 DC mains voltage dips, short interruptions and (short term) variations (R 61-2, 10.3.10)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

Marked nominal voltage, U_{nom}, or voltage[23] range: _____

Load, *L*: _____

Disturbance				Result		
Amplitude (% U_{nom})	Duration (s)	Number of disturbances	Repetition interval (s)	Indication, *I*	Significant fault (> *d*) or detection and reaction	
					No	Yes (remarks)
without disturbance						
0 (high imp)	0.01	3	10			
0 (low imp)	0.01	3	10			
40	0.1	3	10			
70	0.1	3	10			
85	10	3	10			
120	10	3	10			

☐ Passed ☐ Failed

Note: If significant faults are detected and acted upon, or if the EUT fails, the test point at which this occurs shall be recorded.

Remarks:

[23] The reference voltage shall be as defined in IEC 1000-4-11 (1994) section 5.

5 Span stability (R 61-1, 7.2, R 61-2, 11)

Application no.: ----------

Type designation: ----------

Control scale interval, *d*: ----------

Resolution during test: (smaller than *d*) ----------

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

Zero load: ☐

Test load: ☐

Measurement no. 1: Initial measurement

Application no.: ----------

Type designation: ----------

Observer ----------

Conditions of the measurement ----------

	At start	At end	
Temp.:			°C
Rel. h.:			%
Date:			yyyy-mm-dd
Time:			hh:mm:ss
Bar. pres.:			hPa

$E_0 = I_0 + ½\ d - \Delta L_0 - L_0 \qquad E_L = I_L + ½\ d - \Delta L - L$

No.	Indication of zero, I_0	Add. load, ΔL_0	E_0	Indication of load, I_L	Add. load, ΔL	E_L	$E_L - E_0$	Corrected value[24]
1								
2								
3								
4								
5								

Average error = average $(E_L - E_0)$ = ☐

$(E_L - E_0)_{max} - (E_L - E_0)_{min}$ = ☐

0.1 *d* = ☐

If $|(E_L - E_0)_{max} - (E_L - E_0)_{min}| \leq 0.1\ d$, the loading and reading will be sufficient for each of the subsequent measurements.

Remarks:

[24] When applicable, necessary corrections resulting from variations of temperature, pressure, etc. See remarks.

Subsequent measurements

For each of the subsequent measurements (at least seven), indicate under "conditions of the measurement", as appropriate, whether the measurement has been performed after:

☐ the temperature test, the EUT having been stabilized for at least 16 h

☐ the damp heat test, the EUT having been stabilized for at least 16 h

☐ the EUT has been disconnected from the mains for at least 8 h and then stabilized for at least 5 h

☐ any change in the test location

☐ any other specific condition: ----------

Measurement no. 2

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer	----------	Date:			yyyy-mm-dd
Conditions of the measurement	----------	Time:			hh:mm:ss
		Bar. pres.:			hPa

$E_0 = I_0 + ½\ d - \Delta L_0 - L_0$ $E_L = I_L + ½\ d - \Delta L - L$

No.	Indication of zero, I_0	Add. load, ΔL_0	E_0	Indication of load, I_L	Add. load, ΔL	E_L	$E_L - E_0$	Corrected value[25]
1								
2								
3								
4								
5								

If five loadings and readings have been performed:

Average error = average ($E_L - E_0$)

Remarks:

[25] When applicable, necessary corrections resulting from variations of temperature, pressure, etc. See remarks.

Measurement no. 3

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer	----------	Date:			yyyy-mm-dd
Conditions of the measurement	----------	Time:			hh:mm:ss
		Bar. pres.:			hPa

$E_0 = I_0 + ½\ d - \Delta L_0 - L_0 \qquad E_L = I_L + ½\ d - \Delta L - L$

No.	Indication of zero, I_0	Add. load, ΔL_0	E_0	Indication of load, I_L	Add. load, ΔL	E_L	$E_L - E_0$	Corrected value[26]
1								
2								
3								
4								
5								

If five loadings and readings have been performed:

Average error = average ($E_L - E_0$)

Remarks:

[26] When applicable, necessary corrections resulting from variations of temperature, pressure, etc. See remarks.

Measurement no. 4

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer	----------	Date:			yyyy-mm-dd
Conditions of the measurement	----------	Time:			hh:mm:ss
		Bar. pres.:			hPa

$E_0 = I_0 + ½\ d - \Delta L_0 - L_0 \qquad E_L = I_L + ½\ d - \Delta L - L$

No.	Indication of zero, I_0	Add. load, ΔL_0	E_0	Indication of load, I_L	Add. load, ΔL	E_L	$E_L - E_0$	Corrected value[27]
1								
2								
3								
4								
5								

If five loadings and readings have been performed:

Average error = average ($E_L - E_0$)

Remarks:

[27] When applicable, necessary corrections resulting from variations of temperature, pressure, etc. See remarks.

Measurement no. 5

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer	----------	Date:			yyyy-mm-dd
Conditions of the measurement	----------	Time:			hh:mm:ss
		Bar. pres.:			hPa

$E_0 = I_0 + ½\ d - \Delta L_0 - L_0 \qquad E_L = I_L + ½\ d - \Delta L - L$

No.	Indication of zero, I_0	Add. load, ΔL_0	E_0	Indication of load, I_L	Add. load, ΔL	E_L	$E_L - E_0$	Corrected value[28]
1								
2								
3								
4								
5								

If five loadings and readings have been performed:

Average error = average ($E_L - E_0$)

Remarks:

[28] When applicable, necessary corrections resulting from variations of temperature, pressure, etc. See remarks.

Measurement no. 6

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer	----------	Date:			yyyy-mm-dd
Conditions of the measurement	----------	Time:			hh:mm:ss
		Bar. pres.:			hPa

$E_0 = I_0 + ½\ d - \Delta L_0 - L_0 \qquad E_L = I_L + ½\ d - \Delta L - L$

No.	Indication of zero, I_0	Add. load, ΔL_0	E_0	Indication of load, I_L	Add. load, ΔL	E_L	$E_L - E_0$	Corrected value[29]
1								
2								
3								
4								
5								

If five loadings and readings have been performed:

Average error = average ($E_L - E_0$)

Remarks:

[29] When applicable, necessary corrections resulting from variations of temperature, pressure, etc. See remarks.

Measurement no. 7

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer	----------	Date:			yyyy-mm-dd
Conditions of the measurement	----------	Time:			hh:mm:ss
		Bar. pres.:			hPa

$E_0 = I_0 + ½\ d - \Delta L_0 - L_0 \qquad E_L = I_L + ½\ d - \Delta L - L$

No.	Indication of zero, I_0	Add. load, ΔL_0	E_0	Indication of load, I_L	Add. load, ΔL	E_L	$E_L - E_0$	Corrected value[30]
1								
2								
3								
4								
5								

If five loadings and readings have been performed:

Average error = average ($E_L - E_0$)

Remarks:

[30] When applicable, necessary corrections resulting from variations of temperature, pressure, etc. See remarks.

Measurement no. 8

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer	----------	Date:			yyyy-mm-dd
Conditions of the measurement	----------	Time:			hh:mm:ss
		Bar. pres.:			hPa

$E_0 = I_0 + ½\ d - \Delta L_0 - L_0 \qquad E_L = I_L + ½\ d - \Delta L - L$

No.	Indication of zero, I_0	Add. load, ΔL_0	E_0	Indication of load, I_L	Add. load, ΔL	E_L	$E_L - E_0$	Corrected value[31]
1								
2								
3								
4								
5								

If five loadings and readings have been performed:

Average error = average ($E_L - E_0$)

Remarks:

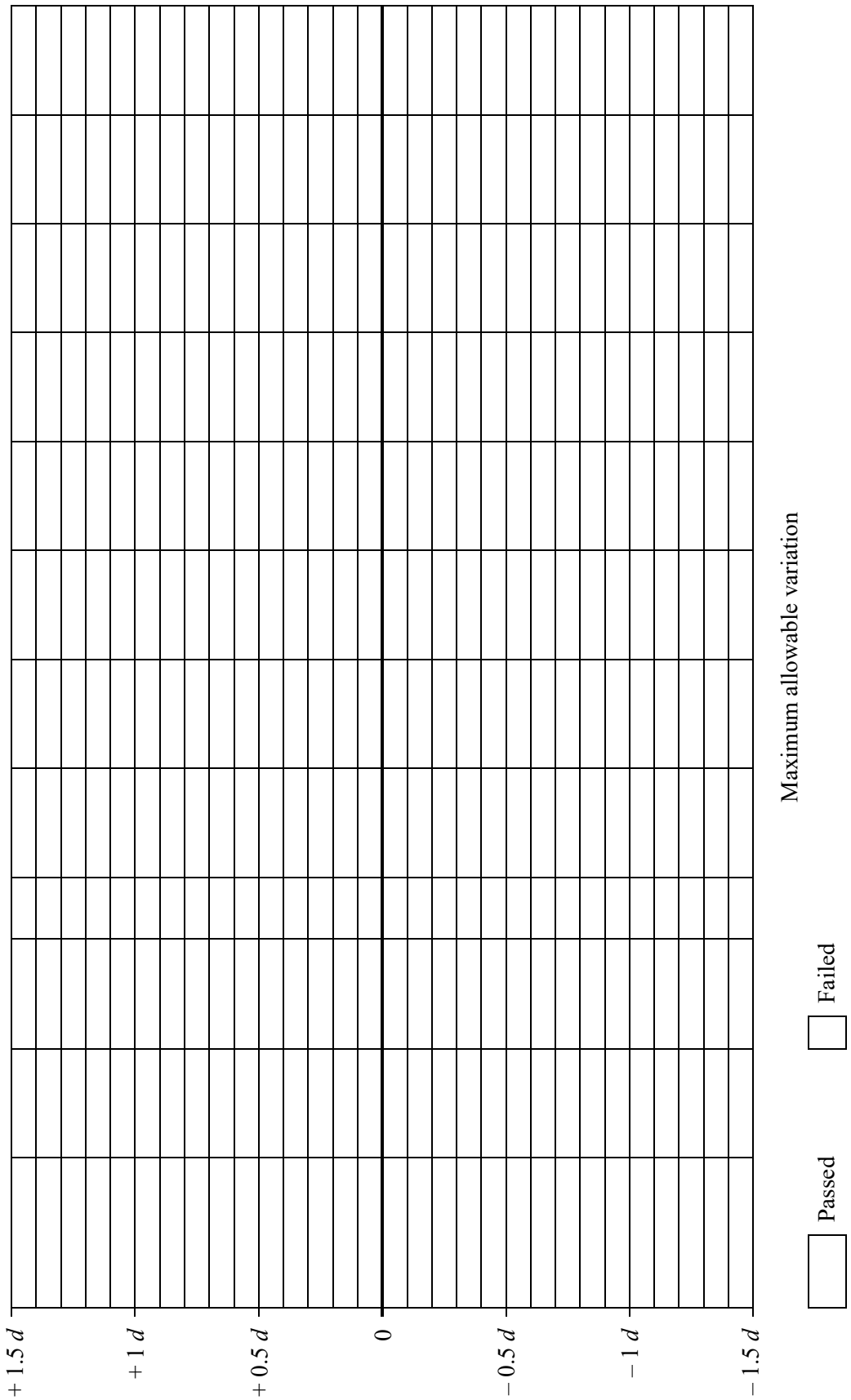
[31] When applicable, necessary corrections resulting from variations of temperature, pressure, etc. See remarks.

5 Span stability (R 61-1, 7.2, R 61-2, 11)

Application no.: Measurement no.

Type designation:

Plot on the diagram the indication of temperature test, **T**, damp heat test, **D,** and disconnections from the mains voltage supply, **P**



6 Material testing (R 61, 8.2.3.1, R 61-2, 9.2 and 12)

6.1 Separate verification method (R 61-2, 8.2.1)

6.1.1 Test 1 (load value close to maximum capacity) (R 61-1, 9.2.2 a)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Material:	
Condition of material:	
Nominal load:	

Correction devices

Type	Settings

Number of loads per fill	

Preset value of fill, F_P	

	Indication of control instrument, I	Additional load ΔL	Mass of fill, F	Deviation from average
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

	Indication of control instrument, I	Additional load ΔL	Mass of fill, F	Deviation from average
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				

Results of material test 1 - Load value close to maximum capacity

Preset value of fill, F_P		Maximum deviation from average, md	
Average mass of fill, $\frac{\sum F}{n}$		Maximum permissible deviation from average for class X(1) $mpd_{(1)}$	
Preset value error, $se = \frac{\sum F}{n} - F_P$		$\frac{md}{mpd_{(1)}}$	
Maximum permissible preset value error for class X(1), $mpse_{(1)}$			
$\frac{se}{mpse_{(1)}}$			

$mpse_{(1)}$ = maximum permissible preset value error for class X(1)

$mpd_{(1)}$ = maximum permissible deviation of each fill from the average for class X(1)

Remarks:

6.1.2 Test 2 (load value close to rated minimum fill) (R 61-2, 8.2.1)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Material:	
Condition of material:	
Nominal load:	

Correction devices

Type	Settings

Number of loads per fill	

Preset value of fill, F_P	

	Indication of control instrument, I	Additional load ΔL	Mass of fill, F	Deviation from average
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

	Indication of control instrument, I	Additional load ΔL	Mass of fill, F	Deviation from average
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				

Results of material test 2 - Load value close to rated minimum fill

Preset value of fill, F_P		Maximum deviation from average, md	
Average mass of fill, $\frac{\sum F}{n}$		Maximum permissible deviation from average for class X(1) $mpd_{(1)}$	
Preset value error, $se = \frac{\sum F}{n} - F_P$		$\frac{md}{mpd_{(1)}}$	
Maximum permissible preset value error for class X(1), $mpse_{(1)}$			
$\frac{se}{mpse_{(1)}}$			

$mpse_{(1)}$ = maximum permissible preset value error for class X(1)

$mpd_{(1)}$ = maximum permissible deviation of each fill from the average for class X(1)

Remarks:

6.1.3 Test 3 (mid-range critical load value) (R 61-2, 8.2.1)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Material:	
Condition of material:	
Nominal load:	

Correction devices

Type	Settings

Number of loads per fill	

Preset value of fill, F_P	

	Indication of control instrument, I	Additional load ΔL	Mass of fill, F	Deviation from average
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

	Indication of control instrument, I	Additional load ΔL	Mass of fill, F	Deviation from average
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				

Results of material test 3 - Mid-range critical load value

Preset value of fill, F_P		Maximum deviation from average, md	
Average mass of fill, $\frac{\sum F}{n}$		Maximum permissible deviation from average for class X(1) $mpd_{(1)}$	
Preset value error, $se = \frac{\sum F}{n} - F_P$		$\frac{md}{mpd_{(1)}}$	
Maximum permissible preset value error for class X(1), $mpse_{(1)}$			
$\frac{se}{mpse_{(1)}}$			

$mpse_{(1)}$ = maximum permissible preset value error for class X(1)

$mpd_{(1)}$ = maximum permissible deviation of each fill from the average for class X(1)

Remarks:

6.2 Integral verification method (R 61-2, 8.2.1)

6.2.1 Test 1 (load value close to maximum capacity) (R 61-2, 8.2.1)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Material:	
Condition of material:	
Nominal load:	

Correction devices

Type	Settings

Number of loads per fill	
Preset value of fill, F_P	

		Indication of control instrument, I	Add. load, ΔL	Mass of load, L	Mass of fill, F	Deviation from average
1	Full					
	Empty					
2	Full					
	Empty					
3	Full					
	Empty					
4	Full					
	Empty					
5	Full					
	Empty					
6	Full					
	Empty					
7	Full					
	Empty					
8	Full					
	Empty					
9	Full					
	Empty					
10	Full					
	Empty					
11	Full					
	Empty					
12	Full					
	Empty					
13	Full					
	Empty					
14	Full					
	Empty					
15	Full					
	Empty					

		Indication of control instrument, I	Add. load, ΔL	Mass of load, L	Mass of fill, F	Deviation from average
16	Full					
	Empty					
17	Full					
	Empty					
18	Full					
	Empty					
19	Full					
	Empty					
20	Full					
	Empty					
21	Full					
	Empty					
22	Full					
	Empty					
23	Full					
	Empty					
24	Full					
	Empty					
25	Full					
	Empty					
26	Full					
	Empty					
27	Full					
	Empty					
28	Full					
	Empty					
29	Full					
	Empty					
30	Full					
	Empty					

		Indication of control instrument, I	Add. load, ΔL	Mass of load, L	Mass of fill, F	Deviation from average
31	Full					
	Empty					
32	Full					
	Empty					
33	Full					
	Empty					
34	Full					
	Empty					
35	Full					
	Empty					
36	Full					
	Empty					
37	Full					
	Empty					
38	Full					
	Empty					
39	Full					
	Empty					
40	Full					
	Empty					
41	Full					
	Empty					
42	Full					
	Empty					
43	Full					
	Empty					
44	Full					
	Empty					
45	Full					
	Empty					

		Indication of control instrument, I	Add. load, ΔL	Mass of load, L	Mass of fill, F	Deviation from average
46	Full					
	Empty					
47	Full					
	Empty					
48	Full					
	Empty					
49	Full					
	Empty					
50	Full					
	Empty					
51	Full					
	Empty					
52	Full					
	Empty					
53	Full					
	Empty					
54	Full					
	Empty					
55	Full					
	Empty					
56	Full					
	Empty					
57	Full					
	Empty					
58	Full					
	Empty					
59	Full					
	Empty					
60	Full					
	Empty					

Results of material test 1 - Load value close to maximum capacity

Preset value of fill, F_P		Maximum deviation from average, md	
Average mass of fill, $\frac{\sum F}{n}$		Maximum permissible deviation from average for class X(1) $mpd_{(1)}$	
Preset value error, $se = \frac{\sum F}{n} - F_P$		$\frac{md}{mpd_{(1)}}$	
Maximum permissible preset value error for class X(1), $mpse_{(1)}$			
$\frac{se}{mpse_{(1)}}$			

$mpse_{(1)}$ = maximum permissible preset value error for class X(1)

$mpd_{(1)}$ = maximum permissible deviation of each fill from the average for class X(1)

Remarks:

6.2.2 Test 2 (load value close to rated minimum fill) (R 61-2, 8.2.1)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Material:	
Condition of material:	
Nominal load:	

Correction devices

Type	Settings

Number of loads per fill	

Preset value of fill, F_P	

		Indication of control instrument, I	Add. load, ΔL	Mass of load, L	Mass of fill, F	Deviation from average
1	Full					
	Empty					
2	Full					
	Empty					
3	Full					
	Empty					
4	Full					
	Empty					
5	Full					
	Empty					
6	Full					
	Empty					
7	Full					
	Empty					
8	Full					
	Empty					
9	Full					
	Empty					
10	Full					
	Empty					
11	Full					
	Empty					
12	Full					
	Empty					
13	Full					
	Empty					
14	Full					
	Empty					
15	Full					
	Empty					

		Indication of control instrument, I	Add. load, ΔL	Mass of load, L	Mass of fill, F	Deviation from average
16	Full					
	Empty					
17	Full					
	Empty					
18	Full					
	Empty					
19	Full					
	Empty					
20	Full					
	Empty					
21	Full					
	Empty					
22	Full					
	Empty					
23	Full					
	Empty					
24	Full					
	Empty					
25	Full					
	Empty					
26	Full					
	Empty					
27	Full					
	Empty					
28	Full					
	Empty					
29	Full					
	Empty					
30	Full					
	Empty					

		Indication of control instrument, I	Add. load, ΔL	Mass of load, L	Mass of fill, F	Deviation from average
31	Full					
	Empty					
32	Full					
	Empty					
33	Full					
	Empty					
34	Full					
	Empty					
35	Full					
	Empty					
36	Full					
	Empty					
37	Full					
	Empty					
38	Full					
	Empty					
39	Full					
	Empty					
40	Full					
	Empty					
41	Full					
	Empty					
42	Full					
	Empty					
43	Full					
	Empty					
44	Full					
	Empty					
45	Full					
	Empty					

		Indication of control instrument, I	Add. load, ΔL	Mass of load, L	Mass of fill, F	Deviation from average
46	Full					
	Empty					
47	Full					
	Empty					
48	Full					
	Empty					
49	Full					
	Empty					
50	Full					
	Empty					
51	Full					
	Empty					
52	Full					
	Empty					
53	Full					
	Empty					
54	Full					
	Empty					
55	Full					
	Empty					
56	Full					
	Empty					
57	Full					
	Empty					
58	Full					
	Empty					
59	Full					
	Empty					
60	Full					
	Empty					

Results of material test 2 - Load value close to rated minimum fill

Preset value of fill, F_P		Maximum deviation from average, md	
Average mass of fill, $\frac{\sum F}{n}$		Maximum permissible deviation from average for class X(1) $mpd_{(1)}$	
Preset value error, $se = \frac{\sum F}{n} - F_P$		$\frac{md}{mpd_{(1)}}$	
Maximum permissible preset value error for class X(1), $mpse_{(1)}$			
$\frac{se}{mpse_{(1)}}$			

$mpse_{(1)}$ = maximum permissible preset value error for class X(1)

$mpd_{(1)}$ = maximum permissible deviation of each fill from the average for class X(1)

Remarks:

6.2.3 Test 3 (mid-range critical load value) (R 61-2, 8.2.1)

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer:	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Material:	
Condition of material:	
Nominal load:	

Correction devices

Type	Settings

Number of loads per fill	

Preset value of fill, F_P	

		Indication of control instrument, I	Add. load, ΔL	Mass of load, L	Mass of fill, F	Deviation from average
1	Full					
	Empty					
2	Full					
	Empty					
3	Full					
	Empty					
4	Full					
	Empty					
5	Full					
	Empty					
6	Full					
	Empty					
7	Full					
	Empty					
8	Full					
	Empty					
9	Full					
	Empty					
10	Full					
	Empty					
11	Full					
	Empty					
12	Full					
	Empty					
13	Full					
	Empty					
14	Full					
	Empty					
15	Full					
	Empty					

		Indication of control instrument, I	Add. load, ΔL	Mass of load, L	Mass of fill, F	Deviation from average
16	Full					
	Empty					
17	Full					
	Empty					
18	Full					
	Empty					
19	Full					
	Empty					
20	Full					
	Empty					
21	Full					
	Empty					
22	Full					
	Empty					
23	Full					
	Empty					
24	Full					
	Empty					
25	Full					
	Empty					
26	Full					
	Empty					
27	Full					
	Empty					
28	Full					
	Empty					
29	Full					
	Empty					
30	Full					
	Empty					

		Indication of control instrument, I	Add. load, ΔL	Mass of load, L	Mass of fill, F	Deviation from average
31	Full					
	Empty					
32	Full					
	Empty					
33	Full					
	Empty					
34	Full					
	Empty					
35	Full					
	Empty					
36	Full					
	Empty					
37	Full					
	Empty					
38	Full					
	Empty					
39	Full					
	Empty					
40	Full					
	Empty					
41	Full					
	Empty					
42	Full					
	Empty					
43	Full					
	Empty					
44	Full					
	Empty					
45	Full					
	Empty					

		Indication of control instrument, I	Add. load, ΔL	Mass of load, L	Mass of fill, F	Deviation from average
46	Full					
	Empty					
47	Full					
	Empty					
48	Full					
	Empty					
49	Full					
	Empty					
50	Full					
	Empty					
51	Full					
	Empty					
52	Full					
	Empty					
53	Full					
	Empty					
54	Full					
	Empty					
55	Full					
	Empty					
56	Full					
	Empty					
57	Full					
	Empty					
58	Full					
	Empty					
59	Full					
	Empty					
60	Full					
	Empty					

Results of material test 3 - Mid-range critical load value

Preset value of fill, F_P		Maximum deviation from average, md	
Average mass of fill, $\frac{\sum F}{n}$		Maximum permissible deviation from average for class X(1) $mpd_{(1)}$	
Preset value error, $se = \frac{\sum F}{n} - F_P$		$\frac{md}{mpd_{(1)}}$	
Maximum permissible preset value error for class X(1), $mpse_{(1)}$			
$\frac{se}{mpse_{(1)}}$			

$mpse_{(1)}$ = maximum permissible preset value error for class X(1)

$mpd_{(1)}$ = maximum permissible deviation of each fill from the average for class X(1)

Remarks:

7 Load indicator performance (R 61-2, 8.5.2)

This form may be used to record static weighing performance of the load indicator if necessary for the integral verification method for material tests.

			At start	At end	
Application no.:	----------	Temp.:			°C
Type designation:	----------	Rel. h.:			%
Observer	----------	Date:			yyyy-mm-dd
Control scale interval, *d*:	----------	Time:			hh:mm:ss
Resolution during test: (smaller than *d*)	----------	Bar. pres.:			hPa

Material:

Condition of material:

Nominal load:

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

$E = I + ½\ d - \Delta L - L$

Load, *L*	Indication, *I*		Additional load, Δ*L*		Error, *E*	
	↓	↑	↓	↑	↓	↑
(*)					(*)	

(*) At or near zero

Remarks:

8 Checklist

Application no.: ---------- Type designation: ----------

Report date: ---------- Manufacturer: ----------

References		Automatic gravimetric filling instruments		Enter value	Remarks
Requirement R 61-1	**Test procedure R 61-2**				
4.2	12.2.4	Static test and reference value for accuracy class Maximum value of [error/$mpe_{(1)}$] for influence factor tests:			
4.8.1	10.2.2	**Temperatures test with static load:**			
		Maximum value of $\frac{E_C}{mpe_{(1)}}$	Ref.		
			High		
			Low		
			+ 5 °C		
			Ref.		
4.8.2	10.2.3	Temperature effect on no-load indication ($mp\Delta z_{(1)} = mpe_{(1)}$ for rated minimum fill) Maximum value of $\frac{\Delta z}{mp\Delta z_{(1)}}$			
4.8.1	10.2.4.1	**Damp heat, steady state (non-condensing):**			
		Maximum value of $\frac{E_C}{mpe_{(1)}}$	Ref.		
			High + 85 % RH		
			Ref.		
	10.2.4.2	**Damp heat, cyclic test (condensing):**			
		Maximum value of $\frac{E_C}{mpe_{(1)}}$	Ref.		
			High + 95 % RH		
			Low + 95 % RH		
			High + 93 % RH		
4.8.3	10.2.5.1	**AC mains voltage variation:**			
		Maximum value of $\frac{E_C}{mpe_{(1)}}$	– 15 %		
			+ 10 %		
	10.2.5.2	**DC power voltage variation:**			
		Maximum value of $\frac{E_C}{mpe_{(1)}}$	Lower limit		
			Upper limit		
	10.2.5.3	Low voltage of internal battery, not connected to the mains power			
		Maximum value of $\frac{E_C}{mpe_{(1)}}$	Lower limit		
			Upper limit		

References		Automatic gravimetric filling instruments		Enter value	Remarks
Requirement R 61-1	**Test procedure R 61-2**				
	10.2.5.4	Power from external 12 V and 24 V road vehicle batteries			
		Maximum value of $\frac{E_C}{\text{mpe}_{(1)}}$	Lower limit		
			Upper limit		
4.8.4	10.2.6	**Tilting:**			
		Maximum value of $\frac{E_C}{\text{mpe}_{(1)}}$			
		or level indicator enables tilt of 1 % or less		Note in Remarks	
8.2.4	9.4	Maximum value of error/$\text{mpe}_{(1)}$ $[\text{Error}/\text{mpe}_{(1)}]_{\max}$			
		Reference accuracy class Ref(X)			
3.5.2.7	A.1	Significant fault			

$\text{mpe}_{(1)}$ = the maximum permissible error for influence factor tests for class X(1)

$\text{mp}\Delta z(1)$ = maximum permissible zero change per 5 °C for class X(1)

Note: The above portion of the checklist enables the reference value for the accuracy class and the value of the significant fault to be determined. The results column should indicate the maximum value from the report for each test (it is not sufficient just to tick the box).

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
4		**Metrological requirements**			
4.1	Observe	**Units of measurement:** • milligram (mg) • gram (g) • kilogram (kg) • tonne (t)		Note in remarks	
4.2		**Accuracy classes** The manufacturer shall specify the accuracy class, X(*x*) and reference value for accuracy class, Ref(*x)*		Note in remarks	
4.3		**Error limits:**			
4.3.1		Maximum permissible deviation, mpd, of each fill		Note in remarks	
4.3.2	9.4	Static testing only, maximum permissible error for influence factor tests		Note in remarks	
4.3.2		Maximum permissible error for static loads		Note in remarks	
4.3.3		Maximum permissible preset value error, mpse		Note in remarks	
4.3.4		Fault limit value is determined – examples for multi-load AGFIs in R 61-2, Annexes A.1 and A.2		Note in remarks	
4.4		Product reference quantity correction		Note in remarks	
4.5		**Error limits for multi-load AGFIs** Effect on the fill shall not be greater than the significant fault value specified in R 61-1, 4.3.4 and the MPE specified in R 61-1, 4.3.2			
4.6	6.2	**Minimum capacity (Min)** The Min shall marked on the instrument in accordance with the descriptive markings in R 61-1, 5.12			
4.7	6.2	**Rated minimum fill (Minfill)** The Minfill shall be specified by the manufacturer			
4.8	10.2	**Influence factors**			
4.8.2	10.2.4	**Humidity**			
		The AGFI shall maintain its metrological and technical characteristics at a relative humidity of either 85 % (non-condensing) or 93 % (condensing) at the upper limit of the temperature range of the instrument			
4.8.3	7.3	**Temperature:**			
4.8.3.1	10.2.2	Prescribed temperature limits comply with metrological requirements from – 10 °C to + 40 °C			
4.8.3.2	6.2	Special temperature limits shall not be less than 30 °C and shall be specified in the descriptive markings			
4.8.3.3	10.2.3	Temperature effect on no-load indication			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
4.8.4	7.1	**Supply voltage:**			
	10.2.5.1	AC mains power voltage variations			
	10.2.5.2	DC mains power voltage variations			
	10.2.5.3	Low voltage of internal battery (not connected to the mains power)			
	10.2.5.4	Power from external 12 V and 24 V road vehicle batteries			
4.8.5	10.2.6	**Tilting:**			
		AGFIs not permanently installed in a fixed position and without a levelling device and a level indicator shall comply with the appropriate metrological and technical requirements when tilted (longitudinally and transversely) by up to 5 %			
	10.2.6.1	Where a levelling device and a level indicator are present the limiting value of tilting shall be defined by a marking. The limiting value of the level indicator shall be obvious, so that tilting is easily noticed. The level indicator shall be fixed firmly on the AGFI in a location clearly visible to the user and representative for the tilt sensitive part.			
		If the AGFI is fitted with a tilt sensor the limiting value of tilting is defined by the manufacturer.			
		The tilt sensor shall release a display switch-off or other appropriate alarm signal (e.g. error signal) and shall inhibit the printout and data transmission if the limiting value of tilting has been exceeded.			
	10.2.6.2	AGFIs not fitted with a levelling device and a level indicator, or an automatic tilt sensor		Note in remarks	
		AGFIs used in vehicles the tilting is up to 10 % or if higher – referring to the manufacturer's specification.		Note in remarks	
		AGFIs fulfills the requirement of R 61-1, 4.8.4 a) and are limited to 1 % or less.		Note in remarks	
5		**Technical requirements**			
5.1	5.4	**Suitability for use**			
		Instrument suits method of operation and products for which it is intended			
		Robust construction			
5.2		**Security of operation:**			
5.2.1		**Fraudulent use**			
		AGFIs shall have no characteristics likely to facilitate their fraudulent use			
5.2.2		**Accidental maladjustment**			
		Effect of accidental breakdown or maladjustment is evident			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
5.2.3		**Security**			
		Means shall be provided for securing components, interfaces, software devices and pre-set controls of the AGFI, to which unauthorised access is prohibited or is detected and made evident by an audit trail or similar			
5.2.2		Print-out is for information purposes only (except preset values and number of weighings)			
5.2.3		Ancillary devices do not affect correct functioning			
5.2.4		All scale intervals are the same			
5.3		**Indication of weighing results**			
5.3.1		**Quality of indication:**			
		Indication of the results shall be reliable, bright and easy under conditions of normal use			
		The scales, numbering and printing shall permit the figures that form the results to be read by simple juxtaposition			
5.3.2		**Form of the indication**			
		Weighing results shall contain the names or symbols of the units of mass in which they are expressed			
		For any one indication of weight, only one unit of mass may be used			
		All indicating, printing and tare weighing devices of AGFIs shall, within any one weighing range, have the same scale interval for any given load			
		Digital indication shall display at least one figure beginning at the extreme right			
5.3.3		**Use of a printer:**			
		Printing shall be clear and permanent for the intended use. Printed figures shall be at least 2 mm high			
		If printing takes place, the name or the symbol of the unit of measurement shall be either to the right of the value or above a column of values			
5.3.4		**Scale interval, *d*:**			
		Scale intervals of all indicating devices associated with a weighing module shall be the same			
		The scale interval for a measured value shall be in the form 1×10^n, 2×10^n, or 5×10^n, where n is any integer or zero			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
5.4		**Fill setting device:**			
		If fill setting is by means of a scale, it shall be graduated in units of mass			
		If fill setting is by means of weights, they shall be either weights in accordance with OIML R 111 [5] requirements or purpose-designed of any nominal value, distinguishable by shape and identified with the AGFI			
5.5		**Final feed cut-off device:**			
		Clearly distinguishable			
		May include device which corrects for residual material feed after cut-off			
5.6		**Feeding device:**			
		Sufficient and regular flowrate(s)			
		Indication of the direction of movement resulting from adjustment			
5.7		**Load receptor**			
		Load receptor, feed and discharge devices are designed to ensure negligible retention of residual material			
		Has facilities for test weights up to maximum capacity in a safe, secure manner			
		Manual discharge is not possible during automatic operation			
5.8	7.2, 9.2	**Zero-setting and tare devices are:**			
5.8.1		Non-automatic,			
		Semi-automatic, or			
		Automatic			
		For combined zero-setting and tare devices, the same key operates the semi-automatic zero-setting device and the semi-automatic tare device. In these cases, the accuracy requirements specified in R 61-1, 5.8.3 and in 5.8.5 apply at any load			
5.8.2		**Operating range:**			
		The effect of any zero-setting device shall not alter the maximum weighing capacity of the AGFI.			
		The range of adjustment of zero-setting devices shall not exceed 4 %, and of the initial zero-setting device not more than 20 %, of the Max of the AGFI			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
5.8.3	9.2.3	**Accuracy of zero-setting:**			
		Capable of setting to less than or equal to 0.25 mpd in-service for a fill equal to the Min			
		After zero setting the residual error at zero shall not affect the result of the weighing by more than 0.25 mpd in-service for a fill equal to the Min			
5.8.4		**Control of the zero-setting and tare devices**			
		Non-automatic and semi-automatic devices			
5.8.4.1		Non-automatic or semi-automatic zero-setting and tare devices must be locked during automatic operation			
		The weighing module shall be in stable equilibrium when the zero-setting and tare devices are operating			
5.8.4.2	9.2	**Automatic zero-setting device:**			
		An automatic zero-setting device may operate as a part of either a) every automatic weighing cycle, or b) a cycle with a programmable time interval			
		A description of the operation of the automatic zero-setting device shall be included in the documentation submitted for type evaluation			
		Operates sufficiently often to ensure that zero is maintained within twice the given mpe in R 61-1, 5.8.3			
		Where the automatic zero-setting device operates as a part of every automatic weighing cycle, it shall not be possible to disable this device			
		Where the automatic zero-setting device operates after a programmable time interval, this time interval shall not be greater than the value calculated according to the method in R 61-1, Annex A, or shall be reduced depending on prevailing operating conditions			
		The maximum programmable time interval for automatic zero-setting required above and specified in Annex A may start again after taring or zero-setting has taken place			
		The automatic zero-setting device shall generate suitable information to draw attention to overdue zero-setting			
5.8.5		**Zero-tracking device** shall operate only when the:			
		a) indication is at zero, or at a negative net value equivalent to gross zero, and			
		b) corrections are not more than 0.5 *d*/s			
		When zero is indicated after a tare operation, the zero-tracking device may operate within a range of 4 % of Max of the AGFI around the actual indicated zero value			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
5.8.6		**Tare device is:**			
5.8.1		Non-automatic,			
		Semi-automatic, or			
		Automatic			
	9.2.4	**Accuracy of tare devices:**			
5.8.6.1		Capable of setting to less than or equal to 0.25 mpd for in-service			
		Control of tare devices:			
		Non-automatic or semi-automatic zero-setting and tare devices must be locked during automatic operation			
		Weighing module shall be in stable equilibrium when the zero-setting and tare devices are operating.			
5.8.6.2		**Subtractive tare device:** When subtractive tare is applied it reduces the weighing range and a device shall continue to prevent the use of the AGFI above its maximum capacity or indicate that this capacity has been reached			
5.8.6.3		**Automatic tare device:**			
		May operate at the start of automatic operation as a part of a) every automatic weighing cycle, or b) a cycle with a programmable time interval			
		Operate sufficiently often to ensure that tare is properly taken into account along the production of a batch			
		Where the automatic tare device operates as a part of every automatic weighing cycle, it shall not be possible to disable this device			
		Where the automatic tare device operates as part of a cycle with a programmable time interval, the manufacturer shall specify the maximum programmable time interval			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
5.8.7		**Preset tare device:**			
5.8.7.1		The scale interval of a preset tare device shall be equal or automatically rounded to the scale interval of the AGFI			
5.8.7.2		**Modes of operation:**			
		Preset tare device may be operated together with one or more tare devices provided that a preset tare operation cannot be modified or cancelled as long as any tare device operated after the preset tare operation is still in use			
		Preset tare devices may operate automatically only if the preset tare value is clearly identified with the load to be measured (e.g. by bar code identification on the container)			
5.9		**Data storage:**			
		If the instrument has a data storage device, its measurement data shall be stored			
		Stored data adequately protected against intentional and unintentional changes during the data transmission and/or storage process			
		Stored data contain all relevant information necessary to reconstruct an earlier measurement			
		Storage of primary indications for subsequent indication, data transfer, totalizing, etc. shall be inhibited when not in stable equilibrium			
		Conditions to ensure adequate security:			
		a) requirements for security of software in R 61-1, 5.10 are applied as appropriate			
		b) if software realizing short or long term data storage can be transmitted to or downloaded into the instrument, these processes shall be secured in accordance with requirements of R 61-1, 5.2.3			
		c) identification and security attributes of external storage devices shall be automatically verified to ensure integrity and authenticity			
		d) exchangeable storage media for storing measurement data need not be sealed provided that the stored data is secured by a specific checksum or key code			
		e) when storage capacity is exhausted, new data may replace the oldest data provided that overwriting the old data is authorized and/or after this data has been archived			
		f) the additional requirements in R 61-1, Annex B apply			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
5.10		**Software:**			
5.10.1		Legally relevant software of the AGFI is identified by the manufacturer			
		Possible to check software identification on an installed AGFI			
5.10.2		**Software documentation:**			
		• description of the legally relevant software			
		• description of a suitable system configuration and minimal required resources			
		• description of the accuracy of the measuring algorithms			
		• description of the user interface, menus and dialogues			
		• the unambiguous software identification			
		• description of the embedded software			
		• overview of the system hardware, e.g. topology block diagram, type of computer(s), types of software functions, etc., if not described in the operating manual			
		• description of the accuracy of the algorithms (e.g. filtering of A/D conversion results, rounding algorithms, etc.)			
		• description of data sets stored or transmitted			
		• list of commands of each hardware interface of the AGFI / electronic device / sub-assembly including a statement of completeness			
		• means of securing software			
		• if fault detection is realized in the software, a list of faults that are detected and a description of the detecting algorithm			
		• operating manual			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
5.10.3		**Security of legally relevant software:**			
		• legally relevant software shall be adequately protected against accidental or intentional changes			
		• the software shall be assigned with appropriate software identification (R 61-1 Annex B.1.1). This software identification shall be adapted in the case of every software change that may affect the functions and accuracy of the AGFI			
		• functions performed or initiated via connected interfaces, i.e. transmission of legally relevant software, shall comply with the securing requirements for interfaces (R 61-1, 6.10)			
5.11		**Equilibrium mechanism:**			
		Equilibrium mechanism may be provided with detachable masses which shall be either weights in accordance with OIML R 111 or purpose designed weights of any nominal value, distinguishable by shape and identified with the AGFI			
5.12	6.2	**Descriptive markings:**			
		• name or identification mark of the manufacturer			
		• name or identification mark of the importer			
		• year of manufacture of the AGFI			
		• serial number and type designation of the AGFI			
		• Product(s) designation (i.e. materials that may be weighed)			
		• temperature range °C °C			
		• supply voltage V			
		• supply frequency Hz			
		• pneumatic/hydraulic pressure kPa or bar			
		• average number of loads/fill			
		• maximum fill (Maxfill)			
		• rated minimum fill (Minfill)			
		• maximum rate of operation (loads per minute)			
		• type approval marking			
		• accuracy class X(*x*)			
		• reference accuracy class Ref(*x*)			
		• scale interval *d* =			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
		• maximum capacity Max			
		• minimum capacity (or discharge) Min			
		• maximum additive tare T = +			
		• maximum subtractive tare T = -			
5.12.2		**Supplementary markings:**			
		Marking shall be such that the materials and alternative class or operating parameters are clearly associated with the appropriate material designation			
5.12.3		**Presentation of descriptive markings:**			
		• indelible			
		• size, shape and clarity enables legibility			
		• grouped together in clearly visible place			
		• possible to seal the plate or sticker bearing the markings if they could be removed without damaging them			
		• if markings are on AGFI, not possible to remove them without destroying them			
		Descriptive markings may be shown on a programmable display provided that:			
		• at least max, Minfill, Ref(x), X(x) and d shall be displayed as long as the AFGI is switched on			
		• possible to display all other markings on manual command			
		Descriptive markings shown on a programmable display shall be described in the type approval (OIML) certificate			
		Markings shall comply with the requirements for securing in R 61-1, 5.2.3 and 5.10.3			
		When a display controlled by software is used, the plate of the instrument shall bear at least the following markings:			
		• type approval sign in accordance with national requirements			
		• name or identification mark of the manufacturer			
		• serial number			
		• temperature range			
		• type approval number			
		• voltage of power supply			
		• frequency of power supply (if applicable)			
		• Pneumatic/hydraulic pressure (if applicable)			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
5.13	6.2	**Verification marks**			
5.13.1		**Position:**			
		• the part on which verification marks are located cannot be removed without damaging the marks			
		• allows easy application of the mark without changing metrological qualities of the AGFI			
		• visible without moving AGFI or removing its protective covers			
5.13.2		**Mounting:**			
		• verification mark support ensures conservation of the marks			
6		**Requirements for electronic instruments**			
6.2		**Performance under rated operating conditions:** maximum permissible errors shall not be exceeded			
6.3	10.3	**Disturbance tests:**			
		• Significant faults do not occur, i.e. the difference between the weight indication due to the disturbance and the indication without the disturbance (intrinsic error) shall not exceed the significant fault R 61-1, 3.5.2.7, or			
		• Significant faults are detected and acted upon			
6.4		**Acting upon a significant fault:**			
		instrument is automatically made inoperative, or provides a visual or audible indication of the fault until the user takes action or the fault is resolved			
6.5, 8.1	Annex C	**Durability:**			
		The requirements in R 61-1, 6.2, 6.3 and 6.6 shall be met durably in accordance with the intended use of the instrument			
6.7	10	**Influence factors:**			
		AGFIs shall comply with the influence factors requirements of R 61-1, 4.8			
6.8	5.5	**Indicator display test:**			
		Upon switch-on (of the indication), a special software procedure shall start that takes care of showing all relevant figure and sign elements of the indicator in their active and non-active state for a time period sufficiently long to be checked by the operator. This required procedure is not applicable for displays on which failure will become evident			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
6.9	5.5, 10.2.1	**Warm-up time:**			
		• no indication/transmission of results and automatic operation is inhibited			
6.10	5.5	**Interfaces:**			
		Shall not allow the metrological functions of the AGFI and its measurement data to be inadmissibly influenced by the peripheral devices (for example computers), by other interconnected instruments, or by disturbances acting on the interface			
		functions that are performed or initiated via an interface shall meet the relevant requirements and conditions of R 61-1, 5			
		it shall not be possible to introduce into the AGFI, through an interface, functions, program modules or data structures intended or suitable to: • display data that are not clearly defined and which could be mistaken for a weighing result, • falsify displayed, processed or stored weighing results, • unauthorised adjustment of the AGFI.			
		Other interfaces shall be secured in accordance with R 61-1, 5.2.3.			
		Interfaces intended to be connected to a peripheral device to which the requirements of OIML R 61 apply, shall transmit data relating to primary indications in such a manner that the peripheral device can meet the requirements.			
7.1	6	**Examination and tests**			
		General appraisal of design and construction			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
7.2	10	**Performance tests:**			
		Instrument meets the requirements of the following tests:			
	10.2.1	Warm-up time			
	10.2.2	Temperature with static load			
	10.2.3	Temperature effect on no-load indication (dry heat and cold)			
	10.2.4.1	Damp heat, steady-state test (non-condensing)			
	10.2.4.2	Damp heat, cyclic test (condensing)			
	10.2.5.1	AC mains voltage variation			
	10.2.5.2	DC mains voltage variation			
	10.2.5.3	Low voltage of internal battery (not connected to the mains power)			
	10.2.5.4	Power from external 12 V and 24 V road vehicle batteries			
	10.2.6.1	Tilting of AGFIs fitted with a levelling device and a level indicator, or a tilt sensor			
	10.2.6.2	AGFIs not fitted with a levelling device and a level indicator, or an automatic tilt sensor			
	10.3.1	AC mains voltage dips, short interruptions and reductions			
	10.3.2	Bursts (fast transient tests) on mains power lines and on signal, data and control lines			
	10.3.3	Electrostatic discharge			
	10.3.4	Immunity to electromagnetic fields			
	10.3.5	Surges on AC and DC mains power lines and on signal, data and control lines			
	10.3.6	Electrical transient conduction for instruments powered by 12 V and 24 V batteries			
	10.3.7	Ripple on DC mains power			
	10.3.8	Battery voltage variations during starting up a vehicle engine			
	10.3.9	Load dump test			
	10.3.10	DC mains voltage dips, short interruptions and (short term) variations			
7.3	11	**Span stability test:**			
		The absolute value of the difference between the errors obtained for any two measurements shall not exceed half the maximum permissible error for influence factor tests for a near maximum capacity load			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
8		**Metrological controls**			
8.1		If metrological control is imposed for conformity, this control may comprise: a) type evaluation, b) initial verification, c) subsequent verification, d) in-service inspection			
	Annex C	Measures to ensure durability which are subject to national regulations shall be taken, which shall include assessments under items a) to d) above			
8.2	8.1	**Type evaluation:**			
		The application for type approval shall include the following information:			
8.2.1	5.1, 5.2	**Documentation:**			
		• general description of the AGFI, description of the function, intended purpose of use, kind of instrument			
		• general characteristics (manufacturer; Max, Min, X(x), Ref(x), temperature range, voltage, etc.)			
		• list of descriptions and characteristic data of all devices and modules of the AGFI			
		• drawings of general arrangement and details of metrological interest including details of any interlocks, safeguards, restrictions, limits, etc.			
		• drawing or photo of the AGFI showing the principle and the location of verification and securing marks to be applied (to be included in the OIML Certificate or Test Report)			
		• securing components, adjustment devices, controls, etc. protected access to setup and adjustment operations			
		• location for application of control marks, securing elements, descriptive markings, identification, conformity and/or approval marks			
		• devices of the AGFI			
		• auxiliary, or extended indicating devices			
		• multiple use of indicating devices			
		• printing devices (only for special purposes)			
		• data storage devices			
		• zero-setting, zero-tracking devices			
		• tare devices and preset tare devices			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
		• levelling device and level indicator, tilt sensor, upper limit of tilting			
		• locking devices and auxiliary verification devices			
		• load receptors, connection of different load receptors			
		• interfaces (types, intended use, immunity to external influences instructions			
		• peripheral devices, e.g. printers, secondary displays, for including in the type approval certificate and for connection for the disturbance tests			
		• other devices or functions, e.g. for purposes other than determination of mass (not subject to conformity assessment)			
		• detailed description of the stable equilibrium function of the AGFI			
		• information concerning special cases			
		• subdivision of the AGFI in modules - e.g. load cells, mechanical system, indicator, display - indicating the functions of each module and the fractions p_i. For modules that have already been approved, reference to test certificates or type approval certificates (R 61-1, 8.2.4), reference to evaluation to R 60 for load cells			
		• special operating conditions			
		• reaction of the AGFI to significant faults			
		• functioning of the display after switch-on			
		• technical description, drawings and plans of devices, sub-assemblies, etc. particularly those in R 61-1, 5.12 and 5.13			
		• a description of the operation of the automatic tare device (e.g. the maximum programmable time interval)			
		• load cells, if not presented as modules			
		• electrical connection elements, e.g. for connecting load cells to the indicator, including length of signal lines			
		• indicator: block diagram, schematic diagrams, internal processing and data exchange via interface, keyboard with function assigned to any key			
		• declarations of the manufacturer, e.g. for interfaces (R 61-1, 5.10.1, 6.10), for protected access to setup and adjustment (R 61-1, 5.2.2, 5.2.3), for other software based operations			
		• samples of all intended printouts			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
		• results of tests performed by the manufacturer or from other laboratories, on protocols from OIML R 61-3, including proof of competence			
		• certificates of other type approvals or separate tests, relating to modules or other parts mentioned in the documentation, together with test protocols			
		• for software controlled AGFIs or modules, additional documents according to R 61-1, 5.10 and Annex B			
8.2.2	5, 8.1	**Type evaluation:**			
		General requirements:			
		Type evaluation shall be carried out on one or more and normally not more than three AGFIs that represent the definitive type			
		At least one of the AGFIs shall be submitted in a form suitable for simulation testing in a laboratory and shall include the whole of the electronics which affect the weighing result except in the case of a selective combination weighing instrument where only one representative weighing module may be included			
8.2.3		Submitted documents shall be examined and tests carried out to verify that the AGFI comply with the:			
		a) requirement specified for static tests in R 61-1, 4			
		b) technical requirements in R 61-1, 5			
		c) requirement in R 61-1, 7			
		Metrological authority conducts tests without unnecessary commitment of resources			
		Metrological authority permits the results of these tests to be assessed for initial verification			
8.2.3.1	12	Operational tests for type evaluation shall be conducted:			
		a) in accordance with the appropriate parts of clause 4			
	12.2	b) under the normal conditions of use for which the AGFI is intended, and			
	8, 12.1	c) in accordance with the material test methods given in R 61-2, 8 and 12.1, using material that is representative of a product for which the AGFI is designed to assess compliance with the technical requirements in 5			
5.10, Annex B		For software-controlled AGFIs, the additional requirements in R 61-1, 5.10 and in Annex B apply			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
8.2.3.2	10	**Influence factor tests:** Influence factors shall be applied to the AGFI or simulator during simulation tests in a manner that will reveal a corruption of the weighing result of any weighing process to which the AGFI could be applied, in accordance with R 61-1, 4.8 and 7			
8.2.3.3		**Modules**			
		Subject to agreement with the approving authority, the manufacturer may define and submit modules to be examined separately. where:			
		• testing the instrument as a whole is difficult or impossible;			
		• modules are manufactured and/or placed on the market as separate units to be incorporated in a complete instrument; or			
		• the applicant wants to have a variety of modules included in the approved type			
8.2.3.3.1	10.1.1	**Apportioning of errors:**			
		When parts of instrument are examined separately in process of type approval, errors apportioned as detailed in R 61-1, 8.2.3.3			
8.2.3.3.2		**Compatibility of modules**			
		The compatibility of modules shall be established and declared by the manufacturer in accordance with:			
		• OIML R 76, Annex F for indicators and load cells			
		• OIML R 76, Annex F.5 for modules with digital output, compatibility (includes the correct communication and data transfer via the digital interface(s))			
8.2.4	9.4	**Type approval certificate and accuracy classes**			
		Type approval certificate shall state the reference value for the accuracy class Ref(x)			
		Type approval certificate shall state that the actual class (equal to or greater than the reference value) shall be determined by compliance with the metrological requirements at initial verification			

Requirement R 61-1	Test procedure R 61-2	Automatic gravimetric filling instruments	Passed	Failed	Remarks
8.3		**Initial verification:**			
8.3.1		AGFIs shall be examined for conformity with the approved type and:			
		if applicable, be tested for compliance with clauses 4 and 5 for the intended products and corresponding accuracy classes and when operated under normal conditions of use			
		tests shall be carried out, in-situ, with the AGFI fully assembled and fixed in the position in which it is intended to be used			
		installation of the AGFI shall be so designed that an automatic weighing operation will be the same whether for the purposes of testing or for use for a transaction			
		in accordance with R 61-1, 4.8.5 if the AGFI is liable to be tilted, or is not fitted with a levelling device and a level indicator			
8.3.2	8, 12	**Material tests at initial verification:**			
		Conducted in compliance with R 61-2, 8 and 12			
		Conducted under the normal conditions and with the products for which the AGFI is intended			
8.3.3	8	**Performance of the tests:**			
		The metrological authority:			
		a) shall conduct the tests in a manner which prevents an unnecessary commitment of resources			
		b) may, where appropriate and to avoid duplicating test previously done on the AGFI for type evaluation under R 61, 8.2, use the results from type evaluation for initial verification			
8.3.4		**Determination of accuracy class X(*x*)**			
		For class X(x) AGFIs the metrological authority shall:			
		a) determine the accuracy class for the materials used in the tests in accordance with 8.2.4 by reference to the material test results (OIML R 61-2, 12) and the limits of error specified in 4.3.1 and 4.3.3 for initial verification			
		b) verify that accuracy classes marked in accordance with 5.12 are equal to or greater than the accuracy classes determined as above			

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