INTERNATIONAL RECOMMENDATION

OIML R 106-2

Edition 2012 (E)

Reconfirmed in 2024

Automatic rail-weighbridges

Part 2: Test report format

Ponts-bascules ferroviaires à fonctionnement automatique

Partie 2: Format du rapport d'essais

OIML R 106-2 Edition 2012 (E)

ORGANISATION INTERNATIONALE DE MÉTROLOGIE LÉGALE

INTERNATIONAL ORGANIZATION OF LEGAL METROLOGY

Reconfirmed 2024

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 106-2:2012 (E) – was developed by OIML Technical Subcommittee TC 9/SC 2 *Automatic weighing instruments*. It was approved for final publication by the International Committee of Legal Metrology at its 47th meeting in Bucharest, Romania, in October 2012. It was sanctioned by the 14th International Conference on Legal Metrology in 2012.

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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1 Introduction

This Test Report Format aims to present, in a standardized format, the results of the various tests and examinations to which a type of an automatic instrument for weighing rail-weighbridges shall be submitted with a view to its approval.

The Test Report Format consists of two parts, a “checklist” and the “test report” itself.

The checklist is a summary of the examinations carried out on the instrument. It includes the conclusions of the results of the test performed, experimental or visual checks based on the requirements of Part 1. The words or condensed sentences aim at reminding the examiner of the requirements in R 106-1 without reproducing them.

The test report is a record of the results of the tests carried out on the instrument. The test report forms have been produced based on the tests detailed in R 106-1.

All metrology services or laboratories evaluating types of automatic instruments for weighing rail wagons in motion (wagon mass) accordingly to R 106-1 or to national or regional regulations based on this OIML 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 Certificate System for Measuring Instruments*, 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 purpose of traceability). For example:

- verification standards (accuracy, or accuracy class, and no.);
- simulator for testing of modules (name, type, traceability and no.);
- climatic test and static temperature chamber (name, type and no.);
- electrical tests, bursts, surges (name of the instrument, type and no.);
- description of the procedure of field calibration for the test of immunity to radiated electromagnetic fields.

Note concerning the numbering of the following pages:

In addition to a sequential numbering: “R 106-2 page ...” at the bottom of the pages of this publication, a special place is left at the top of each page (starting on page 7) 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 complete the sequential numbering of each page by the indication of the total number of pages of the report.

2 Applicability of this Test Report Format

In this framework of the *OIML Basic Certificate Systems for Measuring Instruments*, and the OIML *Mutual Acceptance Arrangement* (MAA) applicable to instruments for weighing automatic rail-weighbridges in conformity with OIML R 106-1, use of this report format is mandatory, in French and/or in English with translation into national languages of the countries issuing such certificates, if applicable.

Implementation of this Test Report Format is informative with regard to the implementation of the OIML Recommendation R 106-1 in national regulations.

3 Guidance for the application of this Test Report Format

Key to the symbols and expressions used in the following pages:

Symbol	Meaning
I	Indication
I_n	n^{th} indication
L	Load
ΔL	Additional load to next changeover point
P	$I + 1/2\ d - \Delta L$ = Indication prior to rounding (digital indication)
E	$I - L$ or $P - L$ = Error
E_c	Corrected error
E_0	Error at zero load
d	Scale interval
d_s	Scale interval for stationary load
p_i	Fraction of the MPE applicable to a module of the instrument which is examined separately
MPE	Maximum permissible error
EUT	Equipment under test
Max	Maximum capacity of the weighing instrument
Min	Minimum capacity of the weighing instrument
U_{nom}	Nominal voltage value marked on the instrument
U_{max}	Highest value of a voltage range marked on the instrument
U_{min}	Lowest value of a voltage range marked on the instrument
v_{min}	Minimum operating speed
v_{max}	Maximum operating speed
e.m.f	Electromotive force
I/O	Input / output ports
RF	Radio frequency
V/m	Volts per metre
kV	Kilovolt
DC	Direct current
AC	Alternating current
MHz	Megahertz
nw_{min}	Minimum number of wagons per train
nw_{max}	Maximum number of wagons per train

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
when the instrument has passed the test:	X	
when the instrument has failed the test:		X
when the test is not applicable:	—	—

P = Passed
F = Failed

The white spaces in the 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 on which 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 R 106-1.

4 The evaluation report

The format of the report is given on the following pages.

A General information concerning the type

Application no.: _____ Manufacturer: _____

Type designation: _____ Applicant: _____

Instrument category: _____

Testing on: ☐ Full draught weighbridge ☐ Partial draught weighbridge ☐ Complete instrument ☐ Module[1]

Accuracy class: ☐ 0.2 ☐ 0.5 ☐ 1 ☐ 2

Maximum capacity = _____ Max wagon weight = _____ n_{max} = _____ v_{max} = _____

Minimum capacity = _____ Min wagon weight = _____ n_{min} = _____ v_{min} = _____

T = + _____ T = – _____ d = _____ d_s = _____

U_{nom} = _____ V U_{min} = _____ V U_{max} = _____ V f = _____ Hz Battery, U = _____ V

Zero-setting device:

☐ Non-automatic
☐ Semi-automatic
☐ Automatic zero-setting
☐ Initial zero-setting
☐ Zero-tracking

Tare device:

☐ Tare balancing
☐ Tare weighing

☐ Combined zero/tare device

Initial zero-setting range: _____ % of Max Temperature range: _____ °C

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

Instrument submitted: _____ Load sensor: _____

Identification no.: _____ Manufacturer: _____

Software version: _____ Type: _____

Connected equipment: _____ Capacity: _____

_____ Number: _____

Interfaces (number, nature): _____ Classification symbol: _____

_____ Remarks: _____

_____ _____

_____ _____

Evaluation period: _____ _____

Date of report: _____ _____

Observer: _____ _____

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

A General information concerning the type (continued)

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.

B 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.

Simulator documentation

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

Simulator function (summary)

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

B Identification of the instrument (continued)

Description or other information pertaining to identification of the instrument:
(*attach photograph here if available*)

C Information concerning the test equipment used for type evaluation

C.1 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:

C.2 Configuration for test

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

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

D Summary of type evaluation

Application no.: _____ Type designation: _____

Report date: _____ Manufacturer: _____

Section R 106-2	TESTS		Report page	Passed	Failed	Remarks
E	Zero-setting					
F	Warm-up time					
G.1	Static temperatures					
G.2	Temperature effect on no load indication					
G.3	Damp heat, steady state					
G.4	Mains or battery power supply variations					
H.1	AC mains short time power reduction					
H.2	Bursts/transients on:	Mains power supply lines				
		Signal and communication lines				
H.3	Surges on:	Mains power supply lines				
		Any other kind of power supply lines				
		Signal and communication lines				
H.4	Electrostatic discharges:	Direct application				
		Indirect application (contact discharges only)				
H.5	Immunity to electromagnetic fields:	Radiated				
		Conducted				
I	Span stability test					
J.1	Accuracy of zero-setting					
J.2	Determination of weighing performance					
J.2.1	Weighing test					
J.2.2	Eccentricity test					
J.2.3	Discrimination test					
J.2.4	Repeatability test					
J.2.5	Stability of equilibrium:	Printing, storage				
		Zero-setting				
K.1	Full draught weighing of reference wagons					
K.2	Partial draught weighing of reference wagons					
K.3	Rail alignment correction procedure					
L	In-motion weighing					
M	Examination of the construction					
N	Checklist					

D Summary of type evaluation (continued)

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

E Zero-setting (3.2.7, A.5.2)

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

$E = I + ½\ d - \Delta L$
$E = I - L$ or $P - L$ = Error

E.1 Range of zero-setting (A.5.2.1)

Zero-setting mode	Positive zero limit load, L_1	Negative zero limit load, L_2	Range, $L_1 + L_2$	% of maximum load

☐ Passed ☐ Failed

Remarks:

E.2 Accuracy of zero-setting (A.5.2.2)

Zero-setting mode	ΔL	$E = ½\ d - \Delta L$	MPE

☐ Passed ☐ Failed

Remarks:

F Warm-up time (4.3.4, A.6.1)

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

Duration of disconnection before test: _____ hours

Automatic zero-setting and zero-tracking device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation[2]

$E = I + ½\ d - \Delta L - L$
E_0 = error calculated prior to each measurement at zero or near zero (unloaded)
E_L = error calculated at load (loaded)

	Time*	Load, L	Indication, I	Add. load, ΔL	Error	$E_L - E_0$
Unloaded	0 min				E_{0I} =	
Loaded					E_L =	
Unloaded	5 min				E_0 =	
Loaded					E_L =	
Unloaded	15 min				E_0 =	
Loaded					E_L =	
Unloaded	30 min				E_0 =	
Loaded					E_L =	

* Counted from the moment an indication has first appeared.

		Error	MPE
Check if:	a)	Initial zero-setting error, E_{0I}	$\leq 0.25\ d$
	b)	Maximum value of error unloaded, E_0	$\leq 0.25\ d$
	c)	Maximum value of zero variation, $E_0 - E_{0I}$	$\leq 0.25\ d$
	d)	Maximum value of error loaded, $E_L - E_0$	$\leq 0.25\ d \times P_i$

☐ Passed ☐ Failed

Remarks:

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

G Influence factors

G.1 Static temperatures (2.7.1.1, A.7.2.1)

G.1.1 Reference temperature of 20 ºC

			At start	At end	
Application no.:		Temp.:			°C
Type designation:		Rel. h.:			%
Observer:		Date:			yyyy-mm-dd
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
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

Check if $E_c \leq$ MPE

☐ Passed ☐ Failed

Remarks:

G.1.2 Static temperatures (specified high = …… °C)

			At start	At end	
Application no.:		Temp.:			°C
Type designation:		Rel. h.:			%
Observer:		Date:			yyyy-mm-dd
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
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

Check if $E_c \leq$ MPE

☐ Passed ☐ Failed

Remarks:

G.1.3 Static temperatures (specified low = …….. °C)

			At start	At end	
Application no.:	_____	Temp.:			°C
Type designation:	_____	Rel. h.:			%
Observer:	_____	Date:			yyyy-mm-dd
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
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

Check if $E_c \leq$ MPE

☐ Passed ☐ Failed

Remarks:

G.1.4 Static temperatures (5 ºC if the specified low temperature is ≤ 0 ºC)

			At start	At end	
Application no.:		Temp.:			°C
Type designation:		Rel. h.:			%
Observer:		Date:			yyyy-mm-dd
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
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

Check if $E_c \leq$ MPE

☐ Passed ☐ Failed

Remarks:

G.1.5 Static temperatures (Reference temperature of 20 °C)

			At start	At end	
Application no.:		Temp.:			°C
Type designation:		Rel. h.:			%
Observer:		Date:			yyyy-mm-dd
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
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

Check if $E_c \leq$ MPE

☐ Passed ☐ Failed

Remarks:

G.2 Temperature effect on no-load indication (2.7.1.2, A.7.2.2)

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	Date	Time	Temp (°C)	Zero indication, *I*	Add. load, ΔL	*P*	ΔP	ΔTemp	Zero-change per 5 °C

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

Check if the zero-change per 5 °C is smaller than *d*

☐ Passed ☐ Failed

Remarks:

G.3 Damp heat, steady state (4.3.3, A.7.2.3)

G.3.1 Reference temperature of 20 °C and 50 % humidity

			At start	After 2 hours	At end	
Application no.:		Temp.:				°C
Type designation:		Rel. h.:				%
Observer:		Date:				yyyy-mm-dd
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		Corrected error, E_c		MPE
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

Check if $E_c \leq$ MPE

☐ Passed ☐ Failed

Remarks:

G.3.2 Upper limit temperature (..... °C) and 85 % humidity

			At start	After 2 hours	At end	
Application no.:		Temp.:				°C
Type designation:		Rel. h.:				%
Observer:		Date:				yyyy-mm-dd
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		Corrected error, E_c		MPE
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

Check if $E_c \leq$ MPE

☐ Passed ☐ Failed

Remarks:

G.3.3 Reference temperature of 20 °C and 50 % humidity

			At start	After 2 hours	At end	
Application no.:		Temp.:				°C
Type designation:		Rel. h.:				%
Observer:		Date:				yyyy-mm-dd
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		Corrected error, E_c		MPE
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

Check if $E_c \leq$ MPE

☐ Passed ☐ Failed

Remarks:

G.4 Mains or battery power supply voltage variations (2.7.2, A.7.2.4, A.7.2.5, A.7.2.6)

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

☐ AC mains power supply, A.7.2.4

☐ DC mains power supply, A.7.2.5

☐ Battery power supply (DC), A.7.2.6

Supply voltage[3]: U_{nom} = ☐ V U_{min} = ☐ V U_{max} = ☐ V

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

Category of power supply (if an instrument has more than one power supply: _____

Voltage	*U* (V)	Load, *L*	Indication, *I*	Add. load, ΔL	Error, *E*	Corrected error, E_c	MPE
Reference value							
Lower limit							
Upper limit							

☐ Passed ☐ Failed

Remarks:

[3] Calculate lower and upper limits of applied voltages according to 2.7.2.
If a voltage-range (U_{min} / U_{max}) is marked, use the average value as the reference value, U_{nom}

G.4 Mains or battery power supply voltage variations (continued)

Category of power supply (if an instrument has more than one power supply: _____

Voltage	*U* (V)	Load, *L*	Indication, *I*	Add. load, ΔL	Error, *E*	Corrected error, E_c	MPE
Reference value							
Lower limit							
Upper limit							

☐ Passed ☐ Failed

Remarks:

Category of power supply (if an instrument has more than one power supply: _____

Voltage	*U* (V)	Load, *L*	Indication, *I*	Add. load, ΔL	Error, *E*	Corrected error, E_c	MPE
Reference value							
Lower limit							
Upper limit							

☐ Passed ☐ Failed

Remarks:

H Disturbances (4.1.2, A.7.3)

H.1 AC mains voltage dips and short interruptions (A.7.3.1)

			At start	At end	
Application no.:		Temp.:			°C
Type designation:		Rel. h.:			%
Observer:		Date:			yyyy-mm-dd
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 range[4]: ____ V

Load, *L*: ____

Disturbance				Result		
Amplitude (% of 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	10				
0	1	10				
40	10	10				
70	25	10				
80	250	10				
0	250	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:

[4] If a voltage-range (U_{min} / U_{max}) is marked, use the average value as the reference value, U_{nom}

H.2 Bursts/transients on the mains power supply lines and on signal and communication lines (A.7.3.2)

H.2.1 Mains power supply lines

			At start	At end	
Application no.:		Temp.:			°C
Type designation:		Rel. h.:			%
Observer:		Date:			yyyy-mm-dd
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:

H.2.2 Signal and communication lines

			At start	At end	
Application no.:		Temp.:			°C
Type designation:		Rel. h.:			%
Observer:		Date:			yyyy-mm-dd
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 and communication lines: test voltage 1.0 kV, duration of the test > 1 minute at each polarity

Disturbance		Result		
Bursts 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			

H.2.2 Signal and communication lines (continued)

Use the space below to explain or make a sketch indicating where the clamp is located on the cable.

☐ 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:

H.3 Surges on mains power supply lines and on signal and communication lines (A.7.3.3)

H.3.1 Mains power supply lines[5]

			At start	At end	
Application no.:		Temp.:			°C
Type designation:		Rel. h.:			%
Observer:		Date:			yyyy-mm-dd
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*:

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

H.3.1 Mains power supply lines (continued)

Disturbance						Result		
3 positive and 3 negative surges synchronously with AC supply voltage						Indication	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:

H.3.2 Any other kind of power supply[6]

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

Kind or type of power supply: _____

DC ☐ Other form ☐ Voltage ☐ V

Automatic zero-setting and zero-tracking device is:

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

Load, *L*: ☐

Disturbance		Result		
3 positive and 3 negative surges		Indication, *I*	Significant fault (> *d*) or detection and reaction	
Amplitude / apply on	Polarity		No	Yes (remarks)
without disturbance				
1.0 kV line ↓ neutral	positive			
	negative			
without disturbance				
2.0 kV line ↓ protective earth	positive			
	negative			
without disturbance				
2.0 kV neutral ↓ protective earth	positive			
	negative			

Use another page for additional test setup information.

☐ 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:

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

H.3.3 Surges on signal and communication lines

			At start	At end	
Application no.:		Temp.:			°C
Type designation:		Rel. h.:			%
Observer:		Date:			yyyy-mm-dd
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	Indication, *I*	Significant fault (>1 *d*)	
				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:

H.4 Electrostatic discharges (A.7.3.4)

H.4.1 Direct application

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

☐ Contact discharges ☐ Paint penetration

☐ Air discharges Polarity[7]: ☐ Positive ☐ negative

Automatic zero-setting and zero-tracking device is:

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

Load, *L*:

Discharges			Result		
Test voltage[8] (kV)	Number of discharges ≥ 10	Repetition interval (s)	Indication, *I*	Significant fault (> *d*) or detection and reaction	
				No	Yes (remarks, test points)
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:

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

[8] 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

H.4.2 Indirect application (contact discharges only)

			At start	At end	
Application no.:		Temp.:			°C
Type designation:		Rel. h.:			%
Observer:		Date:			yyyy-mm-dd
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: ☐ 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:

H.4 Electrostatic discharges (A.7.3.4) (continued)

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

a) Direct application

Contact discharges:

Air discharges:

b) Indirect application

H.5 Immunity to electromagnetic fields (A.7.3.5)

H.5.1 Radiated electromagnetic fields (A.7.3.5.1)

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

Rate of sweep: Load: 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			

Test severity:
Frequency range: 80 MHz [(1)] to 2000 MHz
RF amplitude (50 ohms): 10 V/m
Modulation: 80 % AM, 1 kHz, sine wave

[(1)] Lower limit is 26 MHz if the test according to A.7.3.5.2 cannot be applied due to lack of mains or I/O ports.

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

☐ Passed ☐ Failed

Remarks:

H.5.2 Conducted electromagnetic fields (A.7.3.5.2)

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

Rate of sweep: Load: Material load:

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

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

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

☐ Passed ☐ Failed

Remarks:

H.5 Immunity to electromagnetic fields (A.7.3.5) (continued)

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

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

Radiated:

Conducted:

I Span stability (6.3.3, A.8)

Application no.: _____

Type designation: _____

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

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[9]
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 $\left|(E_L - E_0)_{max} - (E_L - E_0)_{min}\right| \leq 0.1\ d$, the loading and reading will be sufficient for each of the subsequent measurements.

Remarks:

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

I Span stability (6.3.3, A.8) (continued)

Subsequent measurements

For each of the subsequent measurements (at least 7), indicate in the "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[10]
1								
2								
3								
4								
5								

If five loadings and readings have been performed: Average error = average ($E_L - E_0$) ☐

Remarks:

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

I Span stability (6.3.3, A.8) (continued)

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

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

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[11]
1								
2								
3								
4								
5								

If five loadings and readings have been performed: Average error = average ($E_L - E_0$)

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

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

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[12]
1								
2								
3								
4								
5								

If five loadings and readings have been performed: Average error = average ($E_L - E_0$)

Remarks:

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

I Span stability (6.3.3, A.8) (continued)

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

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

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[13]
1								
2								
3								
4								
5								

If five loadings and readings have been performed: Average error = average ($E_L - E_0$)

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

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

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[14]
1								
2								
3								
4								
5								

If five loadings and readings have been performed: Average error = average ($E_L - E_0$)

Remarks:

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

I Span stability (6.3.3, A.8) (continued)

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

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

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[15]
1								
2								
3								
4								
5								

If five loadings and readings have been performed: Average error = average ($E_L - E_0$)

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

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

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[16]
1								
2								
3								
4								
5								

If five loadings and readings have been performed: Average error = average ($E_L - E_0$)

Remarks:

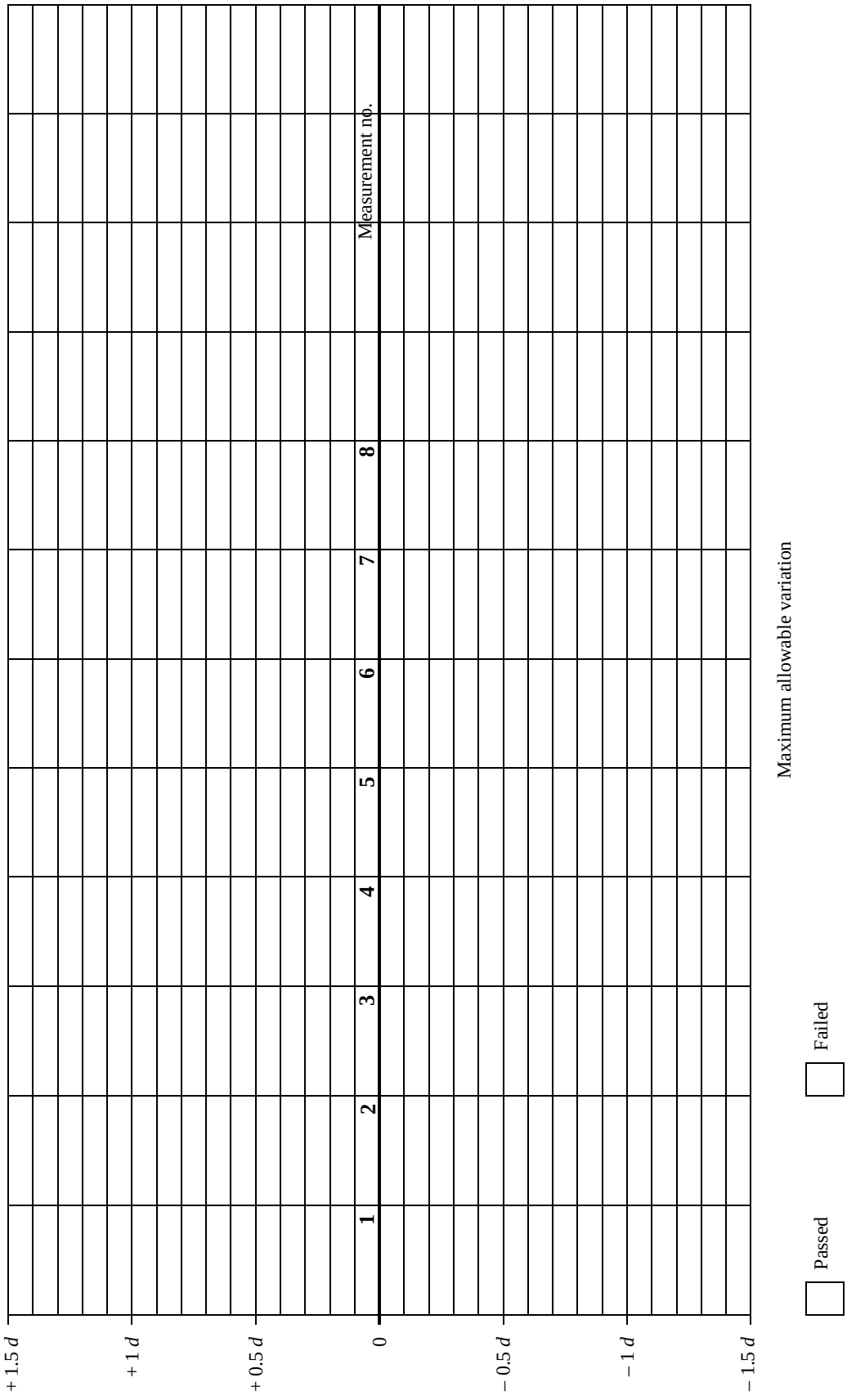
[15] When applicable, necessary corrections resulting from variations of temperature, pressure, etc. See remarks.
[16] When applicable, necessary corrections resulting from variations of temperature, pressure, etc. See remarks.

I Span stability (A.8)

Application 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**



J Static weighing tests for the control instrument (6.2.1, A.5.3)

J.1 Accuracy of zero-setting (6.2.1.1, A.5.3.1)

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

Zero-setting mode	ΔL	$E = ½\ d - \Delta L$	MPE

☐ Passed ☐ Failed

Remarks:

J.2 Determination of weighing performance (6.2.1, A.5.3.2)

J.2.1 Weighing test (A.5.3.2.1, A.9.3.1)

(Calculation of the error)

			At start	At end	
Application no.:		Temp.:			°C
Type designation:		Rel. h.:			%
Observer:		Date:			yyyy-mm-dd
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

Initial zero-setting > 20 % of Max: ☐ Yes ☐ No

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

Load, *L*	Indication, *I*		Add. load, ΔL		Error, *E*		Corrected error, E_c		MPE
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

☐ Passed ☐ Failed

Remarks:

J.2.2 Eccentricity tests (6.2.1.2, A.5.3.2.2)

Note: If operating conditions are such that no eccentricity can occur, eccentricity tests need not be performed.

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

Load ($^1/n$ of Max):

Location of test loads for each section of the load receptor: mark on a sketch (see example below) the successive locations of test loads, using letters which shall be repeated in the table below).

a	b	c

Also indicate on the sketch the location of the display or another perceptible part of the instrument.

Automatic zero-setting and zero-tracking device is:

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

$E = I + ½\ d - \Delta L - L$
$E_c = E - E_0$ with E_0 = error calculated prior to each measurement at or near zero (*)

Section	Load, *L*	Location	Indication, *I*	Add. load, ΔL	Error	Corrected error, E_c	MPE
	(*)				(*)		
	(*)				(*)		
	(*)				(*)		
	(*)				(*)		

☐ Passed ☐ Failed

Remarks:

J.2.3 Discrimination test (6.2.1.3, A.5.3.2.3)

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

Load, L	Indication, I_1	Remove load, ΔL	Add. 1/10 *d*	Extra load = 1.4 *d*	Indication, I_2	$I_2 - I_1$

☐ Passed ☐ Failed

Remarks:

J.2.4 Repeatability test (6.2.1.4, A.5.3.2.4)

			At start	At end	
Application no.:		Temp.:			°C
Type designation:		Rel. h.:			%
Observer:		Date:			yyyy-mm-dd
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

Load (weighing 1-6) ☐ Load (weighing 7-12) ☐

$E = I + \frac{1}{2} d - \Delta L - L$

No.	Indication of load, *I*	Add. load, ΔL	Error, *E*
1			
2			
3			
4			
5			
6			

No.	Indication of load, *I*	Add. load, ΔL	Error, *E*
7			
8			
9			
10			
11			
12			

$E_{max} - E_{min}$ (weighing 1-6) ☐ $E_{max} - E_{min}$ (weighing 7-12) ☐

mpe ☐ mpe ☐

Check if: a) $E \leq$ mpe (2.9)

b) $E_{max} - E_{min} \leq$ absolute value of mpe (3.2.7)

☐ Passed ☐ Failed

Remarks:

J.2.5 Stability of equilibrium (3.3.5.3, A.6.5)

			At start	At end	
Application no.:		Temp.:			°C
Type designation:		Rel. h.:			%
Observer:		Date:			yyyy-mm-dd
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 the case of printing or data storage

No.	Load (about 50 % of Max)	First printed or stored weight value after disturbance and command	Reading during 5 s after print-out or storage	
			minimum value	maximum value
1				
2				
3				
4				
5				

Check if the first printed or stored weight value does not deviate more than 1 *d* from the readings during 5 seconds after print-out or storage, only two adjacent values allowed

☐ Passed ☐ Failed

$E_0 = I_0 + ½\ d - \Delta L - L_0$

In the case of zero-setting

Zero-setting					
No. (*)	Zero-load (< 4 % of Max)	Load, L_0 (**) (10 *d*)	Indication, I_0 after zero-setting	Add. load, ΔL	Error, E_0
1					
2					
3					
4					
5					

(*) Apply the zero load, disturb the equilibrium and immediately release zero-setting, apply L_0 if necessary and calculate the error according to A.5.2.2 of R 106-1. Perform this five times.

(**) L_0 shall be applied only if an automatic zero-setting is in operation. L_0 shall be applied after releasing zero-setting, immediately after zero is displayed the first time.

☐ Passed ☐ Failed

Remarks:

K Weighing (6.1.1, 6.2.1, A.9.3.1)

K.1 Full draught weighing of static reference wagons (A.9.3.1)

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

Control instrument is: ☐ Integral ☐ Separate

K.1.1 Uncoupled static wagon weighing (A.9.3.1.1)

Uncoupled wagon static weighing:

No.	Reference wagon identification	Total wagon mass	Remarks (*)
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			

(*) Include a description of the design of the wagons (number of axles / bogies / axles in a bogie; open or closed wagon).

Remarks:

K.1.2 Static wagon weighing - partially loaded (A.9.3.1.1)

Static wagon weighing (partially loaded):

No.	Reference wagon identification	Total wagon mass	Remarks (*)
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			
Mean			
Error			
MPE			

(*) Include a description of the design of the wagons (number of axles / bogies /axles in a bogie; open or closed wagon).

Remarks:

K.2 Partial weighing of reference wagons using separate or integral control instrument (A.9.3.1.2)

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

Control instrument is:

☐ Integral ☐ Partial axle weighing

☐ Separate ☐ Partial bogie weighing

K.2.1 Empty reference wagons

Partial-draught static weighing (empty):

No.	Reference wagon ID	Partial draught weighing				Total mass ( )	Corrected total (**) ( )	Remarks (*)
		1st mass	2nd mass	3rd mass	4th mass			
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								

(*) Include a description of the design of the wagons (number of axles / bogies /axles in a bogie; open or closed wagon).
(**) If applicable, Total to be corrected with the rail alignment correction procedure in R 106-1, Annex B.
Corrected total = Total mass – rail alignment correction.

Consideration shall be given to the results of the eccentricity test by placing and weighing the bogies on the same three positions. The differences between the results of the three bogie weighings (also middle compared to both front and rear) for determining the mass of the reference wagon may not exceed one sixth of the applicable error for the wagon weight. The result of the three bogie weighing test shall be correspondingly corrected with the eccentricity errors.

K.2.2 Loaded reference wagons

Partial draught static weighing (loaded):

No	Reference wagon ID	Partial draught weighing				Total mass ( )	Corrected total (**) ( )	Remarks (*)
		1st mass	2nd mass	3rd mass	4th mass			
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								

(*) Include a description of the design of the wagons (number of axles / bogies /axles in a bogie; open or closed wagon).

(**) If applicable, Total to be corrected with the rail alignment correction procedure in R 106-1, Annex B.

Corrected total = Total mass – rail alignment correction)

Consideration shall be given to the results of the eccentricity test by placing and weighing the bogies on the same three positions. The differences between the results of the three bogie weighings (also middle compared to both front and rear) for determining the mass of the reference wagon may not exceed one sixth of the applicable error for the wagon weight. The result of the three bogie weighing test shall be correspondingly corrected with the eccentricity errors.

K.3 Rail alignment correction (A.9.3.1.3, Annex B)

		At start	At end	
Application no.:		Temp.:		°C
Type designation:		Rel. h.:		%
Observer:		Date:		yyyy-mm-dd
		Time:		hh:mm:ss

Accuracy class: _____

Maximum capacity, a: _____

Typical wagon tare weight, b: _____

Standard weights required, c: _____

(a – 1.5 × b, rounded down): _____

Scale interval: _____

Scale interval for stationary load, d_s: _____

	Position on load receptor	Indicated mass (t)	
		Empty wagon ( )	Loaded wagon ( )
First axle	Leading end Middle Trailing end		
Second axle	Leading end Middle Trailing end		
Total of six weighings		x =	y =
Divide total by three			
Derived mass of standard weight		z = y – x =	
Alignment correction		c – z =	

Note: Please see the example given in R 106-1:2011, Annex B.

Remarks:

L In-motion weighing tests (uncoupled, coupled or train) (6.2.2, A.9.3.2)

Application no.: _____

Type designation: _____

Observer: _____

Scale interval, *d*: _____

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

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

L.1 Summary of test data

Modes of operation tested (6.3)	
Uncoupled	
Coupled	
Train	
Direction of coupled wagons (single or dual)	

Operating speed[17] (2.10, A.6.3, A.9.4)	
Maximum operating speed, v_{max}	
Minimum operating speed, v_{min}	
Site operating speed (Site)	

Coupled wagon and train weighing (6.3)	
Maximum number of wagons per train, n_{max}	
Minimum number of wagons per train, n_{min}	
Total number of wagons coupled	
Number of reference wagons coupled, n_{ref}	
Train weight	

	Test run 1 Test speed			Test run 2 Test speed			Test run 3 Test speed			Test run 4 Test speed			Test run 5 Test speed		
	v_{max}	v_{min}	site	v_{max}	v_{min}	site	v_{max}	v_{min}	site	v_{max}	v_{min}	site	v_{max}	v_{min}	site
Percentage of reference wagons within MPE															
Percentage of reference wagons within twice MPE															
Sum of masses of reference wagons in train															
Sum of masses from weighbridge															
Train weight															
Pushed or pulled															
Direction (forward or backward)															

[17] The operating speed should not differ from those
a) stated in the *General information concerning the type*,
b) on the descriptive marking shown in code.

L.2 Uncoupled wagon in-motion weighing (6.2.2.2, A.9.3.2.2)

Test speed near v_{max}: ____ km/h

No.	Reference wagon identification	Reference wagon mass -static ( )	Test run 1 ( )		Test run 2 ( )		Test run 3 ( )		Test run 4 ( )		Test run 5 ( )		Remarks
			Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
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30													

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L.2.1 Uncoupled wagon in-motion weighing (continued)

Test speed near typical site speed: _____ km/h

No.	Reference wagon identification	Reference wagon mass -static ( )	Test run 1 ( )		Test run 2 ( )		Test run 3 ( )		Test run 4 ( )		Test run 5 ( )		Remarks
			Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
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L.2.3 Uncoupled wagon in-motion weighing (continued)

Test speed near v_{min}: _____ km/h

No.	Reference wagon identification	Reference wagon mass -static ( )	Test run 1 ( )		Test run 2 ( )		Test run 3 ( )		Test run 4 ( )		Test run 5 ( )		Remarks
			Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
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L.3 Coupled wagon or train in-motion weighing (6.2.2.3, A.9.3.3)

Test speed near v_{max}: ____ km/h

No.	Reference wagon identification	Reference wagon mass -static ( )	Test run 1 ( )		Test run 2 ( )		Test run 3 ( )		Test run 4 ( )		Test run 5 ( )		Remarks
			Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
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L.3.1 Coupled wagon or train in-motion weighing (continued)

Test speed near typical site speed: _____ km/h

No.	Reference wagon identification	Reference wagon mass -static ( )	Test run 1 ( )		Test run 2 ( )		Test run 3 ( )		Test run 4 ( )		Test run 5 ( )		Remarks
			Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
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L.3.2 Coupled wagon or train weighing (continued)

Test speed near v_{min}: _____ km/h

No.	Reference wagon identification	Reference wagon mass -static ( )	Test run 1 ( )		Test run 2 ( )		Test run 3 ( )		Test run 4 ( )		Test run 5 ( )		Remarks
			Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
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L.3 Coupled wagon or train weighing (continuation report page)

Continuation of report page ……..

No.	Reference wagon identification	Reference wagon mass -static ( )	Test run 1 ( )		Test run 2 ( )		Test run 3 ( )		Test run 4 ( )		Test run 5 ( )		Remarks
			Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
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M Examination of the construction of the instrument

Use this page to indicate any description or information pertaining to the instrument, additional to that already contained in this report and in the accompanying national type approval or OIML certificate. This may include a picture of the complete instrument, a description of its main components, and any remark which could be useful for authorities responsible for the initial or subsequent verifications of individual instruments built according to the type. It may also include references to the manufacturer description.

Description:

Remarks:

N Checklist

The checklist has been developed based on the following principles:

To include requirements that cannot be tested according to tests 1 through 6 above, but shall be checked experimentally or visually, e.g. the descriptive markings (3.11);

To include requirements which indicate prohibitions of some functions, e.g. semi-automatic zero-setting devices shall not be operable during automatic operation (3.2.7.3);

Not to include general requirements, e.g. suitability for use (3.1);

This checklist is intended to serve as a summary of the results of examinations to be performed and not as a procedure. The items on this checklist are provided to recall the requirements specified in R 106-1 and they shall not be considered as a substitution for these requirements.

The requirements that are not included in this type evaluation report (tests E through J and checklist N) are considered to be globally covered by the type approval or OIML certificate (e.g. classification criteria [2.1], suitability for use [3.1]).

For non-mandatory devices, the checklist provides space to indicate whether or not the device exists and, if appropriate, its type. A cross in the box for “present” indicates that the device exists and that it complies with the definition given in the terminology; when indicating that a device is non-existent, also check the boxes to indicate that the tests are not applicable (see A. General information concerning the type).

If appropriate, the results stated in this checklist may be supplemented by remarks given on additional pages.

N Checklist (continued)

Application no.: _____ Type designation: _____

Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
2	**A.2**	**METROLOGICAL REQUIREMENTS**			
2.3		**Scale interval, *d*,** for all mass indicating and printing devices on an instrument is:			
		The same for a particular method of weighing-in-motion and combination of load receptors			
		In the form of 1×10^k, 2×10^k, or 5×10^k, "*k*" being a positive or negative whole number or zero			
2.4		**Scale interval for stationary load, d_s,** is:			
		Automatically put out of service if not equal to the scale interval, *d*, during weighing-in-motion			
		Not readily accessible, and			
		Only used for static testing if the instrument is not verified for use as a non-automatic weighing instrument			
2.5		**Minimum capacity:** Is not less than 1 t and not greater than the value of the result of the minimum wagon mass divided by the number of partial weighings			
2.6		**Minimum wagon mass:** Is not less than 50 *d*			
2.7.1		**Static temperature:**			
		▪ stated in descriptive markings; or			
		▪ –10 °C to +40 °C			
2.7.2		**Supply voltage:**			
		▪ AC power supply			
		▪ DC power supply			
		▪ Battery power (DC) voltage			
2.8		**Units of measurement on the instrument:**			
		kilogram (kg) and tonne (t).			
2.9		**Multiple indicating/recording devices**			
		Error of any single weighing result by itself does not exceed the mpe for the given load			
		For any given load the difference between the indications of multiple indicating devices, including tare weighing devices, shall be not greater than the absolute value of the maximum permissible error, but shall be zero between digital displaying and printing devices			
2.10		**Operating speed**			
		Determined by the instrument as the average speed of the railway vehicle as it moves over the load receptor			
		The weigh-in motion indication shall include either the speed in km/h at which the entire railway vehicle was weighed in motion or a notification of speed fault detection			
3	**A.1**	**TECHNICAL REQUIREMENTS**			
3.2		**Security of operation:**			
3.2.1		**Fraudulent use:** Instrument has no characteristics likely to facilitate its fraudulent use			
3.2.2		**Accidental maladjustment:** Effect of accidental breakdown or maladjustment is evident			
3.2.3	**A.6.4**	**Interlocks:** Prevent the indication and recording of the mass of any wagon that has travelled over the load receptor outside specified working conditions for:			
		minimum operating voltage (2.7.2)			

Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
		wagon recognition (3.6)			
		wheel position on the load receptor (3.6)			
	A.6.3	range of operating speeds (2.10)			
		wagon weighment detection			
3.2.4		**Uncoupled wagon weighing**			
		Instruments for uncoupled wagon weighing recognize and indicate the passage of:			
		a) a coupled wagon			
		b) two or more uncoupled wagons so close as to cause either malfunction or errors exceeding the MPE			
		c) whether or not weighing has occurred			
3.2.5		**Automatic operation:**			
		Instrument is designed for accurate operation in accordance with R 106-1 for a specified period durably in accordance with the intended use of the instrument			
		Any malfunction is automatically and clearly indicated (e.g. fault indication or automatic switch off)			
	A.1.1	Uncertainties of measurement, significant faults, overload situation, high speed and failure of the instrument are accounted for. Documentation submitted by the manufacturer includes a description of how this requirement is met			
3.2.6	**A.5.3**	**Use for non-automatic weighing operations (Static weighing for integral control instrument):**			
		The automatic rail-weighbridge is to be used as:			
		An AWl and as a NAWI complies with R 106 and with R 76, and if used as a control instrument its error and uncertainty is less than one-third (if verified immediately before the in-motion tests) or less than one-fifth (if verified at any other time) of the mpe for weighing in motion in 2.2.1			
		An integral control instrument complies with R 106 and its error and uncertainty in static weighing is less than one-third (if verified immediately before the in-motion tests) or less than one-fifth (if verified at any other time) of the mpe for weighing in motion in 2.2.1			
3.2.7	**A.5.2**	**Zero-setting and zero-tracking device:**			
		▪ initial zero-setting			
		▪ automatic zero-setting or zero tracking			
		▪ semi-automatic zero-setting			
		▪ non-automatic zero-setting			
		▪ zero-tracking			
		A semi-automatic zero-setting device shall not be operable during automatic operation			
3.2.7.1	**A.5.2.2**	**Accuracy of zero-setting**: Is not more than ±0.25 *d*			
3.2.7.2		**Maximum effect:**			
		Effect of zero-setting shall not alter the maximum weighing capacity of the instrument			
		Zero-setting range = _____ %			
		Initial zero-setting range = _____ %			
3.2.7.3	**A.6.5**	**Control of the zero-setting devices**			
		Any combined semi-automatic zero-setting and semi-automatic tare-balancing device is operated by the same key			
		For an instrument with a zero-setting device and a tare-weighing device the control of the zero-setting device shall be separate from that of the tare-weighing device			

Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
3.2.7.3	**A.5.2.2.2**	**Control of the zero-setting devices**			
	A.6.5	A semi-automatic zero-setting device shall function only: a) when the instrument is in stable equilibrium b) if it cancels any previous tare operation			
		A non-automatic or semi-automatic zero-setting device shall not be operable during automatic operation			
3.2.7.4		**Stability of automatic zero-setting:**			
		▪ when operating as part of every weighing cycle, it is not possible to disable or set at time intervals			
		▪ description of the operation of the automatic zero-setting device is specified by manufacturer			
3.2.7.5		**Zero-tracking device operates only when:**			
		▪ the indication is at zero			
		▪ in stable equilibrium as specified in 3.3.5.3			
		▪ the corrections are not more than 0.5 *d*/second			
		Zero-tracking may operate within a range of 4 % of Max around the actual zero indication after a tare operation			
3.3	**A.1.3**	**Indication of weighing results**			
3.3.1		**Quality of indication:**			
		Reading of the primary indications:			
		▪ is reliable, easy and unambiguous under conditions of normal use			
		▪ overall inaccuracy ≤ 0.2 *d* for analog indication			
		▪ size, shape and clarity for easy reading			
		▪ reading by simple juxtaposition			
3.3.2		**Printing device:**			
		Printing is clear and permanent for the intended use			
		Printed figures at least 2 mm high			
		Name or the symbol of the unit of measurement is either to the right or above a column of values, or placed according to national regulation			
3.3.3		**Indications for weighing-in-motion operation:**			
		Minimum information from each weighing operation is dependent upon the application of the instrument			
		Includes the date, time, operating speed and the instrument identification			
		In the case of wagon weighing each wagon mass			
		In the case of train weighing each train mass and the number of wagons in the train			
		The printout and/or data storage indicating at least:			
		The date, time, operating speeds, errors, the instrument identification, each wagon mass, for train weighing the train mass and number of wagons in the train			
		The train mass printout is equal to the mass of the train combination including all wagon mass and excluding the locomotive. If the train includes wagons where no mass was recorded, the total printout must indicate the number of and the wagons missed from the total train mass			
		Scale interval of indications for wagon mass or train mass shall be scale interval, *d*, in accordance with 2.3			
		Scale interval of indications for mass values may be to a higher resolution than the scale interval, *d*			
		Weighing results shall bear the name or symbol of the appropriate unit of mass in accordance with 2.8			
		Any additional information from the weighing-in-motion operation, i.e. the maximum allowable weighing speed			

Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
3.3.4		**Digital indication:**			
		Displays a zero for all places displayed to the right of a decimal point and at least one place to the left			
		When no decimal values are displayed, a zero is displayed for each place of the displayed division (i.e. at least one active decade plus any fixed zeros must be displayed)			
		Decimal fraction is separated from its integer by a decimal sign, with the indication showing at least one figure to the left of the sign and all figures to the right			
		Decimal sign shall be on one line with the bottom of the figures			
3.3.5		**Limits of indication of weighing results:**			
3.3.5.1		**Weighing range:**			
		Instruments shall not indicate, record or print the following unless the value is clearly marked with an error code or message: ▪ the mass of any locomotive, ▪ the mass of any wagon that has not been weighed, or ▪ the mass of any wagon that will cause a weighing result less than Min or greater than Max + 9 *d*, ▪ the mass of any wagon where the instrument has detected a speed fault condition. These values may be separated from the other weighing values			
3.3.5.2		**Roll back:**			
		No alteration of indicated values of wagon mass due to any part of any wagon travelling over the load receptor more than once, unless the wagon is been reweighed			
3.3.5.3		**Stable equilibrium**:			
		a) the condition of the instrument is such that the indicated mass of each separate weighing test does not deviate more than 1 d_s from the final weight value (T.3.9), and			
		b) in the case of zero operations a correct operation of the device according to 3.2.7 and A.6.5 within relevant accuracy requirements is achieved			
3.4		**Totalizing device:**	Present [ ]	Not present [ ]	
		a) automatic			
		b) semi-automatic			
3.5		**Data storage device:**			
		The measuring instrument shall record by a durable means the measurement result accompanied by information to identify the particular transaction. And a durable proof of the measurement result and the information to identify the transaction shall be available on request at the time the measurement is concluded			
		▪ in the memory of the instrument (hard drive),	Present [ ]	Not present [ ]	
		▪ removable external storage	Present [ ]	Not present [ ]	
		Stored data is adequately protected against intentional and unintentional changes during the transfer and storage process			
		Stored data contains all relevant information necessary to reconstruct an earlier measurement			
		Securing of data storage:			
		The requirements for security of software given in 3.8 are applied as appropriate			
		If software realizing the data storage can be transmitted to or downloaded into the instrument these processes shall be secured in accordance with 3.9			
		External storage devices, identification and security attributes shall be automatically verified to ensure integrity and authenticity			

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		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			
		When storage capacity is exhausted, new data may replace the oldest data provided that the owner of the old data has authorized the data replacement			
3.6		**Wagon recognition device:**			
		a) detects the presence of a wagon in the weigh zone and detects when the whole wagon has been weighed			
		b) generates an error message or prevents the indication or recording of the wagon mass if it travels in the wrong direction if only one direction of travel is specified for an instrument			
3.7		**Installation**			
3.7.1		**General**			
		The weighbridge is installed so as to minimize any adverse effects of the installation environment. The space between the load receptor and ground shall allow all covered parts of the load receptor to be kept free from all debris or other matter that could affect the accuracy of the instrument. Details of installation (e.g. site levels, length of aprons) which may affect the weighing operation, and the following effects on the weighing results should be taken into account: ▪ lateral forces due to interactions of the control instrument with the railway vehicle ▪ forces on part of the railway vehicle by different transient behavior and friction within the axle suspensions ▪ forces on part of the aprons if there are different levels between the control instrument and ramp that could lead to varying distribution of the axle load			
		a) automatic rail-weighbridges manufactured and installed to minimize any adverse effects of the installation environment			
		b) the space between the load receptor and ground shall allow all covered parts of the load receptor to be kept free from all debris or other matter that could affect the accuracy of the instrument			
3.7.2		**Composition:**			
		Instruments comprise any of the following:			
		a) one or more load receptors			
		b) aprons			
		c) vehicle-type identification devices			
		d) indicating, recording or printing device			
		e) data processing module			
3.7.3		**Ease of static testing:** Accessible to vehicles moving test weight if used as a control instrument			
3.7.4		**Drainage** If the weighing mechanism is contained in a pit, there shall be a provision for drainage to ensure that no portion of the instrument becomes submerged or partially submerged in water or any other liquid			
3.8		**Software requirements:**			
		Legally relevant software of the instrument is identified by the manufacturer			
3.8.1	**A.1.1**	**Software documentation:**			
		a) description of the legally relevant software			
		b) description of the accuracy of the measuring algorithms			

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		c) description of the user interface, menus and dialogues			
		d) the unambiguous software identification			
		e) description of the embedded software			
		f) overview of the system hardware, e.g. block diagram, type of computer(s), software source code, etc., if not described in the operating manual			
		g) means of securing software			
		h) operating manual			
3.8.2		**Means of securing**			
		a) legally relevant software shall be adequately protected against accidental or intentional changes			
		b) the software shall be assigned with appropriate software identification. This software identification shall be adapted in the case of every software change that may affect the functions and accuracy of the instrument			
		c) functions performed or initiated via connected interfaces, i.e. transmission of legally relevant software, shall comply with the securing requirements for interfaces of 4.3.5			
3.9	**A.2.4**	**Means of securing**			
3.9.1		There shall be adequate security and tests conducted to ensure that:			
		a) fitted with a securing means, or			
		b) enclosed			
		c) if enclosed, the enclosure is sealed			
		d) transmission of legally relevant software and device-specific parameters via interfaces shall be secured against intentional, unintentional and accidental changes in accordance with requirements of 4.3.5.2			
		e) the securing possibilities available in an instrument shall be such that separate securing of the settings is possible			
		f) stored data shall be secured against intentional, unintentional and accidental changes in accordance with the data storage requirements of 3.5			
		g) securing provided on all parts of the measuring system which cannot be materially protected in any other way against operations liable to affect the measurement accuracy			
3.9.2		**Means of securing:**			
		a) hardware and/or software means of security to restrict access to authorized persons only			
		b) records of interventions including the date and a means of identifying the authorized person making the intervention (see a) above):			
		▪ can be memorized, accessed and displayed			
		▪ traceability of the interventions is assured for at least the period of time in between periodical verifications depending on national legislation			
		c) software functions are secured against intentional, unintentional and accidental changes in accordance with 3.8			
		d) transmission of legally relevant data via interfaces secured against intentional, unintentional and accidental changes in accordance with 4.3.5.2			
		e) securing possibilities available in an instrument shall be such that separate securing of the settings is possible			
		f) stored data shall be secured against intentional, unintentional and accidental changes in accordance with 3.5			
3.10		**Span adjustment:**			
		a) automatic or a semi-automatic span adjustment device incorporated inside the instrument			

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		b) external influence upon this device shall be practically impossible after securing			
3.11	**A.2.3**	**Descriptive markings:**			
3.11.1		**Markings shown in full:**			
		▪ identification mark and / or name of the manufacturer			
		▪ identification mark and / or name of the importer (if applicable)			
		▪ designation of the instrument			
		▪ serial number of the instrument and modules			
		▪ maximum wagon mass .....kg or t			
		▪ minimum wagon mass ..... kg or t			
		▪ can be used to weigh wagons carrying liquids or other products that may be subjected to fluctuations in its gravity center with wagon movement (if applicable)			
		▪ number of partial-draught weighings per wagon (if applicable)			
		▪ maximum operating speed .....km/h (if applicable)			
		▪ direction of weighing (if applicable)			
		▪ wagons pushed/pulled (whichever is applicable)			
		▪ supply voltage..... V			
		▪ mains frequency (if applicable) ..... Hz			
		▪ temperature range (when not –10 °C to 40 °C)			
		▪ software identification, (compulsory for software controlled instruments)			
3.11.2.1		**Markings shown in code:**			
		▪ type approval sign in accordance with national requirements			
		▪ accuracy class wagon mass (each weighing method, if applicable) 0.2, 0.5, 1 or 2			
		▪ maximum capacity; Max = ... kg or t			
		▪ minimum capacity; Min = ... kg or t			
		▪ scale interval; d = ... kg or t			
		▪ scale interval for stationary load, d_s (if applicable) …...kg or t			
		▪ maximum operating speed; v_{max} = ... km/h			
		▪ minimum operating speed; v_{min} = ... km/h			
3.11.2.2		**For train weighing:**			
		▪ maximum number of wagons per train; nw_{max} =.....			
		▪ minimum number of wagons per train; nw_{min} =.....			
3.11.3		**Supplementary markings:**			
		As required: (please list)			
3.11.4		**Presentation of descriptive markings:**			
		▪ indelible			
		▪ may be either in the national language or in form of adequate, internationally agreed and published pictograms or signs			
		▪ size, shape and clarity that allows easy reading			
		▪ grouped together in a clearly visible place			
		▪ plate bearing markings to be sealed, unless it cannot be removed without being destroyed			
		The descriptive markings may be shown on a display which is controlled by software provided that:			

Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
		▪ at least Max, Min and *d* shall be displayed as long as the instrument is switched on			
		▪ the other marking may be shown on manual command			
		▪ it must be described in the type approval (OIML) certificate			
		▪ the markings are considered as device-specific parameters			
		When a display controlled by software is used, the plate of the instrument shall bear at least the following markings:			
		▪ Max, Min and *d* shown near the display			
		▪ type approval sign in accordance with national requirements			
		▪ name or identification mark of the manufacturer			
		▪ supply voltage			
		▪ AC mains frequency, (if applicable)			
3.12	**A.2.4**	**Verification marks**			
3.12.1		**Position:**			
		▪ cannot be removed without damaging the marks			
		▪ allows easy application of marks			
		▪ visible without the instrument having to be removed			
3.12.2		**Mounting:**			
		▪ verification mark support ensures conservation of the marks			
		▪ the type and method of sealing shall be determined by national prescription			
		TECHNICAL REQUIREMENTS			
4		**General requirements**			
4.3	**A.1.4**	**Functional requirements**			
4.3.1		**Acting upon a significant fault:**			
		By verifying the compliance with documents or by simulating faults check that:			
		▪ either the instrument is made inoperative automatically, or			
		▪ a visual or audible indication is provided automatically and continues until the user takes action or the fault disappears			
4.3.2		**Upon switch-on:** ▪ relevant signs of indicator are active and non-active for sufficient time to be checked by operator			
4.3.4		**Warm-up time:**			
		▪ no indication or transmission of weighing results			
		▪ automatic operation is inhibited			
4.3.5		**Interfaces:**			
		Instrument with interface(s) shall continue to function correctly and its metrological functions shall not be influenced			
4.3.5.1		**Interface documentation:**			
		The manufacturer shall provide documentation on all interfaces comprising of at least:			
		a) a list of all commands (e.g. menu items)			
		b) description of the software interface			
		c) a list of all commands together			
		d) a brief description of their meaning and their effect on the functions and data of the instrument			

Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
4.3.5.2		**Securing of interfaces:**			
		Interfaces shall not allow the legally relevant software and functions of the instrument and its measurement data to be inadmissibly influenced by other interconnected instruments, or by disturbances acting on the interface			
		Interfaces through which the functions mentioned above cannot be performed or initiated, need not be secured. Other interfaces shall be secured and tests conducted to ensure that:			
		a) data is protected (e.g. with a protective interface) against accidental or deliberate interference during the transfer			
		b) all functions in the software interface are subjected to the software securing requirements in 3.8			
		c) all functions in the hardware interface are subjected to the hardware securing requirements in 3.9			
		d) metrologically relevant parts of the target instrument are included in the initial verification (or equivalent conformity assessment procedures)			
		e) easily possible to verify the authenticity and integrity of data transmitted to and from the instrument			
		f) functions performed or initiated by other connected instruments through the interfaces meet the appropriate requirements of R 106			
		Other instruments required by national regulation to be connected to the interfaces of an instrument shall be secured to automatically inhibit the operation of the instrument for reasons of the non-presence or improper functioning of the required device			
4.3.6	**A.6.4**	**AC mains power supply:**			
		▪ maintains metrological information for 24 hours after voltage failure			
		▪ emergency switch-over does not cause significant fault			
4.3.7	**A.6.4**	**DC main or rechargeable power supply**			
		An instrument that operates from the DC mains supply, or rechargeable supply shall, whenever the voltage drops below the minimum operating voltage, either:			
		▪ continue to function correctly, or			
		▪ automatically be put out of service			
5.1.1	**A.1.1**	**Type approval documentation**			
		▪ metrological characteristics of the instrument			
		▪ a standard set of specifications for the instrument			
		▪ a functional description of the components and devices (4.3)			
		▪ drawings, diagrams and general software information (if applicable), explaining the construction and operation			
		▪ description and application of securing components, interlocks, adjustment devices, controls, fault indication function, etc. (3.2.3, 3.2.5, 3.9, 3.10)			
		▪ printing devices (3.3.2)			
		▪ data storage device (3.5)			
		▪ zero-setting devices (3.2.7)			
		▪ connection of different load receptors (2.3, 6.2.1.5)			
		▪ interfaces (types, intended use, immunity to external influences instructions (3.9, 4.3.5)			
		▪ for software controlled instruments general software information (3.8, 3.11.5)			
		▪ description of the stable equilibrium function of the instrument (3.3.5.3)			

Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
		▪ drawing or photo of the instrument showing the principle and the location of control marks, securing marks, descriptive and verification marks (3.11, 3.12)			
		▪ any document or other evidence demonstrating that the design and construction of the instrument complies with the requirements of (5.1.1)			
		▪ operating instructions, operating manual			
6.1		**Test standards**			
6.1.1		**Control instruments for reference wagon weighing:**			
		Full draught weighing on:			
		▪ integral control instrument, or	Present [ ]		Not-Present [ ]
		▪ separate control instrument	Present [ ]		Not-Present [ ]
		▪ control instrument for bogie partial weighing	Present [ ]		Not-Present [ ]
6.1.1.1		Accuracy of control instruments:			
		▪ combined error and uncertainty of integral control instrument for reference wagon weighing is less than one-third of the mpe in 2.2.1 applicable to the weighing-in-motion instrument under test			
		▪ combined error and uncertainty of the separate control instrument that is verified immediately prior to the weighing tests is less than one-third of the maximum permissible error for weighing-in-motion in 2.2.1			
		▪ combined error and uncertainty of separate control instrument for reference wagon weighing is less than one-fifth of the mpe for weighing-in-motion in 2.2.1			
		▪ for re-verification tests combined error and uncertainty of control instrument (separate and integral) following completion of reference wagon weighing shall be as specified for the appropriate control instrument			
		▪ takes into account the combined error and uncertainty obtained from a calibration recently before (and if appropriate, after) the verification, and under about the same environmental conditions			
6.1.1.2	**A.5.3**	**Integral control instrument:**			
		▪ have an appropriate scale interval or scale interval for stationary load (2.4), and			
		▪ comply with the requirements in 6.2.1, or			
		▪ a similar accuracy must be assured by a defined test procedure which is described in the type approval			
6.1.1.3		**Partial weighing of reference wagons:**			
		▪ it shall have a scale interval for stationary load (2.4)			
		▪ it shall comply with the requirements in 6.2.1, and			
		▪ the alignment correction test for single-axle weighing instruments in Annex B shall be successfully applied			
6.1.2		**Test weights used for type examination or verification:**			
		▪ meet the metrological requirements of OIML R 111			
		▪ combined error and uncertainty of test weights is less than one-fifth of the mpes in 2.2.2 of the instrument to be verified for the load			
		For testing control instruments for bogie partial weighing:			
		▪ a special test railway vehicle with known mass shall be used (e.g. a normal three-axle-bogie with a platform for the standard test weights)			
6.2		**Weighing methods**			
6.2.2		Devices for selection (or switching) between various load receptors, load-transmitting devices and load-measuring devices			

Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
6.2.2.1		Compensation of no-load effect			
		The selection device compensates for the unequal no-load effect of the various load receptors and/or load-transmitting devices in use			
6.2.2.2		Zero-setting			
		Zero setting of an instrument with any multiple combination of various load-measuring devices and various load receptors shall be possible without ambiguity and in accordance with the requirements of 3.2.7			
6.2.2.3		Weighing shall not be possible while selection devices are being used			
		Weighing shall not be possible while selection devices are being used			
6.2.2.4		Identification of the combinations used			
		Combinations of load receptors and load measuring devices used shall be readily identifiable. It shall be clearly visible which indication(s) correspond to which load receptor(s)			
6.2.3		**In-motion weighing:**			
		Reference wagons used for testing represent the range of wagons available in the appropriate Member State and for which the instrument is intended			
		Modes of operation:			
		Reference wagons shall be selected to cover, as far as practicable, each mode of operation for which the instrument is to be approved including:			
		▪ loaded or empty wagons			
		▪ pushing or pulling			
		▪ range of operating speed (Min, Max and Site), and			
		▪ one or both directions			
		Wagons carrying liquid loads or other products that may be subjected to fluctuations in their gravity center when the wagon moves, shall be used as reference wagons only if the automatic rail-weighbridge will be applied subsequently for determining the mass of such wagons			
6.2.2.3		Coupled wagon or train in-motion weighing:			
		The test train shall comprise a number of wagons equal to the minimum number of wagons in accordance with Table 6 that the automatic rail-weighbridge is intended to weigh in motion			